SERVICING-PROJECTS-VIDEO-DEVELOPMENTS

Extra: SEME-Panasonic Video Spares Chart



Dealing with Video Tape Chewing Repairing Remote Control Units More on the Panasonic NV333 The Sakura Satellite TV System Servicing the Salora G Chassis **VCR Clinic • TV Fault Finding**



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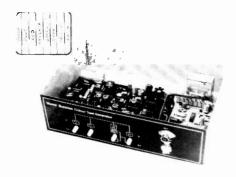


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8000, 8500, 8800, 9800 PANELS tested, exchange. £8.80, Frame. Decoder £10.00 p.p. £2.30. 9000 Series IF/Decoder tested £10.00, Line/Power £20.00, Frame £18.00 p.p. £2.80. 9500/9600 Line Scan £25.00, Power £20.00 p.p. £2.80. TX9 Panels complete & tested £28.00 exchange (shop only) TX9/TX10 Facia, control panel incl. intra-red receiver £5.00 p.p. £2.00 TX9/TX10 Saw filter IF panel £5.00 p.p. 80p. TX9/TX10 Saw filter IF panel £5.00 p.p. 80p. TX9/TX10 Remote & tuning control panel 1515 (incl. SAA5012) £7.50 p.p. £1.80. TX9/I0 Remote & tuning I508A (incl. SAA5012) £2.50 p.p. £1.80. TX9/I0 Remote & tuning I536 (incl. SAA5012, \$1.471) £3.50 p.p. £1.80. TX9/I0 Remote & tuning I536 (incl. SAA5012, \$1.471) £3.50 p.p. £1.80. TX9/10 Stereo Audio Board £3.50 p.p. £1.80. TX90 20" Chassis. Brand new £25.00 p.p. £2.80. TX10/TX90/TX100 Chassis complete & boxed (untested) £20.00 p.p. £2.80.

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LINE OUTPUT	TRANSFORMERS
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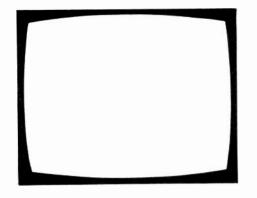
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September 1989

Vol. 39, No. 11 Issue 467

On sale August 16th

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INDEXES

Indexes to Vols. 36 and 37 are available at 80p each from the Editorial Office (address above).

SUBSCRIPTIONS

An annual subscription costs £20 in the UK, £24 overseas (by surface mail). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

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We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in Television, but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. Correspondents should enclose a stamped addressed envelope. Requests for advice on dealing with servicing problems should be directed to our Queries Service. For details see our regular feature "Service Bureau". Send to address above the given "correspondence").

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Repairing Remote Control Units 826

Nick Beer

You can make a reasonable return and build customer goodwill be repairing and renovating remote control units. A guide to the various types and the faults to expect with them.

You Won't Believe it . . . 831

Les Lawry-Johns

Les, HB and the menagerie have moved to the bungalow, where a strange welcome awaited.

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Servicing Salora Colour Receivers, Part 2 Nick Beer and Ian Bowden A start on the G and H chassis which were the first to use the Ipsalo circuit. The initial version of this is described in detail.

An Inexpensive Orthomode Transducer Paul Matthews 841 Orthomode transducers are used to split an incoming microwave signal and tend to be rather expensive. You

can get round this with a bit of plumbing. Roger Bunney 842 Long-distance Television

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Tackling Unknown Small-screen Sets Malcolm Burrell 845 Common fault patterns in small-screen sets and how to find your way around them.

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UPC-1018 170p UPC-1020 200p UPC-1023 60p UPC-1025 230p UPC-1026 95p	2SA-1170 500p 2SA-1186 500p 2SA-1198 70p 2SA-1206 100p	2SC-1393 80p 2SC-1398 70p 2SC-1403 500p 2SC-1407 550p	2SC-2360 12Op 2SC-2361 16Op 2SC-2362 5Op 2SC-2369 10Op	2SC-3419 120p 2SC-3420 120p 2SC-3422 110p 2SC-3450 350p	2SD-896 2SD-896 2SD-900 2SD-905	200p 200p 400p 600p	BR86D 2A/600 BR88D 2A/800 BR32 3A/200 BR34 3A/400	v V	43p 43p 43p 43b		£21.00
UPC-1028 90p UPC-10312 180p UPC-10312 60p UPC-1158H2 70p UPC-1158H2 70p UPC-1181 110p UPC-1182 110p UPC-1183 200p UPC-1183 200p	2SA-1208 70p 2SA-1209 100p 2SA-1210 120p 2SA-1217 100p 2SA-1262 180p 2SA-1263 280p 2SA-1264 280p 2SA-1265 280p 2SA-1264 450p	2SC-1413 240p 2SC-1419 150p 2SC-1424 450p 2SC-1446 100p 2SC-1448 100p 2SC-1450 200p 2SC-1454 320p 2SC-1454 40p 2SC-1472 40p	2SC-2371 45p 2SC-2373 210p 2SC-2389 45p 2SC-2408 120p 2SC-2408 120p 2SC-2412K 50p 2SC-2413 50p 2SC-2458 40p 2SC-2459 65p 2SC-2470 65p 2SC-2470 120c	28C-3487 200; 28C-3459 260; 28C-3460 300; 28C-3466 400; 28C-3466 70; 28C-3468 70; 28C-3482 300; 28C-3502 120; 28C-3503 120; 28C-3504 120;	2SD-917 2SD-921 2SD-923 2SD-946 2SD-946 2SD-947 2SD-950 2SD-951 2SD-957A 2SD-958 2SD-965	130p 300p 320p 360p 120p 100p 300p 350p 520p 60p 100p	BR36 3A/600 BR62 6A/200 BR64 6A/400 BR251 25A/100 BR252 25A/200 BR256 25A/600 BR256 25A/600 BR351 35A/100 BR351 35A/100	V V V V V V	44a 80b 72b 150p 165a 185a 200a 240a 185a 200a	FISHER VBS 7100/VBS 7500 FISHER VBS 9000/VBS 9900	0/721/ £20.75 £29.00 £29.00 £30.00
1185H2 230p UPC-1186 80p UPC-1187 150p UPC-1188H 400p	2SA-1295 500p 2SA-1301 350p 2SA-1302 400p 2SA-1307 160p 2SA-1317 30p	2SC-1473 70p 2SC-1474 125p 2SC-1475 60p 2SC-1505 80p	2SC-2482 40p 2SC-2483 120p 2SC-2484 240p 2SC-2500 80p	2SC-3547 100; 2SC-3568 200; 2SC-3583 170; 2SC-3595 220; 2SC-3605 60;	2SD-970 2SD-973 2SD-973A 2SD-985	170p 60p 70p 120p	BR354 35A/400 BR356 35A/600 BR358 35A/800 BY164 1.5A/100	v v	225p 230p 260p 40p	нгтасні	
UPC-1197 140p UPC-1200 325p UPC-1222 130p UPC-1230 210p	2SA-1318 30p 2SA-1329 200p 2SA-1346 30p 2SA-1352 100p	2SC-1507 140p 2SC-1509 45p 2SC-1514 65p 2SC-1515 60p	2SC-2519 60p 2SC-2527 300p 2SC-2545 55p 2SC-2547 65p 2SC-2550 70p	2SC-3631 130g 2SC-3636 280g 2SC-3657 400g 2SC-3668 120g	2SD-1012 2SD-1021 2SD-1022 2SD-1024	120p 120p 120p 400p 130p	BY179 1.5A/800		40g-	HITACHI VT7-17, VT35-38, VT39 HITACHI VT19	£20.00 . £38.00 £38.00 £31.50
UPC-1238 120p UPC-1263 230p UPC-1277 240p UPC-1278 240p UPC-1355V 320p UPC-1353 180p UPC-1363 190p	2SA-1353 100p 2SA-1356 100p 2SA-1370 100p 2SA-1371 100p 2SA-1380 100p 2SA-1381 100p 2SA-1386 400p 2SA-1423 30p	2SC-1520 120p 2SC-1541 110p 2SC-1545 120p 2SC-1567 140p 2SC-1569 140p 2SC-1570 40p 2SC-1583 30p	2SC-2551 70p 2SC-2552 150p 2SC-2553 200p 2SC-2555 150p 2SC-2562 90p 2SC-2564 230p 2SC-2565 260p 2SC-2568 120p	2SC-3675 160; 2SC-3678 280; 2SC-3679 200; 2SC-3715 480; 2SC-3717 120; 2SC-3719 150; 2SC-3746 120; 2SC-3747 120;	2SD-1031 2SD-1046 2SD-1051 2SD-1060 2SD-1064 2SD-1071 2SD-1073	130p 200p 130p 130p 250p 450p 350p 520p	TIC2060 — 4A/400 TIC2250 — 6A/400 TIC226D — 8A/400 TIC236D — 12A/400 TIC246D — 16A/400	iV IV	60¢ 69¢ 68¢ 85¢ 106¢	HITACHI VT3000 HITACHI VT5000, VT 5500 HITACHI VT65, 7000, 8000, 8300, 8500, 870	£14.00 £20.00
UPC-1365 320p UPC-1368H 425p UPC-1373 85p UPC-1378 210p UPC-1382 110p	2SA-1443 250 p 2SA-1489 300 p 2SA-1491 300 p 2SA-1516 380 p	2SC-1586 540p 2SC-1617 340p 2SC-1624 140p 2SC-1625 150p	2SC-2570 60p 2SC-2577 125p 2SC-2578 220p 2SC-2579 130p	2SC-3789 75g 2SC-3790 120g 2SC-3795 200g 2SC-3798 220g	2SD-1111 2SD-1128 2SD-1135 2SD-1138	60p 200p 150p 80p	TIC253D — 20A/400 TIC263D — 25A/400 T2800D — 8A/400	IV IV	190p 205p 52p	NATIONAL	
UPC-1393 47709 UPC-1397 4809 UPC-1397 4809 UPC-1400 UPC-1400 UPC-1470 480 1009 UPC-1470 4009 UPC-1505C 4009 UPC-1517CA 4009 UPC-1537C 4009 UP	258-324 45p 258-546 70p 258-546 70p 258-561 50p 258-561 10p 258-566 110p 258-566 75p 258-596 75p 258-596 40p 258-647 30p 258-647 30p 258-649 40p 258-649 120p 258-649 120p 258-703 125p 258-703 125p	2SC-1626 1309 2SC-1627 609 2SC-1678 2009 2SC-1678 1209 2SC-1678 1209 2SC-1688 609 2SC-1789 9009 2SC-1740 409 2SC-1740 409 2SC-1740 409 2SC-1756 409 2SC-1756 409 2SC-1775 209 2SC-1775 209 2SC-1775 209 2SC-1789 1009 2SC-1789 1009	25C-2580 240p 25C-2591 290p 25C-2592 200p 25C-2693 40p 25C-2693 45p 25C-2611 40p 25C-2611 40p 25C-2625 380p 25C-2625 480p 25C-2625 450p 25C-2631 45p 25C-2631 45p 25C-2631 45p 25C-2636 50p	2SC-3811 200 2SC-3853 200 2SC-3853 280 2SC-3855 280 2SC-3883 280 2SC-4020 280 2SC-4020 280 2SC-4262 50 2SC-4262 50 2SD-198 180 2SD-201 260 2SD-201 260 2SD-201 250 2SD-201 250	2 255-1160 2 255-1160 2 255-1160 2 255-1164 2 255-1169 2 255-1186 2 255-1186 2 255-1186 2 255-1186 2 255-1186 2 255-120 2 255-	90p 150p 120p 120p 425p 280p 400p 125p 160p 150p 280p 120p 120p 250p 300p 270p	THYRISTORS (SCR's) 2N.5061 — 0.8A/66 2N.5062 — 0.3A/106 2N.5064 — 0.8A/06 C106D 4A/400 TIC116C 3A/300 TIC116C 3A/300 TIC116B 12A/400 TIC126B 12A/400 TIC126B 12A/400 2N.4444 3B/8103	ov ov ov ov ov	20p- 28p- 29p- 28p- 59p- 70p- 75p- 90p- 78p- 37p-	NV 430/NV 460 NV 730 4 HEAD NV 366 4 HEAD NV 180 PORTABLE 4 HEAD NV 780/NV 380 NV 788/NV 810 NV 850/NV 870 NVG 15 NVG 30 NVG 33, NVG 45, NVG 46 NVG 40, NVG 130	£26.50 £21.00 £30.50 £30.50 £41.00 £18.00 £43.50 £50.00 £41.50 £28.00 £41.00 £28.00 £42.00
ZN-426 260/p ZN-427 560/p ZN-428 428/p ZN-428 218/p ZN-435 340/p ZN-435 190/p ZN-134 170/p ZN-134 12150/p ZN-136 150/p ZN-50 120/p ZSA-500 120/p ZSA-500 120/p ZSA-500 150/p	2SB 707 200p 258-7178 30p 258-7178 70p 258-727 200p 258-725 310p 258-724 50p 258-724 50p 258-725 80p 258-825 135p 258-825 135p 258-825 135p 258-825 135p 258-825 135p 258-825 135p 258-825 190p 258-861 190p 258-1077 180p 258-1077 180p 258-1077 180p 258-1070 100p 100p	2SC:1815 15#2 2SC:1819 140p 2SC:1826 190 2SC:1827 120p 2SC:1845 100p 2SC:1845 100p 2SC:1845 100p 2SC:1845 120p 2SC:1845 120p 2SC:1875 220p 2SC:1875 220p 2SC:1890 4 125p 2SC:1906 75p 2SC:1906 75p 2SC:1906 100p 2SC:1906 100p 2SC:1906 100p 2SC:1906 100p 2SC:1906 100p 2SC:1907 100p 2SC:1907 100p 2SC:1908 100p	25C-2671 120p 25C-2681 270p 25C-2682 120p 25C-2680 70p 25C-2780 170p 25C-2790 120p 25C-2791 120p 25C-2740 450p 25C-2740 450p 25C-2740 400p 25C-2740 400p 25C-2740 400p 25C-2751 400p 25C	2SD-348 48092 2SD-358 409 2SD-351 2409 2SD-330 6809 2SD-330 809 2SD-338 1709 2SD-338 909 2SD-400 202 2SD-401 1209 2SD-421 1209 2SD-427 3509 2SD-427 3509 2SD-4	2 SS-1266 2 SS-1272 2 SS-1273 2 SS-1275 2 SS-1275 2 SS-1276 2 SS-1279 2 SS-1279 2 SS-1289 2 SS-1289 2 SS-1390 2 SS-1391 2 SS-1391 2 SS-1305 2 SS-1305 2 SS-1305 2 SS-1305 2 SS-1307 2 SS-1	180p 180p 200p 100p 160p 200p 190p 300p 400p 425p 140p 140p 200p 60p 70p 85p 150p		* * * * *	85p 180p 100p 100p 120p 27p 32p 200p 200p 230p 230p 850p	VTCM10/11/20/21/25/30/31/35/40/50 VTC 5100, VTC 5150, VTC 5300 VTC 5350/5370, VTCNX 10/15/20/30, VTC 5550 VTC 5100, VTC 5150, VTC 5300 VTC 9100/9300/945/9500	£28.00 £28.00 £28.00 £28.00 £30.50 £30.50 £30.50
2SA-562 50p 2SA-603 100p 2SA-606 300p 2SA-608 15p 2SA-634 60p 2SA-636 50p	2SC-380 2Op 2SC-382 12Op 2SC-388A 6Op 2SC-454 45p 2SC-458 15p	2SC-1940 110p 2SC-1941 40p 2SC-1942 190p 2SC-1944 350p 2SC-1945 360p	2SC-2812 40p 2SC-2814 40p 2SC-2834 400p 2SC-2837 360p 2SC-2839 40p	2SD 526 701 2SD 545 601 2SD 549 1201 2SD 551 4001 2SD 555 6001	2SD-1376 2SD-1379 2SD-1380 2SD-1383 2SD-1390	125p 100p 100p 100p 350p	* U322LO * U341 * U342	* * * * *	600p * 500p * 500p *	SHARP	VC 482
2SA-640 80p 2SA-673 20p 2SA-684 60p 2SA-699 100p 2SA-708 300p 2SA-715 80p 2SA-720 20p 2SA-725 80p 2SA-726 25p	2SC-460 10p 2SC-461 30p 2SC-495 60p 2SC-515A 100p 2SC-535 50p 2SC-536 20p 2SC-563 120p 2SC-644 28p 2SC-647 300p	2SC-1946 1500p 2SC-1947 450p 2SC-1957 70p 2SC-1959 20p 2SC-1969 160p 2SC-1970 200p 2SC-1971 400p 2SC-1972 600p 2SC-1973 150p	2SC-2853 70p 2SC-2876 120p 2SC-2877 120p 2SC-2878 40p 2SC-2898 400p 2SC-2899 120p 2SC-2911 120p 2SC-2912 120p 2SC-2912 610p	2SD-560 1500 2SD-571 800 2SD-575 5300 2SD-600 800 2SD-601 400 2SD-612 1000 2SD-613 700 2SD-636 300	2SD-1392 2SD-1395 2SD-1396 2SD-1397 2SD-1398 2SD-1399 2SD-1400 2SD-1400 2SD-1402	450p 150p 150p 240p 250p 210p 300p 280p 280p	VIDEO LAMPS UNIVERSAL VIDEO LAMPS 12V.60 mA (300mm WIRES RED OR BLUE	5)	30p	VC 483 VC 486, VC 3300, VC 8381, VC 9100, VC 9300, VC 9500, VC 9700, VC 582, VC 583, VC 651, VC 681, VC	£19.00
2SA-733 30p 2SA-747A 600p 2SA-798 55p 2SA-748 90n	2SC-681 340p 2SC-683 120p 2SC-710 20p 2SC-711 40p	2SC-1983 130p 2SC-1984 150p 2SC-1985 120p 2SC-1986 160p	2SC-2928 550p 2SC-2929 280p 2SC-2944 620p 2SC-2979 320p	2SD-637 400 2SD-638 600 2SD-639 600 2SD-640 3500	2SD-1406 2SD-1407 2SD-1409 2SD-1415	120p 180p 190p 190p 430p	CASSETTE DC MC		60р	SONY	
2SA-769 130p 2SA-770 200p 2SA-771 130p 2SA-781 150p 2SA-798 55p 2SA-814 170p 2SA-844 30p	2SC-730 450p 2SC-732 40p 2SC-733 25p 2SC-761 150p 2SC-762 150p 2SC-783 105p 2SC-790 80p	2SC-2001 60p 2SC-2002 40p 2SC-2003 25p 2SC-2004 60p 2SC-2021 40p 2SC-2022 200p 2SC-2023 180p	2SC-2988 280p 2SC-2995 60p 2SC-3012 300p 2SC-3019 320p 2SC-3025 500p 2SC-3026 550p 2SC-3039 140p	2SD-655 60 2SD-661 60 2SD-666 70 2SD-667 70 2SD-668 120 2SD-669 40	p 2SD-1426 p 2SD-1427 p 2SD-1428 p 2SD-1429 p 2SD-1430 p 2SD-1431	350p 380p 450p 410p 280p 400p	6V 9V 12V CW 12V CCW 13:2V CW		240p 240p 240p 240p 290p	SLF1E) DSR-43R (FOR SLC7 RANGE SL 5000,	£19.00 £16.50
2SA-872 40p 2SA-872A 60p 2SA-886 90p 2SA-899 60p 2SA-907 650p 2SA-909 700p	2SC-792 380p 2SC-828 25p 2SC-829 20p 2SC-839 25p 2SC-867A 160p 2SC-930 20p	2SC-2026 60p 2SC-2027 450p 2SC-2028 75p 2SC-2029 120p 2SC-2053 120p 2SC-2055 150p	2SC-3040 280p 2SC-3042 300p 2SC-3060 900p 2SC-3057 150p 2SC-3068 80p 2SC-3070 120p	2SD-673 350 2SD-676 250 2SD-716 115 2SD-717 180 2SD-718 100 2SD-722 240 2SD-725 400	p 2SD-1433 2SD-1438 p 2SD-1439 p 2SD-1441 p 2SD-1448	600p 750p 140p 320p 440p 140p 60p	13.2V CCW	* * * * * TAPE HEADS	290p	TOSHIBA V21/V9600	£22.00
25A-913 200p** 25A-921 90p** 25A-933 40p** 25A-933 40p** 25A-935 40p** 25A-939 140p** 25A-939 25A-930 25B-925A-950 70p** 25A-956 90p** 25A-956 70p** 25A-956	250-941 25p	2SC-2056 480p 2SC-2058 40p 2SC-2068 90p 2SC-2071 40p 2SC-2073 70p 2SC-2075 80p 2SC-2078 95p 2SC-2078 95p 2SC-2081 950p 2SC-2120 50p 2SC-2120 50p 2SC-2120 50p 2SC-2120 50p 2SC-2121 550p 2SC-2141 50p 2SC-2166 80p 2SC-2168 180p 2SC-2168 180p	25C-3077 120p 25C-3114 40p 25C-3117 120p 25C-3130 100p 25C-3130 100p 25C-3148 190p 25C-3149 120p 25C-3151 230p 25C-3152 250p 25C-3152 250p 25C-3153 200p 25C-3153 200p	2SD-725 400 2SD-734 60 2SD-734 130 2SD-737 120 2SD-757 120 2SD-758 140 2SD-758 140 2SD-758 180 2SD-777 200 2SD-777 400 2SD-777 400 2SD-778 650 2SD-778 650 2SD-778 660 2SD-778 7 800 2SD-778 100	\$250-1451 250-1452 250-1455 250-1459 250-1459 250-1459 250-1459 250-1459 250-1459 250-1497 250-1595 250-1597 250-1579 250-1579 250-1579 250-1579 250-1579 250-1599 250-1599	60p 260p 170p 320p 220p 120p 450p 450p 450p 450p 450p 450p 120p 310p 160p 200p	MONO HEAD STERED HEAD MINI HEAD AUTO REVERSE HEAD * * * * * * UNIVERSAL TRIPLERS SONY ON/OFF SWITCHES PHILIPS SWITCHES K30, K35, K40, K73, KT4	* * * * *	* * * * 90p 150p 230p 260p * * * 450p 200p 150p	GRANDATA LT FOR ADDRESS & PH PLEASE TURN OVER	ONE

				Number 1		
VCR	FERGUSON	VIDEO MOTORS	4000B SERIES CMOS IC's	74 SERIES 7400 20p		200p 75188 55 p 200p 75189 55 p
PINCHROLLERS		AMSTRAD	4000 13p	7401 16p	74HC257 40p 74LS123 35p 8257	220p 75195 185p
AKAI	3292, 3V00, 3V01150 3V16, 3V22, 3V2365	VCR-7000 REEL MOTOR1700	4001 13p 4002 13p	7402 18p 7403 20p	74HC259 52p 74LS125 30p 8271 3	280p 75451 40p 400p 75454 65p
VS9300, VS9500, VS9700, VS9800 280p	3V29/30120	FERGUSON & JVC	4006 34p 4007 13p	7404 35p 7405 10p	74HC279 42p 74LS126 30p 8272 1: 74HC279 35p 74LS132 30p 8272 1: 74HC280 61p 74LS132 30p 8279	200p 75492 55p 270p 8T26 95p
VS1, VS2, VS3, VS4, VS5, VS6,	3V31/3285 3V35/3680	CAPSTAN MOTOR2100 PU-45979	4008 38p 4009 20p	7406 36p 7407 36p	74HC283 61p 74LS136 30p 8282	300p 8T28 110p
VS9, VS10 360p	3V38-3980 3V42/4365	CAPSTAN MOTOR1950	4010 21 p	7408 25p	74HC299 105p 74LS139 28p 8284	100p 140p
AMSTRAD	3V44/4565	PU-55371V DRUM MOTOR1950	4011 13p 4012 13p	7409 20p 7413 30p	74HC356 48p 74LS147 90p 8287	360p OPTO
VCR4500, VCR4600, VCR4600 Mk2, VCR4700 280p	3V45/5465 3V5565	PU-46414 REEL MOTOR2650	4013 19 p	7414 4:5p 7416 40p	74HC366 36p 74LS151 27p 8748 11	100p COUPLERS
VCR5200 360p		PU-51381V2650	4016 18p	7417 32p 7420 22p	74HC368 36p 74LS154 78p AV3.1016	100p 290p
VCR7000 360p	FISHER	NATIONAL	4017 29p 4018 30p	7421 25 p	74HC373 46p 74LS155 36p SP0256AL2 1 74HC374 48p 74LS156 36p SP0256AL2 1 74HC375 52p 74LS157 22p Z80ACPU	500p 4N25 50p
FERGUSON	1.0.1.2.1	REEL MOTOR1350	4019 28 p	7425 15p 7430 25p	74HC377 52p 74LS158 27p Z80BCPU	100p 4N27 50p
3V00, 3V16, 3V22, 3V23 280p 3V29-30, 3V31-32 280p	VBS-7000245	MYN-135V5L FOR NV333, NV366	4020 33p 4021 36p	7437 28p 7438 32p	74HC390 50p 74LS161 38p 7004 040	500p 4N28 50p 220p 4N29 50p
3V35-36, 3V38-39, 3V42-43,	VBS-9000120	SANYO	4022 36p 4023 13p	7442 38p 7447 60p	74HC423 65p 74LS163 36p Z80BP10 :	340p 4N30 90p
3V44-45, 3V48, 280p 3V53, 3V54-55, 3V56-57, 3V58-59,		REEL MOTOR700	4024 25p	7450 22p	74HC534 61p 74LS165 50p Z80BCTC :	200p 4N31 90p 320p 4N32 100p
3V64-65, FV10-11, FV12-14	HITACHI	4-529V-10800	4025 13p 4026 60p	7454 25p	74HC541 70p 74LS168 60p 280AS10	160p 4N33 100p
HITACHI		SHARP	4027 18p 4028 29p	7473 25p	74HC564 60n 74LS170 68n 7808P10-2 5	580p 4N37 58p
VT11, VT33 280 p VT61-62, VT63-64, VT65,	VT-11, VT-33100 VT-5000120	REEL MOTOR1500 RMTOV 1008 GEZZ	4029 34p	7474 35p 7475 25p	74HC574 65p 74LS175 32p 74S289	180p
VT86-88, 280p	VT-5500130	SONY	4030 17 p 4031 90 p	7481 90p 7482 60p	74HC595 85p 74LS191 43p 74S387 2 74HC597 80p 74LS192 41p 75107	200p 65p LED DIOM AND
VT110-122, VT120-128, VT130-135, VT138-150, VT168,-220	VT-800060 VT-850060	CAPSTAN MOTOR700	4032 52p 4033 60p	7485 28p 7486 28p	74HC620 110p 74LS193 41p 75110	75p LED DISPLATS
VT5000, VT8000, VT9300,	VT-930050 VT-950050	A-6751131A FOR SLC6 CAPSTAN MOTOR2500	4034 76 p 4035 42 p	7489 75p 7490 35p	74HC640 90p 74LS195 44p 75122 1	100p 110p
VT9500 280p	VT-970060	BHF 1100D FOR SLC7	4036 180p 4037 75p	7492 45p	74HC646 120p 74LS197 42p 75150	95p MAN.72 115p 100p MAN.74 115p
JVC		VIDEO LAMPS	4038 46p 4039 180p	7495 48p	74HC651 100p 74LS240 45p 75162 7 74HC652 100p 74LS241 42p 75182	700p MAN.4640 180p
HR3300, HR3330, HR3360, HR3660, HR4100, HR7700 280p	JVC	VIDEO LAMPS UNIVERSAL30	4040 30 p	7497 80p 74107 30p	74HC670 75p 74LS242 43p 75183 74HC688 80p 74LS243 50p 75183	95p MAN.8910 230p 95p DL.747 160p
HR7200, HR7330, HR7660,		12V60mA (300mm WIRES) PANASONIC VIDEO LAMPS60	4041 36 p 4042 30 p	74111 52p 74116 85p	74HC690 110m 74LS244 40m	
HR7610, HR7650, HR7655 280p HRD110, HRD111, HRD120,	HR-3300, HR-3330,150	IDLERS & PULLEYS	4043 36 p 4044 36 p	74119 85p 74122 40p	74HC4002 25p 74LS247 40p 74HC4015 85p 74LS248 40p	-
HRD121, HRD140, HRD150 280p	HR-3360, HR-3660, HR-4100180	REPLACEMENTS	4045 72p 4046 42p	74123 20p	74HC4016 75p 74LS249 70p 74HC4017 48p 74LS251 24p	
HRD160, HRD225, HRD455, HRD565, HRD725	HR-720070 HR-760080	HITACHI	4047 45p	74126 45p	74HC4022 40p 74LS256 52p SOLD	ERING IRON
MITSUBISHI	HR-761095	FF REW IDLER	4049 18p	74132 42 p 74141 55 p	74HC4024 34n 74 S257 32n	5W 240V Soldering Iron
HS200, HS300, HS301, HS302,	HR-765075 HR-765590	6886971 190p PLAY IDLER	4050 20 p 4051 38 p	74145 70p 74153 45p	74HC4040 34p 74LS259 50p 240Vac 74HC4049 38p 74LS260 30p Spare Fleme	540p nt for XS25W 240V 260p
HS303, HS304, HS310, 280p HS320, HS700	HR-770077 HRD-110, HRD-111,100	V-6861482 320p	4052 35 p 4053 35 p	74155 45p 74157 45p	74HC4050 38p 74LS266 22p ANTEX C15	W 240V Soldering Iron
NATIONAL	HRD-120, HRD-225	JAC	4054 53p 4055 52p	74160 50p 74164 50p	74HC4052 85p 74LS279 33p 24UVcm	540p nt for C15W 240V 260p
NV100, NV180, NV300, NV333,	HRD-250, HRD-455,100 HRD-565, HRD-566, HRD-725,	IDLER ASSEMBLY PU-47752 450p	4056 52 p 4060 40 p	74167 35p	74HC4059 85p 74LS283 51p 74HC4060 33p 74LS290 26p	
NV340, NV366, NV600, 280p	HRD-755	TAKE UP IDLER	4063 52 p	74174 30p	74HC4066 33p 74LS293 26p 74HC4072 31p 74LS365 26p	
NV777, NV788 NV230, NV370, NV430, NV460,		PU-51402A 145p TAKE CLUTCH	4066 20 p 4067 120 p	74175 35 p 74176 45 p	74HC4075 26p 74LS366 31p 74HC4078 32p 74LS367 28p	
NV730, NV810, NV830, 280p	MITSHUBISHI	PU-55373 225p IDLER ARM	4068 13p 4069 13p	74180 50p 74182 45p	74HC4094 50p 74LS368 30p 74HC4316 100p 74LS373 45p DESOLI	DERING PUMP
NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000,		PU-55373-3-8 285 p	4070 13p 4071 13p	74192 40p 74196 40p	74HC4351 110p 74LS374 45p 74HC4352 160p 74LS375 48p COLD	ERING IRON
NV7200, NV7800, NV8600,	HS-200200	FAST FORWARD IDLER PU-45896C 210p	4072 13p 4073 13p	74197 45p	74HC4510 120p 74LS390 42p 74HC4511 70p 74LS393 37p ANTEX YS38	5W 240V Soldering Iron
NV8610, NV8620, NVG14 NVG7, NVG10, NVG12,		NATIONAL	4075 13p 4076 42p	74393 70p 74HC SERIES	74HC4515 120p 74LS629 95p 24UV8C	540p
NVG18 360p	NATIONAL	IDLER 200p	4077 13p	HIGH SPEED CMOS	74HC4516 125p 74LS641 88p Spare Element 74HC4518 55p 74LS642 105p ANTEX C151	nt for XS25W 240V 260p W 240V Soldering Iron
NVG21, NVG25, NVH65 360p PHILIPS		SANYO	4078 13 p 4081 13 p	74HC00 14p	74HC4520 60p 74LS644 105p 240Vcm 74HC4538 75p 74LS645 105p Space Flores	540p nt for C15W 240V 260p
VR6460 280 p	NV-300160 NV-333135	REEL PULLEY	4082 13p 4085 36p	74HC02 14p 74HC03 14p	74HC7266 75p 74LS674 310p	111 101 C1544 2404 200p
SANYO	NV-777100 NV-2000150	143-0-662T-01201 520p	4086 30 p 4089 75 p	74HC04 15p 74HC08 18p	74HC22106 580p 74LS687 250p 74HC40104 190p 74HC40105 250p COMPUTER	
VHR1100, VHR1300, VHR1500,	NV-3000160	SHARP	4093 18p 4094 44p	74HC10 20p 74HC11 14p	TALC CERTED IC'S	
VHR2300 360p VTC5000, VTC5150, VTC5500,	NV-700095 NV-720090	NIDLO005 GEEZ 195p	4095 58p 4098 50p	74HC14 26p 74HC20 19p	LOW POWER 2522 220m	DERING PUMP
VTC9300, VTC9150, VTC9500, VTC9300, VTCM10, VTCM20 280p	NV-8600160	IDLER NIDL0006 GEEZ 195p	4099 42p	74HC21 20p	7.T.L 2732 280p Desolder Pur 74LS00 12p 2732A 300p Desolder Pur	
SHARP		SONY	4502 36p	74HC30 20p	74LS01 12p 2764 240p Spare Nozzle 74LS02 12p 27C64 550p	
VC381, VC386, VC2300, VC3300,	PHILIPS	REW PULLEY	4503 30p 4504 55p	74HC32 20p 74HC42 30p	74LS03 12p 27128 350p 74LS04 12p 26256-25 400p	
VC7300, VC7700, VC8300 360p VC9100, VC9300, VC9500, VC9700		A-6706-348-B 400p REW. PULLEY	4505 180p 4506 58p	74HC51 20 p 74HC73 24 p	74LS05 12p 41256-12 450p 74LS08 12p 256DRAM 450p	
VC387, VC481, VC482, VC483,	VR-6460170	A-6706-391-A/B 300 p	4507 30p 4508 67p	74HC74 24p 74HC75 28p	74LS09 14p 4116 75p	
VC486, VC496, VC581 360p VC582, VC583, VC585	CANVO	SERVICE AIDS	4510 32p 4511 30p	74HC76 28p 74HC77 35p	74LS11 12p 6116 180p SOLDER MOI 74LS12 12p 6264 400p	Р 65-р
VC651, VC681, VC685, VC750, VC780, VC781, VC785,	SANYO	SERVISOL	4512 38p 4513 80p	74HC85 33p 74HC86 29p	74LS13 20p 6502 300p 74LS14 24p 6502A 400p	
VC787 360p	VTC-500075	PRODUCTS	4514 65p	74HC93 50p	74LS15 14p 65C02 930p 74LS20 14p 6503 570p	
VC793, VCT72	VTC-5300100	V. HEAD CLEANER 100p SWITCH CLEANER 115p	4516 36p	74HC109 28p	74LS21 14p 6520 170p 74LS22 14p 6522 330p	OLDER
SONY	VTC-550095 VTC-9300220	SILICONE GREASE 135p	4518 36p	74HC112 28p 74HC113 28p	74LS26 14p 6532 460p 19 CIA/C	500g 500p
SLC5, SLC6, SLC7 360p SLC9, SLC20, SLC24, SLC30,		FOAM CLEANER 120p	4519 28p 4520 36p	74HC123 35p 74HC125 32p	74LS28 14p 6551 530p 20 SWG 5	600g 650 p
SLC33, SLC44, SLHF100 360p SLF1, SLF11, SLF25, SLF30.	SHARP	ANTI-STATIC 120p AEROKLEANE 100p	4521 86p 4522 43p	74HC126 33p 74HC131 36p	74LS30	
SLF60, SLF100		AERO DUSTER 125p PLASTIC SEAL 115p	4526 38 p 4527 41 p	74HC132 33p 74HC133 33p	74LS33	
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VP-7100 160p	0. 0. 0. 0.	* TRIPLERS *	40100 120p 40101 78p	74HC160 44p 74HC161 44p	74LS83 37p 8156 360p 74LS85 37p 81LS95 120p	
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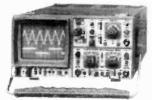
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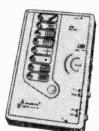
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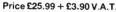
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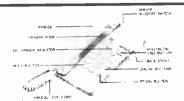
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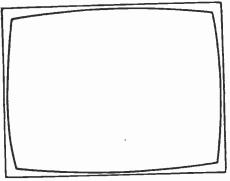
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Product Development

Did you know that in 1950 the UK was the world's largest exporter of motor vehicles? That probably doesn't mean a lot, since at that time the world was still recovering from the devastation of World War Two. It does however mean that the UK's motor industry was in a strong position to develop and establish itself firmly as a world leader. It didn't. Compare the situation today. In 1988 the UK's trade deficit was a record £6-1bn, and the situation has since worsened. Yet from the early Thirties to 1955 the UK had Europe's largest motor industry. Today the indigenous industry – what's left of it – appears to be doing next to no development work on new products (the last launch, the Montego, was in 1984). From the production point of view the situation is expected to improve dramatically by the late Nineties, because of the plants being set up by Japanese manufacturers. Interesting that in 1952 Nissan was producing Austin cars under licence. It's a searing story of industry failure.

