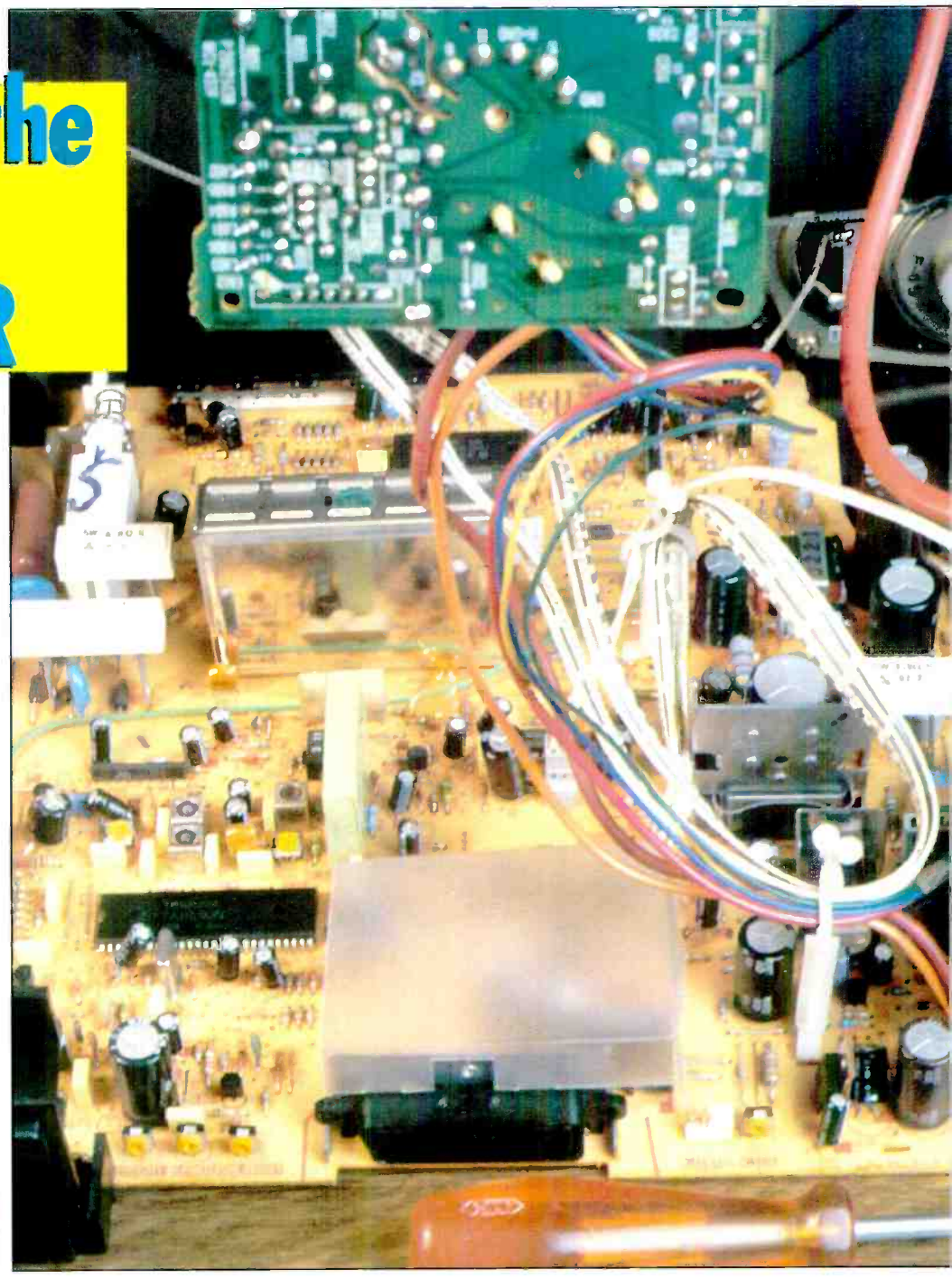
JUNE 1994

£2.20

TELEVISION

SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

A REED BUSINESS PUBLICATION



Servicing the Hitachi C2118T/R

Digital TV – anti-flicker displays, PIPs, noise reduction

Servicing the Hantarex 9000 games monitor

NVQ explained

Satellite '94 show report

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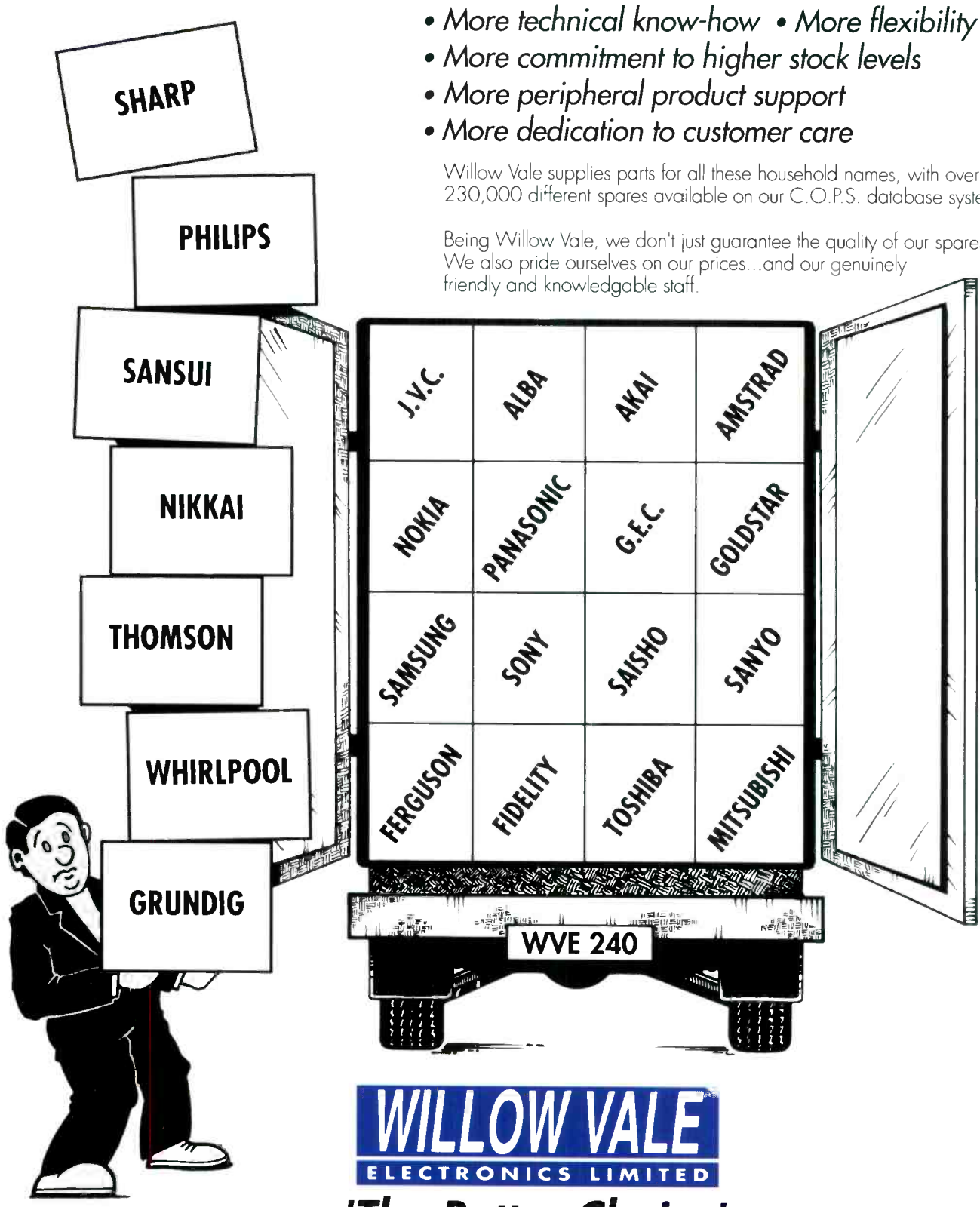

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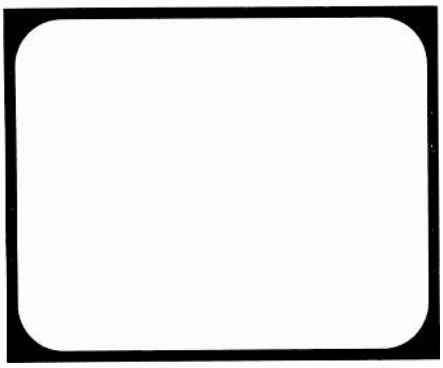

TELEVISION

June 1994

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On sale May 18th

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

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ISSN 0032-647X

OUR NEXT ISSUE DATED JULY WILL BE PUBLISHED ON JUNE 15

BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC140	20p
BC141	20p
BC142	20p
BC143	20p
BC147	8p
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2N6385	120p
2N6403	160p
3N143	65p

DIODES	
Rectifier Diodes	
BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY196	20p
BY206	11p
BY207	9p
BY210	22p
BY226	120p
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BY228	28p
BY296	20p
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BY299	18p
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BYX55/350	30p
BYX55/600	25p
BYX70/500	32p
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OA90	10p
OA91	10p
OA200	10p
OA202	10p
IN.914	2p
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IN.4002	3p
IN.4003	3p
IN.4004	3p
IN.4005	3p
IN.4006	3p
IN.4007	4p
IN.4148	2p
IN.5400	9p
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IN.5402	8p
IN.5403	8p
IN.5404	8p
IN.5405	11p
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IN.5407	12p
IN.5408	12p
RGP15	15p
RGP30	16p
SKE4F2/06	60p
SKE4F2/08	80p
SKE4F2/10	100p
SR2M	60p
I.C. SOCKETS	
8PIN	5p
14PIN	6p
16PIN	7p
18PIN	10p
20PIN	12p
22PIN	13p
24PIN	14p
28PIN	16p
40PIN	18p
ZENERS	
400 MW	
BZY88 RANGE	
2V7 to 39V	5p
1.3W	
BZX61 RANGE	
2V7 to 39V	9p
CRYSTALS	
Freq in MHz	
1.0	260p
2.4576	180p
3.276	115p
4.0	110p
4.194	130p
4.43	95p
5.0	130p
6.0	115p
10.0	140p
11.0	250p
12.0	120p
14.756	200p
15.0	160p
18.0	130p
18.432	130p
24.0	250p
48.0	160p
VOLTAGE REGULATORS	
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7806	25p
7808	25p
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79L08	35p
79L12	35p
79L15	35p
7818KC	100p
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LM317K	200p
LM317T	100p
LM323K	350p
LM723	35p
78H08KC	800p
78H12KC	700p
79HGKC	800p
VALVES	
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DY87	80p
EB91	50p
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PL84	80p
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PL504	120p
PL508	200p
PL519	430p
PY81	100p
PY88	100p
PY500A	190p
LED's	
3mm	
RED	5p
YELLOW	8p
GREEN	8p
5mm	
RED	5p
YELLOW	8p
GREEN	8p
RECTANG. LED's	
5mm x 2.5mm	
RED	5p
YELLOW	8p
GREEN	8p
LINEAR IC's	
AN203	210p
AN210	165p
AN214Q	170p
AN228	280p
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AY3-1015	290p
AY3-1270	800p
AY3-1350	450p

AY3-8910	360p
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UPC1278	240p
UPC1288V	230p
UPC1298V	320p
UPC1318	300p
UPC1335V	320p
UPC1350	115p
UPC1352	400p
UPC1358H	250p

SOLDERING IRONS

ANTEX
25 Watt 240V ac SOLDERING IRON (XS25W 240V) £9.00
15 Watt 240V ac SOLDERING IRON (X15W 240V) £9.00
25 Watt SPARE ELEMENT £4.50
15 Watt SPARE ELEMENT £4.50

SOLDERING IRON STAND

SOLDERING STAND (Made by ANTEX) £3.50
SPARE SPONGE £0.55

SOLDER

18 SWG 500 GRAMMES £5.00
20 SWG 500 GRAMMES £6.50
22 SWG 500 GRAMMES £7.00

DESOLDERING AIDS

DESOLDER PUMP £3.20
SPARE NOZZLE £0.60
SOLDER MOP Standard Gauge 1.2mm £0.60

VIDEO HEADS

AIWA
AV 66/AV 77 £12.00
G700 £11.00
G900 £15.00

AKAI
VS-105/112/115/116/125/126/201/220/250/301/303/304/205/244/247/248/VSP £13.50
VP7100/VP77/VS9300/VS9500/9800 £6.50
VP88/VS12/45/10/VS9700/VSP1 £15.00
VS35/37/38/53/55/56/66/765/767/768 £24.00
VS512/515/516 £28.00
VS465 £26.00
VS11/12 £14.00
VS6/8/9 £24.00
VSX9 £25.00

ALBA
VCR4000/5000/6000 £16.50

AMSTRAD
VCR 4500/5200/9000/TVR1 £11.00
VCR 7000 £11.00
VCR 6000/6100 £12.00
TVR2/TVR3/VCR4600/VCR4600 MKII/VCR4700 £11.50

AUTHENTIC
N850 £8.00

AWA
ATVI £8.00

BAIRD
8900/8901/8902/8903/8906/8922/8928 £6.50
8904/8923/8924/8925/8929/8935/8941/8943/8944 £6.50
8909/8912 £8.00
8930/8931/8933/8940 £8.00
8942 £23.00
8945 £20.00
8947/8948 £18.00

BAIRD
8950 £17.00

BOSCH BAUER
VRP20 £10.00
VRP25 £10.00
VRP30 £33.50

CANON
VR10 £10.00
VR30A/30B/30E/40A £33.50

DAEWOO
912 £18.00
VCP 11 RAF £18.00

DECCA
8300 £10.00
8400/8500 £6.50

FUNAI
E11/VIP1000/VP1400/VCR4000/V1/2S/VCR4500/4800/VCR6200/5600/6400/6600/VIP3000/E1100 £11.00
VCR4600/5400/5800 £12.00
VCR5480/5843 £20.00
VCR6800/6803 £16.00

FISHER
FVHP510/520/530/615/622/710/715/720/721/722/810/FVHP620/711/905/906/908/911/915/916/5000/FVHP420/5005/5050/5075/5001/618/730/830/918 £11.50
VBS3500/7500/7600/9900/VBS3500/7100/7600/9900/VBR330 £20.00
VBS7000/VBS7100/VBS9000 £20.00
FVH711/715/721/722/FVHD720 £11.00
FVHP725/830 £25.00
FVHP990 £27.00
FVHP975 £24.00

FIDELITY
HQS200/VCR600/6100 £15.00
VCR100 £11.00
VTR1000 £11.00

GOLDSTAR
8000 3HSSDB £19.00
GVH51G/VH1221/VCP4000/VCP4100/VCP4200 £13.00
GHV12321/1245/1246/8210/8215/GHVP1240/1241/GHVP1247/1248/VCP400 £13.00

G.E.C.
4000H/4001H/4002H £12.00
V4001H/V4004 £12.00

GRANADA
CS1/DS2 £16.00
VHSAH1 £11.00
VHSAH3 £24.00
VHSAN3 £8.00
VHSAY3 £12.00
VHSBH1/CH1 £21.00
VHSBP1 £8.50
VHSBY3 £26.00
VHSD62 £16.00
VHSEH2 £16.00
VHSEY1/EY2 £14.00
VHSFG2/FG4 £13.00
VHFS1/FS2 £13.00
VHSTJ1/TJ2/TJ3/WJ3/VHSYJ2 £7.00
VHSVH4/WH1/XH1/YH2 £16.00
VHSWJ1/XJ3 £7.00

GRAETZ
4312/4605/4905/4912/4913/P4833/TR4605/4812/4905/4912/TR4913/4914/4943 £6.50
4935/4943/4963/4985/4993/TR4833/4935/4985/4993 £6.50
4970/4927/4930 £17.00
4946/TR4906/4916 £16.00
TR4994 £23.00
TR4995 £33.00

GRUNDIG
VS410/440/450/460/500/505/510/520/521/530 £16.00
BARCELONA/MVS400/440/500/600/SE5100/6100/TVR4500/VS400/440/500/505/510/518/600/610 £14.00
MADRID/SE5140/VS540/VS5480 £30.00
MVS550/620/630/640 £24.00
VS120 £23.00

HINARI
VXL2/VXL3/VXL4/VXL20/VXL25/VXL35 £11.50
VXL5/V20H £13.00
VXL6 £15.00
VXL7 £22.00
VXL8/VXL9/VXL10/VXL11/VTV100 £13.00

HITACHI
VT11/VT14/16/30/33/34/330/340/503/640/5030 £10.00
VT7/VT17/VT18/VT19 £22.00
VT35/VT38/VT39 £24.00
VT100/110/111/112/113/115/118/120/125/128/220/225/VT400/405/410/413/414/415/418/610/518/520/525/526/VTM625/626 £14.00
VT3000 £8.00
VT4000/4200/5000/5500 £11.00
VT77/680/3000/6500/7000/8000/8030/8040/8100/8300/VT8500/8700/9000/9300/9500/9700/9900 £10.00
VT8/VT9/VT56/VT57 £34.00
VT65 £24.00
VT130/VT135/VT138/VT145/VT250/VT255/VT258/VT420/425/426/428/430/435/438/535/536/VTL301/VTM630/635/636 £20.00
VT52/61E/VT62E/VT63/VT64/VT640 £13.00
VT150 (4 HEAD) £26.00
VT530 £25.00

ITT
VR3605/3905/3935/3943/3954/3985/3993 £6.50
VR3933/VR3913/VR3914/VR3963/VR3975/VR3912 £8.50
VR3986 £20.00
VP3826/VR3906/3916/3926/3946/VR3948/6948 £15.50
VR3927 £14.00
VR3978 £23.00
VR3977 £27.00
VR3994 £23.00
VR3995/3997 £18.00
VR3917 £14.00

JVC 3HSS
HR2200/HR3300/HR3320/HR3330/HR3350/HR3360/HR3660/HR3750/HR3960/HR4100 £6.00
3292/8903/89008901/8902/8903/8606/8922/8923/3VO1/3V06/3V22 £5.00
HR3660/HR7600/HR7610/HR7650/HR7700/HRD110/HRD111/HRD120/HRD121/HRD122/HRD225/HRS100 £6.00

FERGUSON 3HSS PIN
8904/8924/8941/8943/8944/3V16/3V23/3V24/3V31/3V35/3V36/3V38/3V39/3V49 £5.25
HRD140/HRD141/HRD143/HRD150/HRD157/HRD158/HRD160/HRD5101/HRS10 £12.50

FERGUSON
8944/8943/3V42/3V44/3V45/3V46/3V47/3V52/3V54/3V55/3V56/3V57 £12.50
8950/8951/3V64/FB10/FV111/3V65/FV20/FV21/FV22/FV26 £14.00
3V48 £24.50
3V43/3V53 £31.50
8930/8940/3V29/3V30 £7.00
8945 £24.00
3V00 £10.00
FV31 £15.00
FV37 £35.00

JVC
HRD170/171/210/211 £14.00
HRD565/586 £24.50
HRD725/HRD755 £31.50
BR7000E/BR7000S £28.00
HR7200/7300/7350/2650 £7.00
HRD455 £20.00
HRD520 £14.00
HRD300/HRD400/HRD600 £23.00
HR4100 £10.00
HRD750 £33.00
HRD250/257 £27.00

JVC & FERGUSON
3V32/8942/HR7655 £23.00
HRD180/230/3V58/FV12L/FV20B/FV22/26/30/32/33 £24.50
HRD370/3V58/FV13H/HRD430/HRD470 £23.00
HRD530/700/FV14T £31.00
GRC1/GRC2/3V41 £28.00

LOGIK
VR960 £15.00
VR950 £14.00

LOEWE
OC410/420/440 £24.00
OC50/OC55/OC60/OC65 £15.00

LUXOR
8225 £18.50

MATSUI
VX500E/VX600A/VX800A/VX810A/VX880A/VX770B/VX773B £12.00
VCRL3/VX730 £14.50
VX735/VX755 £15.00
VX735A/VX755A/VX765/VX850 £17.50

MITSUBISHI
HS303/HS304/HS320/HS700 £15.00
HS305/HS318/HS710 £16.00
HS307 £26.00
HS319 £25.00
HS330 £26.00
HS400 £28.00
HS349 £24.00
HS411 £29.00
HSE30 £24.00
HS338 £22.00
HSE11 £23.00
HS300/HS301/HS302/HS310 £15.50
HS200 £6.50
HS337/HS347 £15.00

NATIONAL PANASONIC
4HSS-3HSSN
NV3000/NV300/NV7200/NV3333/NV7500/NV7800/NV7850/NV322/NV332/NV340/NV390/NV2000/NV2010/NV7000/NV8170/NV8200/NV8400/NV8600/NV8610/NV8620 £6.25

NATIONAL
NV777/NV330 £15.00
NV430/AG1000 £11.00
NV280/NV460/470/480 £16.50
NV730/NV770 (4 HEAD) £15.50
NV336 £18.50
NV180/NV048 £23.00
NV370/NV380/NV100/NV630 £7.25
NV788 £29.00
NV810/NV830 £26.00

NATIONAL Cont.
NV850/NV950 £27.50
NV870/NV890/NV970 £36.00
NVG33/NVG46/NVL23/NVL25/NVL28 £20.00
NVG30/NVG31/NVG40/NVG130 NVJ30/NVL20 £18.00
NVG10/NVG11/NVG12/NVG14/NVG16/NVG120/NV250/NV280/NV450/NV465 £16.50
NVG18 NVG20/NVG21/NVG22/NVG25/NVG28/NVG200/NVD48 £20.00
NVG350/NVG300 £22.00
NVG45/NVG46 £26.50
NVH70 £20.00
NV688 £36.00
NV600 £24.00
AG-6800/6810 £16.00
AG-6100/6200/6300 £26.00
NVH65 £28.00
NVG7/NVG9/NV230 £39.00
NV780 £12.00
NV735/NV745 £28.00
NVG15/NVG400 £26.00
NVM7/NVMC20/NVF70 £38.00

N.E.C.
N9011/N9012/N9013E/N9014E/N9014G/N9015/N9016/N901A/N902A/N9033/N9034/N9054/N9063/N9065/N9068/N906A £13.00
N911A/N915A/N916A/N917 £24.00
PCV754/PV2300/PV2400/PV760/PV784/PV770/PV774/PVC763E £16.50
N380/N381/N830/N831/N832/N833/N834/N835/N836 £7.00
8261/AH1 (for model DX3000) £30.00
N895 £31.50

NORDMENDE
460/9-460/V100/V140/V200/V250/V304/V341/V450/V550 £7.00
V1001/V1005/V1015/V1025/V1035/V1041/V1055/V1065/V1105/V2005 £12.50
V110/V333 £20.00
V101/V102/V103/V112/V141/V142/V200/V300/V3005/V300/V301/V302/V350/V500 £7.00
V1205/1215/V1235/V1245 £14.00
V1305 £24.50
V380 £23.00
V502/V503/V5005 £31.50

ORION
VH3/VH555/VH600/VH700/VH844/VH900/VH1000 (ALL MODELS) £11.00
VH1/VH2A £7.00

PHILIPS
VR6460/VR6520/64/VR60/VR6420 £7.25
VR6711 4 HEAD £18.00
6920/VR6440 £25.00
VR6441/VR6540/VR6541/VR6640/VR6642 £13.00

RANK
BV8900AS N830E A/RV300/RV310/RV320/RV330/RV340/RV350/RV380 £18.00 £7.00

SAISHO
VR100/VR605/VR705/VR805/VR905/VR1000/VR1100/VR1200/VR1600 £12.00
VR3300X/VR3600X/VR3650/VR3800 £14.00
VR3200/VR3500 £14.00
VR2000/VR3300/VR3600 £14.00

SALORA
6500/6600 £16.00
SV7300/8200/8300/9200 £15.00
SV7400/8400 £16.00
SV8100 £12.00

SAMSUNG
SVX301/VB900/VB910/VVT510/VT320/VT5600/VX510/VX511/VX520/VX616/VX626/VX627/VX717/SV716/717/SVX303/305/VB510/520/610/616/617/619/620/626/627/629/710/971/V1520/616/621/626/900/710/VX617/619/629/710/712/VX720/730/970/971/972 £13.50
VB770/V1730/770/VK8220/VX750/770/8225 £19.00

SANYO
VTC5000/VTC5400/VTC8000/VTC8500/VPR6000/VTC1500/VTCM10/VTCM11/VTCM20/VTCM21/VTCM25/VTC2000/VTC5100/VTC5150/VTC5300/VTC5400/VTC5350/VTC5370/VTCNX10/VTCNX15/VTCNX20/VTC1000/VPR5800 £18.00
VTC5500/VTC5550/VTC9100/VTC9300/VTC9350/VTC9355/VTC9455/VTC9500 £19.00
VHR1110/VHR1150/VHR1300/VHR1700/VHR2300 £13.00
VHR3200/VHR3270/VHR3100/VHR3150/VHR3300/VHR3400/VHR3310/HRD500 £15.00
VHR1100/VHR1200 £15.00
VHR1500/VHR2500 £21.00
VHR2700 £24.50

SHARP
VC3000/VC393/VC496 £27.50
VC488 £42.00
VC779 £18.00
VC789/VC790 £29.00
VC300/VC381/VC383/VC386/VC387/VC388/VC482/VC483/VC486/VC3300/VC8381/VC9100/VC9300/VC9500/VC9700/VC7750/VC8000/VC8300 £11.00
VC793 £30.00
VC473/785/786 £22.00
VC899/VCA501/VCA602 £28.00

SONY
DSR-19R (FOR SL-T 9ME) £31.00
DSR-21R (FOR SLC 8-C9) £28.00
DSR-35R (FOR C20/C30/C40/SLF1UB/SLF1E) 2 PIN SLC24PS/SLC33E/SLC44PS/SLF30PF/SLF60PS/SLK85/SLT20ME/SLT30ME £15.00
DSR-43R (FOR SLC7 RANGE/SL5000/SL5100/SL3000) 1 PIN SLC5E/SL36ES/SL37E £13.00
SL3000/8000/8080/SLC5E/SLT7ME £16.00
SLV201/202 £20.00
SLK95/SLT50ME £29.00

TOSHIBA
V63 £15.00
V9680 £34.00
V8600/V8700 £30.00
V21/V31/V33/V50/V51/V53/V9600 £14.50
V55/V57 £7.00
V71/V73/V74/V75/V81/V82/V83/V84/V85/V86/V87/V80/V77 £12.00
V93/V80 £14.50
V5470/V5480 £13.00

TRIUMPH
VR9500/VR9501/VR9525 £11.00

THOMSON
TX8000/309/316/320/321/323/326/4100/4200/4300/VK305T/306T/309BL/3301/312T/410T/411T £6.50
TX8500/V318/342/343/351/352/353/4210/4230/4260 £12.50

VCR PINCHROLLERS

AKAI
VS9300, VS9500, VS9700, VS9800 £2.00
BP7100, VP77 £2.00
VS1, VS2, VS3, VS4, VS5, VS6, VS9, VS10, VS8, VS15 £2.00
VS105, VS112, VS115, VS116, VS126, VS244, VS245, VS247, VS248, VS515, VS516, VS205 £2.00
VS201, VS301, VS303, VS304, VS603, VS606, VS607, VP58-P82 £2.00
VS125, VS155, VS165, VS220, VS240, VS250, VS512, VSX9 £2.00

AMSTRAD
VCR4500, VCR4600, VCR4600, VCR6000, VCR6100, VCR9000 £2.50
VCR5200 £2.50
VCR7000 £2.50
TVR1 £2.50

AWA
AV66, AV77 £2.50
G700, G900 £2.50

ALBA
VCR300X, VCR4000 £2.50
VCR5000, VCR600 £2.50

AUTHENTIC
N850 £2.50

BLAUPUNKT
RVT100, 200, 202, 222, 224, 301, 306, 307, RTV309, 311, 312, 315, 316, 317, 319, 320, 328, RTV404, 414, 434, 444, 478, 707, RTX100 £2.50
RTV211, 214, 321, 322, 348, RTX250, 260 £2.50
RTV324, 325 £2.50
RTV330, 454,520, 530, 535, 560, 660, 670, RTV720, 730, 740, 800, 810, 900, 910, 920 £2.50

DECCA
VRH300 £2.00
VRH8495DK (Pressure Roller Assembly) £4.50

FERGUSON
3V00, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929 £2.00
3V29, 3V30, 3V31, 3V32, 8930, 8931, 8940, 8941, 8942 £2.00
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V64, 3V65, FV10, FV11, FV12, FV14, 3V49, 8943, 8944, 8945, 8947, 8948, 8950, 8961, FV13H, FV20B, FV21R, FV22L, FV26D, FV30B, FV32L, FV33H, FC39S, VC141L £2.00

FISHER
FVHP420, FVHP520, FVHP530 £2.00
FVHP615, FVHP710, FVHP715, FVHP716, FVHP722, FVHP725, FVHP830, FVH618, FVH620, FCH622, FVH622, FVH771, FVH720,FVH721, FVH722, FVH725, FVH730, FVH840 £2.00
FVHP905, FVHP970, FVHP980, FVHP990, FVHP5000, FVHP5005, FVHP5050, FVHP5075, FVHP5100, FVHP5205, FVHP906, FVHP908, FVHP910, FVHP911, FVHP915, FVHP916, FVHP918, FVHP975 £2.00
VBR330, VBS3500, VBS7000,VBS7500, VBS7600, VBS8000, VBS9900 £2.00

FIDELITY
HQS200, VCR100, VCR600, VCR6100 £2.00
VTR1000 £2.00

FUJITSU
HS760, VX715, VX720D £2.00

FUNAI
VA, V2, VCR4000, VCR4500, VCR4530, VCR4600, VCR4800, VCR5200, VCR5400, VCR5840, VCR5843, VCR6000, VCR6600, VCR6800, VCR6803 £2.00
VIP1000, VIP1400, VIP3000 £2.00

GEC
V4004 £2.00

GRANADA
VHSAH1, VHSAH3, VHSVH4, VHSWH1, VHSXH1, VHSYH2 £2.00
VHSAN3 VHSBP1 £2.00
VHSAY3 £2.00
VHSBH1, VHSCH1, VHSFS1, VHSFS2, VHSEH2, VHSEH3 £2.00
VHSBY3, VHSCC1 £2.00
VHSDS2 £2.00
VHSDP1, VHSFP2 (Pressure Roller Assembly) £4.50
VHSEY1 £2.00
VHSFG2, VHSFG4 £2.00
VHSFJ4, VHSYJ2 £2.00
VHSF63 £2.00
VHSTJ1, VHSTJ2, VHSTJ3 £2.00
VHSWJ1, VHSWJ3, VHSXJ3 £2.00

GRUNDIG
BARCELONA, MADRID, MVS500, MVS550, MVS600, MVS620, 660, SE5110, SE5140, SE6100, SE6160, TVR4500, VS500, VS505, VS510, VS520, VS521, VS530, VS540, VS550, VS600, VS610, VS620, VS630, VS640, VS660, VS680, VS5180, VS5480 £2.00
MVS400, MVS440, VS400, VS410, VS440, VS460 £2.00
VS120 £2.00
VS510 £2.00

GOLDSTAR
GHV1221, GHV1232, GVH1240, GHV1241, GHV1242, GHV1243, GHV1244, GHV1245, GHV1246, GHV51, GHVB210, GHVB215, GHVP1240, GHPV1241, GHVP1247, GHVP1248, GHVP1290, GHVP1291, GHVP1295, GHPV1296, VCP4100, GHV51, GHV8000, GHV8200, VCP4000, VCP4130, VCP4200, VCP4300, VCP4301, VCP4305, VCP4306, VCP4310, VCP4311, VCP4315, VCP4316, VCP4320, VCP4321, VCP4325, VCP4326 £2.00

HINARI
V20H, VXL10, VXL11, VXL19, VXL5, VXL5, CXL7, VXL8, VXL9, VXL90 £2.00
VXL2, VXL3 £2.00
VXL4, VXL20, VXL35 £2.00

HITACHI
VT11, VT14, VT16, VT17, VT18, VT33, VT330, VT34, VT35, VT38, VT39, VT52, VT6500, VT680, VT6800, VT7, VT7000, VT8000, VT8500, VT9700, VT9900 £2.00
VT61, VT62, VT63, VT64, VT65, VT86, VT88, VT110, VT122, VT120, VT128, VT130, VT135, VT138, VT150, VT168, VT220, VM200, VM500, VM600, VT100, VT111, VT113, VT115, VT118, VT125, VT145, VT175, VT225, VT250, VT225, VT258, VT260, VT400, VT405, VT410, VT413, VT414, VT415, VT418, VT420, VT425, VT426, VT428, VT430, VT431, VT435, VT438, VT450, VT498, VT510, VT518, VT520, VT525, VT526, VT530, VT535, VT536, VT540, VT545, VT546, VT548, VT570, VT575, VT576, VT580, VT588, VT640, VT8, VT85, VT88, VT88, VTL30, VTM625, VTM626, VTM630, VTM636, VTM640, VTM645, VTM646, VTS80, VTS85 £2.00
VT3000, VT5000, VT8000, VT9300, VT9500 £2.00

ITT
VR3605, VR3905, VR3935, VR3985, VR3986, VR3993, VR3994, VP3826, VR3906, VR3916, VR3926, VR3946, VR3948, VR3976, VR3995, CR3997, VR6948 £2.00
VR3913, VR3914, VR3943, VR3954, VR3963, VR3984 £2.00
VR3907 £2.00
VR3912 £2.00
VR3917, VR3833 £2.00
VR3929, VR3968 (PRESSURE ROLLER ASSEMBLY) £6.25

JVC
HR2000, HR3300, HR3330, HR3360, HR3660, HR4100, HR7700, HR7200, HR7300, HR7350, HR7600, HR7610, HR7650, HR7655 £2.00
HRD110, HRD111, HRD120, HRD121, HRD140, HRD150, HRD160, HRD225, HRD455, HRD565, HRD725, HRD157, HRD158, HRD170, HRD180, HRD210, HRD230, HRD250, HRD257, HRD300, HRD320, HRD370, HRD400, HRD430, HRD470, HRD530, HRD566, HRD700, HRD750, HRD755, HRD950, HRP50, HRS5000, HRS5500 £2.00

MATSUI
VX850 £2.00

MITSUBISHI
HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS700, HS330 HS306, HS307, HS337, HS338, HS349, HS400, HS411, HS412, HS421, HS710, HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE70 £2.00

NATIONAL
NV100, NV180, NV300, NV333, NV340, NV366, NV500, NV688, NV777, NV788, AG6010, AG6015, AG6100, AG6200, AG6400, AG6810, NV3321 £2.00
NV230, NV370, NV430, NV460, NV730, NV810, NV830, NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800, NV8600, NV8610, NV8620, NVG14, AG1000, AG1200, AG1500, AG2100, AG2100, AG2200, NV260, NV280, NV380, NV450, NV465, NV470, NV480, NV630, NV650, NV770, NV780, NV8050, NV8150, NV8200, NV8300, NV8400, NVG15, NVG30, NVG400, NVH70, NVG130 NVG7, NVG19, NVG12, NVG18, NVG9, NVG10, NVG11, NVG120, NVG16 £2.00
NVG21, NVG25, NVH65, NVG33, NVG46, NVG50, NVG300, NVG65, NVF70, NVFS1, NVFS100, NVH75, NVJ30, NVL20, NVL23, NVL25, NVL28 £2.00
NVD40, NVD80, NVG21, NVG45 £2.00

NEC
N830, N831, N832, N833, N895 £2.00
PVC2300, PVC2400, PVC740, PVC744, PVC746, PVC780, PVC764, PVC766 £2.00

ORION
VH1, VH2 £2.00
VC150, VC180, VH1000, VH200, VH201, VH205, VH212, VH250, VH254, VH288, VH3, VH300, VH303, VH3030, VH312, VH33, VH3312, VH404, VH704, VH708, VH712, VH770, VH780, VR2948 £2.00
VH300, VH3050, VH2308, VH2400, VH2800, VH2700, VH4300, VLX20, VXL25, VXL30 Etc £2.00

PHILIPS
VR6460, VR6920 £2.00
VR2020, VR2021, VR2022, VR2023, VR2024 £3.20
VR6711 £2.00
VR6540 £2.00
DV8556, VR6485, VR6485, VR6589, VR6880, VR6948 £2.00
VR445, VR6442, VR6542, VR6843, VR6943 £2.00
DV464, VR2324, VR2300, VR2334, VR2340, VR2530, VR2414, VR2480, VR2486, VR2489, VR2490, VRS2498, VR6462, VR6463, VR6464, VR6560, VR6660, VR6860, VR6861, VR6862, VR6863 £2.00

Pressure Roller Assembly
DV186, DV190, DV286, SV486, DV471, DV582, DV571, DV761, VR6180, VR6182, VR6185, VR6285, VR6290, VR6291, VR6293, VR6362, VR6367, VR6390, VR6391, VR6393, VR6467, VR6468, VR6470, VR6561, VR6570, VR6581, BR6670, VR6676, VR6760, VR8761, VR8762, VR6870, VR6970, VR6975, VR86B1, 62SB7, 68SB4, 71SB4, 72SB8, 92SB31 £4.50

SANYO
VHR1100, VHR1300, VHR1500, VHR2300, VHR1150, VHR1200, VHR2100, VHR2500, VHR2700 £2.00
VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20, VTC5150, VTC5350, VTC5400, VTC8000, VTC8500, VTC9100, VRP5800, VTCM11, VTCM21, VTCM31, VTCM50 £2.00
VHR3100, VHR3300, VHR3310, VHR3700, VHRD500, VHRD700 £2.00
VTC3000 £2.00

SHARP
VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300, VC9100, VC9300, VC9500, VC9700, VC200, VC2300, VC3300, VC384, VC385, VC388, VC390, VC393, VC6000, VC6200, VC7750, VC800 £2.00

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FLYBACK TRANSFORMERS

FERGUSON		
00D-4208-001	TX9	£14.00
00D-4-208-002	TX9	£14.00
00D-4-235-002-01G	TX90	£14.00
06D-3-088-001	TX100	£14.00
GRUNDIG		
29201-019-05		£8.00
29201-024-11		£14.00
PHILIPS		
PS 140-17112	G11	£14.00
PS 140-10306	G90AE	£11.50
PS 140-10353	G90B	£15.50
PS 140-10151	K12	£15.00
PS 140-10283	K30 K30111	£15.00
PS 140-10246	K40	£13.00
PS 140-10247	KT4	£14.00
PS 140-10149	KT2	£9.00
PS 140-10161	KT3	£9.00
PS 140-17033	G8	£10.00
PS 140-17089	G9	£10.00
PS 140-10328	NC3	£14.00
ITT		
	CVC20	£11.50
	CVC25	£11.50
	CVC30	£11.50
HITACHI		
OUTPUT TV MODULE	HM6251 (REF 2370551)	£5.50
	HM6232	£8.00

IDLER TYRES

		Order Code
AKAI	MI327773	IT01
AKAI	MZ366960J2	IT02
GOLDSTAR	VXP0521	IT17
HITACHI	6861471	IT03
HITACHI	6861482	IT04
HITACHI	6886971	IT05
JVC/FERGUSON	PU48967B	IT06
JVC/FERGUSON	PU51380	IT07
JVC/FERGUSON	PU51402A	IT08
JVC/FERGUSON	PU55373	IT09
JVC/FERGUSON	PU55374	IT10
PANASONIC	VXP0329	IT11
PANASONIC	VXP0343	IT12
PANASONIC	VXP0344	IT13
PANASONIC	VXP0401	IT14
PANASONIC	VXP0433	IT15
PANASONIC	VXP0463	IT16
PANASONIC	VXP0521	IT17
PANASONIC	VXP0581	IT18
SANYO	1430662T115620	IT19
SHARP	NIDL0006GEZZ	IT20
SHARP	NIDL0006GEZZ	IT21
SHARP	NPLY0107GEZZ	IT22