The UK's domestic electronics industry and its automobile industry have long followed similar paths. Back in 1950 there was much TV development work being done and the industry was getting into its stride. It was certainly at that time ahead of anything in Europe or Japan, and the US industry was only just restarting after war-time restrictions on production. The situation today is almost exactly as in the automobile industry, apart from the fact that the Japanese got into the act to help out a decade or so earlier, with the result that the trade balance is not nearly so bad – in fact it has been positive in recent times. But there's still almost no development work being done.

There's a saying that today's development is tomorrow's profit, or something like that. The time-scale with the sophisticated products of today is of course rather longer. However that might be, the corollary is that no development work today equals no profits tomorrow for whatever is left of the UK-owned consumer electronics products and automobile industries.

One wonders whether UK industrialists/boardrooms have ever been really serious. Things have started and stopped in half-hearted ways, sometimes in almost bizarre circumstances. There's a story that one of our once leading consumer electronics firms was started up simply as a means of getting rid of a spare line of mains transformers. That sort of thing was perhaps not uncommon in the Fifties, when many small firms started up and eventually merged or fell by the wayside. In those days you could design radio sets and suchlike from a simple data sheet. Change the values of a few resistors here and there to get the tolerances right, then get a lot of young ladies busy with soldering irons. A world quite different from today's sophisticated production engineering. A sort of spontaneous getting in when a market seemed to exist. Yet the UK's domestic electronics industry keep up with things well into the solid-state era. Some of the first transistor radios were produced in the UK and research was being done on solid-state electronics.

The Japanese phenomenon is not something new. Most of the well-known Japanese firms have histories that go back much farther than the UK ones now bought out or merged into overseas concerns. Sony is the best-known exception, being started in the immediate post-war era. Sharp was started in the early Twenties, Matsushita dates from the first world war period, while Hitachi, Mitsubishi and Toshiba have yet longer histories, some being started up in the nineteenth century. These firms established firm roots, survived the depression years and the trauma of World War Two, then must roomed in recent decades to assume their present dominant positions.

roots, survived the depression years and the trauma of World War Iwo, then mushroomed in recent decades to assume their present dominant positions.

It takes professionalism and dedication to do this. Contrast the amateur ways of UK firms. One thinks for instance of the famed EMI body scanner, an electronic development that put the UK in the forefront of medical electronics. But having developed the thing EMI took it no farther. The later versions came from elsewhere. Why does this sort of thing happen so often? Could it perhaps be connected to the lack of engineers or those with some engineering knowledge in boardrooms? It's difficult to persuade accountants that money has to continue to be spent on development work. Like the Japanese, the Germans and others do not lack engineering knowledge in the higher echelons of industry. Our education system has a lot to answer for in this respect.

Today's mass markets are not built solely on the basis of engineering expertise however, vital though this is. The ability to produce goods inexpensively and well is no good if the market is not there. Here again the Japanese have long done the right thing in following the path of market-led development. A lot of effort is put into establishing what the public would find useful and what it would be prepared to pay. This has meant that many items are produced and tried out and are then quickly dropped. The cost of a few failures is readily covered by the major successes

Trying to find out what the public might want is of course a time-consuming business. But it's not only a matter of new products. Have you noticed how often the Japanese come up with just the right combination of features in a particular product? It's all a matter of careful market research.

It seems that from every angle UK industry has failed. Innovation, production engineering and market research: all have been tackled in a half-hearted way, with little sense of commitment. It's not so surprising then that things have ended up in their present sorry state.

EDITOR

John A. Reddihough

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CORRECTIONS

The address of Celtel Ltd. – see Computer Programmed RC System last month – is now PO Box 135, Basingstoke, Hants RG25 2HZ (telephone no. 0256 474 900).

The final item in VCR Clinic last month (page 755) relates to the Ferguson 3V29, not 3V39.

The 25KX1201 portable mentioned in TV Fault Finding last month (page 768) is a Pye model, not Philips. The Philips equivalent is the 10CX1120, also mentioned above under the heading CX1120.

COVER PHOTO

A lady video engineer for a change, shown making probe/pulser checks on the syscon logic circuitry in the Panasonic NV333 VCR. See article on page 848.

Repairing Remote Control Units

Nick Beer

Much domestic electronic equipment nowadays relies on a remote control unit – very often the equipment cannot be operated without the handset, or operation is very limited without it.

The circuits of modern remote control units can be awesome. Some have built-in screens, will talk back, and have send and receive operation. The service policy of different manufacturers varies. Spare parts for the cheaper units are very often not supplied, it being simpler to supply the complete unit. Many dealers adopt a similar policy – they advise customers to buy a new unit rather than have an old one repaired. Personally, I'm not in favour of replacing anything unless it's absolutely necessary – in my view panel and handset replacement must rate amongst the most inefficient practices in this trade. Handset repair can be profitable and straightforward, and if you can save your customer some money and make a greater profit yourself it can't be bad, can it?!

In this article we'll go through the various types and generations of handset, describe basic faults and outline the repair procedures required. Spares can very often be a problem, but we'll give some advice on this too.

Cord Types

The cord remote control units you're most likely to encounter now are those used with early VCRs. Most have a single screened lead that's terminated with a standard audio jack plug, typically 2.5 or 3.5mm in size. Push-switches bring different resistances into circuit. These represent an extension of the on-board control circuits. The other approach is to have a multicored cable with DIN plug termination and just switches (no resistors) in the handset. This arrangement is bulkier.

Likely faults, as you would expect, are breaks in the cables and plugs. With a single screened cable the break can occur anywhere along its length. It usually occurs in the screen rather than the core, presumably due to stretching. With multicored cables the breaks tend to occur at either end, particularly within the DIN plug. In either case the plug is usually moulded on, so repair involves cutting off the old one and fitting another. Repairs of this sort can be carried out using normal workshop stocks of cable and plugs. Note that with this type of fault you will often get the customer on the phone shortly after collecting his unit to say that it still doesn't work. This is invariably due to the socket in the VCR being faulty - damaged when the customer tripped over the cable! Making a simple continuity or resistance test in the workshop will confirm that the unit works without the

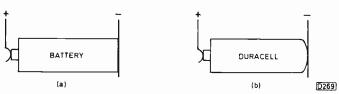


Fig. 1: Battery contact problems. (a) One hundred per cent negative plate surface area contact. (b) Reduced contact with domed negative plate.

need to connect it to a VCR.

The only other problems you are likely to encounter are print breaks. These are usually easy to detect and repair. The switches used are generally just that, not mat and pad contacts (see later), so they are pretty reliable. Should they fail replacement is the only real answer. In most cases this is not a problem. If the manufacturer cannot supply a replacement a search through the advertisements in *Television* will usually reveal something that's suitable.

Ultrasonic Units

Though ultrasonic remote control handsets are rather old now many sets that use them are still going strong, for example some of those fitted with the Decca 100 and Philips G11 chassis and the B and O 35XX series.

There are two major types of fault, no or intermittent no results with all or some functions, and buttons doing the wrong thing. The former type of fault is caused by poor joints etc., see below. Another thing to check is the ultrasonic transducer. These tend to go open-circuit, especially after being dropped. The second type of fault is due to incorrect frequency tuning. Check any coils for damage, cracked or missing cores etc. If no reason for drift can be found realignment is the best course. If possible do it with its own set. This can be a fiddly business. Check for drift over a few days.

Infra-red Units

The infra-red remote control unit is the most common type. It succeeded the ultrasonic type with its rather limited number of functions. Although there were ultrasonic teletext units they were not common, and the advent of text led to a change over to infra-red devices. Once again there are a limited number of basic faults.

The most common symptom has to be no go. Even without a circuit diagram much can be done to establish the cause. The first thing to do is to check the battery/batteries. Always check on and off load. Many tests can be made, such as current consumption, and these can be helpful. But as such units generally have few components general tests can be more time consuming than tests on individual components. Check visually for dry-joints on the infra-red diode(s) and for broken leads on transistors and in particular the crystal. Often a solder round will cure the fault, but make sure that you keep the unit and test it for several days afterwards as a faulty i.c. can be temporarily cured by the application of heat – you may think that you've cured the trouble only to find that it comes back.

Intermittent no go can be caused by any of the faults just mentioned, but is very often due to poor battery contacts. The cause of this can be tarnishing, spillage or battery design. The latter applies particularly with Duracell batteries that have rounded/domed contact plates, see Fig. 1. When this type of battery is fitted in a handset with contacts that have a small surface area, e.g. in some Panasonic units, the result can be intermittent operation. Borderline battery output voltage is another

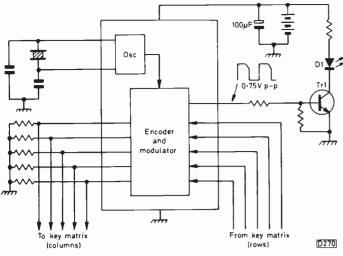


Fig. 2: Typical simple infra-red handset circuit.

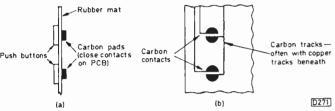


Fig. 3: Mat contact assemblies. (a) Contact mat. (b) Section of PCB.

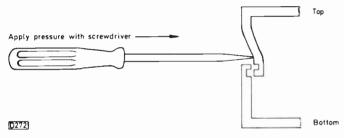


Fig. 4: Opening a click-fit case.

common cause of intermittent operation.

Fig. 2 shows a typical infra-red remote control transmitter circuit. For excessive battery drain check the electrolytic capacitor across the battery and the i.c. For no output check the IR diode, the transistor and the output from the i.c.

The keypads used in infra-red remote control units vary from the rubber pad and carbon contact type to actual copper sprung contacts and membrane/foil arrangements. With the latter, replacement is usually the only viable method of repair. These usually plug into an edge connector on the PCB and breaks in the tracks here are common. It's worth checking this before ordering a replacement as repair can be carried out with RS conductive silver paint.

PCB Faults and Repair

Breaks in PCB copper tracks are in general easy to repair, but with a handset there may be minor complications due to the limited space or infringement of contact area. The best way to deal with a break is to run a lead between the nearest soldered joints on either side, but for the two reasons just mentioned you might have to settle for scraping off the lacquer and bridging the break with tinned copper wire. If this is necessary, ensure that when the case is closed nothing is fouled and that there is

sufficient mechanical strength. Such breaks often occur where a PCB clips into the case: if the repair doesn't strengthen the board it's likely to flex, causing further failure of some functions. You can use Araldite or thin sheets of Paxolin glued on to strengthen the board. Again, you may be restricted by space. If all else fails you'll have to replace the PCB. The boards are usually available as spares minus the components. Swapping over the components doesn't take long, but if you are making an estimate don't forget to allow for this.

Another common type of PCB failure is where the carbon type contact and mat arrangement is used – see Fig. 3. The contacts on the mat or PCB wear, causing loss of one or more functions. Depending on the severity of wear and the constitution of the PCB underneath, this can usually be repaired with soft pencil lead. Either redraw the track several times or grind the lead finely and glue the powder in place. This is more likely to be required with the mat. If more than the odd contact is affected it's better to replace the whole mat. The average manufacturer unfortunately doesn't keep these in stock for long and after that it's worth trying to carry out a repair. If you do, bridge with TCW lacquer or varnish over but be very careful not to insulate any contacts used by the keypad.

Another fault that occurs, particularly with this type of PCB that has layers of carbon print over copper print, is electrical leakage. The symptom is usually transmitting all the time. You can spend ages changing components only to find that the fault persists – it can be difficult to diagnose the cause of this trouble in any other way however, unless you are familiar with the unit. The handset used with the Salora J chassis (and Hitachi equivalents) for example is prone to this trouble. When you've replaced the PCB, snap the old one in half so that if it should lie around for a while you don't use it by mistake.

If copper contacts are used and these are worn they can often be repaired by soldering over. Take care not to do any more than tin them or you could end up with a permanent contact.

Case Faults

Handset construction varies tremendously, but there are some basic patterns. The majority are PCB based with the PCB fitted in the top half of the case. The buttons, whether individual or a rubber mat, fit through the top half as well. The bottom half contains the battery compartment, the two halves clipping together. We'll look next at case dismantling and some of the faults that can arise.

The battery cover is usually clipped into the rest of the unit, being held only by its own elasticity. Not surprisingly these tend to wear out. The modern trend is to clip the case together without the use of screws. This means that to open up the unit you have to push the side of the case where the clips are situated, at the same time levering the two halves apart. This must be done very carefully – see Fig. 4. It's best to use a plastic screwdriver or to cover the metal blade. Sometimes space prohibits this and it's impossible to avoid marking the case. For this reason we keep in stock spare cases for certain Panasonic units and replace them after carrying out a repair. Minor indentations can very often be smoothed down using fine wet and dry paper.

With regard to presentation and finish, if you have to order parts to complete the repair check the case and any printed plates for signs of wear, discolouration or fading.

In view of the cost it's well worth replacing these to restore the appearance of the unit. I have in mind particularly the handsets for Ferguson VCRs such as the 3V53/5 etc. where the button functions are printed on an aluminium fascia that's stuck to the upper case. These wear, marring the appearance and losing the button information. Replacements cost around £1·50. We always replace this when doing up a VCR for re-renting or sale.

Displays

Handsets with displays are becoming more common. So far we've had very few faults in this area. Most units have LCD screens but LEDs are also used, for example with the B and O MCP5500. The main problem with LCD types is dust getting between the layers of the sandwich. This is easily remedied in a clean area. Remember to clean gently with anti-static fluid otherwise you will attract even more dust. Corrupt displays are often caused by a low battery or the driver i.c. Remember that these put a heavy demand on the battery/batteries – most incorporate an auto shut-off circuit.

Bar Scanners

Digital bar scanners are certainly very popular with our customers. Panasonic developed this system, which is also now produced under licence for Amstrad/Fidelity. By far the most common trouble is a blocked sensor. Customers let the units get filthy, the relatively small hole becoming blocked so that it can't read the codes. Such units should always be kept in their wallet, and the little brush supplied for cleaning them should be used regularly. There are now combined scanners/handsets, but these are felt to be clumsy and difficult to use — it's difficult to keep them at the right angle. The charts on which the codes are printed are plasticised but do wear. Replacements are cheap enough.

Dealing with Spillage

Spillage is a common problem. Often it's not mentioned. No go or transmitting continuously are the usual symptoms. Very often the liquid ingress is slight – around the buttons and over the contact area of the PCB. Depending on the time that has elapsed since the spillage occurred the unit may be a write off or may just require cleaning.

If the contacts are damaged and the legs of components are corroded it's best to supply a replacement unit. If cleaning will suffice this should be done with isopropyl alcohol. Don't be tempted to use something stronger, such as solvent cleaner, as this will tend to dissolve carbon print and lacquer. Wash cases and buttons in soapy water. To avoid buttons that stick, completely dismantle the case into its component parts and clean thoroughly.

Testing Cordless Handsets

The ideal way of testing a cordless remote control handset is with the unit it controls. This is seldom possible however. A number of testers which give either an audible or visual confirmation that an infra-red or ultrasonic unit is transmitting are available. I've used several over the years and have found that the Konig type from Willow Vale is the most reliable. We had two of the Planet type and they both failed continually. On one such

occasion an apprentice came up with a very useful suggestion. He fitted an IR receiving diode into the plastic black cover of a quarter-inch jack plug, added a BNC plug and connected this to a scope to check for emission. This is an alternative if you like.

Spares

Whether some/all spares are available tends to depend on the manufacturer. This is not too much of a problem when it comes to transistors and diodes - if necessary equivalents can be sought. Resistors and capacitors are even less of a problem. The only point to watch here is the physical size of capacitors. Very often low-voltage capacitors with relatively high values are used and the equivalent value with a more usual voltage rating will be too large. You will often find $100\mu F$ or $220\mu F$ capacitors rated at 6.3V for example. These are available from RS, Willow Vale and other sources however. The i.c.s tend to be common between units of different manufacture and a look through distributors' catalogues or the advertisements in *Television* should reveal a source of supply. Standard IR diodes and ultrasonic transducers are available and should be kept in stock.

If you want a non-standard part and the manufacturer cannot supply this it's worth checking whether the unit is a clone or is badge engineered. Often the other manufacturer can supply spares. For example, Salora cannot supply certain spares for handsets made by Sanyo, but Sanyo can. It's worth a look around.

Charges

If a new handset costs say £25 you can't apply the usual £15-£18 an hour labour charge. It's quite possible however to make a fixed charge of say £7 and see a decent return. Very often few if any parts are required. Few handsets should take more than half an hour to sort out. In the case of a handset costing £70 to replace (B and O for example) the customer will be pleased indeed if you repair his unit for say £12.

Many customers don't even bother when a handset fails. Others assume that they have to be replaced. Customer education in the form of a notice in the shop or in your advertising should generate a bit of business and a lot of goodwill. If you give the unit a good clean up, replace slack battery covers etc. you will restore the handset to almost new condition.

Developments

Things have developed by leaps and bounds over the years, to the stage where some handsets have looked like the flight deck of Concorde. This was the fashion for a while. We've had multi-function remote control units that control the TV set and the VCR, now we have programmable units that replace three or more units. Flaps that cover up most of the buttons are appearing, for example with the new A1 series of Panasonic colour TV sets. Extensive use is now being made of menus and onscreen displays - this means that we could soon be back with handsets that have only about six buttons but will still control everything. The home automation idea hasn't really taken off yet but it will probably come. Many customers are feeling the benefit of integrated systems such as the Bang and Olufsen Link, where the latest addition is a light controller that can be operated from the Beolink 1000 handset.

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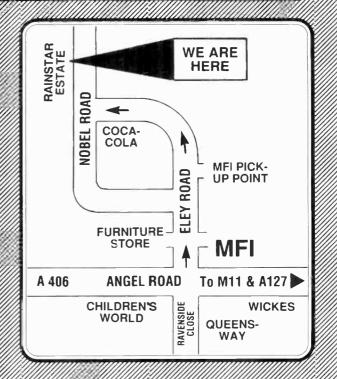
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THORN VIDEO AERIAL AMP 01 M4-597-001	20.00
KT3-K30-K4-K40 CTX ETC Mains Switch 75p each G8 LOPTS PHILIPS £6.00	CVC 40 Cabinets £10.00 Post £5.00 Combiner Switch and Sockets
GH LOPTS £3.00	LINE TRANSFORMER Philips TX 12" and 14" Portable £12.00 Lead 50p
PHILIPS DESK TYPE Dual Power Calculator SBC1704 £7,00	WANDER PHONES Key Pad and Hand Set. No Case £1.00 PHILIPS UNIVERSAL BATTERY TESTER SBC 1695 £5.00
K40 FOCUS POT £1.00	SCIENTIFIC CALCULATOR SBC 1704 Philips. In case \$7.00 THORN RECEIVER
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KT3 Triplers \$6.00	NEW GEC 2110 LOPT \$2.00 M293B1
K3 Tex Front Panels with LCs (SAA3027P/SAB3013/HO448328)	DX-TUNER VHF-UHF SEND FOR DATA 50p SAA5012
K.30 Mains Switch remote \$1.00 K.35 Mains Switch remote 75p K.35 Acrial Socket and Plug in Lead to Funer \$1,10 K.37-K.30 Silider Pots 4.7ku 20p each	MCI4493P
	GEC 20AX POWER SUPPLY Mark 2 £10.00 THORN 9000 4.7m 400V 40p
LARGE Foacs Pots, Fits Pye, GEC, HT, Decca 75p	G8 TUNER V/CAP on Panel £3.50 THORN RECEIVER
8 PUSH BUTTON UNIT for CTX Chassis £1.50 68 Power Supply Panel £4.00 EX DECCA 80-f(t) Decoder £5.00	G8 SPEAKER 75p 564/314
EX DECCA 84-100 Decoder £5.00 EX DECCA 80-100 Frame £5.00 EX HORN 8000-8500-8500 Decoder £6.00	9,000 SPEAKER £1.00 544/301 544/321
THORN 8000-8500-8800 Decoder £6.00 GLASS BEADS Diodes 200v/1.2A 50 for £1.00	THORN 9000 Sound OP Pane! £30p 544/341
GH Tin Switch £20.00	ONE LC K35 Decoder £7.00 SAA 1060 K30 1F/K35 1F £2.00 MAB8440P
G11 H' Panel £8.00 G11 Decoder Panel £8.00	THOUSE 3 15(Y) 2018
IVC HEADS 3H55 £20 G11 Condenser 470/250V ITT £2,00 C9 Payor Payor 53 50	TX9 THORN Tuner Panel with ICS Pots & mains trans. £3.00
G9 Power Panel £3.50 G8 Transductor £1.25 G8 Push Button Unit £2.00	THORN 1600 Rec- & Anode Cap 50p
G8 Con/Panel New Back Type £4.00	KT3-K30 Slider Pots 4.7k
KT4-KT3-K30 Handset Replacement \$12,00 HT520 METER 20,000 Fuse Diode Protector Logic Test Facility \$15,90 HT420 \$12,00	8 for \$1.00
HT420 £12.00 9000 SERIES Decoder 01 929 014 080 Thorn £5.00	HITACHI & GEC 20k Pots and 100K and 69K Philips 20 for £1.00 100K POT & 20K v/cap type with band switch 5p
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For Latest Philips, GEC. Pye and Hitachi. Front panel with memory chip and push button and pots and LED's. £6.00 NEW	K30 Push Button Switch 6 Way £1.00 The Sweep Tuning System TX9 [39/00] £5.00
20AX GEC LOPT Panel with Split Diode	K35 Sound O/P Panel Plug in and KT3 sound o/p £3.00
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T703A LOPT Transformer Rank with Focus Pots and Diode \$2.00 HITACHL Mains Switch 50p	TX9 90D4-099-001 £1.00 Chopper Transformer £1.00 Chopper
HITACHI Mains Switch HITACHI AE Socket 30p	6 off LED DISPLAYS, Mixed £1.00 TX9 06D4-025-001 choke £1.00
1 CONDENSER Axail Leads 450 A/C 1200 D/C 15p	HAND SET TESTER, Infra Red £3.00 TX9 90D4-093-001-01G £1.00 AERIAL SPLITTER with filter £1.00
MAINS TRANSFORMER 24(h in/20h/8v) £1.00 GREEN FLAT, NEC, LED's 3p each 100 for £2	LINE DIDECTIONAL Dunmer Muzzohono 52 06
	20 TURN POTS with Band Switch 10p £3.00 per 10
15V015\$\times 1 Amp Print Type	PUSH BUTTON Mains Switch with Screw Holes Fixing 4 for £1
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WE HAVE OVER 1,000 6 DIODE TRIPLER AT £1 EACH	7 SEG DISPLAYS 4 Bank Displays Z-60421 25p
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2432301 K4 L O P T. 2432491 A40 SPLIT-DIODE 334517 2432871 SA33774 SPLIT-DIODE 363652 L.O.P.T.	AT2076/35 RCO ST CT3325
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2433481 2433581 36832 PHILIPS	3112,338,33634
2433751	3122-138-53861 £1.00 Lamp Pre-set 3y-to-12 volts. 1 AMP TUNER IF for VTS68 Hitacht
TTT Tuner IF CMR800/3 £20 L.U.F. 1. 36922/79 ZJ EAGN	
	VIDEO HEADS from £15 to £20. SEND FOR LIST OF VIDEO SPARES, VIDEO LEAD AND BELTS 00. 30 volt to 15 volts farnell power supply 19" rack mount post £8, in case £2
Decca 100 Lopt Panel	12V/1 AMP POWER SUPPLY WITH MAINS PLUG E4
PIN DATA 40 Pin × 4 £1.00 PHILIPS HALOGEN LIGH	T. NEW. NO ON/OFF SWITCH, NO HANDLE WITH CDRD. BLACK IN COLOUR £5
with co-ax socker UHF v/cap 42 Pin × 5	Z SBUF.E1 VISION MODULATOR A T.V./RF 25-1000MHz T.V. TEST TRANSMITTER £8,000
£10 16 Pin × 10 70p 1 OFF — Can be adapted for video 24 Pin × 5 75p	ROHDE & SCHWARZ EKFZ T.V. MONITORING RECEIVER £1,200
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65.00	
CMR 800 DIL - QIL 16 Pin × 10 £1.00	SAME DAY SERVICE
	ilability. No Accounts: No Credit Cards. Postal Order/Cheque with order.
£5.00 28 Pm × 4 £1.00 All items subject to ava	THE STATE OF THE S
\$EL ITT AB Mains Switch Add 1	5% VAT, then £1 Postage. Add Postage for Overseas.
### \$5.00 28 Pin × 4 £1.00	Callers: To shop at
25.00 28 Pin × 4 £1.00 Add 1	Callers: To shop at
25.00 28 Pm × 4 £1.00 AB Mains Switch 2	

You Won't Believe This . . .

Les Lawry-Johns

We've had a wall built around the rear garden of the bungalow. Not to keep intruders out but to keep the dogs in. The rear garden has also been concreted, again for the dog's use. As repair business at the shop dried up we moved to the bungalow, with the dogs, cat and bird, hoping that the shop will sell before long.

The bungalow is in a secreted part of a housing estate built well after the war on a site previously occupied by Gravesend Airport, which was used by Fighter Command during the war. When an invasion was expected in 1940 all the runways were mined. The public was not informed of course. All these years later the Royal Engineers have been instructed to locate the long tubes of explosives and make them safe. So two days after we arrived we were told that the whole area is to be examined, using metal detectors, and eventually made safe. What a welcome!

Anyway, we've not been blown up yet and the shop telephone number has been transferred to the bungalow.

The other day a man phoned to say that the Decca TV set (80 series chassis) he bought from us some years ago suffered from field collapse after it had been on for about fifteen minutes. He said that hitting the top of the set restored the picture, so I thought it would be a dry-joint. I told him I would be at the shop in ten minutes. When I got there I waited for him to appear. He didn't. So after half an hour I drove to his house. He opened the front door and said "I thought you said ten minutes?"

"I said I'd be at the shop in ten minutes. That way you'd have avoided the call-out charge."

After removing the right-hand side timebase panel I resoldered all the field timebase connections. I then turned the set round and fitted an aerial. There was a good picture when I switched on. It was still there half an hour later

I replaced the back and suggested a charge of £20. He flinched. "That includes the call-out charge," I explained.

He paid me and I drove off. Before I got very far I was held up by traffic. While waiting I saw the chap I'd just left chasing up the road, so I backed down to meet him.

"It's gone again."

Back to the house again. When we got there the set looked perfectly all right.

"Blast. It's come back again."

"I bet your wife was upset," I said.

"Oh no, this is my set. She's watching hers in the front room."

I took the back off again and watched for another half an hour. It was obvious that the fault was not a dry-joint as I'd assumed. It occurred only when the back was on and the temperature rose. I'd no hairdryer with me to make heat checks on the components and it struck me that this would be best done in the shop. I told him I'd call later to pick the set up.

When I got it to the shop I managed to create the fault by pulling away at the upper left plug and socket on the right side timebase panel. So I took the panel out and resoldered all the connections. There was a clear picture when I switched on again. After refitting the back I let the set run for an hour or so. Then, confident that all was well, I put it into the estate car carefully and returned it to Mr. Evans.

I was similarly gentle with the set when I got to his house. I plugged it in and connected the aerial. There was a white line until I clouted the top of the set and a picture appeared. This was too much. I returned the £20 and apologised. In fact I practically ran out of the house. But I've an idea that the set will be all right after this.

The Midday Clinic

When I got back to the bungalow the phone was ringing. A G11 I'd repaired several weeks ago had gone wrong. I asked the owner to bring it to the shop at about twelve the following day. Shortly afterwards a lady rang to say that her ITT portable had a funny fault – the sound would go off until the aerial plug was waggled about. I asked her to bring the set to the shop midday tomorrow.

So just before midday I packed my stuff into the car and sped off down to the shop. The G11 was the first one to arrive. The holder at the back didn't hold a remote control unit. I switched on and a red light appeared. Nothing happened when I pressed the button, and switching off and on again made no difference. There was life on the power supply panel, but only 50V at the fuse. I checked here, there and everywhere but couldn't get the h.t. to rise. The reservoir capacitor was of the blue welded type. I'd fitted it some time ago and it checked o.k. After spending some time checking through the power supply circuit I'd got no further and gave up. Another failure.

Shortly after the ITT portable arrived. I removed the cover and found that the sound came on and went off as the coaxial aerial lead was juggled about over the tuner and i.f. unit. No dry-joints could be seen when the chassis was taken out, but I did find that when the tuner etc. was held in one position the sound didn't go off. So I fitted a wedge. I showed the lady what I'd done and explained that in my opinion the fault was in the tuner-i.f. unit, but that I didn't have a replacement. She seemed happy enough and left me a pound for my trouble. I know that I should have removed the unit and stripped it down, but I didn't have the patience. Sorry.

Another G11

Another call had come in while I'd been away. A G11 with field collapse. When I arrived at the house I found that the owner was the best friend of an old friend of mine, so I resolved not to give up this time.

After removing the rear cover I checked that voltage was present at the TDA2600 field output chip. I then fitted a new TDA2600, with the clip under it, and refitted the heatsink. The line was still there. I told the owner I wouldn't be long and sped off to the shop, hoping to find another panel. As luck would have it I'd kept an old G11 with a duff tube. After extracting the upper left panel I hurried back to the house and fitted it. I crossed my fingers and switched on. The picture appeared and I was greatly relieved.

I felt guilty about charging them £25, but they seemed to be quite happy and I went off with the faulty panel. I'll find the fault on it when I have time. Meanwhile all the best to you all.

Teletopics

BUSINESS PROSPECTS

While sales of consumer electronics goods in the UK remain flat, the latest report from specialist market researchers BIS Mackintosh paints a hopeful picture of what trade will be like in the European Community come 1992. Its predictions, compared to 1988, are as follows:

Market	1988	1992
TV sets	£8bn	£9·15bn
VCRs	£4·12bn	£4.9bn
Camcorders	£1·2bn	£2bn
Audio	£9bn	£10bn
Overall consumer electronics	£22·3bn	£26.7bn

BIS Mackintosh suggest that thereafter the growth rate might accelerate due to the effect of the single European market. Amongst newer products, the report suggests that the market for satellite TV receiving equipment will be around £300m in 1992. Camcorders are picked out as a section of the market where considerably increased demand is expected.

Meanwhile, back to reality. Following Ferguson's retrenchment (see Teletopics last month), Tatung has announced that just over ten per cent of its workforce at Telford is to be made redundant. Most of the redundancies will be in back-up rather than productionline staff. Tatung blames the poor demand for TV sets and the failure of the satellite TV market to develop for the need to make this move. Earlier, the company had expected to take on additional production-line staff during the summer to build up satellite TV equipment output in anticipation of increased sales later in the year. In another move, Thorn EMI has announced the closure of its CTV tube plant in Sunderland. The plant was mainly involved with regunning tubes, some 85 per cent of the output going to Thorn EMI's rental chains. It was originally established in 1950 for the manufacture of monochrome TV tubes. The switch to sets with FS tubes is cited as one reason for the reduced call for regunned tubes.

SKY AND BSB

Sky Movies' transmission hours have been increased to up to sixteen a day, starting at 2 p.m. and running to approximately 5.30 a.m. The final film in each broadcasting day starts at about 4 a.m. and will usually be the main film of the previous day. Meanwhile Sky Television is planning a major move to increase its number of viewers, one aim being to take advantage of BSB's postponed service start. Sky is to offer a rental package consisting of receiving equipment and a Sky Movies subscription at a price expected to be around £4.50-£5 a week. This would mean Sky Television going into the rental market and would represent a considerable investment on top of the present cost of running the Sky TV services, around £2m a week. It's understood that the receivers would be supplied by Amstrad and that an order has been placed for "hundreds of thousands" of them. A network of installers is being established.

BSB is still suffering from the consequences of its decision to adopt the high-tech approach to satellite TV broadcasting. The difficulty over the ITT 2285 chip has led BSB to reassess the possibility of using the Philips/Plessey

MAC decoder chip set. This is understood to cost around £27, which would increase the cost of receivers. There is also continuing doubt about whether the Squarial will be made available, particularly in view of the proposal to use reduced transmitter power in order to start the service with five channels from one satellite.

SERT's one-day seminar on DBS reception, postponed from June because of the railway strikes, has been rescheduled for Friday September 15th, with an enhanced programme. It's hoped that there will be direct demonstrations from the BSB satellite, which is due to be launched at the end of August. The programme will include presentations on Ferguson, Grundig and Salora equipment. The seminar is to be held at the IBA Conference Hall, Brompton Road, London SW3. Additional tickets are available at £75 (£60 for members of SERT) inclusive of lunch and VAT. For further details apply to Consert, 57-61 Newington Causeway, London SE1 6BL (telephone 01-403 2351).

SEME TO HANDLE PANASONIC SPARES

SEME Ltd. has been appointed authorised supplier of Panasonic spares to handle, from August 1st, all orders outside the manufacturer's own franchised dealer network. This development will ensure that non-account dealers and service engineers will now have a speedy access to original Panasonic parts. A new sales office has been established at Buckingham to deal specifically with Panasonic orders. Three new sales staff and a technical liaison engineer have been trained jointly by SEME and Panasonic's head office at Bracknell. The Buckingham office is directly linked to SEME's computer at Melton Mowbray, site of the company's warehouse.

SEME's Buckingham address is Chandos House, School Lane, Buckingham MK18 1HD. The new SEME telephone number exclusively for Panasonic spares is Buckingham (0280) 823 523 or fax 0280 814 916.

SERVICE AIDS

Ferguson has issued an extremely useful pocket book to assist with fault finding in the TX90 and TX100 chassis. There are separate sections on the various parts of the chassis, with symptoms and likely causes listed. It's available under part number 10P1-552-001 from Ferguson Ltd., Service Division, PO Box 1594, Crown Road, Enfield, Middx EN1 1DY.

Robin Electronics, Hirst Hall, GEC Centre, East Lane, Wembley HA9 7YA has introduced a range of high-quality safety test probes designed to fit many instruments including multimeters and insulation testers. All models feature Robin's unique angled prod, have cable engineered in silicone for maximum flexibility and long life, gold-plated tips and terminations for minimum contact resistance, and colour coding in black and red for safe use. Price of the general-purpose SP25RA lead set for use with test equipment that has 4mm shrouded sockets is £12.95.

CD AND DAT

The price of CD players in Europe is set to rise following the decision by the EC to impose anti-dumping duties ranging from 6.4 to 33.9 per cent on imports from Japan and South Korea. This move is the outcome of a two year investigation by the European Commission following a complaint lodged by Philips, Grundig and Bang and Olufsen. In the two years to 1987 the European producers' share of the market fell from just over 50 per cent to

18 per cent. Selling prices will have to rise since under EC trade law the duties cannot be deducted from profit margins. The duties are expected to remain in force for five years.

Digital audio tape recorders are expected to be on sale in Europe and North America by Christmas, following an agreement reached between the world's recording and consumer electronics industries. Consumer electronics manufacturers have agreed to incorporate in each machine a device that will prevent it making more than one copy of each original recording.

UP-MARKET TVs

Sony has released a new top-of-the-range TV receiver, Model KV-FX29TU, with a host of features and a suggested retail price of around £2,000. It has a 29in. (68cm) tube and is compatible with S-VHS and hi-band 8mm video equipment. There are Nicam and Fastext decoders and an on-screen display for control operation. The digital circuitry incorporated includes sufficient memory to be able to produce a flicker-free display and noise reduction. Of particular interest is the fact that it will work with VCRs capable of handling NTSC and SECAM tapes.

Shortly to follow, at around £2,500, is a set with an even larger tube. The KV-DX3412U will have a 34in. (80cm) screen.

Grundig plans to launch a set using the flicker-free (100Hz) technique at this year's Berlin Audio and Video Fair.

A US company, Northwest StarScan, claims to have developed a signal compression system that enables an HD-TV transmission to be fitted into a standard bandwidth channel. Signal compression of ten times is

understood to be possible. This could significantly cut the cost of satellite TV transmissions.

TRANSMITTER PRIVATISATION

The government has decided to privatise the UK's broad-casting transmitter networks (BBC and IBA) in their present form rather than adopting the approach suggested by Price Waterhouse (see last month). The BBC will retain its transmitter network until 1996, when the corporation's royal charter expires. The issue will then be reviewed. An announcement from the IBA has welcomed the decision, and also the suggestion that a uniform transmission tariff should be retained for the Channel 3 companies.

CONFERENCES/EXHIBITIONS

The High-definition Television International 89 conference and exhibition is to be held on September 18-19th 1989 at the London Tara hotel. It's designed for those with little or no knowledge of HD-TV as well as for those working on the development of this technology. Further details can be obtained from Meckler Ltd., Grosvenor Gardens House, Grosvenor Gardens, London SW1W 0BS (telephone 01-931 9985).

The fourth International Cable and Satellite exhibition and conference will take place at the National Hall, Olympia, London from April 9-11th 1990. For further details contact Cable and Satellite 90, 11 Manchester Square, London W1M 5AB.

The fourth International Broadcasting and Telecommunications Show is to take place in Milan from October 12-18th 1989.

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U.H.F. TELEVISION DISTRIBUTION AMPLIFIERS T.S. 2008 8-Way U.H.F. Distribution Amplifier Price £19.95 each + Carriage & VAT (Total £24.68) 10+ £17.22 + Carriage & VAT 20+ £15.84 + Carriage & VAT Specification: Frequency: 470 - 860 MHz Minimum Gain per outlet: 2dB Mains: 240V A.C. T.S. 2004 4-Way U.H.F. Distribution Amplifier Price £14.95 each + Carriage & VAT (Total £18.93) 10+ £13.23 + Carriage & VAT 20+ £12.17 + Carriage & VAT Frequency: 470 - 860 MHz Specification: Minimum Gain per outlet: 2dB Mains: 240V A.C. TAYLOR BROS. (OLDHAM) LIMITED Telephone: 061-652 3221

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VCR Clinic

Philips VR6468

This machine would accept a cassette normally, but if wind or play was selected the cassette would eject. A check revealed that the microcomputer chip thought the capstan wasn't turning even though it was! The tacho pulses were missing – a new P687 amplifier module put that right.

P.B.

Philips VR6561

If play or wind was selected this machine would eject the cassette. The error memory showed that the capstan tacho signal was missing. R3509 (15 Ω) had gone high-resistance – it read about 60Ω . **P.B.**

Philips VR6462

This machine played o.k. but wouldn't tune in a signal. We found that the tuning information pin 16 of the SAB3013 chip was at a higher voltage than it should have been as T7420 (BC547) was open-circuit base-to-emitter.

P.B.

Philips VR6468

There was no vision in E-E or play, though the test pattern worked. The +11.9b supply was missing as C2329 on the signals board was short-circuit. The short had also damaged transistors 7607 and 7304 (both type BC328).

P.B.

Philips VR6180

This machine intermittently failed to accept a cassette. If it was put into standby before the cassette was tried the display would go bright, showing that the cassette in switch was being sensed, but the tray wouldn't move. No supply voltage reached the control motor as there was a dry-joint on plug B2.

P.B.

Panasonic NV-G40/NV-G45

Two similar machines came in with different versions of the same fault. The first one, an NV-G40, had a reluctance to capture and lock on to channels when search tuning. It would tune all the way through the u.h.f. bands, pulling in all the local, fringe and distant channels but refusing to stop at any of them.

The manual contains no description of the search tune circuitry but did provide a clue as to the area involved. In addition to running the clock and the displays, and decoding the push-button inputs, IC7501 on the timer and operation panel provides tuning memory and digital-to-analogue conversion for the tuner and TV demodulator, via the channel select chip IC7551. During tuning search, as a signal is resolved the video from the tuner-demodulator is fed to the luminance/chrominance section and passes via the input/output CBA and emitterfollower Q3013 to pin 1 of IC3002. The sync pulses are separated and fed, together with a 15·625kHz signal, to a comparator. Presence of a signal is detected by identifying line sync pulses – this results in a low at pin 9 of IC3002. This low is fed back to pin 20 of IC7501. The

Reports from Philip Blundell, Eng. Tech., John C. Priest, Eugene Trundle, Chris Plaice, Harvey Benson, Ian Bowden, Alfred Damp and Nick Beer

tuning scan then stops and the tuning point is locked, after which the memory button is pressed.

We found that by artificially introducing a low by momentarily shorting pin 9 of IC3002 to chassis at the point during the tuning scan when a picture was resolved it was possible to lock on to a channel. Pressing the memory button then stored the channel in the normal way. Using this technique, we were able to program all the local channels. The machine would have been usable in this state provided the user didn't move to a different area or unplug his machine long enough for the tuning memory to be lost. Resisting this temptation, also the temptation to provide an extra push-button switch to short out pin 9 during the tuning process, we pressed on.

Scoping the video waveform at the tuner-demodulator output and then tracing it along the path to pin 1 of IC3002 showed that there was no loss of signal here. Pin 9 of IC3002 should have been at 0.1V but was actually at 4.75V and didn't vary whilst tuning. Replacing IC3002 (AN5421N) cleared the fault.

The second machine, an NV-G45, had exactly the same symptoms. So after confirming channel lock by pulling down pin 9 of IC3002 we replaced this chip. This time the fault remained. Resorting to the scope we found that the video input at pin 1 of IC3002 was of very low amplitude, less than 25 per cent of that at the base of emitter-follower Q3013. Further investigation showed that one leg of C3055 (33 μ F, 16V) came loose from its can when moved. Replacing this capacitor finally cleared the fault.

Sanyo VHR4350

This one led us a merry dance. The head drum wouldn't turn, though voltage was present at the drum motor and it was free to turn. The cause of the problem turned out to be dry-joints at CN823 on the deck-mounted junction PCB. As a result the motor was off earth. You have to remove the deck to gain access for resoldering – do all the joints while you are at it.

E.T.

Panasonic NV-G7

The mode switches used in various Panasonic decks can be troublesome. If you replace one in the D1 deck (NV-G7, NV-G10 etc.) don't use the VSS0110 type which you may have in stock for earlier models. It looks similar and fits perfectly, but electrically it's quite different, giving rise to some peculiar deck behaviour. The correct part number is VSS0135.

Mitsubishi HSB20

There was a nasty buzz on the E-E sound with this new machine. We fed the output from a colour-bar generator into the machine and found that the buzz disappeared when the generator's chroma signal was switched off. Attention was therefore turned to the 6MHz filter circuit CF151. By making comparisons with a good machine we found that although the output waveforms at pin 18 of IC101 were similar they were different at the input to

CF151. After replacing various components in this area to no avail I was getting somewhat puzzled. L153, which is connected between CF151 and chassis, had been measured but as a last resort I decided to swap it over with the coil from the good machine. This cleared the fault. Both coils were identically marked and gave exactly the same resistance reading, so I can only assume that the faulty one had a couple of shorted turns or perhaps a crack in its core.

Panasonic NV333

The job card said that the problem was intermittent failure to eject, also other intermittent mode failures. When I checked the machine it behaved like a video possessed. On application of power, sometimes the record LED or the pause LED would light, play was intermittent, and at other times the machine would return to stop after a few seconds. Occasionally the cassette housing would eject five seconds after the button was pressed!

My first thoughts were that perhaps the microcomputer control chip IC6001 was faulty or that maybe the mode switch was defective. With this machine however I've found that the microcomputer chip is usually innocent when there's a syscon fault. Changing it made no difference, neither did removing, cleaning, adjusting and replacing the mode switch. Detailed checks were then made in the syscon circuit. As a result I discovered that transistor Q6008 had an intermittent base-emitter open-circuit. Q6008 is driven by Q6009: they are employed by IC6001 to pulse scan its mode sensor input.

Salora SV6600/Sanyo VHR1300

The problem with this machine was intermittent tuning drift. As all channels appeared to be affected we checked the 33V supply, which was slightly high. We also noticed that the panel (the timer/tuning panel) in the vicinity of the 33V regulator IC6206 was brown and showed signs of overheating. The supply to this 33V regulator chip is provided by a constant-current regulator arrangement on the power supply/system control panel. Note that there are two different circuit diagrams in the manual – this was the more complex one.

The voltages around the regulator transistor Q5004 (2SA984) didn't agree with those in the manual, but the transistor, along with diode D5003 and zener diode D5004, were all o.k. Resistor checks were then carried out. The emitter resistor R5010, which is used to sense the current, was found to be only 270Ω instead of 560Ω – the wrong value had been fitted. In addition R5015 was 560Ω instead of $1.8k\Omega$. Both resistors were original parts and had been in the machine for around three-four years. Maybe this was a one-off occurrence, or maybe more machines with these errors will start to show up soon.

Panasonic NV430

The problem with this machine was that the optical tapeend detection wasn't working. As detection didn't occur at either end of the tape the infra-red emitter circuit was the most likely suspect. On these machines the infra-red LED is pulsed on and off by the system control chip IC6001 via the 2SD636 emitter-follower Q6006. Meter checks showed that the LED, transistor and two assorted resistors all read correctly. But no light reached the end sensors. Scope checks then revealed that while 5V peak-to-peak pulses were arriving at the base of Q6006 the pulses at its emitter were of only 1V amplitude. Replacing this transistor restored normal operation, but it read o.k. on the meter's diode check when tested out of circuit.

Philips VR6760

There was no E-E picture and no playback picture, due to the absence of any 10V supplies on the signal board (P306). Tracing back led us to an open-circuit transistor (7607) on the main board (P606). Removing the panel to replace this transistor is no easy task. It was even more frustrating when the replacement gave an impression of Vesuvius ten seconds after switching on. Further checks revealed that there was a short to chassis on the signals panel. The +10c supply stabiliser transistor on this panel was found to be burnt up and short-circuit, but the short was still present after it was removed. It was found to be in C2329, and when this and the two transistors were replaced normal operation was restored.

Ferguson 3V44

H.B.

This machine had no clock display though the function display worked correctly. Scope checks on the timer/display board showed that there was no output from IC401. The supply to this chip was correct, but there was no clock signal either at this chip or where it enters the board at pin 6 of CN1. The missing signal was traced back to broken print on the power supply module. Repairing this print restored the display.

A.D.

Marantz MV762/Philips VR6860

The complaint with this machine was "lines on the picture and a whistling noise when not in use". A trial with the test tape showed that the "lines on picture" were due to the capstan motor running at full speed. Checks around the MAB8420 servo chip IC7091 revealed that it was not supplying pulses to the D-A converter chip. A new MAB8420 put matters right. A.D.

Hitachi VT-M622

This brand new stock machine came from the shop with the complaint of poor stills in the SP mode. This is not actually a fault with these machines, but it does catch the unwary. On this model preference is given to the LP mode. Thus functions such as picture search and still are of poorer quality in the SP than in the LP mode.

A.D.

Panasonic NV-MC10/NV-MC6

This fault occurred on an NV-MC10 but could equally well be experienced with the NV-MC6. The customer's complaint was that the speed seemed a bit fast. The capstan was rotating at maximum speed, which meant that the reels were also running at maximum speed. The output chip is mounted on the back side of the mechanism, and the servo is on the main PCB, sandwiched across the back. All in all it's impossible to fault find in this area without a set of extension leads. We found that there was no feedback from the capstan motor. A new motor (VEM0284) put matters right.

Letters

POLARISERS FOR TVRO SYSTEMS

Most test reports now seem to mention the use of a magnetic polariser as an effective component in any satellite TVRO system – in one trade publication an NEC spokesman was recently quoted as saying that "if you find a so-called polariser with moving parts, have nothing to do with it", and went on to condemn the cross-polar discrimination with Marconi LNBs, pointing out that the most effective solution is to use a magnetic polariser. Such advice is not always helpful to those in the front line, who find few such clear-cut answers to technical difficulties.

Yes, magnetic polarisers are a useful addition to the TVRO system buyers' shopping list, with their advantages of low insertion loss, no moving parts, fast polarity change etc. But we must also be aware of their weaknesses. The first problem is fundamental to the operation of such a device: for a given magnetisation of the ferrite core in the polariser, it will twist the polarisation of a plane incoming wave by an amount that varies with frequency. This leads to the need to be able to adjust the skew and store this for each channel. Some installers will claim that the results obtained without this facility are adequate when receiving Astra's channels so far. Thanks to Astra's reluctance to fire up all transponders, an installer needs to adjust the skew for best cross-polar rejection only at the mid to high end of the frequency band in use (Screensport on ch. 1 has to date no adjacent signal with vertical polarity to cause cross-polar interference). Unfortunately the problem becomes worse as the required frequency range increases, creating difficulty with reception of future Astra satellites.

The second problem is more obvious – the installer cannot easily see the polariser's "viewpoint". When a mechanical polariser is fitted he needs to look only at the probe position to know the skew setting. When a Marconi LNB is fitted the case position indicates the skew setting, although this must be done manually. The magnetic polariser has no indication of the skew setting other than from the signal level obtained. This makes a signal level measuring facility an absolute necessity. Simple peak-level units aren't suitable as they simply average the total power level of the channels received, when it's necessary to examine individual channel levels. This makes "by the book" installation a tedious job, requiring adjustment for optimum skew on each channel.

A Marconi LNB (or any LNB with two selectable receive probes 90° apart) will not require such elaborate alignment. It will require adjustment for the opposite polarity. Both these types of polariser are able to provide polarity selection with very low insertion loss and with cross-polar isolation better than that of a magnetic device. The mechanical polariser has the extra facility of skew adjustment from the receiver. Neither device will alter skew with frequency across the Ku band.

So next time you're asked to weigh up a TVRO system with a magnetic polariser, check that the receiver stores skew on each channel and be prepared for a return visit

to the system when Astra fires up the remaining transponders.

Gordon McCrea,

Kesh Electrics (Satellite Systems) Ltd., Kesh, Co. Fermanagh, N. Ireland.

PHILIPS REPLY

In response to Martin Blake's letter (July) I would make the following observations which may help to enlighten Martin and your readers.

Philips, being at the forefront of electronic communications and leaders in the field of interactive communications, have translated this expertise into the area of spares distribution to provide material support for the UK's consumer electronics service industry. With the development of our Multi-option Interactive Enquiry System (MOVIES) we offer the trade the ability to gain access to our mainframe computer at Croydon in order to obtain up-to-date information on spares, technical advice and product availability. By using MOVIES the dealer can take advantage of the following facilities:

- (1) Ordering parts. (a) Identify and code parts required.
 - (b) Check on price and availability. (c) Place orders.
 - (d) Check the progress of an order.
- (2) Technical Information. (a) There is access to some 1,200 pages of current technical advice and service tips. (b) Technical assistance can be obtained from our Technical Support Engineer at Croydon via the messaging facility or contact made with Technical Liaison Officers throughout the UK. (c) The user can communicate with other MOVIES users in the UK via the messaging/mailbox facility.

All this is available for what is in most cases the cost of a local telephone call.

We at present have over 1,000 registered UK users (including our five major distributors) who regularly use MOVIES. In May, 67 per cent of all orders transacted at our Waddon warehouse were placed via MOVIES. Our current stock availability is 98.8 per cent of all codes required, and 93 per cent of all order items are cleared from stock. Orders placed before 18.45 hours by the trade via our MOVIES system are picked, packed and ready for despatch via mail or express carrier by 10 o'clock on the following working day (subject of course to stock availability).

Need I say more Martin? Join the MOVIES club or get closer to your Philips Appointed Distributor who will be delighted to help you.

Max Hofmann, Major A/C Manager, Philips Consumer Electronics, Consumer Electronics Service, Waddon, Croydon CR9 4DR.

PHILIPS SPARES FROM WILLOW VALE

I read with interest Martin Blake's letter (July) regarding the distribution of Philips spares through wholesalers. According to Philips, in May Willow Vale supplied 48 per cent of all the non-account spares used in the UK. This comprised nearly 8,000 different parts with a supply ratio from our stock of 94.59 per cent. This means that half the trade ordered Philips parts from Willow Vale and received 95 per cent of their total order the next day.

I doubt whether any other manufacturer other than Sharp and Grundig (for whom we are the sole parts distributor) can boast such an impressive record.

Martin says he cannot understand our invoices. But as long as he gets his parts, why worry? Our rep will explain the paperwork and our technical people will help him order. Martin, my message is: Open an account – your problems should then be solved.

P.J. Bartlett, Managing Director, Willow Vale Electronics Ltd., Reading, Berks RG2 0LU.

THE PVC LEAD PROBLEM

M. Bennett (Letters, August) asks why a PVC lead should attack plastic. PVC (poly vinyl chloride), whether used in mains leads or plastic macs, is somewhat different from other common plastics. Essentially it's a stiff or rigid polymer which is made softer by the addition of a colourless synthetic oil or "plasticiser". In some cases this plasticiser has an unfortunate tendency to migrate or leave its parent PVC compound under the action of heat and/or pressure. This gives rise to the observed effect, i.e. that by contact the plasticiser can migrate and soften silver paint etc. Some PVC/plasticiser combinations are worse than others in this respect. Cheap, poor quality compounds will no doubt be the worst offenders. In hopefully rare cases the plasticiser may contain other materials such as dissolved colour matter which could produce a clearly visible stain.

Although this problem doesn't always arise, it would be prudent to regard all leads as suspect and avoid conditions that would assist the process. In other words, let the leads dangle!

J.W. Turner, Grad. P.I., Morecambe, Lancs.

Editorial comment: We have received several letters on this subject and wish to thank all those who took the trouble to write. A further letter from Andy Emmerson will be published next month – he warns of the danger of using polystyrene roof insulation with PVC-covered cables.

AMSTRAD'S SATELLITE TV RECEIVER

Ian Martin's article on the Amstrad satellite TV receiver system (July) was very interesting. I too live in South Wales and experienced all the same problems as Ian, even down to the LNB packing up after the first week. Unlike Ian however I was quickly given a replacement by the local Currys branch despite my SRX200 kit being self-installed. I agree that the Amstrad system is excellent: the text, stereo sound etc. cannot be faulted. There's only one small thing that I wonder about. As Ian says, it's probable that the decoder will fit snugly in the top of the receiver. The only problem is that the receiver already runs pretty hot, so I don't know how hot the decoder will get! *Chris Plaice*,

THANKS!

I am writing to thank you for the excellent advice provided by your Advisory Service. This has helped me on several occasions. Here are a couple of examples.

The problem with a Philips set fitted with the G11 chassis was inconsistent line sync. Following your advice

to check out decoupling capacitors I scoped the sync signal and found a ring which was causing the mis-sync under certain signal conditions. The cause of this problem was the LT1 supply reservoir capacitor C3150 $(150\mu F)$ on the line output panel.

The problem with a Ferguson 3V35 VCR was intermittent noise on playback of its own recordings. You suggested worn heads, so I replaced them with an economy grade drum at £18. The results were superb! No realignment was necessary and the new heads overcame poor tracking with prerecorded tapes, a fault that had been present almost from new. No guide tweaking was required.

T.G. Borg, Weaverham, Cheshire.

EQUIPMENT IN SCHOOLS

I work for a local authority in the repair and maintenance of audio-visual and reprographic equipment. In 1990 this work will go out to tender at many of the schools within this county and others. Thus in future schools will be able to call in local engineers to carry out repairs and servicing. I would like to point out however that there are some safety practices to take into account, as follows:

- (1) TV sets should be in a cabinet or securely fastened.
- (2) The security of all fastenings should be checked at regular intervals. These sets are prone to working loose from their mounting screws and if not checked the set can slide off its trolley. For this reason a sticker should be attached to one end of the TV set marked "push from this end only".
- (3) It's recommended that the insulation of the TV sets, VCRs and audio equipment is flash tested at least once a year. It's the school's responsibility to ensure that all equipment is tested.
- (4) Fuses, plugs etc. should also be checked every year.
- (5) Extension cables should not be used.

J. Fenton, Hull, North Humberside.

HELP WANTED

Can anyone help me obtain a TBA500 chip which I understand is no longer being made? Alternatively can anyone let me know of any chassis that used it so that I can perhaps salvage one?

Harvey Benson, 5/11 Rehov Hatzanhanim, Entrance B, Magdiel, Hod Hasharon, Israel.

Can anyone supply or suggest an alternative for the hard-to-get LM373N chip?

M. Stevenson, 124 Green Lane,
Eastwood, Essex SS9 5QI.

Can anyone assist with the repair of a Rank T510B ultrasonic remote control unit, used with the Bush Model AC6333? All that's wrong is that there's a missing top to a coil.

David Jackson, Graphic Studio Ltd., 74 Lower Camden Street, Dublin 2, Ireland.

Swansea, Glamorgan.

Servicing Salora Colour Receivers

Part 2: The G and H Chassis

Nick Beer and Ian Bowden

This month we'll start on the G and H chassis – the production of these very similar chassis overlapped. Both chassis use the Salora Ipsalo (integrated power supply and line output) circuit, which was devised as a means of reducing the power consumption. It uses a common transformer, referred to as the combi transformer, for the chopper and line output stages.

The situation is complicated by the fact that two different Ipsalo circuits were used in the G and H chassis. G sets up to serial number 300,000 and H sets up to serial number 200,000 use the Ipsalo-1 circuit while later sets use the Ipsalo-2 circuit. The two circuits are quite different. While Ipsalo-1 uses a thyristor as the chopper device, a second thyristor for protection and soft-start, and a 28-pin type LF0015 hybrid i.c. for chopper control, Ipsalo-2 uses a couple of transistors in the chopper circuit (both as switching devices) and an LF0034A 20-pin hybrid i.c. as the control device. Ipsalo-1 has two driver transformers for the two thyristors while Ipsalo-2 has a single driver transformer with two secondary windings for the two chopper transistors - the primary winding on the combi transformer is connected in series between these two devices. Both Ipsalo circuits provide mains isolation.

lpsalo-1

Fig. 1 shows the Ipsalo-1 circuit used in the H chassis. In the following description we'll use the H chassis circuit reference numbers with the G equivalents in brackets.

The incoming mains supply is filtered and then fed to the bridge rectifier DB708-711 (DB1-4) whose output is fed via the surge limiter RB711 to the anode of the first thyristor THB700 (THB2). The mains input is also fed to transformer MB700 (MM1) which produces an output of approximately 24V a.c. This is rectified by DB700-3 (DB40-3) and fed via DB704 (DB44)/RB702 (RB127) to the start supply regulator circuit TB700/TB701/DB706 (TB15/TB16/DB14) which produces an output of about 12V. With the H chassis there's also a feed via DB704 to the MC78M18 18V regulator ICB700. On the G chassis a 32V feed from the cathode of DB44 is taken to the battery kit socket and remote control PCB if fitted.

During start-up the regulated start supply is used to power the Ipsalo chip HB1, the TBA2593 sync/line generator chip ICB501 (ICB2) and the line driver stage.

Overload Protection and Soft Start

The first thyristor THB700 (THB2), type TIC106M, is used as an electronic fuse in case of an overload and also to provide a slow start-up. Both these functions are controlled by the hybrid chip. For slow-start control a zero cross-point switch in the chip is fed via pin 27 with an integrated a.c. waveform from the secondary winding on MB700 (MM1). This circuit produces a sawtooth waveform which is used as one input to a control amplifier circuit, the other input being a clipped line flyback pulse from the combi transformer. This control amplifier's output is fed to an integrated driver transistor

whose output leaves the chip at pin 4, going to the driver transformer MB701 (MB4) which controls the gate of THB700 (THB2). The soft-start action is to switch THB700 (THB2) on during only one half of the mains input, so that the main reservoir capacitor CB721 (half CB5) receives only a half-wave rectified input. Once the set has started up THB700 (THB2) is driven on both half cycles of the mains input.

The 12V supply at pin 22 of the hybrid chip, the 20V supply at pin 6, the 28V supply at pin 5 and information on the operation of the chopper, fed in at pin 20, are sensed by the overload protection circuit. Should an overload occur the drive to THB700 (THB2) is removed, leaving this thyristor cut off. Thus the set closes down, after which it will try to start up again – with the later Ipsalo-2 circuit the set remains shut down.

Chopper Action

The second thyristor THB701 (THB1), type 18022, is used as the chopper device, controlling the amount of energy transferred from the mains supply to the combi transformer and thus all the secondary output voltages. Note that this device incorporates a reverse current (efficiency) diode. Line flyback pulses are fed back to pin 16 of the hybrid chip and are used to generate a sawtooth waveform which is applied to one input of a control amplifier. The other input is fed in at pin 18 and provides a reference voltage, developed across CB718 (CB15) at pin 10. This reference is preset by RTB700 (RTB1) which thus controls the levels of the output voltages provided by the Ipsalo circuit. This control amplifier acts as a pulse width modulator: each time the sawtooth input falls below the reference level its output changes state. This cuts off the integrated driver transistor whose output, at pin 9, drops. A drive pulse is then coupled via MB702 (MB5) and CB724 (CB20) to the gate of THB701 (THB1), switching it on. When the line flyback occurs a back-e.m.f. is generated by the combi transformer's primary winding, the reverse voltage across it switching THB701 (THB1) off. Current flows through the integral efficiency diode, putting energy back into the smoothing capacitor CB722 (part CB5). As the thyristor's switch-off point is fixed, it's the switch on point - or rather the length of time the thyristor conducts - that governs the amount of energy supplied to the set.

This switch-on point varies to provide regulation of the secondary supplies. If the amplitude of the flyback pulse or the rectified mains input increases, the reference voltage at pin 10 of the hybrid chip will fall (there's an inverting amplifier between pins 18 and 10). The driver transistor will thus switch off later and the thyristor will not remain in conduction for so long, resulting in less energy being supplied. The reverse happens when there's a drop in the mains input or the amplitude of the line flyback pulse.

Standby System

The transformer fed start-up supply is used when the set is in the standby mode. In the H chassis the 18V

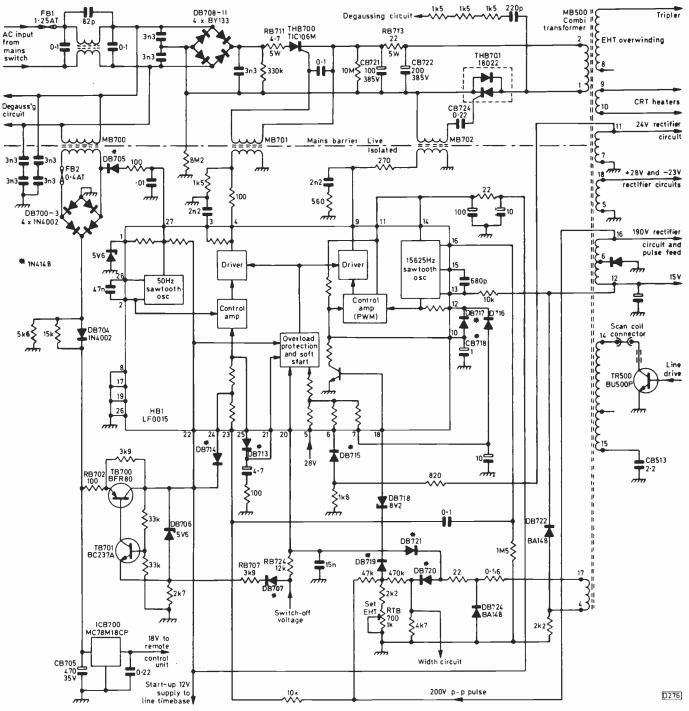


Fig. 1: The Ipsalo-1 circuit as used in the H chassis. Note that the line output transistor's supply is generated across capacitor CB513 by efficiency diode action.

output from ICB700 powers the remote control circuitry in standby, while in the G chassis the 32V output from DB40-3 is fed to the remote control panel where a similar i.c. provides regulation.

When a standby command is received, pin 19 of the SAA1251 remote control decoder chip ICC101 goes low, switching on transistor TC102. This links the 18V line back to the power supply where it passes via RB724 (RB125) to pin 20 of the hybrid chip. This shuts off both driver transistors in the chip, so that neither thyristor in the chopper circuit receives drive pulses. The 18V supply is also fed via DB707 (DB37) and RB707 (RB124) to the start-up supply regulator circuit where TB701 (TB16) switches off. As a result TB700 (TB15) is no longer conductive, removing the start-up supply to the Ipsalo chip, the line oscillator and the line driver stage. When

the set is asked to come on from standby it's simply a matter of switching off TC102 so that the 18V feed to the power supply is removed, after which the set starts up in the usual manner.

Tuning Arrangements

Earlier versions of the G and H chassis used basically the same sweep tune and control circuit. The difference is that in the H chassis the SAA1251 remote control decoder chip is on the microcomputer panel whereas the G chassis has to be fitted with a small extra PCB to perform this function. The reference numbers in the following description apply to both the H and G chassis.

The later eight-channel version of the G chassis did not have this search tuning. Instead it uses preset



potentiometers switched by two i.c.s (ICCP1 and ICCP2) on the lower front panel. These chips are fed with channel number data from the 74C922 channel number keypad encoder chip ICS1 on the upper front panel. This arrangement has proved to be far more reliable and we feel requires no further explanation.

In later H chassis sets with the Ipsalo-2 circuit the search tuning circuit is simplified by the use of an M193C combined microcomputer, memory and varicap supply driver chip. There are two exceptions, the 1H7 which has the same system as later G chassis sets and the 1H3 and 1H5 which have mechanical switch banks to select the channel and the appropriate tuning potentiometer. These circuits are more reliable (apart from switch contacts on the 1H3 and 1H5) than the search tuning system and do not call for any further explanation.