PRICE 22p EACH

Price 18p for pack of 5 for each model Price 15p for pack of 10 for each model

IDLERS & PULLEYS REPLACEMENT

AKAI			
VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	£4.50
VS3, 6, 12, 56, 58, 59			
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	£6.00
VS3, 6, 12, 59, 59			
VS700	IDLER	BV321979	£6.00
VS125, 126, 155,	IDLER ASSY	MZ366960J2	£11.00
VS165, 240, 244, 245, 247, 248, 250, 512, 515, 516			
VS22, 38, 105, 112, 115, 116, 205, 220			
VP7100, VS9300	T-UP IDLER	PU47752	£4.50
VS9500, VS9800			
VP7100, VS9300	UNLOADING	PU46381	£4.00
VS9500, VS9800	IDLER		
VP7100, VS9300	REW IDLER	PU46380	£6.00
VS9500, VS9800			
VP77, VS10	REEL IDLER	BV327815	£3.00
VP88	IDLER	BV336067	£6.00
VS1, 3, 4, 9, 12	REEL TABLE	BR347731	£5.50
VS15, 58			
VS23, 35, 37, 53, 55	CLUTCH	ML373043	£13.00
VS66, 75, VSA77			
VS9700	FF IDLER	BV321761	£3.20
VS9700	REW IDLER	W321762	£4.25
AMSTRAD			
VCR7000	IDLER	150280	£1.50
TVR1, VCR4500	CLUTCH	150873	£3.75
VCR4600, VC5200, VCR9000			
TVR1, VCR4500	GEAR HOLDER	151284	£3.50
VCR4600, VCR5200, VCR9000			
TVR1, VCR4600	REF CLUTCH		£3.50
VCR5200			
VCR6000, VCR6100	CLUTCH	153202	£2.80
VCR4500, VCR9000	CLUTCH		£4.00
VCR4500, VCR4600	MOD KIT	(TAPE CREASING)	£4.50
VCR4700			
MOD KIT TAPE CREASING FOR AMSTRAD:			
VCR4500, 4600, 4700			£3.00
FERGUSON			
3V00, 3V01, 3V16	T-UP IDLER	PU47752	£4.50
3V22, 3292, 8900, 8901, 8904, 9806			
3V16, 3V22	T-UP IDLER	PU49280	£5.50
8903, 8909, 8912, 8922			
3V23, 3V29 3V30,	REEL IDLER	PU48967	£2.50
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942			
3V23, 3V31	ROLLER ASSY	PU49042A	£4.00
3V29, 3V30, 3V31	T-UP IDLER	51402	£1.25
3V32, 3V35, 3V36, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942			
3V29, 3V30, 3V31	T-UP CLUTCH	PU51380	£2.25
3V32, 8930, 8931, 8940, 8941, 8942			
3V35, 3V36, 3V38	REEL IDLER	PU55374	£2.85
3V39, 3V49, 8943, 8944			
3V35, 3V36, 3V38	T-UP CLUTCH	PU55373	£2.00
3V39, 3V49, 8943, 8944			
3V58, 3V59, 3V64	IDLER ARM	PU58645	£2.25
3V65, FV10, FV11, FV12 FV13, FV14, FV20, FV21, FV22, FV26			
FV30, FV32, FV33, 8950, VC141L			
3V42, 3V43	CLUTCH ASSY	PU55822	£13.50
3V43, 3V44, 3V45	CLUTCH ASSY	PU57658	£11.50
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948			
3V42, 3V43, 3V44	T-UP CLUTCH	PU56043-1-4	£2.80
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1-5	£2.80
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V00, 3V01, 3V16	LOADING IDLER	PU43681	£4.00
3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909			
8912, 8922			
3V00, 3V01, 3V16	REW IDLER	PU43608	£6.00
3292, 8900, 8901, 8904, 8906			
3V16, 3V22, 8902	IDLER	PU49281	£1.70
8909, 8912, 8922			
3V16, 3V22, 8902	IDLER	PU49283	£1.00
8909, 8912, 8922			

FISHER			
FVHP420, 520, 530	FF-REW PULLEY	HI638531	£1.00
FVHP615, 618, 620	COMP. IDLER ASSY	FI1430420400300	£3.30
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830			
FVHP840,905, 906, FVHP908, 910, 911, FVHP915, 916, 918			
FVHP615, 618, 620	GEAR IDLER ASSY	FI1430490400900	£4.50
FVHP622, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP615, 618, 620	REEL T-UP ASSY	FI1430410400900	£5.50
FVHP662, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP905, 906, 908,	GEAR IDLER ASSY	FI1430490402400	£4.00
FVHP910, 911, 915, FVHP916, 918			
FVHP975, 980, 990,	IDLER	FI1430420400700	£4.50
FVHP4500, 5000, 5005			
FVHP5050, 5075, 5100			
FVHD40, 55, 140	REEL DRIVE ROLER		£6.00
FVHP1, 10, 20			
FVHP975, 980, 990	GEAR		£3.00
FVHP975, 980, 990	CLUTCH	F12430510404200	£9.50
FVHP420, 520, 530	IDLER		£2.80
FVHP420, 520, 530	TAKE UP IDLER		£3.80
FVHP990	LOADING GEAR		£2.00
VBS3500	REEL DRIVE PULLEY		£5.20
VBS3500	IDLER		£3.00
VBS7000	REW IDLER		£1.20
GOLDSTAR			
GHV1221, 1232, 1240	CLUTCH GEAR	435038A	£2.50
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			
GHV1221, 1232, 1240	IDLER		£1.70
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			
HINARI			
VT11-33, VT63-64	REEL IDLER	40000009	£1.50
VXL2, VXL20	IDLER		£1.50
VXL2	IDLER		£2.75
VXL4, VXL35	IDLER		£8.50
VXL4, VXL35	CLUTCH		£1.30
VXL4, VXL12, VXL25	LIMITER POST		
VXL30, VXL35, VTV300			
VXL5, VXL6	CLUTCH		£3.75
VXL5, VXL6	GEAR HOLDER		£3.50
VXL7, VXL8, VXL9	CLUTCH		£3.80
HITACHI			
VT11-33, VT63-64	CLUTCH ASSY	6879515	£7.50
VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61			
62, 65, 85, 330, 640, VT16S			
VT120-220, 100, 110	CLUTCH ASSY	6886824	£7.50
111, 113, 115, 118, 200		6886972	
125, 128, 130, 135, 138, 145, 150, 175, 225, 250,			
255, 258, 260, VTL30			
VT8000-8300, 7000	FF-REW IDLER	6413663	£2.80
VT8500-8700			
VT8000-8300, 7000	PLAY IDLER	6414221	£3.60
VT8500-8700			
VT8000-8300, 7000	FF-REW PULLEY	6383531	£0.80
VT8500-8700			
VT9300-9500, 6500	FF-REW IDLER	8681471	£3.30
VT680, 6800, 9700, 9900			
VT9300-9500, 6500	PLAY IDLER	6861482	£3.20
VT680, 6800, 9700		6861481	
VT 9900			
VT9300-9500, 9700	IDLER	681505	£3.00
VT9300-9500, 680, 6800	IDLER	687043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6886971	£1.50
VT14, 16S, 17, 19, 34, VT35, 38, 39, 52, 61, 62			
VT65, 85, 86, 88, 330, 640			
VT1000, 110, 111, 113	FF-REW ARM	6886792	£2.75
VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150			
VT175, 220, 225, 250, 255, 258, 260, VTL30			
VT400, 405, 410, 413	FF-REW ARM	6897094	£1.30
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT400, 405, 410, 413	CLUTCH BASE	6896951	£3.25
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT3000	T-UP IDLER (LARGE)		£4.50
VT3000	REW IDLER		£6.00
VT680, 6500, 6800	FS-BRAKE	6861505	£3.00
VT9700, 9900			
HITACHI TV			
OUTPUT MUDULE HM 6251			£5.50
OUTPUT MODULE HM 6232			£8
JVC			
HR330, 3660, 4100	T-UP IDLER SML	PU49280	£5.50
HR7200, 7600, 7650	T-UP CLUTCH	PU53462A	£2.25
HR7655, 7300, 7350, 7610			
HR7200, 7300, 7350	REEL IDLER	PU48967	£2.50
HR7600, 7610, 7650, 7655, 7700			
HR7600, 7610, 7650	ROLLER ASSY	PU49042A	£4.00
HR7655, 7700			
HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200, 7600, 7650	T-UP IDLER	PU51402A	£1.25
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120-121, 225			
HRD110, HRD120-121,	T-UP CLUTCH	PU55373	£2.00
HRD225, HRD111,			
HRD110, HRD120-121,	IDLER ARM	PU55374-3-8	£2.85
HRD225, HRD111			
HRD170, 180, 210, 230	IDLER ARM	PU58465	£2.25
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000			
HRS5500, HRS5500			
HRD456, HRD725	CLUTCH MECH	PU55882Z	£13.50
HRD140, 150, 157, 158	CLUTCH MECH,	PU57658	£11.50
HRD160, 250, 257, 565, 566, 755, HRP50			
HR3300, HR3330	REW IDLER	PU46380	£6.00
HR3660, HR4100			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	£2.80
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56044-1-5	£2.80
HRD160, 250, 257, 455, 565, 566, 725, 755, HPR50			
MATSUI			
VX730, 735, 750, 755,	CLUTCH	850A00005	£6.50
VX810, 820, 850, 880, 990			
VX730, 735, 750, 755,	LIMITED POST LEVER		£1.30
VX770, 800, 810, 880	ASSY		
VX990			
VX800A, VX900	IDLER REEL		£1.50
VX800A, VX820	REEL UNIT CLUTCH		£3.50
VX850, VX900	ASSY IDLER		£3.50
MITSUBISHI			
HS306, 307, 318, 319,	GEAR ASSY	522B00201	£5.25
HS400, 410, 710			
HS337, 338, 347, 349	IDLER	562B01701	£3.50
HS411, 412, 421, HS810, HS820, HSB30, HSE10, HSE20, HSE20, HSE30, HSE70			
HS306, 307, 318, 319	IDLER	641C34301	£2.00
HS400, 410, 710			
HS337, 338, 347, 412	IDLER	522902002	£3.00
HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE70			

MITSUBISHI Cont.			
HS337, 338, 411, 421	IDLER	562B01801	£3.50
HS200	TAKE UP IDLER (LARGE)		£4.50
HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£6.00
HS306, 307, 318, 319	SUPPLY REEL	522A00101	£3.20
HS400, 410, 710	DISK		
HS306, 307, 318, 319	TAKE UP REEL	522A00102	£3.20
HS400, 410, 710	DISK		
HS320	REEL DISK	522C06301	£3.00
HS337, 338, 411, 421	REEL DISK	522P00601	£5.00
HS300, 301, 302, 310	PULLEY	522C05201	£2.25
HS306, 307, 318, 319	GEAR WHEEL	641D71101	£1.50
HS400, 410, 710			
HS306, 307, 318, 319	GEAR WHEEL	641D71001	£1.50
HS400, 410, 710			
NEC			
N830, N831, N832, N833	TAKE UP CLUTCH		£2.25
N830, N831, N832, N833	TAKE UP IDLER		£1.45
N830, N831, N832, N833	REEL IDLER		£2.85
N895	TAKE UP IDLER SMALL		£5.00
N911, N915, N916, N917	REEL DRIVE PULLEY		£5.50
N9012, 9013, 9014, 9016, 9033, 9034, 9054, 9055, 9066, 9110			
N9510, 9520, 9530, 9610			
NATIONAL			
NV322, NV600, NV688,	IDLER UNIT	VXP0463	£2.75
NV777, NV788, NV332, AG6100, 6200, 6800, 6810			
NV300, NV333, NV340	IDLER ARM	VXL0997	£3.60
NV366			
NV300, NV330, NV333	IDLER UNIT	VXP0401	£0.75
NV340, NV366			
NV300, NV330, NV333	PLAY IDLER	VXP0433	£2.75
NV340, NV366, NV8620			
NV300, NV332, NV333	ACTION GEAR	VDG0016	£0.60
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6015			
NV333, NV688, NV2000	LOADING GEAR	VXP0325	£2.00
NV3000, NV7800			
NV300, NV332, NV333	INTERMEDIATE GEAR	VXG0017	£0.65
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6015			
NV330, NV333, NV340	CAM GEAR	VXG0158	£1.00
NV366, NV777, NV788			
NV230, NV250, NV260	IDLER ARM	VXP0521	£1.70
NV280, NV370, NV380, NV430, NV450, NV460, NV465, NV470, NV480			
NV630, NV650, NV730, NV780, NV810, NV830, NV850, NV870			
NVG7, NVG9, NVG10, NVG11, NVG12, NVG 14, NVG15, NVG16, VG18			
NVG30, NVG400, AG1000, AG1200, 1500, 1810, 2100,			
AG2200, NVH6S, NVH70			
NV370, NV430, NV870,	CAM GEAR	VDG0200	£1.20
NV730, NV830, NV850, NVG10, NVG12, NVG18			
NV730, NV770	IDLER UNIT	VXP0581	£2.50
NV2000, 2010 3000	IDLER UNIT	VXP0331	£1.00
NV2000, 2010, 3000	IDLER UNIT	VXP0329	£1.00
NV2000, NV3000	CAM GEAR	VDG0069	£1.00
NV7000, 7200, 7800	IDLER UNIT	VXP0344	£1.00
NV7000, 7200, 7800	CLUTCH	VXP0343	£4.00
NV8150, 8200, 8300,	IDLER UNIT	VXP0245	£0.90
NV8400, 8600, 8610, 8620			
NV8200, 8400, 8600	PLAY IDLER	VXP0243	£0.90
NV8610, 8620			
NV8620	CLUTCH	VXP0340	£4.00
NV332, NV600, NV688	IDLER	VXP0488	£3.50
NVG20, NVG21, NGV25	PULLEY UNIT	VXP0767	£5.00
NVG40, NVG45			
NV230, NV250, NV280	WORM WHEEL	VXP0604	£2.00
NV430, NV450, NV460, NV465, NV650, NV730, NV770, NV810			
NV870, NV890, AG1000			
NV370, NV380, NV630	IDLER	VXP0523	£3.50
NV780, NV830			
NV370	CLUTCH GEAR	VXP0595	£1.00
NVG7, NVG11, NVG12	WORM WHEEL	VXP0691	£1.50
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70			
NV2000, 2010, 3000	LOADING GEAR	VDG0035	£0.60
NV7000, 7200, 7800, 8050			
NV230, NV250, NV370	LOADING GEAR	VXP0520	£1.50
NV430, NV450, NV460, NV630, NV730, NV770, NV780, NV810			
NV830, NV890, NVG7, NVG10, NVG12, NVG15, NVG30, NVG120			
NGV130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	CLUTCH GEAR		£2.50
NV280, NV430, NV450, NV730, NV770, NV810, NV870, NV890			
NVG7, NVG10, NVG11, NVG12, NVG14, NVG15, NVG18, NVG30			
NCG120, NVG130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	LIMITER ROLLER		£1.50
NV280, NV300, NV333, NV340, NV366, NV370, NV430, NV450, NV460			
NV465, NV830, NV650, NV777, NV780, NV788, NV810, NV830, NV850,			
NV870, NV890, NV2000, NV2010, 7200, 7800, NVG7, NVG10, NVG12,			
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70, AG1000			
ORION			
MULTIPLE MODELS	IDLER	850A200004	£3.50
MULTIPLE MODELS	IDLER	850A200005	£6.50
VH1, VH2A	IDLER		£1.20
VH1, VH2A	IDLER		£1.20
VH1, VH2A	DRIVING GEAR		£0.60
VH1, VH2A	INTERMEDIATE GEAR		£0.65
VC150, VC180, VH200	IDLER		£1.50
VH201, VH205, VH212, VH250, VH254, VH288, VH300, CH303, VH312			
VH404, VH555, VH700, VH704, VH708, VH712, VH780, VH844, VH900, VH3,			
VH33			
SAISHO			
VR605, VR800, VR900	CLUTCH	850A20000	£6.50
VR1100, 1200, 1600, 2500, 3200, 3300			
VR3500, 3600, 3800	LIMITER POST		£1.30
VR1100, 1200, 1600, 2500, 3200, 3300, 3500, 3600, 3700			
VR605, VR800, VR900	IDLER		£3.50
VR2500, 3200, 3300, 3500, 3600, 3800			
VR705, VR805, VR905	IDLER		£1.50
SANYO			
VHR1110, 1150, 1200	IDLER	143-0-662T-14730	£5.00
VHR1300, 1500			
VTC5000, 5150, 6000	FF-REW IDLER	143-0-741T-20001	£3.00
VTC6500, VTCM10, M11, M20, M21, M30, M31, M50			
VTC9100, VTC9300	IDLER	143-0-551T-01400	£1.20
VTC9300	FF ROLLER ASSY	143-0-547T-00200	£2.20
VTCM10, M11, M20, M21	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
VTCM30, M31, M50			
VHR2100, 2300, 2500	IDLER	6130374890	£5.00
VHR2700			
VTC5000, 5150, 6000	PULLEY	143-0-662T 01201	£5.20
VTC6500			
VTCM10, M11, M20, M21	PULLEY	143-0-662T-10350	£5.50
VTCM30, M31, M50			
VHR3100, 3300, 3310	REEL DRIVE	143-0-662T-15621	£4.25
VHR3400, 3700, 3800	ROLLER		
VHRD500, VHRD700			
VPR5800, VTC5300	LOADING ROLLER	143-0-661T-03800	£1.00
VTC5400			
VTC3000	FWD LIMITER		£3.50
VTC3000	IDLER		£5.00
SHARP			
	IDLER ASSY	NIDL0005GEZZ	£1.50
	IDLER	NIDL0006GEZZ	£1.50
	IDLER ASSY	NPLYV0107GEZZ	£6.15
VC600, 651, 681, 682			
VC684, 685, 693, 699, 700, 783, VC6FR, VC6V3			
VC7300, VC7700, 7750	PLAY IDLER KIT	NPLYV0041+ NDA1V1007	£7.50

PLEASE PHONE US FOR TYPE NOT LISTED HERE AS WE ARE HOLDING 5000 ITEMS AND QUOTATIONS ARE GIVEN FOR LARGE QUANTITIES.

Please send £1 P&P and VAT at 17½%. Govt, Colleges, etc. Orders accepted. Quotations given for large quantities. Please allow 7 days for delivery. All brand-new Components. All valves are new and boxed. Prices quoted are subject to stock availability and may be changed without notice. TV & video parts sold are replacement parts.

VCR PINCHROLLERS Cont.