Search Tuning Operation

When it comes to faults in the G chassis the search tuning circuit is, after the Ipsalo circuit, the main trouble-spot. As you will see from the fault list next month, the number of faults is comparable to the power supply. When fault finding in this area it's helpful to know how the system operates, so that faults can be tracked down by making test measurements rather than

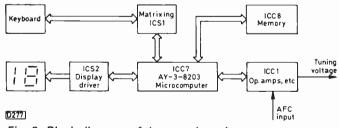


Fig. 2: Block diagram of the search tuning system.

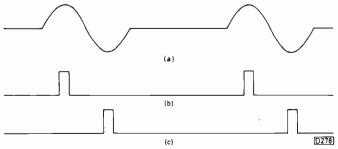


Fig. 3: Tuning up/down waveforms. (a) A.F.C. demodulator output, (b) up pulse, (c) down pulse.

by just changing the i.c.s one by one and keeping your fingers crossed that you will have cleared the fault.

The design is based around the AY-3-8203 microcomputer ICC7 whose function, in conjunction with the front control and display panel, is to provide tuning search and control of memory and channel switching. Fig. 2 shows a block diagram of the system.

Tuning is initiated by the start button, operation of which sets ICC7 in the search mode. A pulse train at approximately 3.9kHz then emerges from pin 35 – this will form the varicap supply voltage. At the same time the fine-tune voltage at pin 33 is centred to give an equal "throw" up and down. Also pin 31 goes low to mute the sound, lower the contrast level and, with the G chassis, switch on the tuning band LEDs.

The pulses from pin 35 vary in width to set the final d.c. level fed to the varicap tuner. They are adjusted to an amplitude of 5.2V by RC58/DC15/TC8/RC54 and then pass to a filter circuit consisting of RC9/10/11/13/14/ 15 and CC5-8 which, in conjunction with an operational amplifier in ICC1 (input pins 8 and 9), produces at pin 7 the d.c. required for the tuner. As the search continues, the a.f.c. demodulator ICCC1 (TBA120A), which is mounted in a screening can on the tuner/i.f. motherboard, gives a pulse output signal – see Fig. 3(a) – which is fed to the control PCB, entering ICC1 at pin 11. When the swing of this signal is greater than ±50mV in comparison with an internal reference voltage of 5.2V, a comparator circuit within the chip produces two output pulses that leave at pins 15 and 16 (the down and up signals respectively).

The down signal is fed directly to the 4011 chip ICC9, providing one input to a nand gate. The up pulses from pin 16 are delayed by CC35/RC66/DC18 before being fed into ICC9 as the second input to the gate. When the up and down signals are both high, the gate's output goes low. This change is coupled via RC71 and CC37 to the level-shift transistor TC12 which turns off momentarily, providing a high pulse at pin 29 of ICC7. This is the stop input. The search then pauses. After a delay of approximately 256msec, set by an internal monostable, the validate input at pin 28 is checked. If it's low, the search will continue: if it's high this indicates that a channel has been found. It can go high only when the video sync fed to pin 12 of ICC1 and the flyback pulses fed to pin 13 coincide, making the output at pin 20 go high. This output is fed via ICC9 and the level-shift transistor TC11 to pin 28 of ICC7. The search will stop and pin 31 will go high, removing the mute and restoring the contrast level. The station can now be stored in the ER1400 tuning memory chip ICC8 by pressing the store button.

ICC7's clock is set at 2MHz by RTC3 and CC26. This is divided by 128 to provide the 15·625kHz memory clock. The search speed is set by the tuning oscillator whose frequency is set at approximately 1·2kHz by RC59 and CC27. ICS2 (U143M) on the front panel drives the LED channel number display, under the control of the four-bit parallel data lines from pins 22, 23, 24 and 25 of ICC7. Channel selection is performed by the MM74C922 chip ICS1 which feeds data directly on to the same data bus. The remote control system uses an SAA1250 encoder in the handset and an SAA1251 decoder in the remote control receiver (ICC101 in the H chassis). This chip provides the same data lines with outputs at pins 8, 9, 10 and 11, via ICC103.

Next month we'll take a look at the Ipsalo-2 circuit then provide a fault guide for the G and H chassis.

An Inexpensive Orthomode Transducer

Paul Matthews

An orthomode transducer is used at the feedpoint of a dish to split the signal two ways. These devices are usually sold at about £99 plus VAT. One type known as IRTE is made in Italy and comes with two adaptor rings. They can be used in various ways. For example you could use one to feed two LNBs from a single feedhorn, one for vertical and the other for horizontal polarisation. This could be done with a fixed dish for reception from a single satellite - you can't do it with a polar-mount dish as there's no skew control. Alternatively you could use the orthomode transducer to feed an 11GHz and a 12.7GHz LNB with a polariser at the input - the 12.7GHz LNB for use with Telecom-1. There's also the possibility of covering three bands by using a dual-band LNB at one port, giving low- and mid-band reception via one port and the high band via the other.

The present article came about to meet the viewing requirements of a home with several young people. I've three sons and their friends are often here, giving rise to frequent squabbles over programme selection. The solution – multiple receivers. But we didn't want more dishes outside. We needed another LNB anyway for the Astra signals. A fairly noisy one, 2dB, is quite adequate for use with our 90cm dish. I bought a used one for £33, which didn't eat too hard into the family budget.

The price of an orthomode transducer was the hardest thing. How much?!! Surely not for a piece of pipe with three flanges?! So I went out into the garage, in thought mode, dived into the central heating bits box and had a fiddle with some 22mm pipe. A visit to the local plumbing supplier produced a Yorkshire tee and a swept elbow. The total cost of these, with VAT, came to 99p.

Construction

The next step was to cut two 50mm lengths of 22mm pipe, slit them lengthways and open them out flat. These form the LNB connecting flanges – see Fig. 1. Another two pieces were cut to 35mm and deburred. The flanges were cleaned with a piece of emery paper then soldered on to the pieces of pipe using ordinary 60:40 solder, with 1mm of pipe sticking through. If you haven't got a blow torch, a gas cooker will provide sufficient heat.

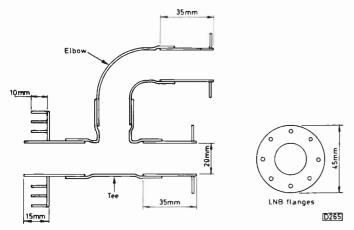


Fig. 1: Constructional details of the orthomode transducer, also a scalar feedhorn.

The inside edge of the swept elbow, which fits into the tee, was chamfered to provide a smooth entry into the socket. These two pieces were soldered together first, making sure that the output via the elbow was in line with the tee's through port output.

Similar treatment was applied to the inside edges of the flange pipes, i.e. they were chamfered to ease entry into the sockets. Mole grips were clamped to the flanges to act as heatsinks while the pipes were being soldered to the main body.

Scalar Feedhorn

After chamfering the edges to fit, a spare scalar feedhorn was fitted to the front of the tee, using two-part epoxy. If you are stuck for a feedhorn one can be made using a 35 × 22mm piece of pipe with a 55mm disc soldered 14mm from the front. Solder on to the disc three 10mm wide strips of copper made from slit pipe, fitted at 5.5mm centres, the longest strip around 175mm, the next 145mm and the smallest 105mm.

Dish Size

Because of the shadowing effect of the orthomode transducer and the extra LNB the dish should be of 85cm diameter minimum. The arrangement is mounted with the extra LNB upwards so that any water that gets past the O rings fitted on the 1mm projection between the flange and the LNB runs down and out through the holes of the spider trap cap.

Spiders

An anti-spider cap is worthwhile. Spiders seem to find this environment all too well suited to catching their lunch but play havoc with the microwaves! The Saturday morning chore is to brush spider's webs and things out of the feedhorn. I once had complete signal fade-out overnight and thought the LNB had died. Eventually I discovered that a spider had made a nest around the LNB's pick-up probe.

Transition Rings

The LNB flanges have eight holes on 45° centres. Thus if you have some spare quarter-wave circular-to-rectangular transition rings or need to fit these to minimise loss they can be fitted to retain the vertical and horizontal positioning. Their function is to match the signal to the polarity of the LNB. They consist of a 45mm diameter block of aluminium 12mm thick, with an oval hole $20 \times 12\text{mm}$ and chamfering to a circle at the input side. I fitted some spare ones to the assembly and noticed only a very slight improvement.

Mounting

The whole assembly was mounted at the dish feed-point using a three-inch PVC pipe clip that gripped around the bottom LNB, with the tripod arms in the form of a Y. The top LNB is used for vertical and the bottom one for horizontal polarisation.

Long-distance Television

Roger Bunney

One correspondent wrote "there's something about most days - if you've the time to look for it". That sums up the conditions during June. Sporadic E signals were present on most days, though at times of short duration. On other days the openings were intense, with hours of reception and the m.u.f. reaching into Band III. The prolonged hot weather also produced good tropospheric reception. First the UK SpE log:

RAI (Italy) chs. IA, B; TVE (Spain) E2, 3, 4; TDFC+ (France Canal Plus) L2; TSS (USSR) R1, 2; TVP (Poland) R1.

TSS R1, 2, 3; C+ L2; TVE E2, 3, 4; EPT (Greece) E3; RAI IA, B; Ercalano (Telemar-4/6/89 ket) E2 and TVA IB - Italian private stations.

5/6/89 RAI IA, B; Teleroland E2 (Italian private); ARD (W. Germany) E2; CST (Czechoslovakia) R1, 2; TSS R2; EPT E3;TVE E2, 3, 4; TVE-2 E2; RTP E3.

TVE E2, 3, 4; RTP E3; RAI IA, B.

RAI IA; TVA IA; Telemarket E2; TVE E2, 3; TSS 7/6/89 R1, 2; PTT (Switzerland) E3; smeary E2 video from the south at 1820, suspect ZTV (Zimbabwe).

NRK (Norway) E2; TVP R1, 2; CST R1, 2; ORF 8/6/89 (Austria) E3, 4; JRT (Yugoslavia) E3, 4; C+ L2; RAI IA, B; TVE E3; RTP E3.

9/6/89 TVE E2; JRT E2; ARD E2; RTP E2

An intensive day: JRT E3, 4; RAI IA, B; Canal-3 10/6/89 (Italian private) IA; Telemarket E2; C+ L2, 3, 4; TVE E2, 3, 4; RTP E3; TSS R1; MTV (Hungary) R1, 2; TVP R1, 2; CST R1, 2; RTSH (Albania) IC; JTV (Jordan) E3. An unidentified Arab station was logged on ch. E5. Low-level aurora activity from 1700.

11/6/89 TVE E2, 3, 4; TVE-2 E2; RTP E2, 3; SVT (Sweden) E2, 3, 4; TSS R1, 2; NRK E2; YLE (Finland) E4; PTT E2, 3; C+ L3; RAI IA; Tele Uno IA; JTV E3 (at 1940); ARD E4. At 1400 Simon Hamer logged an excellent Band III SpE opening with RTT (Tunisia) E5, 6; Libya E6; RTA (Algeria) E5, 6, 7; RTM (Morocco) M4, 5, 7. All these signals were positively identified from test patterns, captions and logos

RAI IA, B; Telemarket E2; TVE E2, 3, 4; RTP E2; 12/6/89 ARD E2; PTT E2; TVP R1, 2, 3; CST R1, 2; TVR R2; TSS R1, 2, 3, 4, 5; SVT E2, 4; DR (Denmark) E3; NRK E2, 3, 4; YLE E4; RUV (Iceland) E3, 4; JRT E3, 4, 7; JTV E3 (at 1925). An unidentified system M signal on ch. A2 was logged during the

13/6/89 TVE E2, 3, 4; RTP E2, 3; TVE-2 E2; RAI IA, B; ARD E2, 3, 4; SVT E2, 3, 4; NRK E2, 3, 4; YLE E3; JRT E3, 4. A coloured news announcer was received on ch. E3 from due south, possibly Sokoto, Nigeria.

RTP E3,TVE E2, 3, 4; TVE-2 E2; C+ L2; RAI IA, B; Videolina IA; TVA IA; CST R1; TVP R1, 2; 14/6/89 NRK E2; SVT E2, 3, 4; TSS R1, 2.

15/6/89 RAI IA; Telemarket E2; RTSH IC; MTV R1, 2; TVR R2; RTP E2, 3; TVE E2, 3; ARD E2; TVP R1; CST R2; TSS R1, 2, 3; NRK E2, 3; SVT E2, 3, 4.

TVE E2, 3, 4; TVE-2 E2; RTP E2, 3; RAI IA, B; 16/6/89 ORF E2a, 4; CST R2; MTV R1, 2; TVR R2, 3; RTSH IC; EPT E3; DR E3, 4; JRT E3, 4; TVP R1, 2; TSS R1, 2, 3, 4, 5; YLE E3; NRK E2, 3, 4; SVT E2, 3, 4; RTM (Morocco) M4.

TSS R1, 2, 3, 4; TVP R1, 2; NRK E2, 3, 4; SVT E2, 17/6/89 3, 4; YLE E3, 4; ARD E2, 3, 4; ORF E2a, E4; RAI IA, B; Telemarket E2; Tele Uno E3; RTSH IC; + PTT E3, 4; C+ L2, 3, 4; DR E3; TVE E2, 3, 4; RTP E3; JRT E3, 4.

18/6/89 TVE E2, 3, 4; RAI IA, B; TSS R1; AFN ch.E3 reported by Bill Cotterill - likely to have been ch. A2 AFRTS Crete (American Forces Radio and TV Service).

19/6/89 RAI IA, B; TVA IA; Telemarket E2; TVE E2, 3, 4, 5, 6, 7; RTP E2, 3; DR E3; MTV R1; RTM Morocco M6, 7 (Roger Fussell).

20/6/89 TVE E2, 3, 4; RTP E2; RAI IA; TVE-2 E2.

21/6/89 SVT E2, 3, 4; NRK E2, 3; YLE E3, 4; TSS R1, 2; CST R2; TVE E2, 3; RAI IA, B.

22/6/89 TVE E2, 3, 4; RTP E2, 3; C+ L2; NRK E2; TSS R1. 23/6/89 RAI IA.

24/6/89

TVE E2, 3, 4; C+ L3; ARD E3. SVT E2; RUV E3, 4; NRK E4; ARD E2; TVE E2, 3, 25/6/89

4; TVE-E2; RTP E3; Arabic ch. E3 signal from 1845-1915 possibly Jordan or Iran.

26/6/89 YLE E2; TSS R1, 2; CST R1, 2; JRT E3, 4; RAI IA; Telemarket E2; ORF E2a; TVE E2, 3.

27/6/89 RAI IA; Telemarket E2; JRT E3; TVE E2, 3, 4; RTP E3; RUV E3, 4; NRK E2, 3, 4; SVT E2; TSS R1, 2.

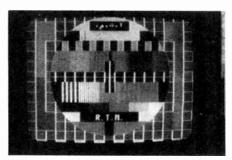
PTT E3; EPT E3; NRK E2, 3; TSS R1, 2. 28/6/89

29/6/89 +PTT E3.

30/6/89 TVP R2; TSS R2.

The 11th and 17th produced the most intense SpE openings. On the 11th radio amateurs achieved two-way contact between the UK and Guyana at 50MHz. The 17th produced a prolonged opening, with the 2m (144MHz) amateur band open for some six hours. Several TV-DXers are now monitoring Band III during intense openings - their patience has certainly been rewarded. The latest solar cycle forecast indicates that the peak will be in early 1990, with a smoothed count of







Left: Test pattern B, from a Cathodeon publication – see Vintage test cards. Centre: The PM5544 test pattern as used by RTM (Morocco), received by Ian Waller in Lincoln. Right: The standard North American 525-line test pattern displayed on a 625line receiver, showing the reduced height when the field hold control is adjusted to lock the picture. Signal received by lan Waller via the Gorizont 14°W satellite (global beam, C band).

 189 ± 32 . We have heard that Greece is to offer experimental amateur radio transmitting licences for the 50MHz band.

There were two spells of tropospheric activity during the month. The first, around the 10-11th, produced Band III/u.h.f. signals from Denmark, Norway, Sweden, W/E Germany, the Benelux countries and France, with the ch. A80 AFRTS outlet in Holland as a bonus. The second spell lasted from the 15th through to the 22nd, with a similar selection of signals but perhaps with a bias towards the south. Intense signals were received from all networks in France, and TVE was noted in the south west. Interference with local services became so severe that on the 19th, a Monday, the *Daily Telegraph* ran a page one story on the subject, including DX-TV as a hobby.

Brian Renforth reports that Tyne Tees TV has been heard on 96.6MHz, using this frequency for outside broadcast to studio links and upsetting the Bilsdale TEM radio service.

My thanks to the following for sending in reception reports: Cyril Willis (King's Lynn), Ian Beckett (Buckingham), Simon Hamer (Powys), Peter Schubert (Rainham), Ryn Muntjewerff (Holland), Brian Renforth (Newcastle), Roger Fussell (Torpoint), Tim Anderson (St. Leonards) and Bill Cotterill (Tipton).

News Items

France: Antenne-2 and FR3 viewing figures have slumped to a combined total of 35 per cent. The government feels that these services are poorly equipped to face the rising competition and is to appoint a combined head to improve matters. This may lead to a radical change in FR3's regional operation, with more alternative programming.

Italy: J.M. Communications of Luxembourg has bought Tele Monte Carlo's Italian operation. Canal Plus has an interest through programme exchange. Tele Monte Carlo can transmit programming throughout Italy and is likely to introduce a new pay-TV service. The other foreign broadcaster who has a right to transmit within Italy is the Yugoslav Tele Capodistria, which is also to become a general entertainment pay-TV service.

Kenya: A modernisation plan for the Kenya Broadcasting Service has been announced and there's to be a study on the feasibility of a second service. In addition the government is expected to approve the establishment of private radio and TV stations.

USSR: Ted Turner's CNN news channel is soon to go Russian. To start with there will be scrambled u.h.f. transmissions from Moscow and Leningrad. The Moscow service will be on ch. R24, using SECAM-K.

In brief: The commercial Tele Madrid service is now in operation . . . BBC-1 and BBC-2 are to start Nicam-728 stereo transmissions in the autumn of 1991 . . . A mystery 45·7MHz transmission logged by DX-ers in New Jersey, USA and the Netherlands turns out to be a sound link for RCN Antena Dos, Bogota . . . The Belgian RTBF service is to include advertisements.

Vintage Test Cards

In the June column we published an appeal for information on test card B. Much detailed information with a copy of "test pattern B" (see photo) has been provided by Peter Delaney of the British Amateur Television Club. At one time Cathodeon Ltd., a subsidiary of Pye, produced monoscope tubes that gave various patterns including B,

AERIAL TECHNIQUES

MULTI-SYSTEM TV AM/FM RADIO DIGITAL CLOCK/ALARM £99.00



Featured above is the very latest black & white multi-system small screen television combination from YOKO International. Model TVC-8M is a must for every serious TV-DXing enthusiast and it's also ideal for Continental travel and home use. The YOKO 'Euro TV' features full VHF/UHF TV coverage and incorporates SYSTEM I (6MHz sound for UK/Eirer/South Africa), SYSTEM B/G (5.5MHz sound for Europe, Middle East, Australasia and other parts) AND SYSTEM L FRENCH standard (6.5MHz sound). The 5.5/6MHz sound switching is automatic, the switching for French standard is situated on the back of the TV. This versatile model also has a high quality AM/FM radio section and a digital clock/alarm on the front panel. The alarm can be selected to switch the television or radio on or off at any given time; the clock is equipped with a 24 hour memory alarm, which can be reset instantly to sound at the exact time the following day. AC mains or 12 DC operation.

Aerial Techniques have now introduced an improved wide/narrow i.f. selectivity function-wide (6MHz) for strong signals-high quality reception; narrow (3MHz) for weak DX signal working and refluced adjacent channel interference, really lifts those elusive signals out of the noise.

The YOKO TVC-8M 4.5" screen multi-system TV combination (standard model) costs just £99.00, the model with switched selectivity is £112.00, all prices are inclusive of VAT. Carriage & insurance to any UK destination is £5.50.

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C, D, F and G. C was the familiar BBC test card C, D was a variation on the RETMA card (not the UK 405-line test card D). The F card was not the familiar colour card but a quite unusual display. G was the usual 625-line card used by several Continental broadcasters. B is not actually a test pattern but a view, apparently of a Cambridge college building, most likely King's College. Hopefully this at last resolves the mystery.

New EBU Listings

France: Nantes ch. E65, 50kW horizontal. M6 service. West Germany: Hennsted/Itzehhoe ch. E49, 100kW horizontal. Private station.

Satellite News

During the last week in June sat-zappers may have noted the various programme inserts plus complete meetings for the Billy Graham movement, via ECS at 7°E. For those with a clear take-off towards the south east and thus able to receive Intelsat 60°E, Hong Kong TV can be seen for several hours in the early afternoon on Sundays and Wednesdays carrying sport.

BBC Enterprises has signed a five-year agreement with the European Space Agency to transmit BBC European programming via a 12·0919GHz transponder (this transponder is officially allocated to Austria). The satellite is at 19°W and the signal power is 62dBW. The agreement is to last until late 1994/early 1995.

The Spanish Hispasat craft will carry eight wideband 72MHz transponders. Two 36MHz channels will be used for transatlantic traffic to the States and three DBS channels will be available for Western Europe. An X

band military frequency will also be available. TVE hopes to use the craft for ENG and EFP links.

AsiaSat hopes to reach over two billion viewers in the Far East, with coverage of Pakistan, India, Thailand, Korea and China – in fact some 35-40 per cent of the Earth's surface. Interesting that broadcasting organisations will be able to link up via this craft, bypassing Intelsat.

Radio Tele Veronique hopes to start transmissions via ECS-4 on January 1st 1990 with a new Dutch TV service. An Astra downlink is also a possibility. The main backers are CLT and three Dutch banks.

There are plans for a pair of satellites called Europsat to be launched in the mid-1990s, each with twelve high-power transponders. Britain, France and West Germany are studying the plans which have been presented by Eutelsat.

There is to be a two-year HD-TV test of the 1125/60 standard in Canada, via Telsat, starting this autumn. The new HD-BMAC scrambled system will also be used.

Astra is to bring forward the launch date of its second satellite to October 1990. The 16 channels will use 65W instead of the present 45W transponders, but as the beamwidths will be greater the signal levels should be much the same as with Astra 1A.

The BBC is using a mobile satellite link unit for radio OBs, via ECS at 7°E, with high-quality digitally encoded stereo (system DS-1).

IBA Technical Information

The 1989 IBA pocket guide is now available free from the Engineering Information Department, Crawley Court, Winchester, Hants SO21 2QA – a self-addressed, stamped foolscap envelope would be appreciated. As usual it contains full information on the IBA networks.

The May and June issues of the IBA's Engineering Bulletin contain very useful articles on TV signal levels, signal-to-noise ratios and using head amplifiers. The June issue article provides detailed head amplifier data, showing how the receiving system noise levels can be calculated and the improvements that can be obtained by using head amplifiers with different noise figures, taking into account cross-modulation (overload) problems. I feel that these two bulletins are very relevant to DX work and are worth reading.

The Yoko TVC-8M Multi-standard TV

The Yoko Model TVC-8M is currently on offer at £99 from Aerial Techniques who lent us one for evaluation as a general-purpose/DX-TV receiver. It has a 4.5in. screen with alongside this a vertical tuning scale for v.h.f. high/ low, u.h.f. and radio coverage of MW, LW and 88-108MHz. The tuning scale covers 6cm and is marked with chs. E2/3/4, all the Band III CCIR channels and a general u.h.f. scale for every ten channels up to 60/65/69. A bank of six buttons below the screen together with an adjacent slide switch control the clock and alarm system - the 24hour digital clock has a bright red LED display immediately below the vertical tuning scale. The lowest panel, which is angled slightly outwards, has four pushbuttons for power on/off, v.h.f./u.h.f., Bands I/III and radio/TV. At the upper right-hand side of the cabinet there's an edge volume control and below this a radio/TV tuning control. There's also a radio band slide switch and a 3.5mm headphones socket.

At the back there's a battery compartment (the PP3 battery acts as a clock back-up supply), a permanently attached mains lead, a systems B/G and L slide switch and an aerial input socket – this consists of a 3.5mm mono audio jack! An adaptor is supplied for a Belling Lee type plug. There are contrast, brightness and field hold controls but the line hold control is an internal preset. A 12V input socket is provided and at the top of the cabinet there's an integral seven-section chromium telescopic whip aerial that can be swivelled to any angle.

The low v.h.f. band was measured as 43·1-83·5MHz, the high v.h.f. band as 136-233MHz while the u.h.f. coverage is 452-860MHz. Scale indication is accurate.

The receiver was found to be stable, locking almost instantly on weak through to strong signals with either positive- or negative-going vision. It resolved system I signals in addition to system B/G and can thus be used in the UK, Western Europe, North Africa and the Middle East. Selectivity is good: for example there was no interference between the local strong Rowridge ch. 24 signal here and weak Crystal Palace transmissions on ch. 23. Sensitivity is similarly good, typical for this type of receiver. The 24-hour clock is I feel an excellent feature to help with logging DX signals. Radio performance is satisfactory.

The alarm facility brings an in-built buzzer or radio/TV reception into operation. There's a sleep function which cuts off radio/TV reception after a set time.

I wasn't impressed by the aerial socket adaptor arrangement, particularly at u.h.f., and feel that the lack of a user line hold control is a disadvantage, though SpE, tropospheric and various French signals locked. With mains operation there was an obvious lamination buzz from the transformer, louder when "off" and falling when on load, i.e. with TV switched on. The power section runs rather warm, the rear of the cabinet being too warm for my liking – repeated warming and cooling of the nearby battery could lead to its early demise.

The v.h.f. radio section enables Band II to be checked as the m.u.f. rises, and the extended low v.h.f. band coverage including chs. R3 and IC is a decided bonus. The design of the 3.5mm mono plug/jack aerial input is such that I would recommend adding strain relief to remove stress. The mono picture is sharp and the contrast range good.

Following comments supplied to Aerial Techniques on the overheating problem we have been informed that the latest models now incorporate improved ventilation.

Programming Guide

Alexander Wiese, once noted for his DX-TV activities, has in recent times become involved in the publication of several magazines aimed at the satellite TV market. On of these, TVI (Television International), lists the monthly programmes for most of the satellite TV services available throughout Europe, also a number of terrestrial services. In addition feature spreads (in German) are given on programmes and technical details are provided on each satellite downlink - frequency, coding etc. This worthwhile publication is available on subscription within Europe at 77DM from TELEaudiovision Medien GmbH, Abt. Vertrieb, Postfach 801965, D-8000 Munchen 80, West Germany. For copyright reasons Sky Movies programmes are not listed - they are officially not supposed to be viewed outside the UK.

Tackling Unknown Small-screen Sets

Malcolm Burrell

Field engineers years ago were accustomed to walking into a living room to be confronted by an unknown monster – not always the customer . . . Usually, if a dead monochrome set was involved, it was a case of replacing a valve or counting the bottles in order to use Ohm's Law to work out the value of the new dropper section required. Other main sections of the set could be identified by the valve type numbers, familiar large components or by tracing along connecting cables. Much has altered since then, and particularly with the smaller sets it's often tricky to find the line output transistor. Nevertheless with monochrome portables much can be ascertained by a cursory look. Most of them use a conventional circuit arrangement.

Video Problems

You may find the video output transistor on the c.r.t. base panel, but it usually resides on the main panel and is fairly easy to locate by following the c.r.t.'s cathode lead, which is usually separated from the other connecting leads. Expect around 40V at its collector - the supply will be derived from the line output stage. If the symptoms are sound and a raster but no picture, much can be deduced by adjusting the contrast and brightness controls, and by noting any variation in the video output transistor's collector voltage when the aerial plug is withdrawn with a signal tuned in. The brightness control sets the c.r.t. bias while the contrast control adjusts its drive. The video output transistor will normally be driven by an emitter-follower video driver transistor which should not be too far away. Coupling between the two is generally by means of a resistor/ capacitor network.

AGC Faults

A.G.C. faults can give similar symptoms to a video problem, but an over-contrasted picture may be resolved. Attenuating the input signal may give you an otherwise normal though noisy picture. A search should then reveal the a.g.c. circuit, probably in the vicinity of the video driver transistor. The intercarrier sound takeoff is usually also in the vicinity of the video driver transistor. So the presence of sound with no vision may help to eliminate certain stages.

With line-gated a.g.c. common in solid-state sets, missing pulses from the line output stage are a possibility. Common causes of this are a dry-joint on the line output transformer or open-circuit print, which may be the result of mechanical shock – a portable TV set is likely to be bumped quite heavily at some point of its life!

Fault descriptions can be helpful. A set that was apparently operating normally and developed the fault at switch on may have one or two semiconductor devices that have failed as a result of a flashover. The video and a.g.c. circuits are particularly vulnerable to this sort of thing. A slight high-voltage click at switch on should lead to a check on whether there's a dislodged c.r.t. Aquadag earthing spring which, since the chassis of most portables

are isolated from the mains supply, may be anchored to the c.r.t.'s Rimband.

Signal Faults

With signal faults much can be discovered by using a signal injector or signal generator to trace through the i.f. stages. Older sets, particularly those that use germanium transistors, are prone to noisy semiconductors – on occasions these ultimately become corroded. More recent receivers tend to have lots of safety resistors that go open-circuit for no apparent reason.

Most of the varicap tuners used in such sets have separate power inputs for the r.f. amplifier and mixer stages, plus an a.g.c. input and the variable tuning voltage which is derived from a stabilised 30V line. If there appears to be a tuner problem, find the tuning line or the connection to the tuning buttons or potentiometer. If operating the control produces a voltage variation at the tuner check that both power inputs to the tuner are intact. On occasions the cause of no output from the tuner is simply an open-circuit resistor.

Don't Blame the Chip!

Don't blame a chip for faults unless you're certain. First check its supply voltage(s) – if known, but probably close to the l.t. rail voltage. Even with an unknown set the chips may be familiar types, and setmakers generally follow the chip manufacturer's suggested circuit. If necessary check in an i.c. data book or look at the circuit of a set of similar vintage that employs the same chip(s).

Check for faults in the associated components. Common faults are defective zener diodes or transistors, leaky or open-circuit electrolytic capacitors and missing pulse inputs. By the way, you do understand the chip's function, don't you?

O.K., so you still suspect the chip. Order a replacement and fit it, but beware of damaging the print or of careless probing that could introduce further problems.

The Power Supply

It's not difficult (usually) to locate the mains transformer. The mains rectifier diodes are particularly vulnerable items and the semiconductor devices in the series regulator circuit are also prone to failure. The regulator transistor is often bolted to the same heatsink as the line output transistor – trace the circuit to avoid being like the dentist who pulled the wrong tooth! Also suspect mains/battery switches or sockets that disconnect the mains when a battery plug is inserted.

Timebase Faults

Line output stage faults generally impose a heavy load on the power supply, with low l.t. as a symptom. E.H.T. rectifier sticks are the most common source of trouble in this area. The diodes and electrolytic capacitors in the rectifier circuits fed by the line output transformer can become short-circuited or leaky. A faulty line output

transistor or transformer or an open-circuit safety resistor are other possibilities, particularly with the sound but no e.h.t. symptom. Check suspect capacitors by replacement. Remove the line output transistor to measure between the junctions – it will usually read short-circuit in situ. A beefy audio transistor can make a useful substitute for testing purposes.

If the output stage is o.k., check its drive. A scope should reveal quite large line pulses at the base of the output transistor. Tracing the circuit back will take you, often via a little driver transformer, to the driver transistor. Look for pulses at its base then at its collector. If they are of low amplitude the transistor may be faulty. If they are absent you may have to trace back to the oscillator. Remember that most faults will be proved only when the suspect component is removed for measurement. Make sure that the l.t. feeds to these stages are intact.

The feedback required to linearise the field scanning can make fault finding in the field timebase difficult. To find the field output stage, trace back from the scan coil connections. Safety resistors often go open-circuit, and good substitute transistors such as the BD131, TIP31 and TIP32 can often work wonders. Where the fault lies earlier in the circuit a signal injector or careful probing can introduce sufficient hum to trigger action on the

screen. If a chip is used in the field timebase the previous remarks apply.

Audio Problems

Distorted sound, particularly at low volume, is usually caused by a displaced loudspeaker cone. Whilst a wad of cotton wool can be effective, the correct course of action is to replace the unit. A spare 80Ω loudspeaker should not damage any audio output circuit and can be used as a substitute for checking. A faulty chip or leaky transistors cannot be discounted, especially where the distortion is accompanied by low volume.

No audio could also be due to the speaker, this time going open-circuit, but check the supply voltages. Though many people never use it, a faulty earphone jack could be the cause – kids have to satisfy their insatiable curiousity by inserting objects into any unoccupied sockets!

In Conclusion

In conclusion, remember that even with a completely unknown set much can be ascertained by using your background knowledge, observation, measurement – and a little instinct!

The Sakura SR800ER Satellite System

D.J. Stephenson, B.A., I.Eng.

The British-made Sakura SR800ER is a budget-priced satellite TV system with remote control, designed for reception of the Astra channels. I obtained one last March from a High Street dealer. It's been used extensively for several months and is installed in the Merseyside area. A similar dish/LNB combination is supplied with certain Alba systems.

The Dish

The neat-looking dish is made of white-painted, heavygauge steel and is of the offset-focus type. All the mounting brackets and hardware are plated and no sign of corrosion has appeared to date. This is a point worth noting since the wall mounting brackets supplied by some manufacturers, notably those that are painted, are already beginning to show signs of corrosion. The LNB support arms are made of white-painted steel and are bolted to the dish and LNB bracket by means of stainless steel nuts and bolts. The whole assembly is quite fiddly and can be timeconsuming to assemble. Two of the arms, which are marked L and R, are longer than the third one which is fixed to the bottom of the dish. After an initial finger-tight assembly it's advantageous to tighten the bolts a little at a time to avoid pulling the LNB off centre. Although this is not specifically mentioned in the instructions, for optimum results the LNB should be bolted as far back in its mounting collar as possible.