Sharp Cont.
VC387, VC481, VC483, VC486, VC496, VC581, VC582, VC583, VC585, VC402, VC471, VC473, VC477, VC500, VC571, VC573, VC584, VC5W20E, VCA1031 £2.50
VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787, VC793, VCT72, VC600, VC682, VC684, VC693, VC698, VC700, VC772, VC7810, VC782, VC7822, VC7282MK2, VC783, VC783, VC786, VC800, VCF3, VCA100, VCA102, VCA104, VCA202, VCA303, VCA211, VCA234, VCA501, VCA602, VCD801, VCD802, , VCH852, VCH881 £2.50
VC220 £2.50

SAISHO
VR2000, VC3800 £2.50

SOLARA
SV6500, SC6600 £2.50
SV7300, SV8200, SC8300, SV9200, SC9300 £2.50
SV7400, SV8400, SV8420, SV8500, SV8520, SC8550, SV8600, SV8620, SV8700, SV8710, SC8720, SV8800, SV8830, SV9500, SV9600, SV9810 £2.50
SV8000, SV8100 £2.50

SAMSUNG
SV716, SV717, VB510, VB520, VB610, VB616, VB617, VB619, VB620, VB626, VB627, VB629, VB910, VB910, VI510, VI520, VI611, VI616, VI621, VI626, V1900, V1910, VX510, VX520, VX616, VX617, VX619, VX626, VX627, VX629 £2.50
SVX301, SVX303, SVX305, SVX307, SVX319, SVX322, VB710, VB770, VB8220, VB971, VB8225, VI730, VI770, VI790, VI8220, VI8225, VX6220, VX710, VX712, VX720, VX730, VX750, VX770, VX790, VX8220, VX835, VX970, VX971, VX972 £2.50

SIEMEN
FM350, FM352, FM355 £2.50
FM361, FM362, FM363, FM364 £2.50
FM391, FM392, FM394, FM461, FM462, FM464, FM468, FM561 £2.50

SONY
SLC5, SLC6, SLC7, SL3000, SL8000, SL8080, SL8200, SL8600, SL36, SL37, SLJ10, SLT6ME, SLT7ME £2.50
SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100, SLF1, SLF11, SLF25, SLF30, SLF60, SLF100, SL200, SLF60PS, SLF90E, SLH150, SLHF850, SLK88, SLK95, SLT20ME, SLT30ME, SLT50ME £2.50
BMC100, BMC200, BMC500 £2.50
SLV201, SLV202, SLV301, SLV302, SLV401, SLV402, SLV801, SLV802 £2.50

TOSHIBA
DV80, DV90, DV96, SC97, V200, V201, V202, V205, V207, V300, V309, V500, V509, V55, V57, V61, V63, V65, V66, V67, V700, V71, V73, V74, V75, V77, V81, V83, V85, V86, V93, V94 £2.50
V5470, V5480 £2.50
V91, V951 (Pressure Roller Assembly) £4.50

VCR BELT KITS

AKAI
VP7100, VS9300, VS9500, V9700, VS9800 £1.30
VS1, VS2, VS4, VS5, VS12, VS15, VS53, VP88, V56, V58, V59 £1.00
VS10 £0.65

AIWA
AV66 £1.25
AV77 £1.40
G700 £1.60
G900 £1.80

ALBA
VCR3000X, VCR4000 £1.30

AMSTRAD
TVR123, VCR4600, VCR4700, VCR5200 £1.60
VCR7000 £0.80
VCR6000, VCR6100 £1.80

AUTHENTIC
N850 £1.20

DECCA
VR8300 £1.20
VRH8945DK £0.80

FERGUSON
3292, 3V00, 3V01, 3V16, 3V22, 8900, 8901 8902, 8903, 8904, 8906, 8909, 8912, 8922 £1.35
3V23, 8923, 8924, 8929 £0.65
3V29, 3V30, 8930, 8931, 8940 £0.90
3V31, 3V32, 8941, 8942 £0.85
3V35, 3V36,3V38, 3V39, 3V49, 8943, 8944 £0.70
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 57, 8945, 8947, 8948 £0.65
3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV30, FV32, FV33 £1.05

FIDELITY
H1S200, VCR600, VCR6100 £1.80
CVR100 £1.60
VTR1000 £1.00

FISHER
VBS7000 £2.45
VBS9000 £1.20
FVHP520, FVHP530, FVHP420 £0.60
FVHP615, FVHP618, FVHP620, FVHP622, FVHP710, FVHP711, FVHP715, FVHP716, FVHP720, FVHP721, FVHP722, FVHP725, FVHP730, FVHP830, FVHP840 £1.00
FVHP905, FVHP906, FVHP907, FVHP908, FVHP910, FVHP911, FVHP915, FVHP916, FVHP918, FVHP5000, FVHP5005, FVHP5050, FVHP5075, FVHP5100 £1.00
VBR339, VBS7500,VBS7600, VBS9900 £1.00
VBS3500 £0.75

FUJITSU
HS760, VX715, VX720D £1.60

FUNAI
V1, V25, VCR4600, VCR4800, VCR5200, VCR5400, VCR5600, VCR6600 £2.10
VCR4530, VCR5840, VCR5843, VCR6800, VCR680 £1.80
VIP3000, VIP5000 £1.60

GEC
3035 £1.50
V4004 £1.00

GOLDSTAR
GHV1221, GHV1232, GHV1241, GHV1242, GHV1243, GHV1244, GHV1245, GHV1246, GHV1248, GHV51, GHV8000, GHV8210, GHV8215, BCP4100, VCP4130 £0.80
GHV1290, GHV1291, GHV1295, GHV1296, VCP4200, VCP4300, VCP4301, VCP4305, VCP4306, VCP4310, VCP4311, VCP4315, VCP4320, VCP4321, VCP4325, VCP4326, VCP4000 £1.20
GHV1247, GHV8200 £1.50

GRUNDIG
MVS400, MVS440, VS400, VS410, VS440, VS450, VS460 £0.55

HINARI
VXL2 £0.80
VXL7, VXL8, VXL9 £1.80
VXL4, VXL35 £0.70
VXL5, VXL6 £1.60
VXL3, VXL20 £0.90

HITACHI
VT11, VT14, VT17, VT19, VT33, VT34, VT35, VT38, VT39, VT88, VT165, VT330 £1.00
VT5000, VT5500 £1.20
VT7000, VT8000, VT8500 £0.60
VT680, VT6500, VT6800, VT9300, VT9500, VT9700, VT9900 £0.50
VT52, VT61, VT62, VT64, VT65, VT85, VT86, VT640 £1.50
VT3000 £1.50
VT100, VT110, VT111, VT113, VT115, VT118, VT120, VT125, VT128, VT130, VT138, VT145, VT150, VT175, VT220, VT225, VT250, VT225, VT258, VT260, VTL30 £1.50

ITT
VR3605, VR3905, VR3935, VR3954, VR3985 £0.90
VR3913, VR3914 £1.00
VP3826, VR3906, VR3916, VR3926, VR3946, VR3948, VR3976, VR3986, VR3995, VR3997, VR6948 £0.65
VR3927, VR3928, VR3977 £1.40
VR3993, VR3994 £0.85
VR3963 £0.65
VR3912 £1.50
VR3917 £1.50
VR3929, VR3968 £0.85
VR3907 £1.00

JVC
HR3300, HR3330 HR3360, HR3660, HR4100 £1.30
HR7200, HR7300 £0.70
HR7350, HR7600, HR7610, HR7650, HR7655 £0.75
HR7700 £0.75
HRD110, HRD111, HRD120, HRD121, HRD225 £0.90
HRD140, HRD150, HRD157, HRD158, HRD160, HRD250, HRD257, HRD455, HRD565, HRD566, HRD725, HRD755, HRP50 £0.80
HRD170, HRD180, HRD210, HRD230, HRD300, HRD320, HRD370, HRD400, HRD430, HRD530, HRD700, HRD750, HRD950, HRS5000, HRS5500 £1.10

MATSUI
VX850 £0.75

MITSUBISHI
HS200, HS318, HS319, HS410 £2.00
HS300, HS301, HS302, HS307, HS310 £1.50
HS303, HS304, HS306, HS320, HS330, HS400, HS700 £1.50

NEC
N830, N831, N832, N83 £1.00
N895 £1.30
PVC2300, PVC2400

NATIONAL
NV300, NV332, NV333, NV340, NV366 £1.35
NV600, NV688, NV777, NV788, AG6010, AG6015 £1.00
NV2000, NV2010, NV3000 £1.50
NV7000, NV7200, NV7500, NV7800 £0.95
NV8600, NV8610, NV8620 £1.60
NV230, NV250, NV260, NV280, NV370, NV380, NV430, NV450, NV460, NV465, NV630, NV730, NV770, NV780, NV810, NV830, NV850, NV870, AG1000, AG1200, AG1500 £1.25

PHILIPS
VR6460/VR6920 £1.70
VR6540 £1.00
DV186, DV190, DV286, SV468, DV471, DV562, DV571, DV761, VR6180, VR6182, VR6185, VR6285, VR6290, VR6291, VR6293, VR6362, VR6367, VR6390, VR6391, VR6393, VR6467, VR6468, VR6470, VR6561, VR6570, VR6581, VR6670, VR6676, VR6760, VR6761, VR6762, VR6870, VR6970, VR6975, VR72SB8, VR68SB4, VR86SB1, VR92SB3 £0.85
VR5442, VR6542, VR6843, VR6943, VR44SB9 £0.70

SAISHO
VR2000 £0.90
VR3800 £0.75

SALORA
SV6500 £1.00
SV6600 £1.50
SV8000 £1.20
SV8100 £0.60
SV8500, SV8520, SV9500 £1.50
SV7300, SV7400, SC8400, SC8420, SV9200, SV9300 £1.20

SAMSUNG
SV16, SV717,V616, V1621, V1626, VX616, VX626, VX627 £0.85
VB520, VB610, VB616, VB617, VB619, VB620, VB626, VB627, VB629, V1510, V1520, V1611, VX510, VX520, VX617, VX619, VX629 £1.00
VB900, VB910, V1900, V1910 £1.10

SANYO
VTC5000, VTC5150, VTC6000, VTC6500, VTCM10, VTCM11, VCTM20, VTCM21, VCTM30, VCTM31, VTCM50 £0.75
VTC5300, VTC5350, VTC5400, VPR5800 £1.00
VTC5500 £0.95
VTC9100, VTC9300 £2.20
VTC1100, VTC1300, VTC1500, VHR1100, VHR1150, VHR1200, VHR1300, VHR1500 £0.90
VHR2100, VHR2300, VHR2500, VHR2700 £1.50

SHARP
VC200, VC381, VC383, VC384, VC386, VC388, VC390, VC393, VC2300, VC8381, VC9100, VC9300, VC9500, VC9700 £1.25
VC6300 £1.50
VC7300, VC7500, VC7700 £1.50
VC8300 £1.50
VC340, VC387, VC471, VC473, VC477, VC481, VC483, VC486, VC488, VC496, VC8481 £1.00
VC402, VC500, VC571, VC573, VC581, VC582, VC583, VC584, VC585, VCSF3 £0.90
VC600, VC651, VC681, VC682, VC684, VC685, VC693, VC698, VC700, VC772, VC781, VC782, VC783, VC785, VC786, VC793, VC800, VC7810, VC7822, VC6F3, VC6V3, VCA100, VCA102, VCA103, VCA104, VCA202 £0.70
VC7750, VC8000 £1.50

SONY
SLC5, SL36ES, SLJ10, SLT6ME £1.40
SLC5, SLC7, SL37E, SLT7ME £1.40
SLC9 £1.65
SL8000, SL8080, SL8200, SL8600 £2.00

TOSHIBA
V55, V57 £0.85
V5250, V5280 £2.30
V33, V53, V96, V9600, V9680 £0.85
V61, V63, V65, V66, V67 £1.50

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THORN 9000 SERIES £7.50
PHILIPS G9 £6.50
G8 520/550 £6.50
KT3 £4.00
DECCA 100 SERIES £6.50
120/130 £6.50
ITT CVC 20/30 £6.00
CVC 825 £7.50
RANK T20A £6.50
UNIVERSAL TO FIT
20AX TUBE £8.00
30AX TUBE £8.00

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

VIDEO MOTORS

AMSTRAD
VCR 7000 REEL MOTOR £20.00

AIWA
AV77 CAPSTON MOTOR £25.00

AKAI
VP7100, VS9300, VS9500, V9700, VS9800 CAPSTON MOTOR £24.00
VP7100, VS9300, VS9500, VS9800 DRUM MOTOR £22.00

AUTHENTIC
N850 REEL MOTOR £12.00

BLAUNPUNKT
RTV211, RTV214, REEL MOTOR £13.00
RTV325 LOADING MOTOR £8.00

DECCA
VR8300 REEL MOTOR £12.00

FISHER
BVR330, VBS3500, VBS7500, VBS7600, VBS9900 REEL MOTOR £8.00

FERGUSON
PU 45979 CAPSTON MOTOR £24.00
HR3300, HR3660, HR4100, 3V00, 3V01, 3V16, 3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922
PU 55371V CAPSTON MOTOR £28.00
3V35, EV36, 3V38, 3V39, 8943, 8944, HRD110, HRD111, HRD120, HRD121, HRD225
PU 46414 DRUM MOTOR £22.00
HR3300, HR3320, HR3330, HR3360, HR3600, HR3660, HR4100, 3V00, 3V01, 3V16, 3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922
PU51281V REEL MOTOR £12.00
3V29, 3V30, 3V31, 3V32, 3V39, 8930, 8931, 8941, 8942, HR7200, HR7300, HR7600, HR7610, HR7650, HR7655

FERGUSON & JVC
PU 58635V CAPSTON MOTOR £29.00
3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430
PU 58636W REEL MOTOR £17.00
3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, FRD430, HRD530
LOADING MOTOR £8.00
3V2, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948, HRD140, HRD150, HRD157, HRD158, HRD160, HRD250, HRD257, HRD455, HRD565, HRD566, HRD725, HRD755, HRP50, R73AF
PV5201W CAPSTON MOTOR £29.00
HRD330, HRD337, HRD400, HRD520, HRD530, HRD700, HRD750, HRD950, FV14T
HRD140, HRD150 CAPSTON MOTOR £30.00
HRD250, HRD565, HRD566
3V29, 3V30 CAPSTON MOTOR £30.00
8930, 8931

HINARI
VXL2, VXL4, VXL20, VXL35 LOADING MOTOR £8.00
VXL20 REEL MOTOR £20.00

HITACHI
5578154 CAPSTON MOTOR £25.00
VT52, 61, 62, 63, 64, 65, 640
VT3000 CAPSTON MOTOR £24.00
VT3000 DRUM MOTOR £22.00

ITT
VP3826, VR3906 LOADING MOTOR £8.00
VR3918, VR3926, VR3846, VR3948, VR3076, VR3997, VR6948
VR3912 CAPSTON MOTOR £24.00
VR3911 DRUM MOTOR £22.00
VR3605, VR3905 CAPSTON MOTOR £28.00
VR3935, VR3954, VR3985
VR3913, VR3914 REEL MOTOR £12.00
VR3993, VR3994

MITSUBISHI
288P02801 MOTOR REEL SPOOLING £35.00
HS300, 301, 302, 310
288P02806 MOTOR REEL SPOOLING £31.50
HS303, 304, 320, 330, 700
288P02401 MOTOR REEL TAKE UP GEN £21.00
HS303, HS320, HS700

NEC
N830EG, N831EG CAPSTON MOTOR £28.00
N832, N833EG
N895 LOADING MOTOR £8.00

NATIONAL
MYN 135V5L REEL MOTOR £13.00
NV300, NV332, NV333, NV340, NV366
VEM0212 MOTOR REEL GEN NV730/NV770 £30.00
VEM0217 REEL MOTOR NV7000 £19.00
MAX13V9LP CAPSTON MOTOR NV300, NV332, NV333, NV340, NV366, NV600 £33.00

ORION
NEVHL, VC150, VC180 REEL MOTOR £20.00
VH201, VH205, VH212, VH250, VH254, VH228, VH3, VH300, VH303, VH312, VH700, VH704, VH708, VH712, VH770, VH774, VH780, VH820, VH844, VH900, VH974, VH1000, VH1204, VH200, VH2004, VH2204, VH3030, VH3050, VH3060, VH4008, VHF2A, VP200, VR2948, VR2949, VR2956, VR2957

ORION Cont.
NVHL, NVHML LOADING MOTOR £8.00
VH250, VH254, VH288, VH300, VH404, VH412, VH512, VH530, VH535, VH600, VH630, VH635, VH640, VH666, VH704, VH730, VH735, VH744, VH770, VH774, VH820, VH844, VH850, VH888, VH893, VH900, VH974, VH1012, VH1204, VH1440, VH1500, VH1660, VH1800, VH2004, VH3030, VH3050, VH3060, VH4010, VH4015, VH4020, VH5010, VH5015, VHF2A, VP220, VR2948, VR2949, VR2956, VR2957, VR2966, VR2980, VXL20, VXL25, VXL30

PHILIPS
VR6540 REEL MOTOR £22.00

SAISHO
VR705, VR805 REEL MOTOR £20.00
VR905, VR2000

SAMSUNG
VB510 REEL MOTOR £11.00

SANYO
4-529V-10800 (RM11) REEL MOTOR
VTC5000, VTC5150, VTC5300 £8.00
VTC5400, VTC6000, VTC6500
VTC3000 CAPSTON MOTOR £20.00

SHARP
RMOTV 1008GEZZ REEL MOTOR £20.00
VC200, VC381, VC384, VC385, VC386, VC483, VC3300, VC8381, VC9100, VC9300, VC9500, VC9700
RMOTV 1007GEZZ REEL MOTOR £16.50
VC300, VC402, VC471, VC477, VC481, VC482, VC488, VC496, VC500, VC571, VC573, VC581, VC582, VC583, VC584, VC5F3, VC8481, VC8581, VC7822, VCA102 CAPSTON MOTOR £32.00
VCA202, VCA234, VCA602

SONY
BHF 1100D CAPSTAN MOTOR £20.00
SLC5, SLC7, SCL37, SL3000

THOMSON
VK300, VK301 CAPSTON MOTOR £21.00
VK302, VK303,VK305, VK3301, VK300, VK302 DRUM MOTOR £19.50
VK303, VK305, VK308, VK3301

TOSHIBA
V55, V57 CAPSTON MOTOR £28.00
V61, V63 LOADING MOTOR £8.00
V71, V73, V74 REEL MOTOR £18.00
V75, V81, V83, V85, V86, V93, V94, V300, V500, V700, DV90
V71, V73, V74 CAPSTON MOTOR £12.50
V75, V81, V83, V85, V700
V86, V93, V94 CAPSTON MOTOR £15.00

CASSETTE HOUSING

GRANADA
VHSDP1 CASSETTE LIFT ASSEMBLY £15.00
VHSVJ2 £26.00

FERGUSON & JVC
3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V48, HRD110, HRD111, HRD120, HRD121, HRD225 £26.00
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, HRD141, HRD150, HRD157, HRD158, HRD160, HRD250, HRD257, HRD455, HRD565, HRD566, HRD725, HRD755 £26.00
3948, 8950, FV10B, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, FV26, FV395, HRD230, HRD430, HRD530 £26.00
3V58, 3V59, 3V64, 3V65, FV11R, 3950, 8951, HRD170, HRD180, HRD370 £26.00

ITT
VR3605, VR3905 £26.00
VR3916, VR3926, VR2946, VR3948, VR3976, VR3986, VR3995, VR3997, VR6948 £26.00

NATIONAL
NV730 £43.00

NEC
N830EG, N831EG, N832, N833EG £26.00
N895 £26.00

PHILIPS
CASSETTE LIFT ASSEMBLY 9120366 £11.00
DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, VR6285, 6290, VR6291, 6293, 6362, 6367, 6393, VR6467, 6468, 6470, 6561, 6670, VR6760, 6761, 6870, 6970 £11.00

TELEFUNKEN
VR2970 £26.00

THOMSON
V320, V321, V323, V326, V4200, V4300 £26.00
V342, V343, V352, V353, V360, V364, V368, V4210, V4230, V4260, V4400, V5500, V6000, V8540 £26.00

TOSHIBA
V55, V57 £26.00
V65, V66 £26.00

PANASONIC MODE SWITCHES

NV2000, 2010, 7000, 7200, 7300 (VSS0048) £3.50
NV230, 260, 430, 810, 870, 2900, 4300 (VSS0110) £2.25
NV830 (VSS0091) £2.10
NV300, 333, 340, 366, 688, 777, 778 (VSS0060) £3.75
NVG21, 25, NVH65, NVD80 (VSS0175A) £2.00

ON/OFF MAIN SWITCHES

GRUNDIG
PART NO: 29703-29102
USED ON: C7500, C7500TT, C8500, C8502, C8712, C8714, C8894, M66-190, M66-190/99, M70-195, P40-345, ST66-1602, T55-340, V7722
PRICE: £3.25

ITT
PART NO: 13/1074
USED ON: CP0200, 0211F, 0323, 0323/1, 0341/15, 0345F, 0351, 0351/1, 0361, 0361/1, 9350, CT0500, 0500/1/T, 0500T
PRICE: £3.50
PART NO: LFC 005
USED ON: CVC40
PRICE: £3.25

MATSUI/SAISHO
USED ON: MATSUI 2190, SAISHO FST2130TX
PRICE: £3.50

PHILIPS
USED ON: K30, K35, K40, KT3, KT4
PRICE: £1.50

SONY
PART NO: (POWER SWITCH + REMOTE SWITCH)
USED ON: KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056, KV2082, KV2066, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KV2756PE3, KX20PS1, KX20PS2, KX27PS1
PRICE: £3.50
PART NO: (POWER SWITCH +REMOTE SWITCH)
USED ON: KV2022, KV2024
PRICE: £3.50
PART NO: 155482011 (POWER SWITCH)
USED ON: KV1810 MK1, KV1810 MK2, KV1820, KV1822, KV2000 MK1
PRICE: £7.50
PART NO: 155496711 (POWER SWITCH 26mm)
USED ON: KV1400, KV1440, KV2040, KV2060
PRICE: £2.00
PART NO: 155258800 (POWER SWITCH 21mm +REMOTE SWITCH)
USED ON: KV2020
PRICE: £2.50
PART NO: 155277400-21 (FUNCTION SWITCH)
USED ON: KV1612 MK1, KV1612 MK2, KV2052, KV2056, KV2212, KV2215, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KV2756PE3
PRICE: £0.50
PART NO: 155336300 (FUNCTION SWITCH)
USED ON: VARIOUS
PRICE: £1.00

VIDEO LAMPS

UNIVERSAL VIDEO LAMPS 9V 80mA (310mm WIRES) £0.30
PANASONIC VIDEO LAMPS £0.50
SHARP VIDEO LAMPS £0.50
HITACHI 5381682 (VT63/64) VIDEO LAMPS £1.35

VIDEO SENSOR LAMPS

AIWA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FIDELITY, FISHER, FUJITSU, FUNAI, GEC, GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, FERGUSON, TOSHIBA
(SENSOR LAMP CODE NO. VL05) £1.60
AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912/VRP3833), JVC (HR2200/3300/3330, HR3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, VR519/610), THOMSON (VK300/305/306/3301), FERGUSON (3V00/3V16/3V22/3V24/3292/8900/8901/8902/8903/8909/8912/8922/8925) £0.30
(CASSETTE LAMP 9V 80mA 310mm WIRES CODE NO: VL01)
BLAUPUNKT, ORION (VH1/2A), NATIONAL (NV2000, NV2010, NV3000, NV8150, NV820D, NV8400, NV8600, NV8610, NV8620), SHARP (VC2300, VC6000, VC6200, VC6300, VC7300, VC7700, VC8900, VC8300) £0.50
(CASETTE LAMP 6V 150mA CODE NO: VL02)
AKAI (VS10), GRANADA (VHSXJ3), ITT (VR3993, VR3994), JVC (HR2650, HR7600, 7610, HR7650, HR7655), TELEFUNKEN (VR630, VR535, VR539, VR550, VR630, VR650), THOMSON (V309, V316, V357, VK309, VK411, TX8000), FERGUSON (3V31, 8941, 8942) £0.50
(CASSETTE LAMP 9V 80mA 310mm SKEQ CODE NO: VL06)
AUTHENTIC (N850), DECCA (VR8300), GRANADA (VHSTJ3, VHSWJ1, VHSEJ3), ITT (VR3913, 3914, 3963), JVC (HR7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMPSON (V4100, VK306, 309, 312, 410), FERGUSON (3V23, 3V29, 3V30, 8923, 8924, 8929, 8930, 8931, 8940) £0.50
(CASSETTE LAMP 9V 80mA 210mm SKEQ CODE NO: VL07)
GRANADA (VHSAY3), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700) £0.70
(CASSETTE LAMP 5V 115mA CODE NO: VL08)

NATIONAL LINE OUTPUT TRANSFORMER

TLF 146-11B £17.00
TLF 15542F £25.00
TLF 14568F £26.00
TLF 14567F £26.00
TLF 14715F £27.00
TLF 14749B £20.00
TLF 6609B £28.00

CASSETTE DC MOTORS

6V MOTOR £1.70
9V MOTOR £1.70
12V CW MOTOR £1.70
12V CCW MOTOR £1.70
13.2V CCW MOTOR £2.90

CASSETTE TAPE HEADS

MONO HEAD £3.90
STEREO HEAD £1.10
MINI HEAD £2.30
AUTO REVERSE HEAD £2.60

JUST ARRIVED

VIDEO HEADS

AKAI
VSF600, VSF650 3600P
VP7100, VP7200, VP77 1500P
VS155, VS165 2500P
VS20, VS22, VS24, VS25, VS26, VS27, VS422, VS425, VS426, VS427, VSF10, VSP8, VSP9 1400P
VS240, VSP82, VS202 1350P
VS33 2400P
VSR9 1500P

AMSTRAD
VCR8800, VCR8804, VCR9340 2400P
DD8900, DD8904, TVR4, VCR6200, VCR8600, VCR8602, VR8700 1200P
VCR8603, VCR8604, VCR8704, VCR8714 1350P

BAIRD
VC14L 3000P
VHS82 7000P

BLAUPUNKT
CR1000, CR1200, CR1500 4650P
CR1800 4100P
RTV321, RTV322 1700P
RTV330 2300P
RTV333 1000P
RTV33B 2800P
RTV348 2700P
RTV404, RTV414 3000P
RTV635 3000P
RTV640 3000P
RTV750, RTV800, RTV900 3500P
RTV810 4400P
RTV910 4500P

JVC
HRD330, HRD337, HRD440, HRD637, HRD641, HRD660, HRFC100 2100P

JVC AND FERGUSON
8902/8903/8909/8912/8922 1000P
8923/8925/8929/8935 650P
8931/8933 750P
FV43H, HRD860 3800P
VC141L, HRD190, HRD610 3050P
FV44L 2200P
BR1600, HRD142, HRD156, HRD152 1550P
BR6200 720P
HRD154, HRD217, HRD321, HRD350, HRD521, HRD522, HRD525, HRD527, HRD550 1700P
HRD580, HRD620, HRD650 2900P

FIDELITY
VR900, VR910 1500P

FISHER
FVHD140, FVHD40, FVHP1, FVHP10, FVHP20 FVHP40, FVHS10 1150P
FVHP200, FVHP210, FVHP300, FVHP310 1800P
FVHP500, FVHP5100, FVHP730, FVHP830 1100P
FVHP980 2500P

FUNAI
E1100, VIP5000 1100P
VCR5840, VCR8007, VIP2500A, VIP3000A, VIP6000, VIP150 2000P
VCR4530, VCR6000, VCR6100 1300P
VCR8103, VCR600, VCR6100 1600P
VCR8103, VCR8107 2200P
VIP300A MKII 1900P

GEC
V4005H 1500P

GOLDSTAR
GHV1232, 1233, 1241, 1242, 1243, 1244, 1290, 1291, 1295, 1296, 1891, VCP4130, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4326 1300P

GRUNDIG
VS456 1600P
SE6110, SE9100, TVR4510, TVR5510, VS500, VS510, VS5180, VS6190, VS700, VS900 1400P
VS790, VS930, VS940 2400P
MVS660, SE6160, VERONA, VS660, VS6690 3500P
MVS710, MVS720, MVS910, SE9120, VS800, VSB10, VS910, VS920, SE7120, VS710, VS720 1700P
VS160, VS740 4400P
VS170 4600P
VS680 4600P

HINARI
VCR34H, VTV200, VXL90 1300P

HITACHI
VT15, VTP10, VTP30 1000P
VT16B, VT260, VT498 2600P
VT570, VT575, VT576, VT580, VT585, VT588 3400P
VT5600 1100P
VT60 1300P
VT660E 2600P
VT6700, VT6800 1200P
VTL30 2000P
VT522, VTM620, VTM622, VTM720, VTM722, VTM822 1900P
VTM725, VTM726, VTM72B 1400P

ITT
VR3520, VR3701, VR3719, VR3720, VR3721, VR3759, VR9720 2000P
VR3730, VR3731, VR3749, 2500P
VR3907, VR3908 1600P
VR3918, VR3919, VR3938 1500P
VR396B 7000P
VR3984 2300P
VR3958, VR4993 650P
VR4913, VRP3833 650P

LUXOR
9245, 9251, 9254 1225P
9255, 9256 2150P
9270, 9271, 9273 1800P
9272, 928217 2700P
9252 2500P
928017, 928077, 928097, 929107, 929117 1700P
9253 2500P
9281 2700P
9284, 9295, VR3701, VR3721, VR3731, VR3761 2100P

MATSUI
VX600 1100P
VX750 1500P
VX990 1500P

MITSUBISHI
HSE12, HSE22, MX1 2200P
HS411EZ, HS411GZ 2900P
HS273 1700P
HSB10, HSB20, HSE10, HSE20, HSE21, HSE41 2200P
HSB11, HSB21 2200P
HSB30 2400P
HSE31, HSB31, HSE32 2800P
HSE50 3300P

NATIONAL
NV8050, NV8051 2800P
AG1000, AG1050, NV260 1600P
AG6010, AG6015 2500P
AG6840 2400P
NV200 725P
NVD80 3900P
NVF65, NVH75 3200P
NVF51 4200P
NVG19 2300P
NVJ33, NVL21, NVJ30 1800P
NVJ35 2500P
NVM1, NVM3, NVM5 4200P
AG2100, AG2200 700P
NVF65 3200P

N.E.C.
DX2000 3400P
DS6000 3500P
DX1000, DX1600, N9040, N9053, N9055 1300P
DX4000, N9610, DX3000 3000P
N9052, N9530 3400P
N9110, N9120, N914C 2400P
VCP1 1700P
PVC2300, PVC240, PVC740, PVC744, PVC760, PVC764 1400P

SAMSUNG
VM1560, VN1561 2200P

SANYO
VHR7900 3000P

SHARP
VC585, VC685 2000P
VC90ET 3900P
VFH815 2800P

SONY
SLV373UB 2600P

TOSHIBA
V660 2350P
V880MS 2600P
V700G 3700P
V500G, V509G 2500P
V9680 2900P
V300G, V301, V305, V309G 2550P
V61, V63 1700P
V110, V120, V130, V140, V210, V220 1800P

TELEVISION ON/OFF MAINS SWITCHES

Baur, Normende, Nova, Pioneer, Quelle, Saba, Salora, TEC, Thomson & Vega 375P

VIDEO MOTORS

HITACHI
VT11, VT14, VT15, VT16, VT17, VT19, VT35, VT39, VT57, VT88 (capstan motor) 3100P

BANG & OLUFSEN
VHS65, VHS90 (capstan motor) 3100P

LOADING MOTOR UNITS

ITT
VR3605, VR3905, VR3955, VR3985 1500P
VP2826, VR3906, V43926, VR3976 1250P
VP3946, VR3906, VR3948, VR3986, VR3995, VR6948 1500P

JVC
HRD110, HRD111, HRD120, HRD121, HRD225 1500P
HRD140, HRD150, HRD157M, HRD158MS, HRD160, HRD250, HRD257MS, HRD566, HRP50 1250P
HRD455, HRD725, N895 1500P

SABA
VR6005, VR6014, VR7004, VR7011, VR8011, VR8014 1500P
VR6006, VR6007, VR608, VR6009, VR6018, VR7007, VR7018, VR9006 1250P
VR6016, VR6038, VR7016 1500P

TELEFUNKEN
VR1925, VR1930, VR1940, VR1950, VR925, VR930, VR940, VR950 1500P
A920, VR2920, VR12970, VR7921, VR7926, VR7931, VR7971, VR975 1250P
VR1970, VR1980, VR7970, VR7980, VR970, VR980 1500P

THOMSON
V320, V321, V323, V326, V4200, V4300 1500P
V342, V343, V352, V353, V360, V4210, V4230, V4260 1250P
V364, V368, V4400, V6000 1500P

THORN-FERGUSON
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 1500P
3V44, 3V45, 3V48, 3V54, 3V55, 3V57, 8947, 8947B, 8948 1250P
3V43, 9845 1500P

TOSHIBA
V55, V57 1500P
V65, V66, V67 1250P
V61, V63 1500P

CASSETTE HOUSING

AKAI
VS35, VS53, VS55, VS66, VS75 2600P

FERGUSON
FV31R 4300P

JVC & FERGUSON
HRD515, HRD520, HRD527, HRD540, HRD550, HRD580, HRD600, HRD610, HRD620, HRD660, HRD670, HRD830, HRD840, HRD850, HRD860, HRD4050, HRD6600 & FV37H 2400P

IC TRANSISTORS

M491BB1 500P
SAA5243PE 800P
TIP112H 50P
UPC1486H 150P
STR4090A 650P

IC AND TRANSISTORS

BU506DF 120P
BUZ11 200P
BUZ80 200P
M494B1 700P
SAA5231 300P
SAA1293 550P
S2000AG 175P
S2000AF 175P
S2055A 175P
S2000AF 200P
S2530A 100P
TEA2018A 200P
UC3844 100P
UPC1185H2 400P

REMOTE CONTROLS

AKAI
RC-V10A 1000P
RCV37B 1000P
V25A 1000P

BUSH
2020T, 2114T, 2321T, 2514T 1000P
2020, 2114, 2321, 2514 1000P

DECCA
RC70 850P

FISHER
RC905B 1000P

GRANADA/REDIFFUSION
UNIVERSAL, 79500C, 986700 850P
SATELLITE 1000P
MK4 TEXT, 70115G, 70133G, 70357E 850P
MK4A TEXT, 70375C 850P
95288E 1000P
94490D 1000P

REMOTE CONTROLS

Description	Order Code	Price
GRUNDIG		
TP160E	RC 107	900p
TP200, TP300	RC 380	800p
TP400	RC 401	800p
TP590-600	RC 600	850p
TP390,TP610	RC 610	850p
TP621	RC 621	850p
TP630, TP650	RC 650	850p
TP660	RC 660	850p
TP661	RC 661	850p
HITACHI		
CLE800-CLE830	RC 140M	850p
A617402/655602	RC 192	875p
A512120/230	RC 900	800p
A514790	RC 901	850p
A5088470	RC 902	800p
A518612	RC903	900p
SCL002	RC904	850p
C2096	RC 905	850p
A511940	RC 906	800p
655602H	RC 907	850p
ITT		
IFB13, 14, 15	RC 143	875p
FS4	RC 148	850p
RG305	RC 305	825p
RG306	RC 306	825p
FS9/1-10/1	RC 307	850p
VS5 RUK	RC 308	825p
VS4-1	RC 310	850p
MULTICONTROL (17C20)	RC 311	800p
KORTING		
18279, 18396, 18460, 18521 SE	RC 108	850p
40540 VTS	RC 108	900p
LOEWE		
DC11	RC 146	850p
MATSUI		
010270601	RC 889	850p
VX770	RC 892	850p
METZ		
JAVA COLOR (6890)	RC 166	850p
COLOR (7156)	RC 183	850p
JAVA (7180)	RC 184	850p
MITSUBISHI		
939P/03607, 939P/03609	RC 140M	850p
NOKIA		
SATELLITE	RC 550	850p
NORDMENDE		
TC2336	RC 351N	850p
CMC1, TC3519	RC 356	875p
OCEANIC		
390C9500	RC 339	900p
ORION		
RC53	RC 892	850p
PANASONIC		
EUR51200	RC 200	850p
TC2200	RC 201	850p
VSQ0357/NV730	RC 202	875p
TNQ1621	RC 203	900p
PHILCO		
CARVEL, CONCORDE, MERCURY, TELESTAR	RC 108	850p
TC10	RC 152	900p
PHILIPS		
RC5002,5154	RC 134	850p
KT3 NON TEXT	RC 135	825p
69117032	RC 178	875p
69117194	RC 180	875p
RC5991-UNIV	RC 300	850p
RC38	RC 301	875p
KT3 TEXT	RC 5301	800p
RC5352	RC 5352	800p
RC5375	RC 5375	850p
RC5 STANDARD	RC 5534	850p
RC5901	RC 5901	850p
RC5903	RC 5903	800p
SABA		
T6772	RC 149	900p
TC319-320	RC 328	875p
TC356	RC 356	875p
TC358	RC 358	850p
TC360	RC 360	800p
TC365	RC 365	800p
SALORA		
SERIES L	RC 190	875p
86173	RC 882	850p
SANYO		
RC218, RC222, RC228, RC238	RC 140M	850p
JXGE	RC 878	850p
JXDE	RC 884	850p
VHR2300	RC 890	850p
RC628	RC 865	900p
SHARP		
G0121CESA, 123CESA, 204, 251	RC 140M	850p
SIEMENS		
FC616	RC 130	850p
FC631	RC 132	850p
FC742	RC 164	900p
SONY		
RM604, RM605, RM606	RC 140	850p
32 CHANNEL	RC 140M	850p
RM613	RC 141	850p
RM632, RM636	RC 160	850p
TATUNG		
FXA	RC 877	850p
RC70	RC 883	750p
FX70 FASTTEXT	RC 894	850p
TELEFUNKEN		
FB632	RC 632 ST	850p
FB639	RC 639 ST	850p
THORN/FERGUSON		
3V35-42	RC 342	850p
3V31-32	RC 344	850p
3V57-58	RC 628	900p
TX10 TEXT	RC 732	750p
TX10 STEREO TEXT	RC 738	750p
TX9-90-100	RC 740	750p
3V55, FV11	RC 783	900p

Description	Order Code	Price
TX100 FASTTEXT	RC 785	800p
TX100 STEREO FASTTEXT	RC 789	800p
PROFESSIONAL	RC 790	800p
TOSHIBA		
CT937	RC 950	850p
CT9117	RC 951	850p
201R4B	RC 952	850p

UNIVERSAL PROGRAMMABLE REMOTE CONTROL
Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (need original remote control TC program)
Order code: IR100R Price: 1950p

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

BACKUP BATTERIES

REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES
Replaces Philips Part No's:
138-10138, 138-10313. 1.2V – 90mAh 120p
Replaces Philips Part No's:
138-10229. 2.4V – 90mAh 200p

REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES
Replaces Ferguson Part Nos:
00E6-066-001, 2.4V
Used on: 3V35, 3V56, 3V58, 3V65 250p
Replaces Ferguson Part No: 00E6-067-001. 1.2V
Used on: TX10 150P

REPLACEMENT LINE OUTPUT TRANSFORMERS

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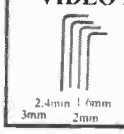

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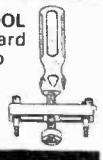

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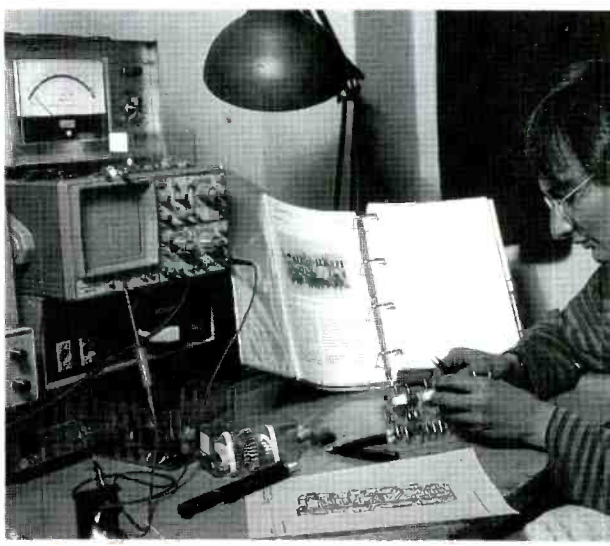

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NVQs

For as long as one can remember the City and Guilds of London Institute has set the pattern for technical training in our industry. Its approach has served us well and has proved to be adaptable as the technology has evolved. The City and Guilds qualifications are respected, and those who hold them consider the effort to have been worthwhile. Now, as an article by Joe Cieszynski on a later page relates, all this is to change. We are to move to a system called National Vocational Qualifications, which will be based on an assessment of candidates' competence in carrying out set tasks. Assessment will be a problem in itself, apart from educational considerations. How will it be practical, at a reasonable cost, to carry out workplace assessments as envisaged? The logistic problems will be formidable to say the least. So formidable that the system may never get off the ground. In which case the system would atrophy and we would be worse off than before. But it is the educational aspects that are the main concern. Here again there is good cause to suspect that we shall end up worse off than before.

There seem to be several fundamental fallacies about the NVQ approach. One is the assumption that technologies are all fundamentally the same and can be learnt and students' abilities assessed in a similar manner. The real debate concerns how much theory one needs to know. One doesn't need a degree in agronomics to be able to plough a field competently. Nor does one need a knowledge of the finer aspects of electronic circuit design to be able to fault find effectively. One does however need to know how circuits work if one is to fault find at component level. Maybe the idea is that such fault-finding ability is no longer necessary or economic. Since most circuitry is today hidden away in anonymous-looking plastic lozenges, perhaps it's thought that the 'black-box' approach is adequate. Check the listed voltages and clear/condemn on that basis alone. This overlooks the interactive nature of much circuitry, particularly in TV sets. D.C. connections, feedback loops, shut-down systems, dependence on the presence of pulses for identification purposes, clamping, gating and so on mean that much of what goes on in TV and video equipment cannot be checked on the black-box approach alone. You have to be able to see a TV or video chassis as a complex system with many parts that depend on each other for the successful operation of the whole. I'm far from sure that an assessment of a few basic technical competences – say the use of test equipment, being able to carry out and assess the results of measurements, changing components and so on – is an adequate foundation for technological sleuth work. All right, with a bit of luck it may work for much of the time. But even when it does, time spent on methodical checking can be saved if one has a deeper appreciation of how the equipment concerned works.