Wall Bracket

Unfortunately the wall bracket is a nightmare to assemble correctly and it's very easy to orientate it the wrong way so that the azimuth adjuster becomes the elevation

adjuster and vice versa. In the vast majority of cases this will not be a problem, but if the dish is to be mounted at nearly right angles to the wall the azimuth adjustment will be restricted due to the limited size of the elevation adjuster slots. To avoid the installation team taking on a Laurel and Hardy look it pays to get this right before any mounting holes are drilled. The instructions that come with the dish are virtually incomprehensible and do not warn adequately of this possible mistake. The two-piece wall bracket ends must be mounted horizontally and not vertically. If you find that the stay bar can be fitted only horizontally the wall brackets are mounted the wrong way.

The wall bracket provides poor stability for such a heavy dish. It's best to use half-inch Rawlbolts – any lesser fixings could be a bit risky due to the closeness of the fixing points, which are spread over only one or two brick courses. The stay bar improves the overall strength of the assembly however. To avoid cracked bricks it's important not to overtighten Rawlbolts.

Marconi LNB

The LNB is the well tried and tested Marconi unit which gives good results. Its 10.96-11.7GHz coverage is converted to a first i.f. of 960-1.700MHz, which corresponds to a local oscillator frequency of 10GHz. The gain is typically 53dB with a noise figure of 1-8dB. An industry-standard 75Ω F-type output connector is used. The solid-state polariser needs approximately 13V for vertical and 17V for horizontal polarisation. Thus a single coaxial cable is used, the polarisation threshold switching voltage sharing the same cable as the LNB's output signal. This simplifies installation significantly.

Now that these Marconi units have been up for some time a couple of problems have become apparent. Both lead to water getting into the unit. The first problem applies to early units only – they can be identified by the silver "Do not remove this cap" label on the blue cap that covers the mouth of the feedhorn. The cap tends to distort due to the sun's rays being brought to a focus at certain times of the day. This can lead to either a gap at the edge, where water or insects can get in, or in severe cases the cap can melt, producing a large hole. Fortunately repair/ prevention is easy. Replace the cap, ensuring that no insects or moisture are trapped inside. Apparently the cause of this problem was a manufacturing error - the ultra-violet stabiliser was omitted from the plastic. Later versions of the cap have "Do not remove this cap" embossed on the face side and can be regarded as being beyond suspicion. Secondly, in a small number of cases the rivets can pop or distort after a period of time. As a result water can penetrate the seam around the periphery of the unit. To prevent this, smear a small amount of sealer around the seam. This of course applies to all installations that use this LNB.

The Receiver

The receiver, optimised for the Marconi LNB, is housed in a small, neat looking black plastic case. It boasts a 20-channel non-volatile programmable memory and MAC compatibility. While it comes pretuned to Astra some of the newer channels that have come into operation recently need to be tuned. The synthesis tuning system scans rather slowly and tuning can be tediously slow. A dual seven-segment display on the front panel shows the selected channel, a pair of LEDs indicating the polarisation. Manual push-button controls provide ± tune, store, H/V polarisation for setting up, ± channel, parental lock and finally standby. The brief specification provided by the manufacturer is as follows:

R.F.: Input frequency range 950-1,750MHz; input noise 12dB; i.f. 479·5MHz; input impedance 75 Ω .

Video: Static threshold better than 7dB; dynamic threshold better than 8dB; frequency deviation 13·5MHz/V; output 1V at 75Ω ; de-emphasis CCIR 405-1 (PAL); MAC output baseband, unclamped and unde-emphasised.

Audio: Carrier 6.5MHz; bandwidth 20Hz-15kHz; de-emphasis 50μ sec; output 0.5V r.m.s. at less than $1k\Omega$; harmonic distortion less than 1.5 per cent.

The unit and its remote control system are easy to use. The built-in parental lock consists of an audio jack plug with a 5.6V zener diode across the terminals. This can be removed to disable any channel that's programmed to be locked out via the front panel controls. It's a welcome feature that's present in few receivers, and will defeat the vast majority of children.

Another facility that's perhaps useful for DIY minded people is the audible satellite finder. On operating a switch on the rear panel an audible signal can be heard through the TV set's speaker. The pitch increases with the signal strength – but the volume must be turned up very high to hear it from the top of the ladder! Another switch produces a test pattern for tuning a TV set or a VCR to the modulator's adjustable output. The LNB connection is via an F-type socket.

The top can be lifted off after removing five screws. This reveals two boards. One is the sparsely populated

main PCB, the other one containing all the control circuitry including an M494B1 microcomputer chip. A meaty transformer on the left-hand side produces outputs that were measured at 20V and 16V. Next to this are three regulator chips mounted on a heatsink. A 7805 and a 7812 produce 5V and 12V rails for the receiver's circuitry. The LM317T is a programmable regulator which is used to provide the switched 13/17V LNB/polarisation supply. The receiver runs fairly cool provided the ventilation slots are not obstructed.

Four metal cans house the majority of the circuitry. These include the satellite tuner module and the u.h.f. splitter/modulator module. The other two cans contain most of the rest of the signal circuits. A TBA120U is used for sound processing; the only other visible chips are an LM358M dual operational amplifier and a TC4066 logic chip. The receiver appears to be easy to service – especially if the canned modules are thought of as replacement items.

Decoders

A scart/peritel socket is provided at the back for attaching decoders etc. Fair results were obtained when I tried this with a Filmnet decoder. To do so it was necessary to pull pin 8 low to give unde-emphasised and unclamped baseband video at pin 19. Audio is present at pins 1 and 3.

Summary

Installation, apart from the assembly problems mentioned earlier with the dish, is straightforward and alignment is easy. The picture produced is, subjectively, as good if not better than much of the higher-priced competition. Neither heavy rain nor high winds noticeably degrade reception.

My only criticisms of this package are of the lack of stereo audio and the poor mounting bracket assembly. In view of the price, around £250 retail, these points are of little importance. The system is ideal for bridging the gap until the industry sorts itself out and decides on a standard transmission system. It's unwise at the present time to spend a large amount on a "flash" system that may restrict programme choice or require the addition of large numbers of decoders for various channels in the not too distant future. Beware of claims that current receivers are compatible with the forthcoming BSB DBS transmissions since with these there will be conditional access control signals that must be decoded within the receiver to make reception possible. In other words my advice is to buy/sell a cheap basic system, such as this Sakura one, which is designed to work with the Astra signals, then wait to see how the true DBS market develops next year. Otherwise if you are a dealer you could be left holding stocks of unsaleable equipment or having to explain the situation to dissatisfied customers.

Dual-band, multi-satellite systems will be essential once the BSB transmissions and those from the medium-power Eutelsat II series craft become available – the idea of ten or more receivers and decoders stacked on top of each other is clearly absurd. BSB's reluctance to supply chip sets to other than a handful of TV set manufacturers will only add to its marketing problems. From listening to the comments of many potential customers it's clearly not a matter of whether they would like to receive Sky of BSB programmes. They want both.

More on the Panasonic NV333

David Botto

The popular Panasonic NV333 VCR has been around for a few years now. It has proved to be so reliable that many of our customers are reluctant to part with their machines. An article by Nick Beer in the November and December 1988 issues of *Television* provided a comprehensive servicing and fault guide. In this article we'll deal with the operation of the power supply and fault tracing in the logic circuitry used in the system control section of the machine.

The Power Supply

Knowing exactly how the power supply operates is important for speedy servicing of a dead machine. The power supply circuit is straightforward – see Fig. 1 – and servicing presents few problems. Use of a modern digital multimeter (one with a 3¾ readout is best) and a component tester will cut service time to a minimum.

The a.c. mains input is fed to the mains transformer via fuse F1001. On rare occasions this gets tired and suddenly fails. If you find that it's the original fuse replace it to avoid a callback later.

Bridge rectifier D1001-4 produces some 15V across C1002. Note that in some machines D1001-4 comprise a single unit, type EM1Z. This 15V supply is fed to pin 1 of the STR1096 regulator chip IC1001. Pin 4 of this chip produces a regulated 9V supply which is fed to the video

circuitry on the same panel and via P1003 to other parts of the machine. You should get a reading of $9.3V \pm 0.1V$ at TP1002. It's been known for this voltage to increase to 10V or more, causing various problems such as failure to record the sound. If the voltage on this rail exceeds the correct level don't waste time making extensive checks – replace IC1001.

Pin 5 of IC1001 provides a regulated 6V supply which is dropped to about 5V by D1008.

With the VCR on you should measure 10·65V at pin 2 of IC1001 with your DMM. This pin is connected via D1011 to pin 2 of IC6002 (M53216P) on the system control board. If pin 1 of this chip, which contains six logic inverters, receives a logic high from pin 8 of the MN1405VKF microcomputer chip IC6001 pin 2 will go low, grounding the cathode of D1011 with the result that the voltage at pin 2 of IC1001 falls to about 0·74V, cutting off the regulated 9V supply. On rare occasions D1011 goes open-circuit.

IC1001 is quite reliable but can nevertheless fail. Before you replace it make the following quick checks. Make sure that 15V is present at pin 1. Next disconnect D1011 to remove the input from the control circuitry. Finally disconnect the loads from pins 4 and 5. If none of these checks restores power, replace IC1001.

D1005-6 produce 15V across C1003. This is used to provide the motor 15V supply and also a supply for the

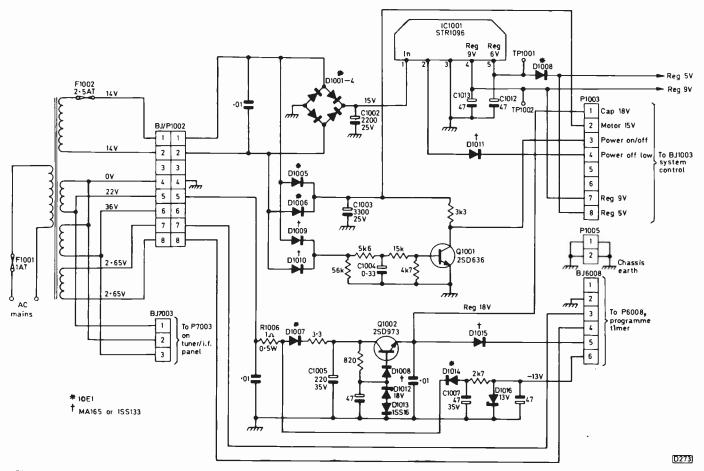


Fig. 1: The power supply circuit. Note that there are regulators elsewhere in the machine.

collector of Q1001. D1009-10 provide base bias for Q1001, which thus provides a power on/off indication at pin 3 of P1003.

The 22V output from the mains transformer is taken via the safety resistor R1006 to the cathode of D1014 and the anode D1007. D1014 develops a negative voltage across C1007. This is stabilised at -13V by zener diode D1016 and is used by the front panel control board. D1007 produces about 22V across C1005, the following regulator circuit providing a stabilised 18V output. If diode D1015 fails the clock display doesn't light. The same thing happens if Q1002 goes open-circuit.

The filaments of the clock display are provided with a 2.65V a.c. supply via pins 7/8 of BJ/P1002 and pins 3/4 of

BJ/P6008.

All the components in the power supply can be quickly checked using a component tester. Remember that with time the electrolytic capacitors, especially the smaller ones, can dry out or corrode, with loss of capacitance.

The Syscon Circuitry

The logic circuitry, including the MN1405VKF microcomputer chip IC6001, is extremely reliable. Some puzzling faults can occur in this circuitry however.

Table 1: Logic levels at IC6001

Pin	Reading	Function
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 39 39 39 39 39 39 39 30 30 30 30 30 30 30 30 30 30 30 30 30	0V H L L H H H H H H H H H H H H H H H H	Stop: H goes to L Pause: H Fast forward/cue H — Power off: H Record: H — — — — — — — — — — — — — — — — — — —

next month in

TELEVISION

SERVICING THE PANASONIC U3 CHASSIS

The Panasonic U3 and U3W chassis were used in a wide range of sets including the TC208/221/225/2000/2011/2024/2211/2213/2216/2221/223/2226/2622 and TX2284. Screen sizes are 20-26in. and the sets vary from standard to remote control and teletext versions. Nick Beer on the various faults that arise in these sets and fault-finding procedures.

● THE SALORA ASTRA PACKAGE

Continuing our series of reviews on receiving systems for the satellite TV transmissions from Astra, lan Bowden reports on the Salora package. Being specifically designed for use with Astra the system is capable of provicing very good performance.

SERVICING CD PLAYERS

Having in recent issues described the form of the data stored on the disc, in next month's issue Joe Cieszynski outlines the basic operation of the decoder and provides guidance on fault diagnosis.

• UNIVERSAL FREQUENCY RESPONSE CURVE

Coupling and filtering networks are fundamental to electronics. Their behaviour determines the frequency response cf a circuit and there are basic laws that govern this. Stan Amos shows that a universal response curve can be drawn and describes how this can be used to find the effects of particular component combinations. H.F./L.F. attenuation/boost and phase response are all considered.

• UNUSUAL CCTV FAULTS

Whilst using the usual well-known video/TV techniques, closed-circuit arrangements can introduce unexpected fault conditions. Peter Graves describes some of the more unusual problems that may be encountered in practice.

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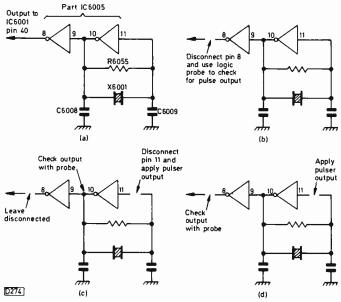


Fig. 2: Checking the 455kHz oscillator. (a) Basic Circuit. (b-d) Probe and pulser checks.

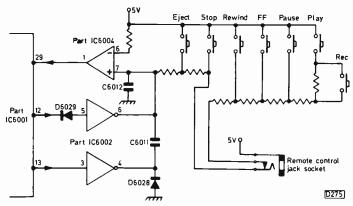


Fig. 3: Simplified analogue/digital function selector circuit (ramp circuitry).

Before you delve into the system control circuitry make sure that the problem is not a mechanical one (see *Television* November 1988). Check that the various switches such as the eject, cassette in and especially the mode switch are clean and in good order. If the drive belts are the original ones or are in any way suspect, fit a new set. You may then find that the machine works normally and that you don't need to get involved with the logic control circuitry. A slack loading belt for example will result in the capstan motor on signal remaining low when it should go high.

The usual faults in digital/microcomputer circuitry are short- and open-circuits and incorrect logic levels. Problems can also arise due to a stopped clock oscillator or, very occasionally, an off-frequency oscillator. For fast fault location you'll need a digital multimeter, a logic probe and a logic pulser. These two probes are also ideal for locating printed circuit breaks that might not be easy to detect visually. Further information on the use of these probes was given in the November 1985 and August 1987 issues of *Television*.

After making the previously mentioned mechanical checks, ensure that the d.c. supply voltages at the logic chips are present and correct. Then examine the board carefully for cracks and poor soldered joints – especially if someone else has had a go. You can then start to make checks in the logic circuitry. Table 1 shows the logic levels

associated with the various pins of the microcomputer chip IC6001. To check these, connect the probe's positive supply clip to pin 39 and the negative supply clip to pin 1.

Check the oscillator (pin 40) first. If the probe shows that oscillations are not present the most likely cause of the trouble is IC6005 (μ PD4069UBC), see Fig. 2. This chip contains six inverters, two of which with their associated components form a 455kHz crystal oscillator. IC6002 and IC6003, both type M53216P containing six inverters each, seem to be more reliable than IC6005.

Desolder pin 8 of IC6005 and ensure that it's clear of the printed track. Touching pin 8 with the logic probe should give a pulsing signal indication. If not, check C6008 and C6009 (50V ceramic, originally 100pF later 300pF) with a capacitance checker or bridge. Then measure R6055 (1M Ω). Crystal X6001 (VSX0100 or EF0A45501V) could fail but we've not had this. To check the two gates, start by desoldering pin 11 and applying the output from your pulser at this point: your probe should show an inverted output at pin 10. If so touch the probe on pin 8 where a reinverted signal should be present. It's much better to test inverter gates in this way rather than attempting to check them in circuit.

Once oscillations have been restored at pin 40 of IC6001 the logic circuitry, provided all else is well, should operate normally. If you've a frequency counter, check that the oscillator frequency is 455kHz, using a 10:1 isolating probe. It's been our experience however that X6001 keeps the oscillator locked to the correct frequency.

If a pulsating H + P + L signal is not present at pin 30 of IC6001, check transistors Q6013/4 (both 2SD636) and diode D6041 (MA165).

If all or nearly all the logic levels at IC6001 are high no matter what signals are applied to its inputs this is a sure indication that IC6001 has failed. Fortunately this seldom occurs.

If a particular function fails to work, check that the correct logic levels are present at the relevant pins of IC6001 then make sure that the logic inverters in IC6002/3/5 are working correctly – check as previously described.

Analogue/digital ramp circuitry is used to select different functions, see Fig. 3. IC6004 (AN6912/ μ PC339C) contains four operational amplifiers, with pin 1 feeding data to pin 29 of the microcomputer chip. It's possible for IC6004 to fail, though the most likely causes of trouble with the function controls are dry-joints on the front panel and faulty solder joints around the function selection buttons.

Loading/eject problems

If the loading or eject operations do not work properly though the correct logic levels are present at pins 22 and 23 of IC6001, suspect transistor failure. Check Q601, Q6025, Q6030 (all type 2SD636), Q6024 (2SD1273), Q6026/7 (both 2SB819) and Q6028/9 (both 2SD1051). Then check D6050 and D6054 (both MA165) and the 12V zener diode D6042 (RD12JB2). Use of a component tester will give you a fast check on these devices.

Reel Motor Difficulties

If the reel motor doesn't operate correctly and the logic levels at pins 24 and 25 of IC6001 are correct, check Q6016/7 (both 2SB793), Q6018/9 (2SD973) and Q6020/1 (2SD636).

Books

Servicing TV and Video Equipment by Eugene Trundle, M.S.E.R.T., published by Heinemann Newnes at £25.

What more suitable book than this for readers of Television? It's written by one of our best known contributors, Eugene Trundle, who also writes the regular Test Case feature. Perhaps you feel you know it all? Even so there are times when a difficult problem can have you running around in circles. At such times the help provided by consulting an authoritative source can get you back on the right path. This book is eminently suited to the provision of such guidance, being based on many years of practical fault-finding experience and presented in such a manner that quick reference to advice on particular problems is easy - this is guaranteed by the extensive symptom index. To those new to the game this book should be a godsend, providing clear guidance on the problems that arise in day-to-day video/ TV servicing.

The coverage is surprisingly wide, dealing with all aspects of TV receivers (including teletext and remote control systems) and domestic video equipment. This has been achieved by cutting out lengthy exposition of theory and sticking to what goes wrong with practical circuits and mechanisms. Provided you can read a circuit diagram, this book takes you in one jump into the world of expert servicing.

A line has to be drawn somewhere. So old TV sets using valves are not covered. There are not that many sets of this type still in service. The emphasis is on the sets of the transistor and i.c. era, going back as far as thyristor line output stages in the case of TV receivers and top loaders in the case of VCRs.

While most chapters consider a particular part of the set or VCR, e.g. power supplies, line timebases, VCR system control arrangements etc., there are in addition valuable chapters on test and diagnostic equipment (not forgetting test patterns and what they tell you), intermittent faults and repair techniques (including surface-mounted components).

The book has been carefully devised to meet the needs of today's service technician. It doesn't omit such practicalities as repair viability, the prevention of callbacks and safety. We feel that it represents a very worthwhile investment, presenting as it does a wealth of information that's either not available elsewhere or is spread through back issues of technical magazines. There is a special pre-publication offer until September 23rd at £22.50 inclusive of post and packing – see advertisement on page 865.

J.A.R.

Digital Techniques by K. J. Bohlman, I.Eng., F.S.E.R.T., published by Dickson Price Publishers Ltd., Hawthorn House, Bowdell Lane, Brookland, Kent TN29 9RW at £9.95.

As we are all too well aware, more and more digital circuitry is being incorporated in TV sets and VCRs. Do you know exactly how i.c. memories, AD/DA conversion, input/output and interfacing arrangements work? I imagine that we could all do with a handy reference book on such subjects to refresh our minds from time to time.

This one is certainly clearly presented and easy to read. It covers the Ditigal Techniques syllabus for part three of the City and Guilds course 224 on electronics servicing. Although written to cover this particular course it should prove of help to anyone wishing to understand the basics of digital circuitry. Its coverage inclines towards VDUs, keyboard encoders and the digital control of motors rather than specifically consumer electronics applications. Compact discs, teletext and the use of digital techniques in VCRs are not mentioned.

J.A.R.

The ATV Compendium, edited by Mike Wooding, G61QM, published by the British Amateur Television Club at £3·50. Available from BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN.

The BATC has produced some excellent publications over the years – including its magazine *CQ-TV* (whose distribution is restricted to members). This latest book provides details of a wide variety of video, r.f. and special projects. These have been selected on the basis that they employ up-to-date technology while not requiring the use of sophisticated test equipment. For space reasons, and because the editor feels that the time has come to place the emphasis on the higher bands, the r.f. section does not contain any details of 70cm equipment.

The extensive video section includes, amongst other items, a superimposing caption generator, an electronic ATV test pattern generator, a teletext pattern generator, a dual-standard colour coder and a video distribution amplifier. The r.f. projects consist of a GaAs f.e.t. 24cm down-converter, a 24cm f.m. ATV transmitter and a 3cm ATV transceiver. Special projects are a digital frame store, a universal sync generator and an EPROM programmer for use with the Spectrum range of computers.

The book is produced in the usual BATC style. It's a valuable source of information for those interested in building their own video/TV equipment.

BATC membership details can be obtained from Dave Lawton, G0ANO, Grenehurst, Pinewood Road, High Wycombe, Bucks HP124DD. J.A.R.

Books Received

A Concise Advanced Users Guide to MS-DOS by N. Kantaris, published by Bernard Babani (Publishing) Ltd., The Grampians, Shepherds Bush Road, London W6 7NF at £2.95.

PC-DOS and MS-DOS microcomputer system users who have mastered the basics and are looking for ways to improve the efficiency and appearance of their systems will find this book useful. As with the author's previous Concise Introduction to MS-DOS, you can use sections that interest you without having to read through the whole book. There are 68 pages with paperback.

More Advanced Midi Projects by R.A. Penfold, published by Bernard Babani (Publishing) Ltd., The Grampians, Shepherds Bush Road, London W6 7NF at £2.95.

This book is intended mainly for electronic music enthusiasts. The projects featured are more complex than those in the earlier *MIDI Projects* book. They include a merge unit, a programmer and a channeliser. Not a book for beginners. There are 113 pages with paperback.

TV Fault Finding

Ferguson SAP1 Satellite Receiver

The customer complained that the satellite TV picture intermittently became snowy. At the house we found that the receiver unit was very sensitive to tapping virtually anywhere on the PCB. This produced vision splashing. A careful look around showed that R149 had never been soldered – the legs were bent over and were making good contact. Soldering R149 into circuit certainly seemed to cure the problem. The manual doesn't seem to be available yet, so when we got back I phoned Ferguson who kindly faxed a circuit diagram. This showed that R149 provides the 12V feed to the r.f. modulator.

While in contact with Ferguson I took the opportunity to ask about the very high running temperature of these Pace made units. An engineer said the company was perfectly happy with the situation, but I can't help thinking that the heat will eventually lead to reliability problems. Another puzzling thing is that the regulators are rivetted instead of bolted to the heatsink. This would seem to me to be unwise for two reasons. First rivets tend to work loose, causing problems with overheating. Secondly replacement is more difficult.

Salora/Luxor Mk II/9570 Satellite Tuner

Following a night with a lot of lightning we were inundated with the usual dead equipment calls. Amongst the casualties was a satellite TV tuner at a local tourist attraction. It had not been bought from us as the owner had obtained it when living in another part of the country, and was of the type intended for Eutelsat/ Intelsat reception, with a 1-8m dish. The fault was no output and no front panel operation. This is the tell-tale sign of a blown LNB fuse, which was the case. The inline fuseholder was chewed up as the fuse had previously been replaced. A check on the 18V rail showed that it was at about 9V: the regulator was drawing excessive current as it had a 28Ω leak to chassis. Replacement calls for a fair bit of dismantling.

Ferguson TX90 Chassis

One of these 14in. portables would "go off" when changing channels. We found that there were dry-joints on both the field output transistors. It looked as though the heatsink on which they were mounted had received a knock, forcing the legs of the transistors farther through the board than they ought to have gone.

N.B.

Thorn 1615 Chassis

This set had been seen by one of our field service engineers a few days previously. The complaint had been no results and he'd repaired some dry-joints on the coils in the line output stage. This time the set had to be brought in – there was an i.f. fault, i.e. no sound and a blank white raster. A check on the voltages in the i.f. strip showed that they were haywire. Resistance checks then showed that the first i.f. amplifier transistor VT1 was leaky while the third transistor VT3 was open-circuit all ways round. Replacing them made no difference and the base of VT1

Reports from Nick Beer, Gerry Hoey, J.G. Grieve, Chris Orr, Alfred Damp, Ray Crockit and Ian Bowden

was at over 6.7V! Not much more time was wasted before we changed the TCA270SB detector/a.g.c. chip. This finally restored the signals, but there was a severe striation down the left-hand side of the picture due to the line linearity coil's damping resistor being open-circuit while the c.r.t. was, as usual, very low emission.

Hitachi CPT2650

Not a fault perhaps but something that could catch you out – no picture at switch on, the picture appearing up to half an hour later. The cause is incorrect grey-scale setting. My first experience of this was after replacing a c.r.t.

Ferguson SRA1 Satellite Receiver

Ferguson has issued the following advice on the SRA1 Astra satellite receiver system in the latest issue of Ferguson Feedback.

Always disconnect the receiver from the mains supply before removing or fitting the LNB. As the cable carries power to the LNB, an accidental short-circuit is possible when making the connection, leading to power supply failure. The LNB F connector must be water-tight to avoid serious signal degradation.

As a general guide to fault finding, if any of the LEDs light but the screen is full of snow, check the LNB's output with a portable spectrum analyser or a signal strength meter. Alternatively substitute a known good receiver. If only snow is still present, suspect the LNB or the cable. Before changing the LNB, make a visual check that the dish is correctly aligned. When doing this remember that the dish focuses light, heat and sound – beware of sun glare and sound from overhead aircraft.

If only half the channels can be received, the fault is due either to the polariser or the transistor that changes the polarising voltage.

Philips CP110 Chassis

An EW fault on one of these sets was traced to R3599 (47Ω) being open-circuit. While investigating this fault we noticed that two of the transistor types have been transposed in the circuit diagram, i.e. T7600 should be shown as type BC558 instead of type BF819 while T7601 should be shown as type BF819 instead of type BC558. G.H.

Philips CTX-E Chassis

This one kept losing its memory. The 2.4V cell 1777 had been fixed in position but never soldered. All was o.k. after soldering.

J.G.G.

Philips 2A Chassis

These sets can give you a bit of trouble when one comes in with a short-circuit line output transistor. C2609 (9·1nF) in the diode modulator circuit is a known offender. Sometimes we have also replaced the EW modulator diodes D6609 (BY228) and D6610 (BYW95C), the

protection capacitor C2618 (1.5nF) and the 140V h.t. reservoir/smoothing capacitors C2697 and C2701 (both $47\mu\text{F}$ – we use higher voltage ratings in these two positions). It has not been possible to pinpoint the primary cause of the trouble but we find that replacing these components avoids any comebacks. J.G.G.

Rank T20 Chassis

We find that it is often necessary to replace a number of components when the BU326 chopper transistor 7VT2 goes short-circuit. These items are as follows: 7THY1 (BR103), 7VT1 (BC252B), 7R17 ($2\cdot2\Omega$), 7C4 and 7C5 (both 47μ F) – and of course the two fuses 7FS1 and 7FS2. In addition all the diodes in the power supply module should be checked.

Fidelity ZX3000 Chassis

This set was dead with the chopper transistor TR3 short-circuit and both fuses open-circuit – the mains fuse F1 (T2A) was blackened. When these items had been replaced we still had no results as R97 (4.7Ω , 4W) in the feed to the line output stage was open-circuit. Our experience with these sets has been that if any one of the diodes in the bridge rectifier circuit is faulty it's advisable to replace all four with the larger version of the BY127. It's tricky but it can be done.

Thorn 9600 Chassis

Insufficient width with the extreme verticals bowed inwards was traced to R865 (4·7 Ω) in the diode modulator stage being open-circuit. It's a flat type located behind the tripler and replacement necessitates complete removal of the scan panel.

Another of these sets tripped at switch on. We found that the T9013V line output transistor VT801 was leaky. As we didn't have one of these to hand we decided to fit an R2010B – the chopper device used in the old 3500 chassis. A week-long soak test showed that it worked quite happily in this position.

Hitachi NP81CQ Mk II Chassis

There were no results and a check on the 111V h.t. line revealed that it was at 20V via the start up diode D908. Checks on the STR441 chopper chip IC901 showed that there was 0V at pin 4. R904 (82k Ω , 0.5W) was open-circuit.

Ferguson 16A2 (TX90 Chassis)

The reported fault was "only snow when the set first comes on". When we tried the set we found that this description was correct, but the customer had neglected to tell us that the fault lasted for only about thirty seconds. We tried a new tuner, then the M923 tuning chip, but neither of these was responsible. The set started to take longer and longer to come on, and at last we were able to get some sensible readings from the test equipment. The tuner unit's tuning pin was permanently high at 31V. A check at pin 19 of IC902 (M923) with the oscilloscope then revealed that there were no tuning output pulses. At this point the set returned to normal working and had to be left for another day.

The next time the fault occurred we immediately checked the 5V supply to the chip. It was missing from

the 5V regulator which was without its 12V input. This comes from the main board and was present at the output from the 12V regulator. A check on the main board print showed that there was a hairline crack around the solder pad where the 12V supply is taken off to the tuning board.

A.D.

ITT TX3446

This set came in with a blank raster. A quick scope check showed that a composite video signal was present at the digital video board, was of the correct size and shape and was entering the VCU2100A video codec chip. The digital signals on all the parallel data output pins were of incorrect shape and size however. Replacing the chip restored normal results.

A.D.

Mitsubishi CT2227

This set suffered from field collapse. The old rule about looking first paid off: two electrolytics appeared to be very stressed. A check with the circuit diagram showed that they were the field scan couplers C412/3. They are both $330\mu F$, 50V, and both had bulged tops. A cold check with the Avo showed that one of them was open-circuit and the other short-circuit.

Toshiba C2095

This set would trip and go off shortly after switching on. If you switched off, waited half a minute, then switched on again the cycle would repeat. All was well when the set was powered at 210V via a variac, and a check on the h.t. rail indicated that there were no problems here. After we ran the set for a quarter of an hour in this state we decided that the fault was probably in the fail-safe (over-voltage protection) circuit. This is centred around transistor TR471, but the voltages here were in order. Placing the meter's probe on the base connection produced a trip however, as did touching the 6.2V zener diode D472 which is connected between TR471's base and chassis. We checked TR471 out of circuit and found that it was o.k. Deciding that removal of the zener diode for a zenering test was hard work (that comes last) we removed its $1M\Omega$ feed resistor R476 and found that it was open-circuit. A replacement cured the fault.

A number of Toshiba sets use this chassis, which was also fitted in some Bush/Murphy models (Rank T24 chassis).

Salora 26J40

This was an odd problem. The set had been in the workshop three weeks previously, when we had replaced a faulty LF0041 hybrid Ipsalo control chip. Its start-up regulator section had failed. This time the same part of the chip had failed and the set wouldn't come on. Examination of both the faulty chips showed that there were signs of excessive heat around the start-up regulator transistor. After fitting another chip we made some further checks around it. When running, line pulses should be present at pin 2. This is connected to the regulator's zener diode, the action of the pulses keeping the circuit off for most of the time. These pulses were not present because RB723 hadn't been fitted from new. Somehow the set had managed to work for around four years before failing. LB.

Dealing with Video Tape Chewing

Eugene Trundle

Tape damage causes more customer hassle than almost any other VCR trouble. There are many ways in which a VCR can damage tapes – in spite of the built-in syscon, whose main function is to prevent this. Especially when intermittent, the fault can be difficult to trace and cure. But careful examination of the damage to the tape will give you clear evidence as to what's happening, and in many cases of which particular deck or control system component is faulty or misadjusted. If the fault is intermittent, the key to diagnosis is sight of the damaged tape – get the user to bring you a sample.

Basic Checks

When dealing with this problem, examine the surface of the tape and closely watch the behaviour of the deck during loading, unloading and normal running in the play, cue and review modes. A dental mirror is essential for this purpose, the illuminated type being ideal. Use it to examine the surface and edges of the tape as it runs across every component in its path, including the spool carriers within the cassette where relevant.

Some chewings occur only in the search modes (particularly review), which are well worth checking when the symptom appears to be intermittent – especially with Video 8 equipment. Where the tape oxide is being stripped or shredded, even on the tiniest scale, the point where the damage is occurring will almost certainly be given away by the presence of a pile of black tape debris immediately below, on the deck surface.

Types of Damage

The best starting point is the tape itself. In the following text ten typical tape damage patterns will be analysed, with notes provided on effects, causes and probable culprits.

Starting with the most dramatic cases, Fig. 1(a) represents the end of a clear leader tape that's been pulled out of its anchorage in the cassette's spool carrier. This can happen only at the end of the fast forward or rewind functions, and is normally prevented by the end sensors seeing the cassette lamp or LED. With one or two exceptions (early designs) lamp failure invokes shut down, so likely causes of this defect are incorrect position (slipped down?) of the end sensors or lamp, or possibly the fact that the lamp has been obscured by foreign material or a deposit of nicotine.

Conversely, auto-rewind or auto-stop will be unexpectedly triggered by a tape whose oxide layer has been torn off, as depicted in Fig. 1(b). To the end sensor the remaining clear backing layer looks like leader tape. The invariable cause of this one is dew – condensation on the surface of the video head drum – and corresponding black or brown patches will usually be found here. Heavy scrubbing with a solvent-moistened cotton bud will remove them. The most common cause of this symptom is use of the machine too soon after head cleaning by hand or with a wet cassette, though natural condensation, not always detected by the dew sensor, may be responsible. The operation and effect of the head heater and dew

sensor, where fitted, are worth checking. Most sensors, surprisingly perhaps, go high resistance when moist.