I recall someone who once ran a successful rental/repair operation telling me how he deliberately restricted his staff's knowledge. His main concern with the raw recruits he took straight from school was their ability to maintain good customer relations. He taught them how to do field servicing on one or two particular chassis by panel swapping (that was before the setmakers spoilt things by putting most of the circuitry on one panel). By doing this he had staff who could just about carry out first-line servicing – and would never be pinched by other firms because they would be useless to anyone else! Anything that didn't respond to panel swapping could be handled by himself.

The danger is that the NVQ system will produce the equivalent of a generation of panel swappers. All because those who set themselves up to decide what needs to be done and how don't themselves know what is involved. Perhaps, the assessment process being what it is, it would be possible to cobble on extra bits indefinitely as the basic deficiencies of the system became apparent. But it would be better to take the existing approach and improve/develop it as necessary than move to something totally different that might work in some fields but seems to be inherently defective where complex technology is involved.

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COVER PHOTO

This month's cover photograph shows the Hitachi G7PS Mk. 2 chassis. See servicing article on pages 548-550.

Teletopics

CONSUMER DIGITAL VCR STANDARDS

The fifty members of the HD Digital VCR Conference have agreed, at a meeting in Tokyo, to standards for domestic digital VCRs. There are two, for standard and high-definition pictures. Members of the Conference include Matsushita, Philips, Sony, Thomson, Toshiba and computer companies Apple and IBM – they are involved because a digital VCR can be used to store computer data. The new generation of VCRs will store the video information in digital form using a cassette about two thirds the size of a standard VHS cassette – playing time will be four and a half hours. Initial models could be launched some time next year. Prices in the region of £2,000 have been suggested.

SATELLITE TV

Launch of the Astra 1D satellite this autumn could see fourteen new channels in operation by the end of the year, bringing the total number of Astra channels to 64. SES is reserving only one or two of Astra 1D's transponders for experimental digital TV transmissions.

Eutelsat has carried out, via its II F1 satellite at 13°E, the first European demonstration of a high-quality digital and analogue TV simulcast using a single 36MHz transponder. It has confirmed that an analogue channel with multiple sound subcarriers can occupy 27MHz of the bandwidth of a Eutelsat transponder simultaneously with a digital channel that uses the remaining 9MHz to provide a video signal exceeding normal broadcast quality with near-CD sound and auxiliary data. Thus broadcasters can at no extra cost transmit digital and analogue TV via a single satellite channel. The digital compression equipment used in the demonstration was provided by NTL.

NTL and Pace Micro Technology Ltd. have formed a new company to market a range of digital TV products to the MPEG-2 standard in time for the start of digital satellite transmissions next year. The new company is known as Pace-NTL Technology Ltd. and will operate on a worldwide basis.

BT has launched Europe's first TV distribution service using digital compression, via Intelsat 601 at 332·5°E. The service can cut broadcasters' costs by up to sixty per cent in comparison with the current rate for similar analogue distribution services. BT plans to launch a digitally-compressed transatlantic TV service later this year.

Swift Television Publications has introduced the *Mk. 2 Satmaster Pro for Windows* program, written by D.J. Stephenson, to enable installers, designers, system engineers, managers and enthusiasts to design satellite systems at virtually the touch of a button: the program enables a system's performance to be tested prior to installation; generates all the necessary look angles for fixed and motorised dishes at any location in the world; lists all visible satellites and their longitudinal position from any receiving site; calculates multiple full link budgets, indicating minimum dish size; has over thirty satellite footprints in its graphics file; displays beam-width and lobe patters for various dish sizes, graphs, tables etc.; and contains a 20,000 word Hypertext technical guide with fault-finding notes, cable specifications and so on. Users can add project notes and scan in extra footprints. The program is available at £99 (plus postage, £1 in the UK, £2 to Europe, £4 elsewhere) from Swift Television Publications, 17 Pittsfield, Cricklade, Swindon, Wilts SN6 6AN (0793 750 620, fax 0793 752 399). A DOS version is available at £69 plus postage.

BUSINESS NEWS

Daewoo is to invest £17m to increase VCR output at its Antrim plant in Northern Ireland. Production will be increased by thirty per cent when the programme has been completed in 1996.

Sony is to invest £4m at its Bridgend plant in South Wales to enable the factory to produce the steel frames used to support the aperture grill in Trinitron tubes. The investment is part of Sony's plan to spend some £147m on its plants at Bridgend and Pencoed.

Distribution of Crown brand products in the UK is now being handled by Crown Corporation UK, a subsidiary of HI Group plc. Spares continue to be handled by Datapart (see Spares Guide, April).

The NEI Spares Division (Nikkai, Dansai etc.) is now located at Unit 6, Southfork Business Park, Dartmouth Way, Leeds LS11 5JL (0532 774 310, fax 0532 774 312).

AZ Electrics, listed in the general/miscellaneous parts suppliers section of our Spares Guide (April issue), has moved to 183 Acre Lane, Northampton NN2 8DX (telephone/fax 0604 841 871.

THE FIELD BLANKING INTERVAL

Additional uses of the field flyback blanking interval are under investigation. Audio Descriptive Services (ADS) would add a separate sound channel for those with impaired vision. A trial service is to be started this year. Trials of an anti-ghosting system are also due to be started this year: an echo-cancelling reference signal will probably be inserted in line 318 to enable suitably-equipped receivers to cancel ghosts with delays of up to 40μsecs. The BBC is developing, for OB and news gathering purposes, a narrow-band (150Hz-3·6kHz) talkback system using two compressed audio data channels. A widescreen switching signal may be added on line 23 to enable future receivers to adjust the aspect ratio and positioning of subtitles automatically when a 16:9 format picture is being transmitted.

BS415:1990 SUPERSEDED

The British Standards Institution has just published BS EN 60065:1994 (also known as BS415:1994), *Safety requirements for mains-operated electronic and related equipment for household and similar general use.* It supersedes BS415:1990 which will remain current until September 15th 1995. Products that comply with BS415:1990 prior that date can continue to use the certification until September 15th 1999. Copies of the new standard are available from BSI Customer Services, Publications, Linford Wood, Milton Keynes MK14 6LE at £86.50 each (£43·25 to BSI subscribing members).

CINEMA SOUND FROM NOKIA

Nokia has introduced, at a suggested price of around £400, the HCS1000 Home Cinema Sound System. It enables a Nicam stereo colour TV receiver to produce four-channel Dolby Pro Logic Surround Sound. The system consists of a three-channel decoder/amplifier and three extra speakers, a centre sound unit and two surround sound units.

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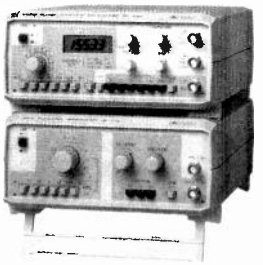

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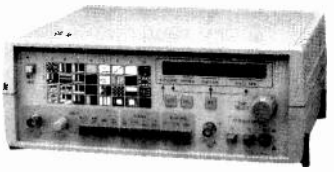

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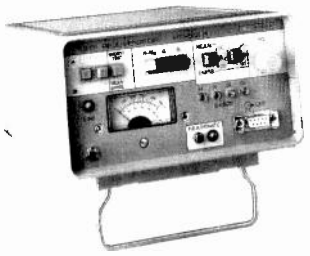

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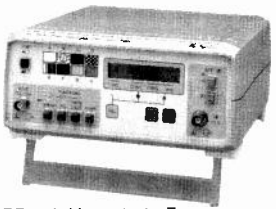

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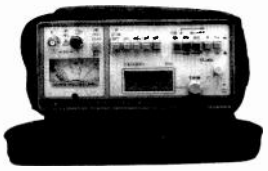

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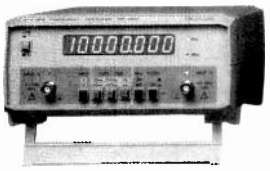

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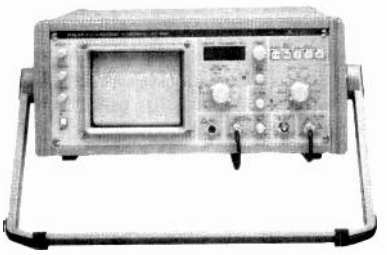

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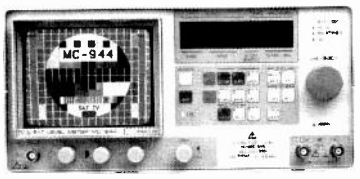

TV & Satellite Level Meter
Model MC-944

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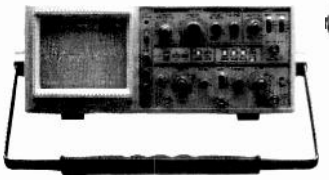

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Servicing the Hitachi Models C2118R/T

Mike Leach

The Hitachi Models C2118R and C2118T (G7PS Mk. 2 chassis) were introduced in 1990. From the reliability point of view they've proved to be reasonably good, and the picture quality is excellent. The sets have definitely turned out to be good little earners for those retail outlets that chose to put them out on rental. Now, four years or so on, these sets are coming back into workshops as ex-rental receivers: in most cases the tubes are in very good condition for their age, also taking into account the heavy use that many rental sets get. Why then write an article about them if they are so good? Because, as with even the most reliable of sets, there are some common faults. Fortunately they are fairly easy and straightforward to put right and the sets can, in most cases, be fixed reasonably economically.

The chassis is compact (see front cover photograph) and very easy to work on. We all know that most modern sets can be very difficult to service, with many leads that have to be disconnected from wiring looms in order to get the chassis clear of the tube. This is not the case with the G7PS Mk. 2 chassis. The leads are all long enough, and access to the component and print sides of the PCB is easy. As the on/off switch is mounted on the main PCB there are no extra screws or brackets to remove or get in the way in the unlikely event that a replacement has to be fitted.

The two areas of the chassis that give most trouble are the power supply and the field output stage. You get the odd fault in other parts of the set, but not to the extent that any regular fault patterns have emerged.

The Power Supply

The power supply (see Fig. 1) is of discrete component design, being basically a self-oscillating series chopper. Mains bridge rectifier D901-4 develops about 320V across its reservoir capacitor C904. This voltage appears at the collector of the chopper transistor Q903 which, along with the primary winding (between pins 2 and 3) of the chopper transformer T901, is connected in series with the supply. T901 thus acts as an inductive reservoir, the regulated 112V output being smoothed by C905. The 130V zener diode ZD903 provides over-voltage protection. D906 acts as an efficiency diode, conducting when Q903 switches off and the voltage at its emitter swings negatively. Current flow is thus maintained, with the energy applied to the circuit depending on Q903's on/off times.

Q903 is connected as a blocking oscillator, with feedback to its base from the secondary winding (between pins 2 and 4) on the transformer via R904, R914, C908 and R908/C907. When the circuit is initially powered the bias applied to Q903's base via R902 and R903 switches it on. The feedback is then positive, and Q903 saturates. At this point C908 has charged negatively and Q903 switches off. C908 discharges via R908, R902 and R903: when the voltage at Q903's base is sufficiently positive it switches on again. The free-running frequency of operation is set by the time-constant of C908 and the associated resistors. Regulation is achieved by controlling Q903's on and off times. This is done by Q904, Q905 and their associated components, which set the d.c. condition at the base of Q903 and thus C908's discharge time. D905 and C906 develop a voltage that's proportional to the output. This is used by the error sensing transistor Q905 to control the regulation. VR901 in its base circuit sets the h.t. voltage.

Standby switching is provided by Q902 and Q901. In the standby mode Q902 is switched on by the microcontroller chip IC001. Its low collector voltage is applied via D908 and R906 to the base of the pnp transistor Q901 which also switches on, shorting the base and emitter of Q903 which is then held cut off.

This means that a second supply, for IC001, has to be generated from the mains input. This supply is produced by the rectifier circuit D907, C913 and the following regulator circuit ZD001, Q007. LED D001 indicates that the set is on. When the set is in the on timer mode transistors Q001 and Q006 are switched on and off by the output at pin 12 of IC001. As a result the LED flashes to indicate that the set is in this mode. D007 supplies 50Hz pulses to IC001 to control its timer functions.

With the 'no results' complaint you are likely to find that D001 is lit. A good place to start is the over-voltage protection diode ZD903. Check whether it's short-circuit. If so the h.t. voltage has obviously risen above 130V. The most likely cause is that R909 (39kΩ, 0·5W) has gone high in value. It does so slowly over a period of time, the h.t. eventually rising above 130V. Replace R909 and ZD903, which must be of the correct type (P6KE130A). The customer may complain that the set has tended to trip in recent weeks, as R909 slowly deteriorates. This is only a possibility however and is not always the case. When the set is working again adjust VR901 for 110V at pin 3 of T901.

If the set is stuck in the standby mode, check the bias resistors R902 and R903 (both 82kΩ, 0·5W). If one of them goes open-circuit the set will appear to be dead with D001 alight. Usually only one of these resistors fails but it's best to replace them as a pair. Discharge C904 before replacing them – it's something I'm prone to forget to do!

Failure of the BUT12AF chopper transistor Q903 is rare, though I have come across this on occasions. I believe that the cause is deterioration of R909.

The other semiconductor devices in the power supply are very reliable. They are unlikely to fail other than in extreme circumstances such as a thunderstorm.

The Line Timebase

The line timebase is also reliable, though there are one or two things that are worth mentioning. The most common fault in the output stage is a whacking great dry-joint at one end of the 200V supply reservoir capacitor C711 (47μF). This item is easy to see towards the back of the chassis when the rear cover has been removed. The reported fault will usually be 'a very bright picture with lines' – the symptom is a peak white raster with flyback lines. Nine out

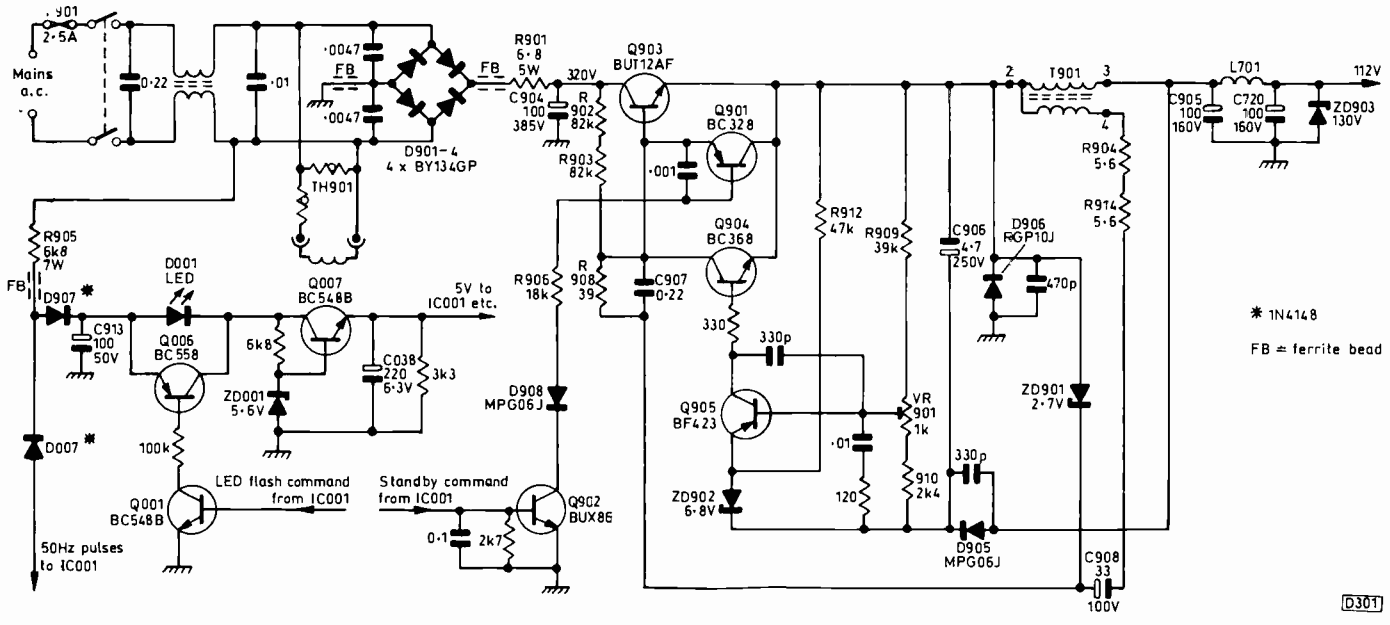

Fig. 1: Power supply circuitry in the Hitachi G7PS Mk. 2 chassis.

of ten times the cause will be a dry-joint here. It's worth checking the condition of this capacitor whenever one of these sets comes into the workshop. You'll often find that it has dried up but isn't actually giving any trouble.

I don't think I've ever had to replace the 2SD1877 line output transistor Q702 (note that it incorporates the efficiency diode). The line output transformer T701 is also reliable.

For no line drive check the 9·1V zener diode ZD703. I've known it to go short-circuit, causing various problems. It sets the voltage at pin 25 of the TA8690N multi-function (i.f., colour decoder, timebase generator) chip IC201.

The Field Timebase

The field timebase is the area that gives most trouble with these sets. You get all sorts of problems. The most common complaint is of field jitter and bouncing, often developing after the set has been on for a short while. With all field faults other than collapse, check the h.t. first. As mentioned earlier, the h.t. tends to rise as R909 deteriorates. An h.t. voltage rise can cause field timebase problems when it reaches about 118V. The customer will usually complain about bouncing pictures. Replacing R909 will sort that out. A point worth mentioning is that the customer doesn't always notice that the picture size has increased as the h.t. voltage has risen. In fact high h.t. will often cause reduced height with bouncing. This doesn't always happen, but we have had it on several occasions.

If R909 is in order and you still have field bouncing check for dry-joints or poor earthing print around the LA7835 field output chip IC601. To gain access to the print side of the chip the small earthing can must be removed from the underside of the board. I find that the best way to go about this is to remove IC601 completely, then thoroughly clean and desolder the connections on the PCB. Before replacing the chip check the print at pins 4 and 10. These tracks go straight to chassis and you sometimes get a break here, causing intermittent connection. The result is either minor field bouncing or, with very bad print, the picture may collapse completely then jump back to full size. Be sure to reconnect the earthing can before completing the repair.

So you've done all this and the picture still bounces. What next? Remove the MC7809 9V regulator IC703 from the board and clean the print, as with IC601. This regulator commonly suffers from dry-joints and is also prone to intermittent failure. It's best to replace it. Many component suppliers don't seem to stock this device, but it's readily available from Hitachi. I'll list some useful part numbers at the end of the article.

If the picture seems to be slightly displaced and the vertical shift adjustment can't pull it down far enough, leave the set on for a while longer to see whether the fault becomes more pronounced. After a while you will probably find that the picture is cramped at the bottom and slightly stretched at the top. These sets don't have a vertical linearity control. The cause of the fault is usually the field scan coupling capacitor C606, whose value is 3,300µF, 16V in Model C2118T and 1,000µF, 16V in Model C2118R.

Other Problems

Tuning problems are usually caused by the 33V zener diode ZD002 or the tuner itself. We've had several instances where a faulty tuner has resulted in no signals at all.

The remote control handset is generally reliable, but the rubber pads can break down, leaving one function inoperative. I don't think I've ever had a teletext fault in the model with this feature.

The Portable Version

Hitachi used a similar chassis (G7P Mk. 2) in two portable sets, the C14-P216 with remote control and the C14-P218 with teletext. The most noticeable difference is the multipurpose (i.f., colour decoder, timebase generator) chip IC201 which in the portables is type TA8691N (it's type TA8690N in the large-screen sets). These two chips are quite different and are not interchangeable.

In early production sets the TA8691N chip was sometimes responsible for buzzing which sounded like field buzz. Until the cause of the fault was discovered I, and I suspect many other engineers, spent considerable time chasing around in the field and audio stages to no avail. The cause of the trouble was a faulty batch of chips. A replacement TA8691N will put matters right – there are still a few sets around that suffer from this problem. The replacement chip is very reliable.

We've had three or four cases of one predominant colour

with flyback lines in the portables. In two cases the cause of the trouble was definitely a faulty tube, which fortunately failed during the guarantee period. The large-screen tubes have been very good.

As with the large-screen sets, tuning problems are generally caused by the tuner or the 33V zener diode. In one case however the cause was C033 (0·1µF) in the tuning voltage filter circuit.

If a portable set is stuck in standby it's very likely that, as with the large-screen sets, the two 82kΩ resistors R902/3 are the cause.