Severed Tape

Fig. 1(c) shows a severed tape – the break usually occurs when a badly caught-up tape is extracted from the machinery by the user or an engineer. Video tape is very tough stuff, and a VCR's motors don't usually have sufficient torque to tear across it in this way. Ring-loading VCRs are the ones most prone to this "tape caught in the machinery" effect, with the tape trapped and tangled beneath the loading ring, its drive cogs and retainers. Failure of the spool drive system (motor, idler, etc.) to retract the tape into the cassette during tape unloading is the cause.

Tape Scrunching

Similar causes lead to the severe scarring and creasing shown in Fig. 1(d). This is the sort of trouble that makes you wince as you hear the tape passing round the head and see the picture disappear into a mass of lines, dots and snow – sometimes not to return until you've cleaned the heads. The scar material and loose oxide layer often blocks the head gaps. As well as removing the picture (and sound with the Video 8 system), hi-fi sound may with other formats be affected.

The cause of this type of damage is less easy to pin down, but it always means that the tape has gone adrift in the deck, way out of its normal path. Unless the tape creeps a long way up or down due to some influence that causes excessive deflection, this sort of snarl-up takes place during cassette or tape loading/unloading.

We'll take cassette loading first. A slack tape inside the cassette will produce this symptom. The cause is usually incorrect reel behaviour when the cassette was last ejected – see later. If the guides etc. are not fully retracted as the cassette comes down, the tape is crumpled on them. Check the mechanism phasing and the mode switch setting.

Both reels should be soft braked during tape loading. Check this if the reels spin and the tape bounces during the loading process. Conversely, fully-braked reels (due to the solenoid, mechanics or syscon) will result in the tape being stretched and strained during the attempt to load.

The greatest potential for the type of scrunching de-

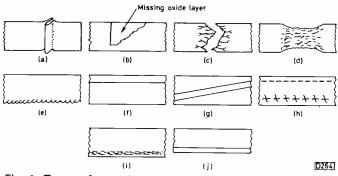


Fig. 1: Types of tape damage. See text.

picted in Fig. 1(d) is during the tape unloading phase, should one of the spools fail to take up the slack fully. Test at both ends of a three-hour tape. If a loop of tape is left hanging from the cassette's flap at eject suspect the reel idler, reel motor if separate, drive belts etc.

Tape looping, with subsequent crumpling when the cassette's flap closes, also commonly occurs at the end of fast tape transport, usually rewind. The most common cause of this is worn "hard" brakes or the levers that operate them – after rewind the right-hand brake should come on first to maintain tape tension across the front of the cassette. Check whether there are any manufacturer's modifications for this.

Some VCRs (Sharp for example) have a program for tensioning the tape as a prelude to ejecting the cassette (from the stop mode). This takes the form of a kick from the loading motor to a reel, a kick of the loading mechanism or a short fast-forward sequence. Check the mechanics involved as necessary.

Another cause of tape scrunching of the sort shown in Fig. 1(d) is failure, often intermittent, of the take-up spool to rotate in play or record. This is usually caught by the syscon before damage is done, but we have had a few cases where several metres of tape were wound round the capstan shaft, probably initially due to a sticky spot on one or the other. Zero or low take-up torque is typically caused by a slipping idler, clutch or belt: stop the spool and see what slips first.

Edge and Scratch Problems

Fig. 1(e) shows the serrated edge sometimes seen in tapes from old or worn machines. It's usually caused by a worn and grooved guide somewhere along the tape path, but can be the result of incorrect spool height settings, the tape scraping on the shoulder of the lower drum (tape too low) or scalloping as it passes a worn or faulty audio head stack. More than any other, this type of damage leads to a build up of oxide dust deposits or flakes on the deck, beneath the trouble spot.

A scratched or scored tape, as shown in Fig. 1(f), gives rise to a continuous horizontal line of dropout at some point across the playback picture. It can be seen best by holding the tape so that light is reflected across the whole width. The cause is an abrasive speck on one of the fixed components along the tape path – the lower drum, full erase head, audio head stack or the back-tension pole. Examine these carefully and clean the entire tape path.

If, as in Fig. 1(g), scratch lines run at an angle of about 5° to the edge of the tape there's no doubt that the damage is taking place while the tape is traversing the rotating upper drum. Foreign bodies are usually responsible, but a chipped or damaged ferrite head tip is a more expensive possibility.

Sometimes the scratching or creasing effect takes the form of regularly repeated dots, dashes or patterns on the tape, as shown in Fig. 1(h). The symptom is of rhythmically repeated dropout sequences in the playback picture. It's a sure sign of damage to or dirt on a rotating deck component – the capstan, the pinch roller and the exit/entry guide sleeves are the most likely culprits. If the cause of the trouble isn't obvious on inspection, a clue to the diameter of the offending part is given by the spacing of the pattern. Typical causes are dirty tape guides; grit, fluff or cotton on the pinch roller (replace it!); and a polluted/damaged capstan shaft.

Fig. 1(i) shows a tape with a wrinkled or corrugated edge. This may be at the top, giving rise to sound flutter

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and dropout, or at the bottom, in which case there will be poor control pulse transfer. This condition is often the result of excessive take-up torque, but a badly misaligned stationary guide can also be the cause. If it's confined to small areas of the tape, watch the action during and immediately after tape loading – the tape may be vertically misaligned for a brief period or stretched over a guide collar.

The same sort of defect leads to the damage shown in Fig. 1(j), where one edge of the tape is actually folded over, causing loss of sound or the control pulses (top/bottom respectively) and producing an audible sound as the video heads hit the overlap. Grossly incorrect reel height settings can also be the cause. The ultimate progression of a folded tape is a reversed one, with no sound or vision at all.

Tape Repair

At the current low price of blank-tape cassettes, attempts to repair a damaged tape are rarely worthwhile. Spending time on this is justifable only when the software is very precious.

Tape splicers are available commercially and work well with new blades and the use of cotton gloves by the operator. Cut back to good tape and follow the instructions to the letter. Where, as is usually the case, the damage is near the end of the tape, cut back and splice to the clear leader. It's possible to dismantle a cassette to retrieve or anchor tape. Reassemble it with care and mark the cassette with its new shortened playing time.

Old video tape strung across the vegetable patch makes an excellent bird scarer. . .

1.00	V2 4AZ	W	M	210	ME	HA	R	LVE	O	5. W		OX	B	PO	ËŞ	/IC	E	C D	MI	10	0	EO
Section	3.06 TDA4440 3.2 1.98 TDA4442 4.1 2.15 TDA4500 4.7		4,98 9,52	STR1096 STR4090	5.42 5.42 2.61	SAS560T SAS570T SAS570S	1.98 0.90 1.32	MC1330P MC1350P MC1351P	7,43 1.73 2.26	HA1196 HA13001 HA1306	1.10 6.53 1.15	BU126 BU137 BU205	0.31 1.96 1.96	BDX54B BDX62A BDX63A	0.14 0.26 0.10	BC207 BC212B BC213L	2.40 5.09 3.33	AN2140 AN234 AN236	1.90 1.25 1.70	2SC1678 2SC1741 2SC1810	2.72 3.28 5.61	5/80H 5/85R 7052
1.00	1.05 TDA4600-2 2.1 2.39 TDA4610 6.8 2.16 TDA4620 6.7	TCA270SQ TCA290A TCA420A	4.93 8.16	STR451 STR453	1.33 1.33	SAS6600 SAS660	2.15 1.48	MC1357P MC1358P	2.65 4.02	HA13342 HA13365	1.85 1.12	BU207 BU208	1.18 0.29	BDY81 BF115	0.40 0.10	BC225 BC237	1.71 4.90	AN241 AN245	0.67 2.25	2\$C1826 2\$C1829	9.30 3.45	7074 7089
Mary	2.25 TDA5500	TCA530 TCA640	7.98	T6029V	1.33 2.21	SAS670 SAS6710	2.15 3.46	MC14494P MC14497	2.75 2.45	HA1367 HA1368R	1.12 1.43	BU208A BU2080	0.67 0.25	BF121	0.25	BC239B	7.92 5.52	AN272 AN295	0.98 1.37	2SC1893 2SC1906 2SC1921	1.50 0.04 0.06	N4001 N4002
Section Sect	3.05 TDA8190 3.9 2.60 TDA9403 1.5 3.81 TDA9503 2.9 2.25 TDA9513 3.1	TCA660B TCA730	2.11	T6037 T6044V	19.35 1.95	SC84203 SC9504P SDA2006	1.10 2.15 3.88	MC14528BCP MC1712	1.80	HA1374 AA117	0.99 1.49	BU326A BU406	0.29 0.58	BF137 BF153	0.35 0.23	BC300 BC301	3.09 8.88	AN302 AN305	2.25 1.98	2SC1929 2SC1942	0.05 0.05	N4004 N4005
March Marc	5.95 TDB1033 2.6 2.38 TDE1081 7.0 5.44 TEA1002 2.3		1.45 0.87	T6049 T6052V	5.26 8.75	SG264A SG613	3.49 1.23	MC7724CP MCR106-5/6	2.05 2.39	HA1389FI HA1389	0.82 5.29	BU407 BU412	0.33 0.18	BF157 BF158	0.30 0.06	BC303 BC307A	5.53 9.35	AN316 AN318	0.95 1.53	2SC1957 2SC1953	0.07 0.03	N4007 N4148
Mary 1968 1969	2.04 TEA1009 0.8 1.65 TEA1014 1.5 0.82 TEA1020SP 4.9 2.93 TIC106C 0.6	TCA910 TCA940	2.77 1.25	T6059 T9003V	10.31 7.50	SG6533 S11125H	0.75	ME6411 ME6002	2.37 3.75	HA1394 HA1397	1.45 1.89	BU500 BU508A	0.31 0.38	BF160 BF167	0.17 0.13	BC309 BC317A BC327	2.25 6.78 5.37	AN322 AN337	1.78 3.28 1.55	2SC1969 2SC1983 2SC1985	0.13 0.18	N5402 N5403
14	3.67 T1C106M 0.7 5.36 T1C44 0.7	TD3F800R TD3F900H TDA1001B	1.40 4.95 2.42	T9013V T9014V	1.39 0.85 0.35	SKE2F1/04 SKE2G3/04 SKE4F1/06	0.75 3.30	ME0411 MJ2501	0.85 2.07	HA1452 HD14538	2.50 0.85	BU 705 BU806	0.40 0.36	BF178 BF179	0.09 0.12	BC337 BC338	5.98 1.50	AN355 AN362	2.33 2.11	2SC2029 2SC2028	0.14	N5408 N914
Margin M	1.79 TIC47 0.7 2.22 TIP120 1.5 7.00 TIP110 0.5	TDA1003A TDA1005A TDA1006A	1.98 1.45	T9019W T9034V	0.80 1.33	SKE4F2/06 SKE4F2/10	1.53 1.89	MJ481 MJE2955	5.77 7.25	HD38750A53 HD38750A-7	1.95 1.39	BU826A BUW84	0.32 0.34	BF181 BF182	0.69 0.46	BC440 BC441	3.43 4.50	AN5111 AN5120N	3.39 1.54	2SC2078 2SC2073	0.10 0.10	S44 S921
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NESSE 61 525114 92 AMENON 4 6 1054 107 1070 917 19712 12 10714 10715 12 107	2.45 TIP132 0.9 2.42 TIP137 0.9 2.95 TIP29 0.8	TDA1028 TDA1034B TDA1035S	0.49 3.90 4.80	T9064 TA7027	3.69 3.44	SL414 SL432A	3.01 2.51 5.77	ML237B ML238	9. 81 10. 9 5	HM6231 HM6232	0.44 0.52	BY164 BY176	0.17 0.16	8F196 BF197	0.32 0.41	BC478 BC479	3.95 1.66	AN5630 AN5701N	1.20 1.69	2SC2233 2SC2236	0.14 0.18	N3702 N3703
March 1968 1968 1969	2.55 TIP2955 0.8 1.95 TIP29A 0.4 2.05 TIP29B 0.6	TDA1035T TDA1037 TDA1037D	1.74 2.55	TA7051 TA7054	2.88 3.14	SL471 SL480	3.58	ML926 MM5314N	4.85 4.00	HM7103 HM9032	1.05 0.77	BY182 BY187	0 17 0.37	8F199 BF200	0.17 0.10	BC546 BC547	4.40	AN6300 AN6310	0.87 t 7.00	2SC2314 2SC2335+K	0.14 0.16	N3706 N3707
Section 19 1955 19 1956 19 1958 19 19 19 19 19 19 19 1	1.95 TIP29C 0.4 3.25 TIP29D 0.7 0.90 TIP3055 0.6 1 1.21 TIP30A 0.4	TDA1047 TDA1059B TDA1054M	1.27 3.13	TA7061AP TA7069	8.32 9.07	SL901B SL918A	3.15 2.01	MM5318N MM5369N MM5387AA/N	3.24 13.25	HM9015 HT4207 HT4208	1.62 0.22	BY198 BY207 BY208	0.65 0.19	BF237 BF240	0.10 0.16	BC550 BC556	16.00 1.95	AN6363 AN6531	0.80 1.60	2SC2570 2SC2577	1.55 2.20	N3772 N3773
No. 1. 26 15077 1. 66 1. 67 1.	2.60 TIP30C 0.4 3.25 TIP31A 0.3 1.22 TIP31B 0.3	TDA1060 TDA1082 TDA1151	1.98 7.50	TA7074P TA7076P	10.25 7.19	SN16966N SN29717N	12.65 7.92	MN1400VL MN1405	7.68 4.85	KC581C KC582C	0.27 0.19	BY210-600 BY210-800	0.50 0.49	BF245 BF245B	0.10 0.10	BC558 BC559	0.68 1.65	AN6552 AN6610	0.91 1.85	2SC2671 2SC288A	1.17 0.15	N3823 N3904
1988 1988 1988 1988 1989	2.11 TIP31C 0.3 2.48 TIP32A 0.3 1.51 TIP32B 0.4 3.88 TIP32C 0.2	TDA1190Z TDA1200	9.94 3.99	TA7092P TA7093P	6.04 11.95	SN29715N SN29722	5 07 4 00	MP1192 MP2794	0.75 1.56	LA1201 LA1210	1.88 0.25	BY224-600 BY226	0.20 0.28	BF255 BF256	0.34 0.20	BC635 BC636	2.52 2.80 9.90	AN7145 AN7146	1.40 1.16	2\$C372 2\$C373 2 \$C383	1.33 2.60 0.90	N4240 N4444
Month 19	3.30 TIP33 0.0 3.74 TIP33A 1.0 1.50 TIP33C 0.0	TDA1236 TDA1270 TDA1327A	1.61 3.71	TA7108P TA7109 TA7122B/P	2.38 3.90	SN29764AN SN29767 SN29770BN	1.57 2:13 0:60	MP8512 MPC596 MPF256C	2.87 9.00 1.05	LA1320 LA1357N LA1363	0.60 1.12 0.92	BY228 BY229-1000 BY229-600	0.34 0.57	BF259 BF262	0.24 0.40	BC640 BCX34	2.85 2.34	AN7156 AN7158	0.81 0.60	2SC394V 2SC403C	0.50 0.48	N5294 N5296
Miles 15	1.08 TIP34 0.7 1.52 TIP41A 0.4 3.45 TIP41B 0.3	TDA1412 TDA1420 TDA1440	1.50 1.27	TA7129P TA7130P	4,15 1.67	SN29771BN SN29791	0.35	MPSA42 MPSA56	1.15 1.53	LA1365J LA1385	1.03 0.20	BY295-600 BY298	0.34 0.20	BF271 BF273	0.70 1.31	8D116 BD124	4.56 5.87	AN7223 AU107	0.92 1.85	2SC495 2SC515A	0.61 1.58	V5298 V6109
2. Sales 16. Dischera 16. Dische	2.90 TIP41C 0.8 4.25 TIP42A 0.6 6.58 TIP42B 0.7 4.60 TIP42C 0.8	TDA1470P TDA1506	0.98 3.87	TA7137P TA7141AP	0.44 0.61	SN2709 SN7400N	0.86 1.56	MPSU05 MPSU10	1.43 1.60	LA3350 LA3361	0.90 1.49	BY407 BY409	0.23 0.33	BF324 BF336 BF337	0.42 0.53 0.36	BD133 BD135	2.08 1.09	AY105K AY106	0.54 1.16	2SC537 2SC605L	0.73 1.65	N6180 N6292
Alegon 6 25 School 188 80-127 32 58 00-40 42 39 597 42 50 50 50 50 50 50 50 50 50 50 50 50 50	2.89 TIP47 0.6 2.89 TIS43 1.4 3.15 TIS90 0.2	TDA1512 TDA1515 TDA1559	1.67 3.26	TA7148P TA7149P TA7152P	0.65	SN7402N SN7404N SN7408N	0.33 0.50	MR818 MR854	1.25 1.30	LA4100 LA4101	0.14 0.23	BYW56 BYX55-600	0.49 0.60	BF355 BF362	0.26 0.28	BD137 BD138	0.14 1.98	BA310 BA1310	1.54 0.67	2SC643A 2SC668	1.65 0.49	A1011 A1015
AGAMES 45 (2011) 6 13 8 8448 22 80191 92 87 8448 137 (1004) 6 27 1448	4.48 TL011CP 1.5 2.75 TL494CN 8.9 1.27 TL072CP 1.4	TDA1670 TDA1770 TDA1905	3.61 1.41	TA7162P TA7172P	1.60 0.37	SN74121 SN7413N	17.35 13.95	MSM5816RS MSM5840H	0.56 2.25	LA4112 LA4125	0.62 1.20	BYX71-350 BYY56	0.50 0.25	BF371 BF391	0.32 1.43	BD140 BD144	3.95 2.75	BA1322 BA1330	1.88 1.65	2SC682 2SC684	0.80 0.45	SA 1020Y SA 1027R
1.00	2.98 TMP4320 15.0 1.95 TMS1024NLL 10.5 2.50 TMS1025N 6.2 1.45 TMS3720ANS 5.2	TDA 1940 TDA 1950	4.80 2.16	TA7193P TA7204P	1.51 1.27	SN74151AN SN74154N	2.65 0.19	NE542 NE555	0.70 1.50	LA4140 LA4192	0.37 0.76	C106D C106M	1.87 0.30	BF418 BF422 BF423	0.67 1,60 0.71	BD157 BD160 BD163	0.40 0.12	BA154 BA155	1.15 0.50 1.28	2SC711A 2SC717	1.25 1.25	C1173Y C1474
SAME 1.17 250.567 3.64 3.64 3.64 3.64 3.65 3	1.55 TMS3748NS 14.9 1.48 TMS3755 13.6 0.90 TMS3894NL 19.2	TDA2006 TDA2004 TDA2002	2.15 1,45	TA7208P TA7210P	0.49 0.27	SN7430 SN7440N	0.TI 0.TS	DA202 DA47	1.00	LA4422 LA4430	3.25 2.20	CA3090AQ CA3094	0.29 0.41	BF451 BF457	0.28 0.30	BD175 BD179	0.09 0.19	BA159 BA182	3.98 1.85	2SC783 2SC790Y	3.00 #5.00	SA1095 SA1103
10.00000000000000000000000000000000000	1.00 TMS5102NLL 6.2 1.35 TUA2000 8.9 2.14 TY60108 2.9 6.20 ULN2204 8.5	TDA2030 TDA2140	2.58 1.45	TA7215P TA7217AP	0.44	SN7474N SN7490AN	0.03 2.52	DA95 OC28	1.80 1.75	LA4445 LA4460	0.34 0.27	CD4001 CD4002	0.52 0.99	BF459 BF460 BF469	0.99 0.99 1.21	BD182 BD183 BD184	0.65 1.45	BA311 BA312	3.04 0.96 0.54	2SC876 2SC930	1.17 1.32 2.25	SA489 SA490 SA493
SACHS 0.69 2501453 1.39 BASS 1.77 BD072 0.98 BH40 0.77 0.50017 0.98 0.71 0.70 0.71 0.75 0.7	1.30 UPA53C 4.9 4.01 UPC1003 5.9 2.40 UPC1009C 6.3	TDA2151 TDA2160	3.57 4.22 1.35	TA7229P TA7230P	3.50 2.97	SN76013ND SN76023N	7.53 0.35 0.18	DC44 DC45	1.18 13.86 11.97	LA7020 LA7025	0.29 0.24 0.33	CD4012 CD4013	0.33 0.33	BF471 BF472	0.69 0.69	8D189 8D190	0.04 0.09	BA317 BA318	4.68 2.90	2SC940 2SD1128	0.62 4.88	A564 A614
ARM 1.70 20198 347	4.50 UPC1025H 2.9 3.96 UPC1028H 2.0 2.25 UPC1032H 0.8		2.55 5.92	TA7240AP TA7245P	5,54 0.90	SN76033N SN76110N	0.46 1.06	0C75 0N236	9.20 3.90	LA7040 LA7042	0.40 1.23	CD4017 CD4020	1.79 0. 50	BF480 BF491	0.68 0.46	8D202 BD203	1.37 6.27	BA333 BA335	1.30 1.33	2SD1273 2SD1453	1.75 0.49	A639S A659 A673
SAME	2.50 UPC1042C 8.9 4.50 UPC1156H 3.9 3.90 UPC1161C 4.9 2.50 UPC1182H 1.5	TDA2524 TDA2525	0.65 5.94	TA7313AP TA7314	0.82	SN76131 SN76227N SN76226DN	1.45 2.45	0T121 PT6042	0.90 3.61	LA7801 LB1274	0.28 0.64	CD4023 CD4025 CD4028	0.24 0.18 0.27	BF596 BF597	1.23 0.50	BD208 BD222	1.00 1.20	BA514 BA521	0.47 0.60	2SD234 2SD235	0.80 1.25	A697 A699
. A636	2.20 UPC1186H 1.0 1.88 UPC1181H 1.3 2.15 UPC1185H 2.1	TDA2530 TDA2541 TDA2540	1.85 5.95	TA7339P TA7340P	5.23 5.23	SN76242 SN76243	2.19 1.33	R1039 R2008B	2.75 1.81	LD3150 LM1017N	1.06 0.24	CD4047 CD4049	0.59 0.47	BF757 BF759	0.63 1.05	BD228 BD229	7.98 2.98	BA526 BA527	1.98 4.09	2SD257 2SD292	1.95 0.18	A748 A817
ASSIGN Q. 2.1 SQUILLY 1.0 BANKS Q. 2.2 SQUILLY 1.0 SQUILLY	5.94 UPC1188 8.7 2.17 UPC1212C 0.8 0.50 UPC1225H 4.8 2.73 UPC1230 1.4	TDA2560 TDA2575A	2.65 2.32	TA7609 TA7611AP	2.47 0.91	SN76533N SN76532N	2.98 1.33	R2010B R2029	5.94 7.45	LM2808 LM2877	0.21 0.29	CD4066 CD4069	0.34 0.49 0.30	BF762 BF869 BF870	0.42 0.47 0.28	BD234 BD237 BD238	1.70 3.10 1.00	BA6209 BA656	3.05 7.50	2\$D350 2\$D353	0.65 0.59	A844 A872
ASSO 0.72 250560 2.95 BAM 9 0.06 BD/34C 0.54 BB/BI 0.92 C01556 1.07 C0	1.60 UPC1238 2.1 1.80 UPC1278H 5.9 1.80 UPC1351C 1.8	TDA2576A+K TDA2581 TDA2582	8.94 2.50 7.50	TA7628P TA7629P	3.47 2.45 3.08	SN76546N SN76549 SN76570	2.35 1.49 1.18	R2265 R2305	0.98 0.41 11.85	LM339N LM340K	0.14 0.40 1.10	CD4093 CD4511	0.49 0.56	BF960 BF970	0.57 0.39 0.50	BD240 BD241 BD242	28.98 3.96	BA841A BA843	1.40	2SD401 2SD414	0.97 2.23	A937R A940
ASSP 0.75 250613 1.03 5AV21 0.12 5U240C 0.10 5B786 0.25	2.70 UPC1350C 1.4 3.40 UPC1353 1.5 3.40 UPC1355C 2.1 5.52 UPC1363 4.2	TDA2594 TDA2593	2.40 2.55	TA7640AP TA7672P	2.59 2.48	SN76620 SN76660N	0.76	R2323 R2354A	2.80 1.71	LM380N LM567CN	1.47 1.70	CD4556 CR02AM-8	0.92 0.50	BFR61 BFR62	0.50 0.31 0.72	BD243C BD244 BD244C	0.06 0.11	BAV18 BAV19 BAV20	2.95 2.98	2SD 560 2S D600 2SD601R	0.72 1.75 0.85	A950 A951 A966-Y
BAMD 10,000 20,	7.60 UPC1362 4.1	TDA2600 TDA2611AQ TDA2612Q	10.25 1.27 0.80	TAA320A TAA350A	4.86 5.94 1.23	SN76708 SN76709N SN76707N	1.36 1.50 1.91	R2461 R2540	10.15 0.69 3.87	LM748 LM8360	3.14 8.77 12.48	CX104 CX108	1.08 1.63	BFR86 BFR89	0.80 1.05 0.70	BD246C BD253 BD278A	0.11 0.11	BAW62 BAX12	0.40 0.72	ZSD636 ZSD639-R	0.65 1.13	B774 B185
859.6 5.6 5.6 5.2 520811 7.5 3 BC13 0.14 BD143 0.44 BP.87 0.55 CLTS 7.52 LUG0112 12.37 RF920M 0.28 SN49041 2.55 FAA710 2.23 T10A283 858.6 2.50 250823 1.98 BC13 0.14 BD143 0.44 BP.87 0.55 CLTS 7.52 LUG0112 12.37 RF920M 0.28 SN49042 4.35 TAA350 4.27 T10A283 858.6 2.50 250823 1.98 BC13 0.14 BD143 0.44 BP.87 0.55 CLTS 7.52 LUG0112 12.37 RF920M 0.28 SN49042 4.35 TAA350 4.27 T10A283 858.6 2.50 250841 2.00 BC132 0.14 BD143 0.44 BP.87 0.44 BP.87 0.45 BD143 0.44 CLTS 5.50 LUG0112 12.37 RF920M 0.39 TAA350 4.27 T10A283 858.6 3.50 250841 2.00 BC132 0.14 BD143 0.44 BP.87 0.44 BP.87 0.45 BP.87	1.25 UPC1360C 4.5 2.79 UPC1378H 2.4 1.96 UPC141C 4.9		4.85 1.00	TAA621AX1 TAA6618	5.54 0.60	SN76730 SN76810N	0.67 2.00	R2615 RCA2060	9.37 9.37	LR3419 LR3471	8.76 11.10	CX130 CX134	0.34 0.37	BFX29 BFX84	2.72 0.42	BD318 BD375	0.08	BAX16 BC107B	2.80 0.80	2SD657 2SD661A 2SD731	0.40 1.03 2.65	B400 B405 B511
2.00 250944 2.00 2.00	2.50 UPC1458 2.0 2.73 UPC151C 2.9 3.61 UPC2002 1.4 8.25 UPC30C 2.5	TDA2631 TDA2640	2.37 4.87	TAA700 TAA930	5.54 4.35	SN94041 SN94042	0.30 0.28 1.58	RGP10 RGP30M RT402	5.95 14.95 12.37	LU52012 LU52011 LU03112	11.83 5.52 5.50	CX139 CX157 CX158	0.36 0.55 0.34	BFX86 BFX87 BFX88	0.49 0.44 0.45	BD433 BD434	0.14 0.36	BC113 BC119	7.63 1.98	2SD811 2SD823	0.56 2.80	B546 B56
15 15 15 15 15 15 15 15	6.18 UPC324C 4.7 4.73 UPC32C 4.9 2.48 UPC339C 4.3	TDA2653 TDA2654 TDA2670	0.70 1.05	TAG626 600 TBA120AS TBA120SB	2.50 3.16	ST1702L STA401 STA441C	5.34 1.84 2.90	\$1299 \$2800D \$2802	1.30 1.98	M21C M23C	5.26 12.95	CX187 CX755	0.30 0.33 0.27	BFY50 BFY51 BFY52	0.60 0.41 0.52	BD436 BD437 BD438	0.14 0.14 0.18	BC132 BC135 BC137	2.00 1.00	2SD841 2SD856 2SD857Q	2.00 0.50 3.67	3631 3643 3669
1.16	3.20 UPC41C 4.16 6.00 UPC4558C 2.19 8.84 UPC474 5.11 2.78 UPC554C 1.88	TDA2740 TDA2780AQ	2.50 1.05	TBA120U TBA120A TBA1440	5.54 7.72 6.91	STK0029 STK0050 STK016	5.21 13.10 9.98	\$3702\$ \$40W \$6080B	1.69 5.24 3.15	M51102L M5115P M51203L	0.40 0.28 0.25	E1222 E5024 E5386	0.42 2.20 0.22	BFY90 BLY49 BR100	0.66 1.42 0.75	BD442 BD509 BD510	0.33 0.45	BC139 BC140	1.75 0.82	SD894 SD898	1.98 0.65	B695 B774
11 3.22 78 5 790 5	1.81 UPC575C2 2.40 13.25 UPC580C 6.60 UPC587C2 1.30	TDA2791 TDA2910 TDA3300B	1.95 1.10 1.20	TBA1441 TBA395 TBA396	5.25 12.95 13.34	STK022 STK031 STK040	5.17 1.85 4.76 4.40	SAA1006 SAA1020 SAA1025	4.13 5.25	M5134-9341 M51353P	0.84 1.75 2.53	GF758 HA11215 HA11211	0.66 1.15 2.08	BR103 BR303 BRC84	0.60 0.80 0.67	BD529 BD530 BD533	0.23 0.34	BC142 BC143	0.63 0.45	805-T022 808	1.16 3.98 4.54	01096 01104 01106
1133 0.64 A0143 1.93 BC153 0.14 B0538 0.67 BSTB0140G 450 HA1125 429 M5144F 3.77 SAA1130 4.99 STK2110 7.23 B8550 1.84 H0125 1.05 A0145 1.05 A014	4.40 UPC595 2.90 UPC596 1.90 12.09 UPD1514C 4.70	TDA3506 TDA3501	2.34 1.30	TBA440C TBA480Q	27.50 7.67	STK058 STK077	2.81 4.25 7.44	SAA1024 SAA1075 SAA1121	9.48 12.50 6.85	M51393AP M51394P M5142P	4.29 3.46 1.75	HA11229 HA11235	0,34 0.69 0.67	BRX49 BRY39 BSS38	0.45 0.50 0.50	BD535 BD536 BD537	0.13 0.11 0.13	BC148B BC148C BC149B	0.64 0.80 1.06	1815 1905 AD 140	4.95 1.26 1.65	C1116 C1124 C1129
	5.95 UPD553 164 19.52 9.71 UPD8049C-1 11.50 6.99 X0022CE 5.75	TDA3510 TDA3520 TDA3540	1,84 1.30 1.15	TBA520 TBA530 TBA540	7.33 16.95 16.65	STK2110 STK2145 STK2240	4.99 7.77	SAA1130 SAA1174	2.55	M5144P M51513L M51515BL	4.29 1.38	HA1125 HA1137W HA1138	4.93 8.64	BSTC0246 BSTC0233	0.67 0.83 0.40 0.57	BD544B BD677 BD679	0.14 0.16 0.40	BC154 BC159 BC160	1.60 0.30	AD145 AD161	3.33 0.55 2.22	C1158 C1162 C1172
C1195 6.09 AF114 2.47 BC161 0.28 BD880 0.52 BS701043 2.16 Ha1156 1.15 M5152 2.20 SAA1351 8.11 S10204 4.95 TBA5700 1.80 TDA3560	2.22 X0029CE 7.05 4.25 X0031CE 6.33 2.83 X0035TA 6.11 7.48 X0040TA 4.56	TDA3560 TDA35710 TDA3576	1.60 1.71	TBA570Q TBA570A	4.95 5.75 4.50	STK3042 STK3044 STK4019	8.11 2.55 3.25	SAA1351 SAA3027P SAA5000	2.20 5.74	M5192 M5194AP	1.16 4.79 6.60	HA1156 HA1160 HA1166X	2.85 3.91 0.60	BSTD1043 BSV57B BSW68	0.52 1.48 2.47	BD680 BD681 BD696	0.28 0.36 0.16	BC168 BC169C	2.47 1.24 1.20	AF114 AF115 AF118	0.89 1.46 0.90	C1213 C1226 C1 293
1305 199 AF127 0.65 BC171 0.11 B0700 3.70 BSX20 0.19 HA1106 3.61 MS2274P 1.33 SAAS010 4.00 SIKAS2 4.79 TBA70 1.85 TDA359 1.33 SAAS012 5.50 STKAS2 6.25 TBA70 1.85 TDA359 1.35 AB502 5.78 STKAS2 6.25 TBA70 1.85 T	6.79 X0042CE 4.36 6.45 X0043CE 2.75 5.90 X0056CE 6.25 2.60 X0057GE 6.00	TDA3590 TDA3591 TDA3650	1.85 2.30 3.55	TBA700 TBA720 TBA730	6.25 4.95 1.95	STK4332 STK435 STK4352	5.50 5.78 6.33	SAA5012 SAA5020 SAA5030	1.33 1.50 1.22	M53274P M54532P M54544L	3.61 8.00 4.22	HA11706 HA11705 HA11703	0.19 0.50 0.51	BSX20 BSY52 BSY79	3.70 0.60 0.60	BD700 BD707 BD709	0.11 0.27 0.17	BC171 BC172B BC173	0.40 1.45	NF 139 NF 178	1.98 0.50 0.49	21306 21317 21364
1.531 2.65 AF180 0.55 BC179 0.55 B0809 0.80 BT119 1.76 HA11701 2.56 MS9489 1.75 SAA5950 7.74 STK435 7.21 TBA7500 2.59 IDA3551 1.338 0.75 AF180 0.53 BC178 0.55 B0809 0.69 BT120 2.71 HA11713 2.90 MA05 1.07 SAB3010 7.74 STK4372 13.13 IBA800 1.80 IDA3551 1.4343 5.00 AF186 0.53 BC178 0.53 B0879 0.74 B1121 2.50 HA11713 2.90 MA05 1.07 SAB3011 7.34 STK4372 13.13 IBA800 1.80 IDA3551	3.95 X0065CE 5.77 1.95 X0074GE 10.00 2.50 X0077GE 15.90	TDA3651AQ TDA3651A TDA3651A	2.90 1.71 1.08	TBA7500 TBA760 TBA800	7.21 7.50 13.13	STK436 STK437 STK4372	7.74 5.98 7.34	SAA5050 SAB1009B SAB3011	1.07	M58485P MA06 MA8001	4.56 3.45 2.90	HA11710 HA11713	1.76 2.17 2.48	BT119 BT120 BT121	0,80 0,69 0,74	BD809 BD810 BD879	0.35 0.26 0.26	BC177 BC178 BC179	0.55 0.53 0.53	NF180 NF181 NF186	2.45 0.75 5.00	1391 1398 1413A
1.1445 1.25 AF.259 0.53 BC182 0.09 B0895 2.18 BT123 1.99 HA17175 9.30 MA8000 1.16 SAB3021 7.90 STR465 1.77 BA8105 1.51 T044550 1.77 BA8105 1.51 T044550 1.77 BA8105 1.95 SAB3024 6.36 STR465 1.77 BA8105 1.95 SAB3024 6.36 STR465 1.77 BA8105 1.95 SAB3024 6.36 STR465 1.77 BA8105 1.78 SAB3024 6.36 STR465 1.77 BA8105 1.78 SAB3024 6.36 STR465 1.77 BA8105 1.78 SAB3024 6.37 BA81	3.40 X0092CE 4.95 7.20 X0096CE 5.95 1.95 X0109CE 11.25	TDA4050B TDA4280 TDA4290	1.75 0.66	TBA810T TBA820	11.77 9.52 6.32	STK466 STK4833 STK501	7.90 6.36 5.82	SAB3021 SAB3024 SAB3209 SAB3210	1,16 1,98 1,85	MA8003 MB3705 MB3712	9.90 7.76 13.10	HA11715 HA11714 HA11716	1.98 1.03 2.42 2.48	BT123 BT151-800R BT76018	2.18 0.99 0.65 0.99	BD895 BD901 BD902 BDW83C	0.14 0.26 0.13	BC182LB BC183LB BC184	0.88 3.98 1.89	NT279 NN115 NN155	2.67 0.60 1.00	C1447 C1475 C1505
C1514 1.37 AN706 2.58 BC184.6 0.26 BDW84C 0.59 BUIGB 1.50 HA17/25MP 16.00 MB3730 2.08 SAF1002P 3.58 STK5314 12.40 TDA4420 10.44 C15730 1.83 AN708 3.55 BC186 0.25 BDW84C 0.59 BUIGB 1.50 HA17/25MP 16.00 MB3730 2.08 SAF1003 1.55 STK5730 1.20 TDA4420 1.65	4.90 X0113CE 2.07 2.30 X0195CE 7.56 8.32 X0204CE 8.74 9.00 X0261 CE 8.98 2.27 ZPY120 3.25	TDA4420 TDA4422 TDA4427S	3.30 1.65 1.87	TBA890 TBA920 TBA940	12.40 3.20 13.10	STK5314 STK5730 STK7216	3,58 1.95 8.39	SAF1032P SAF1039 SAS5010	2.09 3.90 2.25	MB3730 MC13002 MC1310P	16.00 6.23 21.15	HA11725MP HA117555P HA11781	1 50 2.25 5.69	BU108 BU109 BU110	0.99 1.88 4.93	BDW840 BDX32 BDX53A	0.26 0.25 0.28	BC186 BC187	3.55 2.28	N208 N210	1.63 0.34	C1573Q C1583