While similar to that in the large-screen sets the field timebase circuit in the portables is not prone to any particular faults.

In Conclusion

The large- and small-screen chassis are both very reliable. Hopefully any faults you encounter will have been covered in this article. If not, let us know! As promised earlier, here's the list of useful part numbers:

ZD903 over-voltage protection diode	**2344121M**
Type U743 tuner	**E710019**
LA7835 field timebase chip	**2381662**
MC7809 regulator (IC703)	**T900489**
TA8691N chip (portables)	**T900486**
Remote control unit (remote only)	**2572281**
Remote control unit (with teletext)	**2572282**

Satellite Fault Notes

Reports from John LeJeune, Ian Rees and Andrew J. Finn

Amstrad SRD510

This unit failed to start. The two start-up resistors R602/3 had gone very high in value. Replacements should have a working voltage rating of 500V. There's a repair/update kit available for the power supply – it's well worth fitting this. **J.LeJ.**

Amstrad SRD400

If there's no LNB power supply from the aerial input socket check whether RP506 (6·8Ω, 2W wire-wound) is open-circuit. **I.R.**

Pace SS6000

There were no pictures or sound, just a large patterning effect down the screen, with the vertically polarised channels. The channels with horizontal polarisation were o.k. We found the cause of the fault in the vertical LNB supply, where C75 and C69 were open-circuit. They are both 10µF, 25V types. **A.J.F.**

Finlux SR5100

This receiver had 'SC' flashing in its front display. Obviously stands for short-circuit. On investigation in the LNB supply we found that one leg of the preset was being earthed by the double-sided print. Normal operation was restored when we soldered the preset slightly away from the board. **A.J.F.**

Pace SS6000

When replacing the U2829B audio demodulator chip U1, note that the replacement should be type TBA229-2. Also replace C23 and C24, both 1µF, otherwise the chip could fail again. Has anyone else noticed the increase in sound level between these two chips? **A.J.F.**

Salora 5902

"Decoder stops working" was the complaint with this receiver. Sure enough the screen went blank when we tried Sky Movies. After switching to an unscrambled channel and back a few times the receiver worked all right for a while. I thought it might be the relay, which could be heard switching, but no. There was no baseband output when this was checked with a scope, so we started to dismantle the receiver. Getting it to work out of its case on the bench while upside down involved removal of the lot, including the mains transformer. Then the receiver worked faultlessly for two days! Eventually it did fail and we found that TV30, a BC817-25 surface-mounted transistor, was the cause of the trouble. For a surface-mounted device it runs rather hot. Maybe the manufacturer should have used a conventional transistor. **A.J.F.**

Pace SS9000

The complaint was that there were small diagonal white dots on the screen with decoded channels. Changing the decoder made no difference. We eventually found that the culprit was C29, a high-temperature 100µF capacitor on the secondary side of the chopper transformer. **A.J.F.**

Salora 5902

When this receiver was switched on a loud buzzing could be heard from relay REL1. In addition only the top half of the number 1 in the front display was visible. When the PCB was removed we found that there was a very nice dry-joint at the 4,700µF reservoir capacitor CP16. Resoldering this put everything right. **A.J.F.**

Finlux SR3000

This nice receiver displayed only snow. Checks around the tuner showed that the tuning voltage was missing. As the transistor in the integrating network was o.k. we monitored the tuning output at pin 18 of the SDA3202-3 chip IC11. With the receiver in the scan mode only 0·4-0·5V was present here. The inputs to this chip are at pins 4 and 5, which are connected to the SDA and SCL lines respectively. Oh no! As far as I could tell the conditions here were correct (how do we know for sure?), so a new SDA3202-3 chip (part no. 4400 3001-027) was ordered and fitted. Fortunately for me this cured the fault – I'm not too keen on fast-moving digital pulses. **A.J.F.**

Finlux SR5100

There was sound but just a blank screen. This was a simple one: the 1µH choke L7 in the video feed through the de-emphasis network was open-circuit. **A.J.F.**

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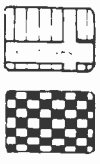

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Letters

THE COWBOY ELEMENT

Various letters have been published over the last year or so on the subject of the 'cowboys' in our trade. I'd like to add my views, but first let me explain the situation in which I find myself.

My business went into liquidation some two years ago. I had sold new products and some second-hand units, and carried out repairs both to items we sold and generally. A number of authorised dealer agencies had been secured. I feel that the reasons for the collapse of my business, apart from the recession, relate to something-for-nothing cowboys and more importantly a certain manufacturer who was unable to abide by, or ensure that his dealers do, the manufacturer's contract. A letter in the May 1993 issue of *Television* complained of lack of technical support for certain manufacturers' products the writer sold. The point is that he shouldn't have been selling them and shouldn't have been able to obtain them: the dealer who acted as a wholesaler was in breach of his contract which states "that you will sell only to an end user or another authorised dealer". In order to be granted an agency by the manufacturer concerned one has to meet certain requirements. Our business did so, but a shop across the road didn't. To make matters worse they put up a sign bearing the manufacturer concerned's logo (there were also other manufacturers' logos), implying to the public that the shop was an authorised dealer. It took the manufacturer several months to force the other shop to remove the sign, by which time it was too late for us.

A number of people who call themselves TV/video repairers and advertise as such cannot repair the products and either bodge or farm the work out. Here are a couple of examples.

A man phoned me one day. He told me he'd been led to believe that the servicing trade can be lucrative, but he didn't know enough about servicing. He could clean heads and resolder dry-joints. Could he bring the other work to me? He charged about £50 to clean heads, and about £80 to replace the limiter post assembly in a Matsui VCR! His problems started when he quoted £80 to replace the memory chips in a Philips TV set (back-up battery problem), then he encountered a set fitted with the Thorn 9000 chassis. He knew that as a check you can disconnect the tripler then switch on. But he didn't know which lead to disconnect – he switched on after disconnecting the e.h.t. cap!

A local repairer who advertises "free estimates" in a local paper charged a young lady £120 to repair her Philips VCR. When it jammed up two months later he wanted another £120 to replace the rack. So she came to me. The original repairer had replaced the pinch roller and fitted a service kit. The VCR's owner decided to try, with my help, to retrieve some of her money. When she issued a county court writ it transpired that the 'repairer' had subcontracted the work to someone else who had in turn subcontracted it to a trade repairer. If each person in the chain charges £40 it's easy to see how a bill for £120 can arise. To make matters worse, the first two 'repairers' live opposite each other.

Another repairer left a Philips G11 in a very dangerous state. He also repaired an Amstrad TV set in such a way that it started to burn.

In all the above cases, including the shop across the road from mine, the Trading Standards people wouldn't get involved. They even told the lady with the Philips VCR that it was just tough.

So what should be done ? Be under no illusion. These cowboys are stealing our business. They shouldn't be allowed to represent themselves as repairers or advertise their 'services' when they are clearly not able to fulfil such functions – unless they clearly state that the work will be subcontracted out.

Licensing could be an effective way of dealing with the problem. In the USA for example you have to show the authorities that your business is competent before you can carry out work and provide services. This applies to car repairers, TV repairers, plumbers, builders – even hairdressers. The trade should consider this, possibly setting up its own body to regulate the industry.

After losing thousands of pounds I'm now employed by a national Service company. I earn a regular salary but don't get anything like job satisfaction.

Name and address supplied.

TECHNICAL BACK-UP

I'd like, as an avid, long-term reader, to say how much I agree with Michael Cordner of M & M Video (letters, April) who expressed his concern at the decline of technical back-up from manufacturers, especially to those of us who are small businessmen and are not associated with specific manufacturers.

If however, like me, you have an account with Willow Vale you'll find that this company provides a very good service through its Technical Department. Alan Dyson in particular seems to have a wealth of information at his fingertips and is only too willing to assist those of us who require some technical help from time to time, especially with some of the not-too-often seen clones. As an ex-Grundig engineer he can be especially helpful with this company's products.

Well done Willow Vale, and thank you Alan for all your assistance in the past. Keep it up!

A.E. Somerville, Grad. I.E.I.E., Tony's TV, Southampton.

LESS HASSLE

I recently ran into an old trade colleague – from about twenty years ago. Last time we met was about five years ago, when he was trying to decide between taking up a job offer in a nearby town or setting up on his own. He tells me that he has now left the trade altogether to become a traffic warden. He says there's less hassle!

John C. Priest, Blankpool, Lancs.

SPARES PRICES

Michael Cordner (letters, April) complained about spares price increases that are implemented without warning. I would urge others to check prices before ordering. In a spare moment I looked back through last month's invoices and checked the prices against those in the 1994 catalogue of a well-known supplier. At least two had gone up by around 12 per cent, another by a little less. Then came the final blow! A package containing just a few cassette belts arrived on the doormat – a back order from about a month before. Ten had originally been ordered at 23p each. Twenty had been sent at £1.28 for two (64p each). Not

only had the price been almost tripled, twice as many had been sent!

A quick call was made to the company's sales department. I was told that it has no control over the prices charged by its suppliers and that it would not be practical to advise customers of price increases on back orders. I was given a returns note number and sent the belts back, insisting that the 30 per cent charge normally levied on returned orders wasn't charged. Inflation is still running at under five per cent a year. I'm wondering whether the steady prices we've enjoyed over the past few years have finally come to an end now that we appear to be emerging from the recession.

M.J. Goodall,
Littleport, Cambridgeshire.

FAULT-FINDING SYSTEMS

When I bought an expensive fault-finding system recently I thought I was getting access to manufacturers' database material and could be as smug as their technical support teams. But I was fooled.

The system boasted availability in several languages, though I'm not really sure which one was used by the system I was sent. I think it was translated by Manuel. "It's the Lines Output Transformer Mr. Fawlty. It's gone slightly open-circuit. I learn it from a book". Many of the remedies have the vagueness of a horoscope, telling you for example to resolder the legs of a capacitor without mentioning which particular one. There are strange resistors that switch off, and even stranger TV sets that won't change stores. What are they supposed to do – pop next door to Rumbelows?

The little red and blue Datatech books have the same information without all the gobbledegook and at a fraction of the cost. And yes your own fault index is of course excellent and we all love it very much!

Why can't manufacturers make their databases available for sale? Then those that still do provide free advice wouldn't be pestered so much.

P. Barry, Teletechs,
Bedale, North Yorkshire.

FUN WITH AN AMSTRAD CTV2200

The untidy chassis of the Amstrad CTV2200 has never been one of my favourites. This one came in with the chopper and line output transistors and C845 (4·7µF, 250V), which smooths the 180V supply for the RGB output stages, all short-circuit. The h.t. was o.k. when the power supply was tested using a lamp as the load. There was no line drive from the LA7800 timebase generator chip unless the protection pin (pin 4) was connected to chassis. After blowing another pair of transistors I replaced the line output transformer. Nothing happened for about a minute, then the new C845 fizzed and blew up. Monitoring the voltage across its replacement (uprated to 350V) with the collector of the line output transistor disconnected produced an astonishing reading of 360V!

To cut a very long story short, because of partial failure of the 100µF h.t. smoothing capacitor C520 the line output transformer was being driven by the power supply. I don't know whether the original LOPT had been damaged – I didn't feel inclined to risk putting it back. Other damage as a result of the basic fault was failure of both audio output transistors and the sound chip. Incidentally there are several inaccuracies in the circuit diagram, which shows both the main h.t. and the RGB output h.t. lines as being 112V. The block diagram shows the former as 150V and the latter 180V, which is correct. The voltages shown around the TDA3652 field output chip are also incorrect.

One is accustomed to thinking that with the line output transistor disconnected the transformer is inactive: it was scary to find that in this case it was more than usually active, producing very high output voltages. I wonder whether this can happen with any other models? The fact that the chopper circuit used is of the series type could be relevant.

L.P. Watkinson, Telesonic Services,
Holsworthy, Devon.

A SALUTORY TALE

There can be very few occupations where a minor lapse in concentration can have such frightening consequences as occur in our trade. One slip of a test prod or screwdriver and you can be up to your ears in it! This was brought home to us recently when a Samsung VI8220 VCR came in with the complaint that there was a buzz on the sound when tapes were being played. The cause turned out to be a dry-joint on C102 in the power supply. Having carried out the repair, we connected the machine to the mains supply and switched on. There was a smell of burning and the thing went dead. Too late we realised that the earth lead that's anchored to the case when the bottom cover is in place had been left floating around and had found its way under the main PCB. This meant that the machine now had a fault which was probably several times worse than the original one.

As we didn't have the manual, we had to play this one by ear. So checks were initially made in the power supply, where R101 (1Ω) was found to be open-circuit. When this item had been replaced the machine displayed good playback pictures, but with no sound and a blank, noise-free raster in the E-E mode. As there was no 12V supply at the tuner, we traced the print back from the B+ pin. This led us to Q106 which was short-circuit. A replacement restored normal working and produced sighs of relief all round, as the potential for damage in such an event can be horrendous.

The lesson of course is to check, check and check again before switching on!

Ed Rowland,
Luton, Beds.

CITY AND GUILDS

The City and Guilds as Mickey Mouse (letters, November 1993)? Hardly – I speak as a C&G stalwart from 1967 through to 1993 (full 48 and 224 TV and video), with twenty years at the sharp end, an original Colour Tech on G6s and 2000s etc. and as a good Telly Man before that, with a pocket-full of PL81s and PL36s. Perhaps C&G by itself could be considered M. Mouse, but it was always intended as a supplement to practical experience in a job. A full-time HND takes two years at four days a week on a £40 student grant and a garage for the paperwork. The colleges are full of professional students who, if asked, couldn't fix their bottoms to a seat!

HND or not, the Telly Man has always needed the heart of a lion, the brain of Einstein and the strength (in the old days) of Charles Atlas. Also an encyclopaedic street knowledge and the ability to make a TV van fly. M. Mouse indeed!

K. Wells,
Liverpool.

Modern TV Receiver Techniques

Part 18: Field-store Systems

Eugene Trundle

The analogue transmission and scanning systems currently used for broadcast TV were established many decades ago, suiting the circumstances and hardware of the day. They represented an excellent compromise between performance, use of spectrum space and picture flicker rate and have served us well – they will continue to do so for many years yet.

Impairments

There are several shortcomings however with all three of the established broadcast systems – PAL, SECAM and NTSC. The main one is large-area picture flicker, which is particularly noticeable with large screens and is at its worst with bright displays and at peripheral viewing angles. It arises from the inability of the human eye/brain to integrate fully successive pictures that have a 'flash rate' of 50Hz, as currently used in Europe. In the USA, Canada and Japan, where a 60Hz field rate is standard, the flicker effect is less perceptible. As the field rate is increased, the perceived flicker is lessened: at a flash rate of about 90Hz it disappears under all picture brightness, viewing angle and ambient light conditions. It would be very wasteful of broadcast spectrum space to transmit 90 fields per second however, while the use of a quadruple-interlace system to achieve the same effect would result in intolerable line flicker.

Other problems with current TV systems are interline flicker where sharp horizontal edges of objects in the picture and fine horizontal lines have a 25Hz repetition rate, cross-colour which produces coloured interference patterns where fine vertical detail is present, and cross-luminance which results in a fine dot pattern in the region of sharp colour

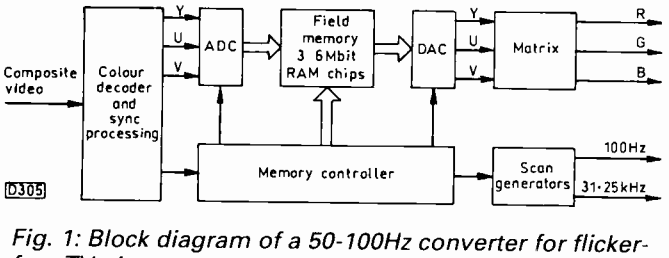


Fig. 1: Block diagram of a 50-100Hz converter for flicker-free TV pictures.

transients. These last two conditions arise as a result of the need to interlace the luminance and chrominance signals so that they share a common channel bandwidth, and can be minimised (at a price) by the use of sophisticated comb filter techniques in the receiver. The flicker effects, which are inherent in the basic analogue TV systems, show up because it's traditional for the display to be presented in synchronism with the transmission. The advent of large capacity, high-speed memory chips at reasonable prices has overcome the need for the scanning rates to be tied to the transmission standard, opening the way to the removal of the flicker problems.

100Hz Pictures

To arrange for the receiver to display the transmitted pictures at a 100Hz field scan rate a device that can store a complete field of video information is required – and it's not practical to store the video information in analogue form. Thus digital memories are used. For a high-quality picture on a large screen a total memory capacity of about 3Mbits is required – in the most sophisticated and expensive sets that use this technique the storage provided is up to 6Mbits.

The basic idea, shown in Fig. 1, is simple. The video signal is converted from analogue to digital form, the video data being fed into the memory at the 50Hz broadcast rate. It's read out of the memory at the faster rate of 100Hz, converted from digital to analogue form and displayed on the screen at double-speed line and field scan rates.

The transmitted field sequence is ABCD etc., the double-rate memory read out giving us AABBCC etc. as shown in Fig. 2. This eliminates large-area flicker, but interline flicker remains. The rate of change of the actual picture information is still 25Hz, corresponding with the transmitted 25Hz interlace rate. To eliminate interline flicker the interlace rate has to be increased to 50Hz, which involves the display of two different fields in each 20msec period. Thus the field readout sequence becomes ABABCDCD, as shown in Fig. 3. It's clear from this that to operate this scheme we need two complete field memories, with alternate readings from each at 10msec cycles.

Once the line flicker problem has been solved in this way a new problem arises. While the ABABCDCD sequence produces excellent still pictures, with a moving image the change in the order of the transmitted fields gives rise to a strange juddering effect – because of the continuous hopping to and fro in time. The best current solution to this problem is a compromise one, using a processor to compare the contents of the successive transmitted fields on a pixel-by-pixel basis in order to detect motion. The system is referred to as a median filter, and works by selecting picture elements from each of the two memories to make up the alternate 100Hz fields. With a still picture the sequence remains ABAB etc. Where there is movement in the picture it becomes AB'A'B, as shown in Fig. 4, the A' and B' fields being assembled from pixels in both the A and B fields transmitted. The interlace rate remains at 50Hz, so that interline flicker is eliminated all the time.

Television transmission of cine films presents a special case. In the telecine converter each film picture is scanned twice, producing two identical fields before moving on to the next frame. There is however no fixed relationship between the field pairs and interlacing, so that identical pairs may form fields AB or BC. Sets that use the median-filter system incorporate a special detector that identifies a film transmission and the sequence of identical field pairs. This facilitates perfect reproduction on an ABAB or BCBC basis, free of all line and field flicker.

Not all 100Hz sets incorporate the double-memory interline flicker reduction system, which increases the cost and complexity.

AD Conversion

A single analogue-to-digital converter (ADC) could be used to convert the composite video signal, chroma subcarrier and all, to digital form. In practical 100Hz designs

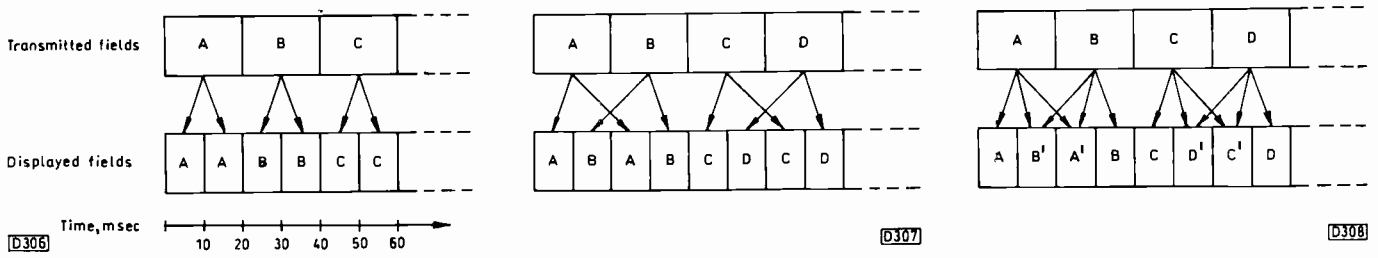


Fig. 2 (left): Simple field rate doubling by repeating fields.
Fig. 3 (centre): Interlacing at 100Hz: this removes interline flicker but produces blurred, shaky motion.
Fig. 4 (right): 100Hz interlaced fields with interpolation using a median filter.

however the PAL (or whatever) signal is first filtered and decoded, by analogue or digital means, producing the separate luminance and colour-difference (YUV) signals. These are then separately converted to digital form and stored. At the end of the chain they are matrixed to provide the usual RGB signals to drive the tube.