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FERGUSON/JVC VID1 01X0-003-381 VID2 01X0-018-024 VID3 01X0-018-025 VID4 01X0-018-025 Fewind idler assembly T VID5 01X0-040-006 VID6 01X0-033-454 VID7 01X0-040-007 VID8 01X0-040-007 VID8 01X0-040-017 VID9 01X0-045-016 VID9 01X0-065-016 VID10	47752 f3V16/PU492 49280 PU48941-2 sing) T3V23/F PU48967B /29/30/PU513 /28/39/PU553	5.00 6.20 9.61 9.62 9.63 9.63 9.63 9.63 9.63 9.63 9.63 9.63	20.86 £0.86 £1.42 £1.76 £1.08 £1.76 £0.68 £1.65 £1.42 £1.42 £1.42	BELTS JVC HR 2200 DBK137 HR 3300 DBK107 HR 3300 DBK105 HR 3360 DBK105 HR 3560 DBK107 HR 3600 DBK107 HR 3600 DBK103 HR 3600 DBK103 HR 3600 DBK103 HR 3600 DBK132 HR 7700 DBK132 HR 7700 DBK132 HR 7700 DBK132 HR 7700 DBK132	00.68 91.65 91.65 91.42 92.55 90.86 90.86 91.76

FERGU VID1 VID2 VID3 VID4 VID5 VID6 VID7 VID8 VID9 VID10	ISON/JVC 01X0-003-381 01X0-018-024 01X0-018-025 01X0-018-729 01X0-040-006 01X0-033-454 01X0-040-007 01X0-040-017 01X0-065-009 01X0-065-016	Tension band T3292/PU545904A Take up idler T3292/PU47752 Rewind idler assembly T3V16/PU49282 Take up idler T3V00/PU49280 Loading belt T3V29/30/PU49841-2 Roller Assy. (cass. Housing) T3V23/PU49042 Take up idler 3V29/30/PU48967B Reel motor assembly 3V29/30/PU51381V Capston motor 3V35/36/38/39/PU55371V Cass. housing Assy. 3V35/36/38/39/PU29825	2.55 5.00 6.20 6.95 0.26 4.50 2.90 27.95 22.10
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The Room at the Back

J. LeJeune

Summer had settled at Milldale and a new name had been decided upon for Topcut's Discount Store – "Electric Dreams". There had been a hot debate about this. Ralph Topcut had wanted "The Milldale Home Entertainment Centre", but Sid Bias had argued that this was not a complete description of the business since the store also sold washing machines and refrigerators. "I know that some of our customers are mad" he'd said, "but I doubt whether many of them get much entertainment out of watching their front-loaders in action with the dirty linen." So he'd won, and Electric Dreams in Terry Green's pink and green neon tubes was attracting scores of younger people into the store. It had proved to be a great success, and as a result Ralph Topcut was in a good mood.

Peace reigned in the service department. Norman Gates was deep in the bowels of a Toshiba V8600 VCR, while Andy sighed resignedly over an anonymous-looking VCR that turned out to closely resemble the Ferguson 3V35. It was probably an ex-rental job and was plagued by head speed hunting. Andy was terrified of servo systems – even though CD players, about which he was supposed to be an authority, have four of them.

Loss of Line Drive

Young Gareth's job was a Sony KV1810 that no one else had wanted to repair. Its line driver transistor Q509 had failed. Fitting another one got the set going again but all was not well – the replacement seemed to run hot. Gareth probed around the area with a scope and found that the transistor's drive was too low. A dab with a wet finger confirmed the problem. There was ample drive on the far side of the coupling capacitor C538 (0·47 μ F). Gareth didn't like the idea of an electrolytic being run at line frequency, so he replaced it with a low-inductance Mylar type. The effect was immediate: Q509 now ran happily and was cool. He put everything back together and mercifully had no screws left over.

Modulator Problem

Meanwhile Norman had established the cause of the Toshiba's lack of output signal and was busy changing Q661 in the modulator. He spent a few minutes with the equivalents book looking for a more powerful replacement but the terminology used was not helpful. So the Toshiba type was fitted. This restored the r.f. output and the machine was put on soak test in the E-E mode.

Scheming

Sid sauntered over to Norman's bench and pulled a drawer open, resting his foot on it. "What do you think of this scope?" he said, showing Norman an advertisement in a popular trade magazine.

Norman briefly scanned the advertisement and looked up at Sid. "I suppose your idea is to catch Ralph T. while he's in a good mood and get us a new scope" he suggested.

"You could put it like that" replied Sid.

"In that case go for the most expensive one and haggle as long as you can. We badly need a sixty-meg scope

around here what with all the high-tech goods he's putting on the shelves out front" said Norman.

"A good point" Sid agreed. "They make extravagant claims about our service and then expect us to operate on a shoestring. It's time they backed their claims with some extravagant test equipment."

A Couple of VCRs

Andy was not feeling too happy. He'd let his meter probe slip and the 3V35 lookalike now had two faults, the original one plus the consequences of his inattentive moment. The head drum still didn't revolve. While Sid and Norman continued to whisper together Gareth was immersed in his next job, a Sanyo VTC5000 VCR. Andy took the opportunity to nip across into the stores for a replacement IC404.

Gareth had a fierce, unreasoning hatred of the VTC5000 but was determined not to let this one get the better of him. Its capstan motor ran at top speed and Gareth concluded that the problem shouldn't be too difficult. He checked around the central control chip IC3001 and to his horror found that the 5V rail was at nearly 9V. Out came the 5V regulator transistor Q3001 but there was no spare in the stores. It looked as though a BFY50 or a 2N3053 would do. Gareth tried the former and the machine then worked normally. Very satisfactory, he thought. And time for a stroll.

Sid had gone through to the shop, waving a magazine in his hand and saying over his shoulder to Norman "I'll try him on it now – won't be long!" Norman picked up his toolbox and departed to make some outside calls.

3V35 Problem Solved

Gareth stopped alongside Andy and asked about his problem. "Why not take a look at Norman's 3V35 manual?" he suggested. "Norman notes every fault in his manuals and puts the correct voltages on the diagrams." As Norman was out they borrowed his 3V35 manual and found the drum speed control part of the circuit. There was a circle around R446, which should be $270k\Omega$. When it was removed and checked the reading was around $800k\Omega$! A replacement restored normal operation and Andy remarked that making such notes seemed worthwhile.

Sid's Return

Sid looked pleased with himself when he returned to the workshop. "Ralphie boy has just agreed to buy us a sixty-meg scope" he announced. "Trouble is, he says it should enable us to find faults in half the time."

"He can't really believe that" commented Andy.

"Oh yes he does" said Sid. "He'll expect to see it used for everything, even mending kettles. Seriously, the time will come when one won't be enough. We'll need one each."

"We'll have to prove that this one, when it comes, earns its keep" added Andy somewhat gloomily.

"That's right" replied Sid, "and the only proof Ralph Topcut understands is our output figures."

Eye Protection

David Botto

We tend to take the precious gift of sight for granted. But if proper care is not taken it's all too easy to suffer eye damage in a TV/VCR workshop. The precautions required are quite well known but are not always observed as conscientiously as they should be.

The TV/VCR workshop can be full of hazards to your eyes. These are considerably reduced if the workshop is well organised, tidy and spotlessly clean. For guidance on this, see my article in the December 1988 issue.

Sections of aerials jutting out, TV sets left with their backs off so that the end of the picture tube sticks out, and various sharp objects left dangerously exposed are potential eye accidents waiting to happen. The insides of delivery vans can also present plenty of hazards if not kept in a tidy state.

Glasses

Many people need to wear glasses in order to see clearly. In a workshop it's possible to shatter a glass lens accidentally on a sharp corner of the TV/VCR chassis on which you are working, with possibly disastrous consequences for the eye behind the lens. It's far safer – ask any optician – to have the lenses made of plastic that doesn't shatter so easily. Modern plastic lenses are as hard as glass ones and don't suffer from the scratching and other problems that affected older types.

Eye Tests

It's worth having your eyes checked regularly – despite the current fee. If you don't normally wear glasses you may nevertheless find that you need them as you get older. With the passing of the years the lens of the eye loses some of its elasticity and is thus not able to focus as accurately as it once did at close range. As an example, a twenty-year-old person with normal eyesight can see objects clearly at a near range of about 250mm. A forty-year old person will have difficulty in seeing clearly at a range of less than 500mm. Fortunately it's easy to correct for this by obtaining glasses from a *qualified* optician. Make sure you find one who really knows his job and is prepared to take time and trouble with your lens prescriptions. Ask for the best frames and plastic lenses that are available. Money spent in this way is a wise investment.

Safety Goggles and Spectacles

A pair of safety goggles is an essential item of equipment for the TV/VCR engineer. Each engineer should have his own personal pair – using goggles that someone else has worn can easily spread eye infections.

Suitable goggles can be obtained from RS Components for less than £3 plus VAT. They incorporate a soft PVC frame and polycarbonate lens, are easily adjusted to suit different head sizes, and are "Kitemarked" to BS2092. They can be worn over most spectacles without loss of protection. The RS order no. is 551-980. Halfords and B & Q also supply suitable goggles. Make sure that the goggles you buy have the Kitemark and the number BS2092.

If your eyesight does not require optical correction,

obtain a pair of safety spectacles (RS order no. 551-996, price about £4.85 plus VAT) in addition to your safety goggles. Safety spectacles look like ordinary ones with protective side pieces. They are easier to wear if you wish to keep them on all day. For some jobs however safety goggles give your eyes better all-round protection.

Always keep your goggles and safety spectacles spotlessly clean. Goggles can be washed in hot (not boiling) water. A proper lens-cleaning fluid is best for safety spectacles.

Chassis Cleaning

When a TV set or a VCR is cleaned out with a vacuum cleaner and brush the dust and fine particles can, if they reach the eyes, cause infection. Furthermore dust can scratch the cornea of the eye. It's wise to wear safety goggles during the cleaning process.

CRT Replacement

We all know that we ought to wear safety spectacles or goggles when replacing cathode-ray tubes. In the workshops I visit however only a few TV/VCR engineers now seem to take this necessary precaution. The modern c.r.t. is soundly constructed of course and seldom implodes, but don't get over-confident. Accidents can still happen and it's simply not worth taking chances.

Soldering

Soldering and desoldering present a constant risk to the eyes – a risk we seldom consider. Solder can splutter and if it hits your eye the result can be permanent damage. If you wear optical spectacles with plastic lenses you've a degree of protection. If you don't, always wear safety spectacles when handling a soldering iron, and avoid shaking the iron to remove surplus solder. Instead, carefully wipe your soldering iron on a proper cleaning pad.

Lifting Heavy Objects

Lifting extremely heavy objects can not only cause back troubles but can also result in a burst blood vessel in the eye. This can lead to partial or complete blindness. This is an important warning – I've talked to a man who lost his sight in this way. Ask your own doctor.

Glues and Sprays

Fibreglass body-filler is sometimes used to repair damaged TV cabinets. The danger here is the hardening catalyst that's mixed in with the filler paste. This catalyst is an organic peroxide (methy-ethyl-ketone peroxide – MEKP). A bodyfiller kit I have to hand contains only an incomplete warning in extremely small print.

A spot of this MEKP catalyst in the eye will at once begin to destroy the sensitive eye tissue, causing either immediate or eventual blindness. The recommended procedure if you have such an accident is to wash the eye with copious amounts of water for at least ten minutes. This must be done within three to four seconds otherwise permanent eye damage will occur. There is no known chemical neutraliser. Thus it makes sense always to wear a pair of properly fitting safety goggles and to have plenty of water to hand whenever you use fibreglass fillers.

In fact it cannot be too strongly emphasised that you should wear your safety goggles when using any kind of

glue, especially those that need added hardeners and super glue.

Aerosol cleaning fluids, freezers, circuit varnish and special fluids to clean audio and video heads are found in virtually all TV/VCR workshops. None of these will do your eyes any good if the spray or liquid reaches them. Safety goggles are essential protection when using these products.

Lasers

Some domestic electronic equipment, such as the CD player, incorporates a laser. A stick-on label on the chassis – it should never be removed – warns the TV/video engineer. Provided the manufacturer's service procedures

are followed all should be well. But take care when servicing such equipment. The laser beam should never be viewed directly – it will cause eye damage.

In Conclusion

Finally, if you should be unfortunate enough to suffer any kind of eye injury, or get some foreign body in your eye, immediate qualified medical attention should be sought.

The information provided in this article is not intended to alarm or scare readers but perhaps to prevent someone from suffering some injury or accident to his eye(s). If it succeeds in this aim, the article will have been well worth the research and writing.

Servicing Compact Disc Players

Part 7 Joe Cieszynski

This month we continue our account of the data frame format used with the compact disc system. The next item to consider is the eight-bit subcode word that's added to each frame following the sync word. Just to refresh your memory, the data recorded on the disc consists of a succession of frames each of which have 588 data bits. Each frame contains six left/right audio samples, P and Q parity check words, the frame sync and one subcode word. The composition of the frame was shown in Fig. 11, Part 5 (page 694, July).

The subcode contains data to control the player's LC display. It also contains the cyclic redundancy check code (CRCC) data, which is used to detect and correct any errors within the subcode. Before we go any farther, let's see how the subcode data is processed.

Processing the Subcode

Although the subcode section of each frame consists of eight bits it's not in fact an eight-bit word. Each of the eight bits is one part of a much longer (96-bit) word that's spread over a number of frames. Thus as the subcode data is detected by the player it must be stored until enough data is available to recreate the 96-bit words. During playback the decoder locates the eight-bit subcode in each frame, extracts it and stores it in a RAM. When 98 frames have been played, this RAM will hold 98 subcodes - see Fig. 1. As shown, each word has a length of 98 bits, but as the first two eight-bit subcode symbols are subcode sync the usable word consists of 96 bits. The subcode sync is required because, with the subcode symbols being continuously extracted during playback, something has to tell the decoder when a new word is about to start. The two sync symbols are of a particular pattern that's recognised by the decoder. As a result the decoder clears the RAM and begins to load new data at the start of the third subcode symbol.

The rate at which these words are formed and processed is very fast. With 7,350 frames per second and 98 frames per subcode block, there are 7,350/98 = 75 blocks per second. So the central processor is receiving 75 data blocks per second, each one containing eight 96-bit words.

What do these words say? In the CD specification the

letters P, Q, R, S, T, U, V and W have been allocated to each bit of the subcode. When 96 eight-bit symbols have been collected in the RAM we have words that are labelled P, Q, R etc. At the present time only the P and Q words contain any data. The others are reserved for future developments in the system. A word of warning: don't confuse the P and Q subcode words with the P and Q parity words discussed last month. They are quite different and the name similarity is unfortunate.

The P Word

The P word informs the microcomputer chip when a music track is about to start or end, enabling it to take the appropriate action such as mute on/off. The word has two statements: when music is playing P=0, whereas when music is about to start or end P=1. Thus when a music track is about to end P goes to one for about two seconds. The end of this one period marks the start of the next music track. During the lead-in track (table of contents) P goes to one, the end of this one indicating the start of

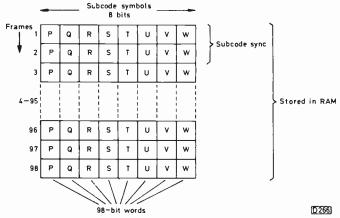


Fig. 1: A subcode block stored in RAM.

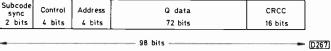


Fig. 2: Q word composition.

music. During the lead-out track P toggels between zero and one at about 2Hz, telling the microcomputer to initiate the stop mode (unless it has been programmed otherwise).

The ones between tracks can be used for track search, enabling the player to locate a particular track of the user's choice. If for example you wish to skip two tracks the microcomputer will look for the one signals and begin playing when it reaches the third one. Although this is a feasible approach it's not often used because the microcomputer may not realise which part of the disc it's actually dealing with, making track search in this way rather limited. Any player of even modest quality employs a more sophisticated search technique that makes use of the Q subcode data – we'll consider this later in the series.

The music start flag can be inserted between pieces of music that fade into one another. In this case the P subcode will carry the flag two seconds before the end of one track, enabling you to miss the following track in the search mode if you so wish. As the subcode is not part of the audio data there's no audible interference.

The Q Word

The Q word consists of a number of sections as shown in Fig. 2. These are as follows:

- (1) Subcode sync. We've already explained the function of this.
- (2) Control. This tells the microcomputer chip if the disc player has (a) two audio channels without pre-emphasis, (b) four audio channels without pre-emphasis, (c) two audio channels with 50μ sec pre-emphasis or (d) four audio channels with 50μ sec pre-emphasis.
- (3) Address. This carries the data required by the microcomputer to enable it to function.
- (4) Q data (see Fig. 3). The make-up of this is highly complex. When decoded by the microcomputer it gives:
 - (a) Track number the number of the music track being played.
 - (b) Index. This is required only when more than one disc is being used to form an album. The disc's number in the album is displayed on the LCD.
 - (c) Playing time. This is the time that has elapsed during a particular track. It's reset to zero at the start of the next track.
 - (d) Separation this section contains no usable data.
 - (e) Running time. This is the elapsed time from the start of the disc. If a track has been skipped the running time displayed will be the time that would have elapsed if the skip had not taken place. This data can also indicate the number of tracks that have passed up to the present time, including any that have been skipped.

Table of Contents

The table of contents information is also contained in the Q data. As you may recall, this track appears at the start of the disc and is automatically read by the player as



Fig. 3: Make-up of the 72-bit Q data.

soon as the disc is inserted. Its information tells the control microcomputer the number of tracks on the disc and the length of each one. This information is used in the track search mode to enable the player to locate a track of the user's choice quickly.

CRCC

Last month we considered the problem of incorrect data during music passages, describing the ways in which errors can be detected and corrected. Errors can also occur in the subcode of course. The cyclic redundancy check code data included in the subcode enables these to be corrected.

The way in which this is done is highly mathematical and makes the CIRC principle we looked at last month appear simple! Basically what happens is that the Q data bits are multiplied by another binary number during encoding. Dividing the Q data in the microcomputer by the same number during playback should restore the original information. If there's enough data for the microcomputer to decipher what the original basically was, it can correct the Q subcode when errors occur. Like CIRC, CRCC is effective until a large amount of data has been corrupted.

Other Subcode Words

As previously mentioned the R-W subcode words don't at present contain any useful data. The designers have left the space provided by these words for system expansion, and will use it as and when necessary – one hopes after international agreement, which is likely since Sony and Philips have a tight control over the system. Whenever I have the opportunity I ask manufacturers whether there are any concrete proposals for the use of these subcode words. They usually look at the floor and mutter something like "nothing definite yet". At the time of writing it seems that the most likely use is for controlling a VDU, but it's not clear what the VDU would display!

What Next?

In these last three instalments we've looked at the theory of compact disc data encoding. This provides a good introduction to the operation of the decoder, which will be our next subject. Looking further ahead, this basic theory will be relevant when we come to filters, oversampling, the disc servo, track search and central control processing. Furthermore as conversion of the familiar analogue TV signal to digital form for processing in various ways becomes more common, this theory will be seen to have wider relevance. Finally a word of comfort for those who may be finding all this theory a bit overwhelming. Didn't PAL colour seem very complex when it first came on the scene? Didn't you go hot and cold the first time a VCR came in for repair? Yet nowadays all this is commonplace. Likewise sampling, quantisation, A-D conversion, eight-to-fourteen modulation and CIRC will before long all be part of the day-today job. It's not as bad as it sounds!

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £2 cheque or postal order (made out to IPC Magazines Ltd.), the query coupon and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.

SONY SLC20

The initial problem was a regular sudden increase in take-up tension at a rate of about three-four times a second. This produced wow on music though speech was just acceptable. With the top cover removed the tape loop between the capstan and take-up spool could be seen jerking. The problem has got worse and now the take-up fails completely towards the end of a cassette.

There are two possibilities here. First check whether the take-up turntable spins freely by hand with the brakes off. If not, check whether its nylon bearing is loose in the brass tube. Where necessary the bearing can be pushed down and the tube squeezed. Alternatively the cause of the trouble may lie in the drive system. Replacement of the pendulum arm assembly X-367-911-43 and rotor X-262-220-13 often cures the problem. After the repair has been carried out RV309 on board SS16 must be set for 80g/cm. This is difficult without torque test cassette SL-0003C.

PIONEER SV2801

The problem is with the teletext function. If the teletext is mixed with the picture it works except that the text is black. By itself you get only a bright green screen. Selecting subtitles (page 888) locks up the teletext.

First check transistor TV36 (BC548B) on the decoder panel. Then if necessary transpose the connections to pins 7 and 8 of BV06 on the text panel. If the fault now appears in red, the SAA5040 chip is the most likely culprit. If there's no difference the U4606B chip is suspect.

HITACHI VT64

There's no mention of lubrication in the service manual. I'd welcome guidance on this.

The manufacturers consider routine greasing or oiling of the deck to be unnecessary. In practice we find that one small drop of light machine oil is permissible on any shaft that squeaks while a touch of light (we use graphited) grease is often required at the bottom tip of the capstan shaft.

FERGUSON TX90 CHASSIS

This set works perfectly apart from the presence of teletext lines at the top of the picture.

First check that the 95V supply is correct at pin 5 of the line output transformer. If so check D106, D107 and C171 before suspecting the field output transistors TR104 and TR105. If the latter have to be replaced they must be of

exactly the correct type, preferably sourced from Ferguson.

GRUNDIG CUC2401 CHASSIS

This set goes into the standby mode after about half an hour. Operating the on/off switch or the remote control unit will restore normal results for about a quarter of an hour, then it's back to standby. Use of heat and freezer has failed to reveal any cause of the fault.

There are several possibilities for this fault in these sets. First check R641 ($100k\Omega$) and the condition of and connections to R631 and R632. If these items are in order the next suspects are R661 (1.5Ω) and C661, then the TDA3640 chip IC665.

FERGUSON 3V23

The problem is overloading when prerecorded tapes and tapes recorded on other machines and cameras are played back, i.e. whites tend to go negative and there's hum on sound that varies with the intensity of the negative whites. The playback level control in the video circuit has been set as low as possible and the odd thing is that the machine records and plays back its own tapes normally.

It's likely, but check, that the signal level at the video output socket is correct (1V pk-pk) or low. If so the problem is in the u.h.f. modulator and can be cured by very careful adjustment of the small preset potentiometer inside. No details of the modulator are given in the manual.

AMSTRAD VCR4700

This machine seems to work quite well but is rather noisy on playback – best described as a cyclic clattering in the cassette region. The noise is no longer present to any extent with the cassette removed and the sensors disabled. Rewind is also a bit noisy but fast forward is reasonable.

There are two reasons why the VCR4700 is noisier than many VCRs. First it's a "cost effective" design, and secondly it uses pinion rather than idler drive to the reels. Ensure that the cassette cradle bottom plate is not bent or damaged and that the reel turntables are perfectly free to rotate. Grease the reel drive pinions with a *light* graphite grease.

PHILIPS G11 CHASSIS

This set can be tuned in correctly using the pushbuttons on the front panel but when the remote control handset is used to change channels all the stations go off tune, some of them quite considerably.

We suggest that you check the alignment of the a.f.c. coil L5630 in the U5600 vision detector module, then if necessary check the operation of transistor T5060, ensuring that field sync is being received via R5062.

SAMSUNG CI514F

The problem with this set is that R428 ($1.3k\Omega$, 2W) and the starter transistor Q403 (KTC2229) burn out after a few weeks. We've been unable to find fault with any of the associated components.

It's almost certain that the set is trying to run continuously on its start-up system. Normally Q403 works for only a second or two at switch on, i.e. until the 16.5V line is established. Confirm that 16.5V is developed at the anode of D405, then suspect D405 and D401. The latter should be reverse-biased after start-up, relieving Q403.

TEST CASE

321

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

The causes of intermittent faults in VCRs can be very difficult to trace. Given an adequate fault description however such problems can often be sorted out without the technician actually seeing the symptoms. This applies particularly to "borderline" conditions like excessive back tension, insufficient take-up torque and tape path problems.

It was with reasonable confidence then that John confronted a Sharp VCR, Model VC7700, that arrived on the bench with a ticket bearing the comment "sometimes goes to stop during play or record, depends on make of tape". A very common cause of this problem is low take-up torque, so this was the first check made. It came out at 110g/cm, which is within the maker's tolerance. The machine was then set to run on soak test while other repairs were attended to.

An hour later a click and whirr of machinery signalled that the fault had appeared. John set the machine to playback again and settled down to watch the mechanism. After a minute or two the reels stopped and a few seconds unthreading occurred. Clearly the control microcomputer chip was responding to a lack of reel sensor pulses. What might stop the reels turning? The take-up torque was checked again and found to be over 100g/cm. So the machine was once more returned to the playback mode. After a run the tape again stopped moving and the machine went into the stop mode. This time however the deck was being closely watched. As a result, two important clues were obtained. First, the head drum continued to rotate until the unthreading was complete. Secondly no slack loop of tape developed downstream from the capstan. Indeed all the tape throughout the deck stopped moving.

By the time these points had been noted the deck was back in the stop mode of course. The first possibility that occurred to John was that the capstan motor was stopping sporadically, perhaps due to a dead spot in its commutator. In fact this was highly unlikely once the motor was up and running, and further tests and observation from below showed that the capstan motor continued to run after the tape had stopped. So did the belt and capstan flywheel.

Thus the capstan was turning while the tape stood still. When he asked around the workshop fraternity John learnt that excessive back-tension could cause this, as could too much friction around the lower drum. He inserted a back-tension gauge cassette into the machine and watched the dial. It registered 27g/cm, which is within

the range specified in the service manual. Then a funny thing happened: the tape stopped moving and the gauge actually dropped back. Certainly the fault was not due to an excessive back-tension setting.

How do you check for friction around the lower drum? By now the machine had started to behave itself for long periods (don't they always?). A rough check on beforeand-after drum tension was carried out by deflecting the tape with a plastic rod just upstream of the entry guide and just downstream of the exit guide. Certainly the tape was tauter after the exit guide, but to some degree this is to be expected.

In view of this another possibility occurred to John – that the pinch-roller pressure was insufficient. To check this you have to fool the machine into thinking that it's got a cassette in then select play and heave on a spring-type tension gauge, looking for a force of about 1kg at the lift-off point. As he set up this test John saw what the trouble was – not the pinch-roller spring pressure! Any ideas? See next month for the answer.

ANSWER TO TEST CASE 320 – page 778 last month –

Last month's test case concerned a Sanyo VHR3100 whose tuning memory didn't work. The seek process operated correctly, but as soon as an attempt was made to store the tuning point data this was lost. Much time was also lost in unnecessarily changing chips and panels to arrive at a diagnosis that was perhaps obvious.

The type of EAROM used in this and many similar designs operates with serial data fed via a single bidirectional port, the addresses being defined and the operation synchronised by the main microcomputer chip. The memory chip is non-volatile and requires a negative supply of about -30V to erase (over-write) the data it already holds. Under all other circumstances, including complete loss of operating power, the data is held securely and without corruption.

The fault lay with the -30V line of course – as was clear from the dimness of the fluorescent display, which is operated from the same negative voltage source. In fact the line was at only -15V. It comes from the series regulator transistor Q5003 in the power supply section, all three of whose electrodes were found to be at around -15V. The associated resistor R5008 (47 Ω) was opencircuit, the voltage that was getting through arriving via Q5003's base-emitter junction and R5006/7.

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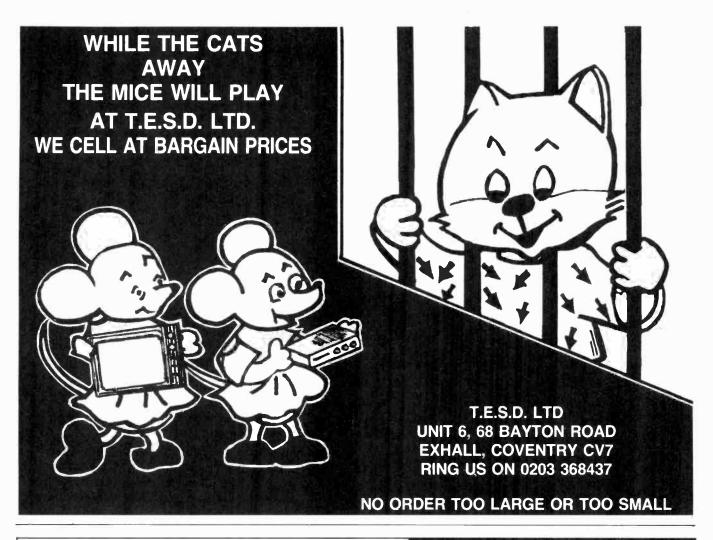
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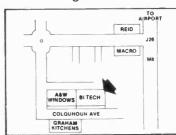
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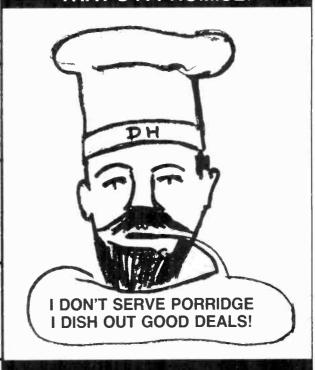
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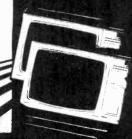
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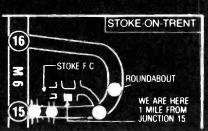






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REPLACEMENTS

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VT8000, VT8500, VT8500
VT9300, VT8500, VT9700
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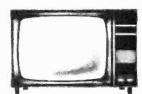
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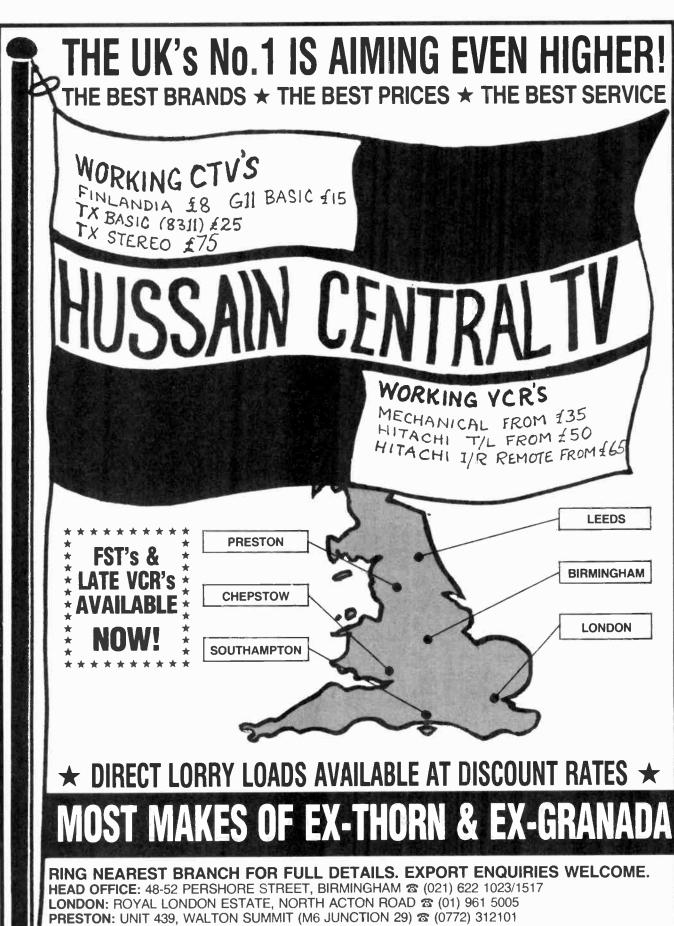
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N/333/366 (DLER N/333/366 (PLAY/TAKE UP) N/337/34/39 (DLER N/373/49/39 (DLER N/507/69/39 (DLER N/507/69/39 (DLER N/737/79 (DLER N/737/79 (DLER N/737/79 (DLER N/7300) SERIES (DLER N/7000) (PLAY/TAKE UP) N/7000 (PLAY/TAKE	VXZ0165 VXZ0076	3.18 1.24 1.24 5.76 2.56 8.51 7.93 7.58 10.66 7.85 2.08 1.95
TENS BAND NV2000/2020 TENS BAND NV7000/7200 REEL MOTOR NV333/366	VXZ0076 VXZ0078 MYN13V5L	5.92 3.00 15.03
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RM615P KV2056/2212/16/2705 ETC	3
RM632 KV2062/66/2216/17 ETC	21
RM641A KV2092/2096	21
RM651 KV1442	1
RM661A KV21XRU	1! 2: 3: 3:
RMT211 SLF1	3
RMT213 SLC9	3
RMT216 SLC20/30/40/HF100 GREY	3
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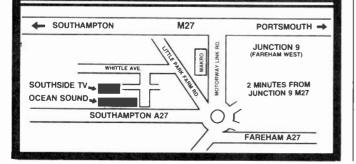
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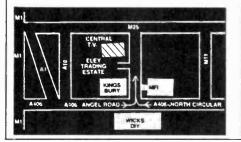
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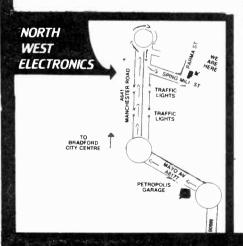
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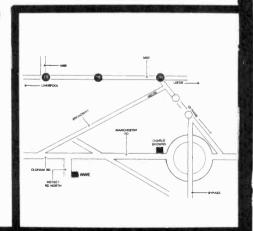
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1 DVC 3/103VA 124.300 VS-10 95	906114 450p	AN610	175p	HA1397	275p	STK457	775p 625p	TDA3562A 30		65p 250p	2SC-1383	40p	2SC-2551 2SC-2944	280p
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SONY ON/OFF SWITCH	14pın 8p 16pin 9p	AN7110	150p	TA7227P	220p	STR441	575p 575p	2SA-798 60	200700	30p	2SC-1815	15p	2SO-400	200
TX10 ON/OFF SWITCH WITH REMOTE \$2 000 HR-3330 \$2.00	19pm 12p	AN7116	150p	TA7229P	330p	STR451	575p	2SA-808 150	0 205.741	30p 195p	2SC-1819 2SC-1845	75p 20p	2SD-401	50p
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two minutes walk from Upton Park Tube Station	BU508A 95p	AN7311	1250	MB3730	250p	UPC1363H	275p	2SA-1102 190	p 2SC-1050	320p	2SC-2240	25p	2SD-745	250p
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Colebourn Electronics		Microforge Ltd.	801	Tree, W., Trade TV	000
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Crewe Wholesale TV	868	Wildiand IV 5		UK Rental & Retail Ltd	892
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		Omega Electronics	955	Vincent, J., Technical Books	893
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Electrosmart		Powell T	041	Wiltsgrove Ltd	
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Flintdown Channel 5	803	P.V.S		Zoneport	876

Hill Intercom £8 Philips small stereo	Y 716 1	10p T 6052 T 6054	40p 40p	Varta Batteries 2.4V 100M/A 50p	NI.CD 5 Hours B Charger with battery to	oct ck 3-12 volts 1 amp 1
headphones £2.50	Y 729 Y 730	10p T 6068V T 6070V	50p £1.00	TV Battery 50p 1.2V NC. 2.4V NC. each	Hill Deluxe Universa	al Ni-
Rank UHF 4 push button tuner £4	Y 860 Y 933	5p T 9005	40p 40p	4 amp-1.2V Nickel Cadmium Battery D	Cad Charger Nickel Cadmium B	Philips' Video Cleaning Cassette SBC461 £6
GRC power supply PC743B £10	Y 969 Y 997	90p T 9051V 2TX 107	£1.00 10p	Cell £1.00 3.25V Battery 50p	Charger AA-C-D-PP9	£4.50 Compact Disc Stereo Type £10
Rank front panel 2950 £5	R 1038 4	ZTX 109k	10p 5p	12V Video Battery Packs 4Amp U2 Cells £10	12 Volt Aerial Change Relays 144 Mc/s 45 wat	i over
GEC IF tuner panel PC786B £12.50	R 2010b	80p ZTX 213 £1 ZTX 341 50p ZTX 342	5p 10p 10p	24V 4Amp (100VA) Trans £4.00	6 Push Button Unit for 2100 Series Replaceme	c Pocket Personal D.M.M.
Rank IF 742 £3 TX10 8 Button Unit	R 2210 6 R 2257 6	50p ZTX 384 50p ZTX 451	10p 10p	Mains 240V (100VA) to 240V out fully shrouded £5.00	Touch Button Unit 8 SEG LED Display	vith
6 Button Unit	R 2305 5 R 2306 3	50p ZTX 550 50p MJ 2253	10թ 60թ	ITT CVC45 8 way resistor unit for v/cap £3	driver I.C. LM1017	6 Push Button unit with (UHF- VHF) band switch £4
Rediffusion Mark 3 £5 Rediffusion Mark 4 & 7	I R 2323 I R 2396	30p MJE 3(40) 15p MJE 2209 50p CD 9395	60p 10p	CVC40 8 button unit with mains lead & slider pots	PHILIPS' MIN. HEAD PHOP	
Push Button unit £10 Tuner IF Cans ITT	R 2461 8 R 2030 5	80p SAB 3205	50p £1.00 £1.00	with sockets £10.00 Book on An Introduction	Electronic Buzze	
CMR200 £10	R 2540 R 2737	£2 300M + 700 320 40p 200 + 100 + 100	V £1.80	to Satellite TV £5.95 No VAT	6 volt, 12 volt 40 15V, 015V, 1A	£1 SSC17507 Calculator £12 L5v-40-15v Amp Transformers £1
ITT SEL HF Modul 2 UK IF Tuner £8	R 2775=T1P41c 4 R 3129=T1P47 4	150 + 200 + 250 10p Computer Trans	•	Book TV DX Handbook by R. Bunney £5.95 No VAT	Print Type Trans	
4 types of front panels Fidelity 2000/3000	R 4050 £1. S 2008b 8 2SD898B	.00 00 100 20v/2.25A; 20v/1 17/.5A; 19/.5A;	.5A;	Electronics Hobbyists Handbook £4.95 No VAT	print type 10 amp Changeover	D.P. RGP15 10p RGP15G 6p
types £5	2SC1942 Hitachi sets etc.	OLD TYPE	TEX. I.C. £3.50	Multi Core		T6024WG1 10p GP10 5p E4.50 GP15Q 5p
CVC20, CVC32 I.F. CVC40 Cans £5 CMR800/3 NEW £20	STR6020	£2 TX005GN £1 TX904	£3.00 £3.00	60-40 Soldar 500G 20 SWG 15 Watt Stereo Amp Sanyo !	Module with Data	\$5.00 THORN RGP80G 30p DUBLE 7 SEG Displays 15p
CMR800/3 £20 CMR803/2 £20	2SC940 BU 105/04 8	£1 X908 30p MM2102AN	£4.00 £2.00	PHILIPS 25 Watt Solder Iron	11	£4.00 LN5 26RA or 10 for £1
20AX Line lin coil 50p	BÚ 124 5 BU 126 8	50p Voltage Regulato 40p +5V/11A78PO5S		Self adjusting cutter stripper 10 mixed tube bars	Various Tools and Acc	£5.00 £4.00
GEC switch mode trans 20AX	BU 180a 6 BU 204 6 BU 205 7	55p -8V/79M08c 50p +6V/78M06c	30p 30p	5000 Diodes-Resistors T/V V/Aerial 300Ω or 75Ω		£3 pack £1.50
ITT mains CVC9 to CVC33 print type 60p	1 BU 207	£1 LM 317T	20p 30p	* D/P push mairs switch Mains lead & two pin socket T/V loop aerial	for radio cassette	20p each 35p 75p
ITT 2,800 mains remote switch 50p	BU 208A 7	80p LM 337 75p LM 342/18 LM 340T 5.0	30р 30р 50р	Radio Telescopic Aerial Philips Neon Lamps for TV	sets	£1.00 5p
NEW	BU 326	£1 +12V/LM 340TI 50p +18V/MC78M18	2 50p	Freeze Philips Foam Cleaner Philips		£1.20 £1.20
2110 GEC Sound O/P Panel £1 2110 GEC L.O.P.T.	BU 426A 4 BU 426V 6	15p +24V/78M24 50p MC 7724cp	30p 40p	Contact Cleaner Philips Cans of Anti Static, Degrease Lorlin Full Remote Relay Sw	e Cleaner and Anti Cor	ona All at £1.20 mains 4 tag, 2 tag 12 volt £1.00
Panel £6 2110 GEC Power	BU 500D BU 508A 9	£1 MC /024 90p TIS 90	40p 10p	Mains timer. 13 amp — up t Screen locking agent, large of Red E.H.T. LEAD and And	o 2 hours: easy to use.	plugs into socket £3.00 £1.50
Panel £5	BU 705	1 TIS 92 1 TIS 93	20p 20p	Weller solder iron 25 watt Hitachi Silver Oxide Battery		£1.00 £4.00 4 1.5V 60p
Line o/p frame panels GEC 20AX £10.00 ITT CVC40 Push	BU 807 BU 824 5	£1 U 19885	40p 15p	100 Coax Plugs De-solder pump + 2 nozzles		£12.00 £4.00
Button Unit & Mains Switch £12	BUW II 5	£1 U 3845 50p MR 508	15p 10p	Flat Red LED and Green 500gm 60/40 solder reel Solder 1 kilo ree!		5p £6 £5.50
Tuner & 1F Panel. Complete 6 button and	BYW 20-08-9 BYW 95	60p MR 501 £1 MR 502 10p RGW 71P	10p 10p	Dual v/u meter -20 = +10db K30 thermistor 232266298009		£1 75p
preset 1F with s/wave filter and tuner. Mullard M342 5"×61/2"	BUX39 25A-150V BUX84 5	£1 BCW 71R 50p BYF 1202 50p BYF 1204	30p 10p 10p	De-solder Pump Portasol Flameless Gas Solde Green & Red. LED pack mi	ering Iron	£2.50 £16.00 100 for £1.00
£6.00	BUY49 2 TIC 106a 3	20p BYF 3126 BVF 3214	40p 40p	Hill Meter Leads, S/Rubber		£4.00
POTS BA 301 £1 TA 4127 £1	TIC 116n/Y 1003 3 TIC 126N 3	30p BYX 10 30p BYX 36/600	10p 35p	Miniature Linesman Pliers Miniature Side Cutters	£2.20	Miniature Pliers £2.20 sture End Cutters £2.20
HD 3884 2A23 £3 TA 4184 £1	TIC 2258	30p BYX 38/300 30p BYX49/600R 30p BYX 55/350	25p 75p	KT3 PANELS Sound Output RGB Output	Chroma 100	Fuses £2.00 W/W Res. £1.50
TA 2125 £1 TA 4190 £1 TA 4138 £1	I TIC 236m 3	30p BYX 55/600 (Be BYX 71/350	ad) 10p 20p	Panel, I.F. Panel and Line C	SC £7.00 each BF 10 >	199 20 for £1 < 20 Turn 100k pots. Rank £2
TA 4196 £1 TA 4174 £1	(T092 case 2A/400V) 1 TIP 29 2	10p BYX 71/600 25p BYX 72/300	50p 20p	PYE 6 Key Switch & Panel G11 Front Panel	£10 6 M	470 20 for £2 ixed UHF Aerial Isolating Sockets,
TA 4198 £1 TA 4167 £1	TIP 30 2 TIP 30A 2 TIP 30B 2	25p BYX 36/600 25p BYV 95B	50p 10p	SONY 1400KV Chroma Pane	el £6 Phili	e with long leads. Fit ITT, GEC, ps. Pye £1.00
BA 546 £1	TIP 30C 2 TIP 31 2	25p BYX 36/600 25p BYV 95B 25p BYV 95C 25p BYV 96D 25p BYZ 106 50p BPW 41	12p 10p 10p	SONY 1400KV Touch buttor GEC Decoder Panel PC772A		Mixed Packs of 12 Power Trans RCA 16182 NPN
TA 4176 £1 TA 4145 £1	TIP 32 TIP 33B TIP 33C	25p BYZ 106 50p BPW 41 70p BYW 56 2A/100 50p BYW 29/50	15p	PC446A	A5 £6 Rep Kits	lacement for BD124 and Mounting
HA 11710 £1 TA 4188 £1	L TIP 34B 6	50p	15p 10p	12 Volt Mains Trans 500M/A Double 1.5 Digital Display.	10A	tanel Mount Bulbs & Neons £1.50 £1.50 £1.50 £1.50 £1.50
TA 4197 TA 4183 TA 4197 £1 E1	TIP 35B TIP 35C TIP 35D	70p BYW 95C 50p BZU 15/24 70p BZY 93c75 80p BZV 15/18	54p 50p 30p	High brightness	10p 201/0 20 L	C Holders £1.20 arge LED Red £1.00
TA 4183 £1 TA 4195 £1 TA 4175 £1	TIP 36C 77	70p BZY 93c75 BZV 15/18 BZV 15/30 BZV 15/30 BZW 70c6v2 BZX 79.3v	30p 30p 10p	Quantity Reduction	ns 10×	mail LED Red . £1.00 20 Turn 100K Pots £1.00
TA 4177 £1 TA 4192 £1	TIP 41 TIP 41B TIP 41D 7	15p 40p BZX 79.3v Bush thyristor R	10р	BY204/4 BY206 KT3 touch button black	6 for £1 Mix	& Green LED on Panel lp each ed 100 Transistor B.F. and B.C. and
TA 4146 £1 TA 7265 £3 TA 7699P £3	T1P 42 T1P 42/BRC 6109	Transformer 240	v/20v-500Ma75p	G11 touch button red K30 full remote Dawer Ass	6 for £1 PET	£1.50 1000 for £10.00
The Service Engineers Guide to Teletex £2	TIP 49 TIP 57	30m 240v/12 Volts 50	0m/a 75p se £2	I.C. K30 VHF, UHF Dawer Ass BY298 3 amp/fast/R	£6.00 Type	/olt 4 Amp Video Battery Pack 10 of E D Cells £8.50
4 Types Fedility front	TIP 110 TIP 100 TIP 102	CVC 20 tube ba Tube Base Rank Infra red led	& G11 £1.20	BU126 BU205	10 for £6.00 10 for £8.00	dass reed switch £1 press to make switch 70p Pots £1.50
panels with i.c. & pats £2 each	TIP 115 5 TIP 117 5 TIP 125 3	50p 1.D57CA 50p 15K-20 turn pot		BU105 BF458 BF224	10 for £1.00 With	n Focus Pin, 10 Tube Bases,
BB 103 10p BB 105A×12 £1 BB 105B×12 £1	TIP 126 TIP 127	40p Thorn 3500 2A	cut out 50p	OA90 50 Ceramic Condensers	40 for £1.00 Ban	0 Diodes, Condensers, Resistors on doller £1.00
BB 105G×12 £1 BB 121a 10p	TIP 130 3 TIP 131 TIP 136 3	30p BRII: 6p KBL 005 30p KBL 02	30p 30p	Mixed Mounting Kit for Pow Transistors 300 Condensers	50n Cha	m Fuse Holders ssis Mount C Diodes, small 20 for £1 20 for £1
1A/1600V 10p each	TIP 140 5 TIP 142 8 TIP 640 5	6p KBL 005 30p KBL 02 50p KBP 04 80p W02 35p W004	30p 30p 15p	300 Resistors 150 Electrolytics	£1.50 £2.00	Mixed Diodes £2
DG3P EQV-BY228 10 for £1	1 TIP 1761A-1000V/4Amn 7	75n W/005	15p 20p	15 Bulbs Philips GEC-Hitachi Thick Film Fra	me £5 Mix	500M/A Fuse £1 ed V/Cap Pots ITT-GEC-Hitachi-
2 amp bridge rec. wire end 15p	T 6032 T 6036 T 6040	30p 40p 40p 40p 40p MA		CENIDY C	ITT	ips etc, 20 for £1 Mains Switch with Remont C113 £1
SKE4G2/02 15p Eqv. BYX71/600 500ns.	I T 6049 4	40p MICRO : 40p GEC & Double	SWITCH	TO ORDER SEE BA	MPONENTS 12v	DC relay 1½×1½×2 print type 10 D.P. change over £1
					1,	

896 TELEVISION SEPTEMBER 1989

SFND7	COMPONENTS	Thorn TX90 Chassis with Line Line S4471	£1.00	420M 400V	£20.80	Philips Handset IC SAA3010P MAB8461/WO63	£3.0
TO OPPER S	EE BACK PAGE	2SD1878	£1.00 £1.00 £1.00	470M 380V	£1.00	MAB 8420P-CD31 MAB 8400B-6	£3.0
10 OnDER 3	K35 Decoder £8.00	TDA3506	£1.00	220/400V 1200PF 15KV	00.13 q01	MAB 8440P-D070 MAB 8440P-D033	£3.0 £3.0
.A11440	E1 K35 Sound OP £4.00 Thick Film Daughter KT3 3122-127-43891	SAA7020 /01	£5.00 £3.00	.01.2KV 150m-385v	10p 50p	MAB 8440P-D056 MAB 8441P-T001	£3.6
[AA7750 5	12 C.H. K30 Tex Rec Front Panel with	HD614080SA90	£4.00	1000m-160v TX90	£1.00	M58484P	€2.0
JPC1373 5	LT 1.C.	225m ± .25m 380v	£1.00	1+1 MFD Mains Filter ITT 3 1/100 × 10	Pin 15p 340p	Hand Sets	
458657P	i i	220m 385v	£1.00 £1.00	22/100 4.7M/100 6800pt=1000v	10p	Fidelity £15,00 to £35.00	
M50441/550	E1 Plug In E1 K4 Focus Poi £1.00	G11 470m 250v	£2.00 £1.00	470/100	5р 20р	FIT 8 and 6 Push Button Pve 725 LOPIS	£1.0 £6.0
	II III III III III III III III III III	175m/100m/100m 350v	£1.00	47(0)/100 47/160	75p 10p	Pye 725 LOPTs Pye 731 LOPTs Thorn 8500-8800 LOPTs	£6.0
Receiver TX100 Panel .C. No. SAB3035	Fidelity Tube Base with transitor & focus pot £1.50	TX9 500m ± 500m 175v	£1.00	300 300/300V in 1.6KV	80p	CMC 301 front panel	€5.0
-MAB8440P D066 -SAA1060	ļ	C7 Hand Set	€6.00	800/160 1/250 Pulse	50p 5p	CMC 303 front panel	£5.0
-PCF8571P	Bush Tube Base on panel £1.00			2.2.250s	10p	CMC 302 Panel with TC mains etc.	switch £5.0
lew Model Philips Meter £25.	IXIO Tube Base on Panel £3.00		£7.00 .	7N5 1500V 3n3/250 A.C.	15p 10p	CMD 800 Decoder	€8.0
	25	G8 IF & Chroma	£6.00	.33/250V	20p	GH	£1.5
	G8 Lopt £5.00	G8 Chroma	£3.00	.39/250V 4n7/250 tested 5KV	15p 25p	1.1.C. Receiver Panel	
4itsumi MEC1-F51	65 G9 Lopt £4.00	G11 Chroma Panel	€4.00	22/250	∦5p	3.1.C. Power Supply G11 Full R Receiver Panel	temote £3.0
Thorn Spares	6 Diode Tripler, Mullard 75p Line O.P. Trans. Mono T.X. 12"-14"		£6.00 £5.00	47/250 100/250	10p 20p	PHILIPS SBC 469 Stereo Micro	phone
lew 9000 Decoder £8.	2/40-	CITTI Tanci	2,	GEC600/250 700/250	₩0p £1	Meters Hills 520	£23.0
KO Cyclops panel £1.	28 4822 £10 50 10273 £10	GH IF Detector	£3.00	2.200PF-2Kv	10p	Meters Hills 420 Hills HD5000 Digital Meter 100	E10.0
800 convergence panel	66 Thorn 1690 LOP1	G11 Selector gain module Pve G11 Front panel with transduc	er.	300+300 MFD 350v	£L00	750AC 10 Amp 20 MRG Range	
IOO Power supply IOO Mains lead, switch	3 G8 Trans Philips £7.00	pots, tuner pots, 6 pb switch+lead	£5.00 £1.00	800/250 32/300	10p 20p	HT 100 Multimeter HT 300 Multimeter	£6.
605 IVNPN 1066 80V6A — 1	G11 Split Diode £12.00 CVC820 Split Diode 1 FT £10.00	GFC V/can VHF/UHF tuner and I	E+	4/350 8/350	5p	HT 500 Multimeter	£9.0
000 Sound output panel 000 Focus unit £1.	fi Thorn B/W AD5308F + Stik. + 50 Lead £1.50		£6.00	4.7M/350v	8p 10p	HD1000 Digital HD3000 Digital	£20.6
	E4 GEC 2040 £3.00 E4 GEC 2110 £7.00		£8.00	33/350 220/350	20p 30p	HD5000 Digital HD5500 HD6000 Digital	£25. £29. £32.
00 IF panel	Mullard A J 2036 £1,50 Pye 169 Line Trans £3,00	mains input panel	£4	300/350	40m	[FHD6000 Digital [HD8000 Digital [HD9500 Digital with capacity To	£37.
00 A1 Diode 2	Pve mono £3.00	COLUMN TO LOCAL DE LA COLUMN TO		400/350 22/375	50p 15p	Trans Volts Ohms and Amps ra	inges £
00 A1 pots 5	Split Diode Trans £7.00	CVC 40 PUSH BUTTON ASSY w sliders: complete with lamp assy +	pots	220/385 (11T)	75p	Infra Red Hanset Tester	
am limiter panel €1.	50 Rank I O P T. Z970 £3.00	8 button units Universal Focus Fits Pve, Thorn a	£9.(M)	330/385 CVC 820HT 0,1/400	60p 15p	Works at 24 feet - Sound repeat Works off 9 volt battery	ter £8.
Way regulated adaptor 240V 6V/	CVC825 Split Diode £10.00	Decca Units		KT3 E/W .39/400	15p	Fits in top pocker	2.07.
5/9V/300mA £3. ink/Toshiba preh unit 0354 £9.	50 CVC 45		£1.00 £1.50	.56K,400v 4700pt/400	20p 10p	Handset Tester with LED	£4.
Push button unit pren £1. Push button VIIF/UHF for	00 GEC Portable G1O12046 £3.00 EHF Split Diode Leads ITF £0.00	T20 Focus Unit	£1.00	.22/4(0)	10p	Repaired Handsets Philips K4-K35, RC5350-RC530 RC5370, RC5375, repaired same	ю.
ap GEC-Decca type £7.	3500 L.O.P. Γ. & HT Frans each £2.00	Large Type Decca Small	75p 75p	8/4(0) 33/4(0)	15p 20p	RC5370, RC5375, repaired same	e day £10.
√ √ √ √ √ √ √ √ √ √ √ √ √ √ √ √ √ √ √	00 K35 Split Diode 3122/13835930 £10.00	KT3 Focus Unii K30 Focus Pot	75p 75p	400/4001	20p 40p	RC4001 Full Remote KT3 K36 Handsets exchanged	Teletext
3 (Export) 12 P.B.u Push button Unit Thorn £1.	100	K30 Tube base on panel	£1.00	394K/400V 1000m-160v	20p £1.00	NEW Type RC4001 9 CH not 4.	
Push button GRC £6.	10 Universal Tripler	TX10 Focus Units CVC 32 Focus Unit	£8.50 75p	220/450	40p	GEC Full Remote Intra-red, 19	
Push button PYE 731 £6. caring aid unit £3. ink Z718 4 P/B/Unit MECH £4.	56	Fidelity Focus Unit 14R-14S	.30p	47/500	25p	THE TEN REMARK THIRD TEN. T.	£15.
ink Ž718 4 P/B/Unit MECH - £4. Button Unit GEC with Lamps £7.		ITT Small for use with Split	£1.00	0.1/600 0.1/1200V wire end	15p 20p	TOSHIBA HAND SET	S £7.
7 Push Button Unit £6.	00 STC Universal Tripler £6.00	Z718 Bush Focus Diode	£2.00 - 50p	0 1/450 A/C wire end	20p	CT9176 CT9133	£7.
916B panel £5. 513AP panel £5.	10 IL TGA £2.00	Remo TV12SP	50p	22/1000 047/600	20p 15p	Rediffusion MK3	£5.
Video Tuner	ITT CVC 5-8-9	1600 Thorn FILL Rec and Lead TV14	50p 50p	0.047/1000	10p	FOSHIBA	
6100/05 I/V and Tel/Text unit an ind set £90.	1 Rank 11TCP A823 £3.50	TV20 TV45	£1.00 50p	0.01/1000 0.11/1600v	10p	HAND SFTS 24 Button CT938 Fuliremote	£5.
end for data.	H TEZ Rank £3.00 G9 Philips £4.00	1743	р	150m/385y 47/1000s	£1.00	32 Button CT983 Videotext	£6.
TT14 GEC TEX-DECODER	GFC 2)10 £4.00 3500 Thorn £3.00	FX9 8 Button Unit	£6.00	.47/250V A C.	65p 10p	VCR Front Display Panel	€7.
IC Panel with cable form £9.	50 Phorn £4.00	I STORE OF THE STO	C/ 00	.001K, 1250 0.0047/1500	10p 10p	Large type ITT TV and V C R	
PHILIPS	9100 Thorn £7.00 9500 Thorn £4.50		£6.00	005/1500	10p	Handset GFC Ultrasonic 8CH Full Rem	£15
40 Text Panel £8. P90 Chassis 14", 17" and 21" NF	W 2040 GFC £3.50	TX90-TX925 8 Button		0105/1500 In8/1500	10p 15p	G11 Full Remote Ultrasome	£32.
0.00	GEC TVM25 Tripler £2.00 Universal Tripler £5.00			2n2/1500	15p	G11 Ultrasonic Teletext Handson GFC Full Re	et £20
KT3-K30	G8 Tripler £5.00 CVC20-32 £5.00	1X100 8 Button Unit	£6.00	.01/1600 GEL8200/2KV	15p 15p	C2014H/C2219H New Replacement for G11 Ultr	£15
	p Decca 80 100 £4.50	TX10 8 Button Unit	610.00	0.1/2KN	20p	Full Remote Thorn 4000 insert with 7 button	£12
F-513 correction I	(2) Pvc 731 £3.00	77 To the Button Come		3n9/2KV 0.0015/2KV	15p 10p	Decca RC 11	£14
DIODES	D22 for Pvc 18" colour portable £4.00	TX10/TX100-16 Button UHF-VHF BAND S.W.	£10.00	6n2/2KV *	15p	G11 Intra-red full feletext Dynatron-Full remote C1V 62,	63, 64
Y 126 1	P BG 100/41 £3.25			2n2/2KV 470pt 4KV	15p 10p	Land or the contract of the contract of	£19
Y 133 1	P ERO Fripler print type with foacs PO7 BO2087 £5	G11 drawer ASS 3 pots Mains swit		7500pf/2KV	10p	Philips full remote KT3 - 16C928 7228/7324, K12-26C 797/TST 66	k/200°93 K
Y 134 1	Dp Γ/text ultrasonic ree'r pane' £14.00 5p 12-14\(\) 20 for £5.00 200 for £25.00	and lead	£2.00	3000PF/3000N - 4n7/2KV	10p 15p	[1826] [G] I. Full remote top button ass	¥12
Y 179 4	Op GEC 8 touch unit assy complete with all	K30 Drawer Ass with pots cable		6n2/2KV	10p	G11, Full remote repair service	(exchar
Y 187 1	Op G11 E.W. Fransformer 50p	forme	£1.00	7n1/1500V 8n2/1500V	10p 10p	GFC intra red full remote 8 ch. (LC SAA1250)	£14
7 196 - 3	3p G11 Transient Suppressors 245V 20p	TX10 Drawer with 8 way pots, ass	£2.50	9n1/2000V 8n2/2KV	10p 15p	Philips infra red full remote 9 cl 60 CP2605	£6
Y 204/4	G11 Scan Coils			0.0082/2500	15p	Philips infra red full remote 12 of for 60 CP2605	channel £12
Y 206 - BY 407 Eqs. Y 208/800	kn KT3 line OSC transformer £1	1 X to Ex-port with band switch	£2.50	150/3500 1800/4KV	10p 5p	KTVK30 FText	£12
Y 210/400	KT3/K30 infra-red receiver head £1	(drawer)	14.50	4.7nf/5KV	10p	KT 3/K 30 Full remote KT 3 Power supply GFC intra-red 2236-2026	£15
Y 223 💮	Dp (Borne) (Fig.	Hills Meter for the ear man, volts,		170/8KV 180/8KV	10p 10p	GEC 8 button full remote	£4 £14
Y 224/600; 4.8A/600v bridge 5 Y 226 1	K30 drawer unit with IC's	ohm with dwell and r.p.m.	£35.00	210/8KV	10p	GFC push pad handset button l	
Y 227 1	P KT3 AF Sockets 50p	Hills 9 piece tool kit in case	£5.00	1000/10KV 47/100V	10p 80p	Pve & Philips handset KT3-K30 No RC5150-RC5176-RC5171-R) chassi :C5177 £13
at BY229 black 1	P KT3 line driver transformer 50p	<u> </u>		Tube Thermpath 167 Rank Secam Decoder Panel	£1.00	Special Price RC4001 KT3 and Teletex IT CVC 32 handset repaired	£14
Y 229/400 3	Pye, K30, GEC, etc. Pre-mains stand-by switch	Abbey Security Smoke Alarm Mod [0]	del £5.00	VHET115A	£1,3.00	CVC 32 Hand Set CVC 45 3 and 2 Pin	£15
Y 299/60p Tag Y 237	Decea 80/100 IF panel £5 NPN PNP 80V 6 Amp TO66 O P		50-1\P(I	10 off -91 CAP G11 Philips K4 CAP 150M/385V	£2.00 50p	TX10 Hand Set Text TX9 with Text	£12
Y 254 1	Op Frans. pair 25p Op 5 button touch tuner BBC3/2 ITV1/2	Philips Coaxial Cable Stripper SBC	'325	Philips Coaxial Cable Strippe SBC325	r	TX9 & TX10 button print TX10 Focus Pots	£2 £5
Y 298		£7.50		L		177	
Y 406	Rp G11.8 touch button unit replaces old 6	CVC 20-25-30 Mains Switches	days 18	waster Panul	60p £30	T/V & Video Processor 1200 Tv	vpc £10
Y 527 Y 407a	Op Tube base + base unit for 820 Euro	Intra Red and Ultrasonic GH Tek RANK & ITT Mains Remote On-C	Off Swite	ch (720R)	£1.50	PHILIPS UNIVERSAL HAND SET £12	2.00 RC
Y 448	Op chassis £4.00 GEC Line O/P Trans. & Rec Stick for	RANK & HT Remote Switch 2800 GH Mains Switch	ohm		£1,50 50p	KT3 - K45	
Y 602	P Portable £3.00	4 amp Mains Switch			25p 30p	We have all parts for Philips I	
247	OP CVC 20/25/30/35/40 decoder panel	KT3 Mains witch			£1.00	RC5353 RC5300	£15
P20G	5p CVC 40/45 IF panel £5	G8 Mains Switch G11 Preh Red LED P/Button for 0	CH Ch	range	75p 20p	Philips RC5	£15
K 3102	OP PHILIPS NESTIN £1.20	RANK TOSHIRA Transductors I	PC-201	1 -	50p 75p	TEXT-TYPE Replace Hand Set for	۲
ridge TX10 800/3 amps	UP 20 GEC Black Spark Gaps \$1.00	Mains Switch ITT Long Type Prin Mains Switch Philip Long Type T/ Mains Switch GEC Long Type TA	iG.		75p	Philips KT3-K30, K4 etc	£12
BPC35-02 Bridge £1 ridge Rec, D35B10 4	50 K13 Front Panel Control 0p Assy £2.50	2000 Chassis Fidelity Mains Switch	(4) //(i)	75p 60p	FHORN HAND SETS 9000 = 9600 - TX9 - TX10 Tags and Nam Tags	-TX100
	BTW 30/50 50p	250V/4A White Lorlin Mains Swite	ch		60p £1	Text and Non-Text PHILIPS	£10
tomational Pastikas LIPT DEST					613	Increase	€12
	Op BTW 92/800R £3 Op 25A473 PNP C/P 10p	Teletext Adaptor Kit 11-300 Fana	isonic id chara	er vis	£12 £6	RC5171 K35-K4 HAND SET	

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