The ADC used for this relatively high-speed application is known as the 'flash' type, see Fig. 5. It provides an eight-bit output, using 256 separate comparators. Each

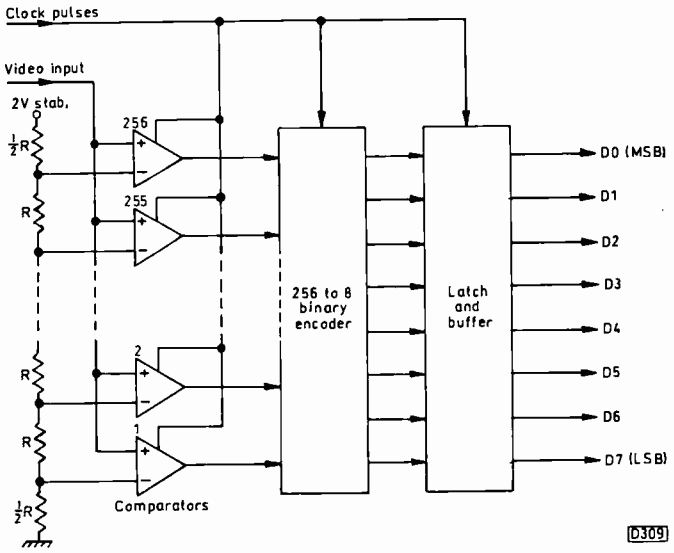


Fig. 5: Operating principle of a fast 8-bit ADC of the type used for video signals.

comparator has two inputs. One of these is connected to its own individual tapping point in a chain of 256 equal-value resistors. The other inputs are all connected together and receive the video input signal. A stable voltage, here exactly 2V, is maintained across the resistor chain so that each resistor has across it one 256th of the total voltage. The video input is gain controlled at precisely 2V peak-to-peak, its black level or sync tip being clamped – see Fig. 6(a) – at a fixed level so that the peak white video level just turns on the topmost comparator in the chain. As the video signal swings from black through grey to white, progressively more comparators are turned on in 256 steps of 7·8mV.

When a clock pulse arrives, the outputs (0 or 1) of the 256 comparators are loaded into a 256-to-8 binary encoder. This converts the 'quantised' samples into eight-bit bytes which are passed to a latched buffer. With each clock pulse a fresh sample is taken and a new eight-bit byte is produced. The frequency of the sampling clock is typically 13·5MHz. To avoid aliasing and spurious effects, a Nyquist filter limits the luminance input to less than half this frequency – it cuts off at 6·5MHz. At 13·5MHz we get 676 samples per 52µsec active line period. Increasing the clock frequency or omitting the line blanking interval enables a greater number of samples to be taken. There's no fixed sampling rate. In some sets the sampling/write clock runs at 16MHz, but in all cases the read clock is twice as fast. The frequency depends mainly on the speed (access time) of the memory chips being used.

The U and V colour-difference signals are similarly AD converted. Because they can swing positively or negatively with respect to zero, their clamping point is at the centre line – see Fig. 6(b). Since the bandwidth of the colour-difference signals is only about a quarter of that of the luminance signal they require less frequent sampling and less memory

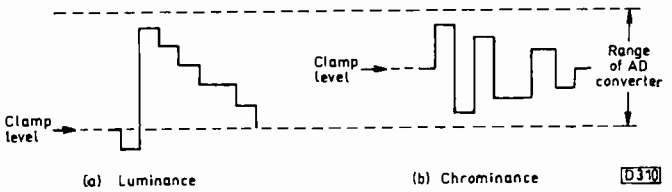


Fig. 6: Clamp points for (a) the luminance and (b) the U/V signals on their way to the AD converters.

capacity. In practice they are often sampled at the same 13·5MHz (or similar) clock rate, after which three in four samples are discarded by clocking the signals out of the

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	Bits
Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	U0	U1	V0	V1	Word 1
Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	U2	U3	V2	V3	Word 2
Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	U4	U5	V4	V5	Word 3
Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	U6	U7	V6	V7	Word 4

13·5 MHz
3·375 MHz
D311

Fig. 7: Interleaving the Y, U and V data bits to produce the 12-bit words that are fed into the memory. The effective sampling rate for the Y signal is 13·5MHz, that for the U and V signals being 3·375MHz. This diagram depicts four Y samples and one each U and V samples, all with 8-bit resolution. The four words run in succession.

shift register at a quarter of the basic rate, i.e. 3·375MHz.

Thus for every eight-bit luminance byte there are two bits of U data and two bits of V data, complete U and V bytes being produced during the time taken for four luminance bytes. A complete YUV 'bundle' consists of twelve bits, with interleaved data streams – see Fig. 7. This bit interleaving is carried out by 'formatting logic' between the ADCs and the 12-bit memory-write register.

Memory Access

The AD conversion and memory-write clocks are controlled by the video signal's sync pulses. We must next see how a single memory bank can be simultaneously

written into and read from without tripping over itself as it were. Fig. 8 shows the principle, using a simple frame with only eight scanning lines. The write pointer, representing a sequential address generator, starts at point B1 in the broadcast field and feeds the eight lines of the field into the memory. At the start of this field the write and read pointers are both positioned at point A1/B1. They set off clockwise, the read pointer rotating at twice the speed of the write

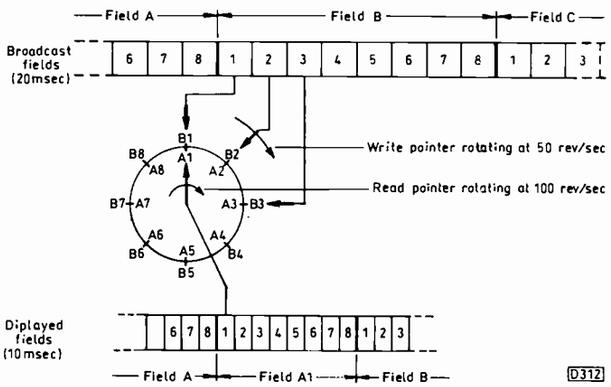


Fig. 8: Writing into and reading from the memory at different rates. The write and read pointers represent the operation of the addressing section of the memory-control chip.

pointer. At the end of read-out field A1 the read pointer has returned to position A1 while the write pointer has reached position B5. 10msec later the read pointer overtakes the write pointer at point A1/B1 to start the second read-out field (B) while the write pointer is inserting field C into the memory. The cycle is repeated continuously.

Memory Chips

The memory chips used are very fast DRAMs (dynamic random access memories) with sequential addressing. The 3Mbits capacity required usually consists of three 1Mbit

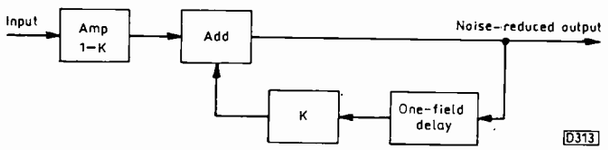


Fig. 9: Principle of noise reduction by integrating successive fields. Although shown simply here, in practice the process is a complex, digital one.

memory chips each arranged as 256K by four bits. They are connected in parallel, with one chip storing the four least significant bits, the second the four middle bits and the third the four most significant bits of the 12-bit time-multiplexed YUV data (Fig. 7).

There are several ways in which the memory system can be arranged: 8-bit Y data can be stored in its own 2Mbit (i.e. 2 x 4 bits x 256K) section while the 4-bit UV data is held separately in another 1Mbit chip; or three 2Mbit stores can be provided, one each for Y, U and V data, as in the Sony KV-FX29. While this latter system requires an expensive 6Mbits of memory it provides a YUV sampling ratio of 4:4:4 and full bandwidth in all three channels, which is useful for RGB operation. With the 4:1:1 ratio scheme the RGB inputs have first to be filtered then matrixed to obtain YUV form and finally stored, being reconverted to RGB form after digital-to-analogue conversion in the 100Hz part of the circuitry. This is not as bad as it may sound: no encoding, modulation or interleaving is required, and with an RGB signal much of the information in the three channels is common to them all and is thus redundant.

Digital Noise Reduction

There are several causes of noise in an analogue video signal, amongst them weak signal reception and tape noise with VCR playback. Noise is random, with no correlation between successive video fields. With a still picture the video fields have total correlation. Thus if several video fields are integrated the noise cancels to virtually zero while the picture-signal components add. The integration can be carried out with the signal in analogue or digital form – or indeed using a photographic camera's film (take a one-second exposure of a noisy, stationary TV picture and see how, in the photograph, the noise has disappeared as if by magic!).

Electronic noise reduction can be carried out in a field-store TV set by progressive integration of the current and previous field. Fig. 9 shows the basic idea in block diagram form. The block marked K is a 'recursive filter' whose characteristic (K factor) determines the noise reduction as follows:

K factor	**0**	**0·25**	**0·5**	**0·75**
Noise reduction	**0dB**	**2·2dB**	**4·8dB**	**8·5dB**

The noise reduction requirements of the Y and U/V circuits differ: for U and V the optimum K factor is 50 per cent greater.

Unfortunately for noise reduction, most TV pictures don't stand still; and with picture features that move there's little or no time for successive integration. This is overcome by using the arrangement shown in Fig. 10, where a motion detector modifies the action (K factor) of the recursive filter in accordance with the rate of change of individual picture features, typically in eight steps between 0 and 1. The effect of this is that the longer an object in the picture remains still, the better and more noise free it appears.

With a single-memory TV set the noise-reduction circuit works digitally on a pixel-by-pixel basis at the 50Hz rate, using two memory data readout ports, one at 50Hz for noise reduction and one at 100Hz for the display as shown in Fig. 11. With a two-field memory noise reduction can be carried out at 100Hz: Fig. 12 shows the arrangement.

There is less definition loss with a digital noise reduction (DNR) system than with the analogue system described in

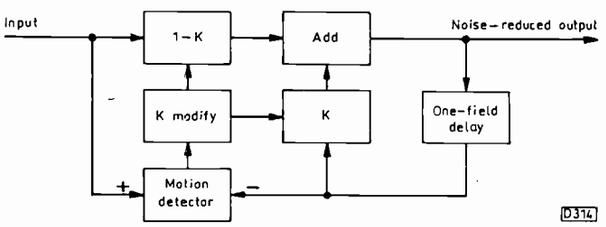


Fig. 10: To cater for movement in the picture a motion detector is used to reduce the K factor in proportion to the rate of change of individual pixels in successive fields.

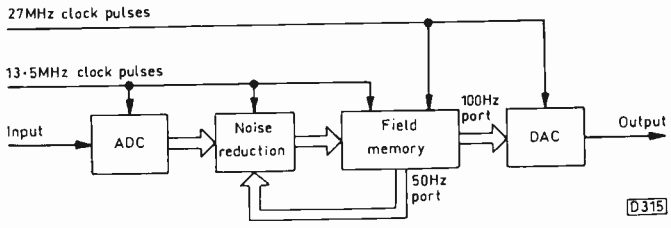


Fig. 11: Noise reduction with a single memory bank. The memory section has two readout ports, one operating at 50Hz for noise reduction and the other at 100Hz for the display.

Part 7 (page 624, July 1993). But provision is usually included for control of the digital noise reduction by the viewer, in one or more stages – perhaps on an individual channel basis with the setting stored in the EEPROM and implemented by I2C bus control of the DNR chip.

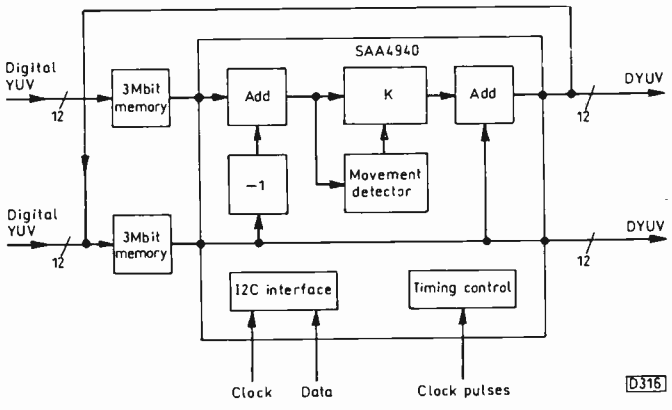


Fig. 12: 100Hz DNR using two separate memory banks.

Memory Readout

A memory controller chip governs the read and write processes and generates the sync pulses for the 100Hz/31·25kHz timebases. Fig. 13 shows in block diagram form a sophisticated system that has two sets of field memories, DNR at 100Hz, 4:4:4 ratio sampling and field and line flicker reduction. The sampling and read/write clock rates can be selected by the setmaker: this gives an idea of the chip set's flexibility. At the higher rates the definition is better than that called for by the CCIR standard, but all rates call for very short DRAM access times. If the time-constant of the VCO that controls the memory readout is long, the system takes on the characteristic of a timebase corrector (TBC) ironing out timing jitter. This will, for example, provide better off-tape picture stability. Plainly it's not possible to combine this with effective DNR because the pixels in successive fields are no longer time coincident.

Other features of the system shown in Fig. 13 are worth mentioning. The delay in the Y data stream is part of the bit interleaving/data formatting system that produces the 12-bit YUV words. The SAA4940 chip carries out noise and cross-colour reduction by recursive filtering. The next chip downstream, the SAA7158, implements the three-point median filtering described earlier for interline flicker removal. It also carries out U and V signal reformatting, digital colour transient improvement (similar in effect to the system described in Part 7) and Y signal peaking, and contains the cine-mode detector mentioned earlier and three high-speed DACs. Two additional features of this chip are called Zoom 1 and Zoom 2. The former provides vertical picture expansion so that 4:3 aspect ratio letterbox pictures can be displayed correctly on a 16:9 aspect ratio c.r.t. Zoom 2 gives magnification by two of the displayed picture, both horizontally and vertically, as a user feature. All the memory-control and post-memory processing functions can be software controlled via an I2C bus.

DA Conversion

Where necessary the data from the memory is de-interleaved to separate it into its Y, U and V components for application to three separate digital-to-analogue converters. Each of these works on the principle shown in Fig. 14. The first step is serial-to-parallel conversion: the 8-bit serial data words are stepped through a register by the bit-clock pulses at the memory-read rate, e.g. 27MHz. The eight bit words are loaded into a slave register at the byte clock pulse rate, thus making parallel data words available to the actual DAC. Each bit in the word being converted controls a two-

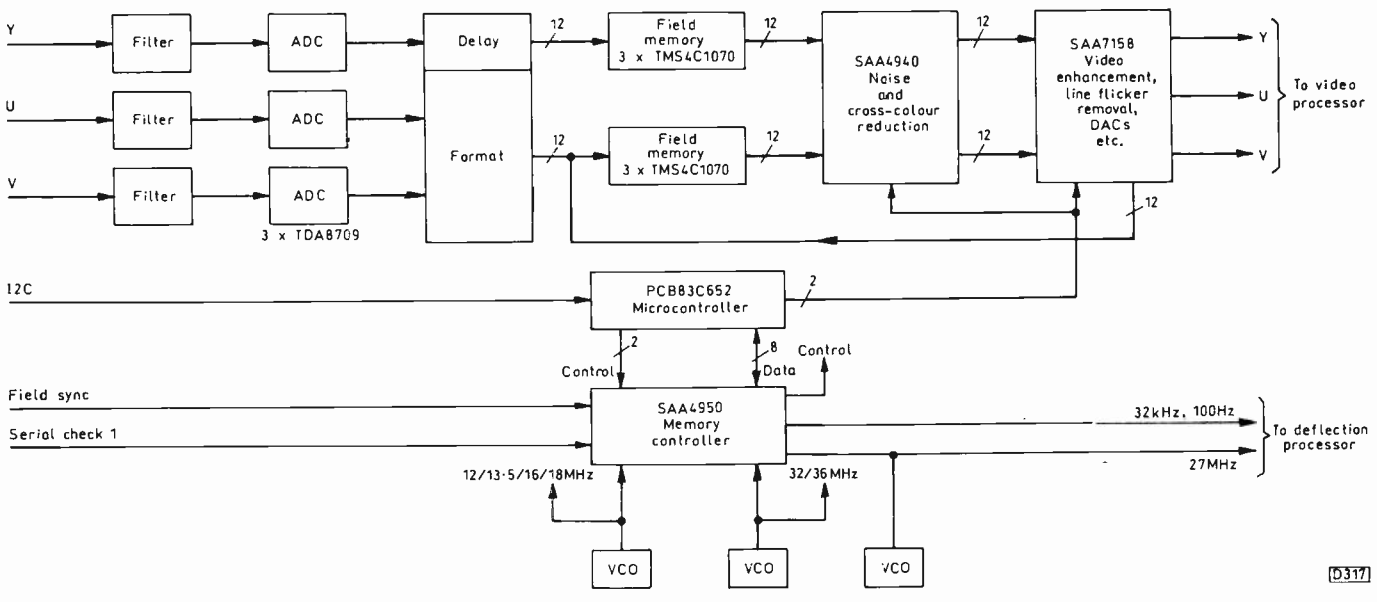


Fig. 13: A Philips full-feature, flicker-free processing system using 6Mbits of memory.

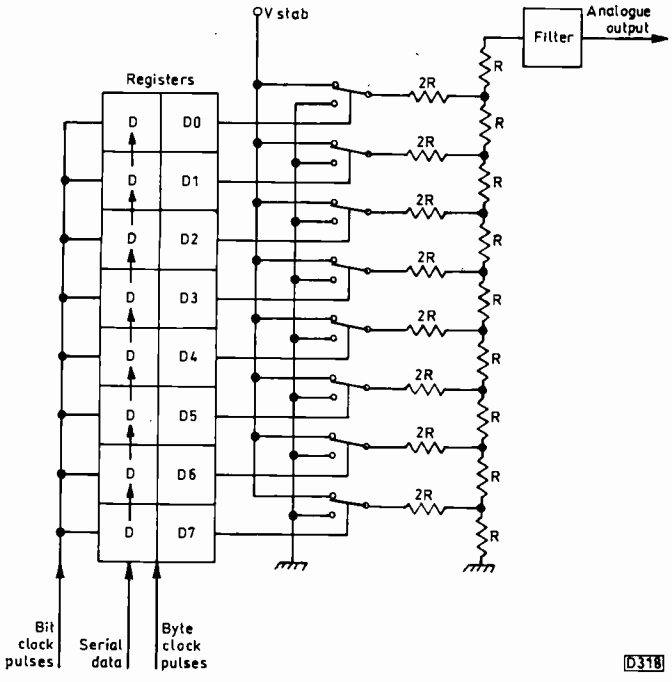


Fig. 14: Operating principle of an 8-bit DAC.

way switch connected to an R/2R ladder network with eight 'rungs'. The ladder has a fixed, closely regulated voltage across it. The effect of each bit in the word depends on the position of its switch along the resistive ladder. Thus the most significant bit (MSB) D0 at the top of the chain commands 50 per cent of the output voltage swing, the next significant bit D1 25 per cent and so on down to the least significant bit (LSB) which influences the output voltage by only 1/256th or 0·4 per cent.

A 256-step video signal waveform cannot be distinguished from a non-processed analogue video waveform by the human eye. The other advantage of 8-bit processing (you can get away with 6- or 7-bit quantisation) is that the noise introduced by the digital system is very low at –54dB – a low noise figure is essential for a high-quality, flicker-free TV picture.

DA conversion is followed by a sharp cut-off analogue filter (usually an LC type) that smooths out the quantisation steps and eliminates the remnants of the clock frequency. The Y signal filter cuts off sharply at about 12MHz. Since the frequency of the U and V signals is so much lower than the DAC clock rate their filter requirements are much less demanding. To capture all the picture detail the bandwidth of the analogue circuits that follow the Y converter and the RGB channels between the matrix and the c.r.t. must be around 12MHz.

Effects

In addition to the zoom features mentioned above various effects are possible in a TV set with a field store. The first and most obvious is a perfect freeze-frame facility: the memory writing process is halted while the 100Hz readout continues as long as the viewer requires. Other possibilities are pixelation, in which the DAC clock rate can be progressively slowed (in practice progressively halved) by the viewer to give the picture an increasingly mosaic-like appearance; and solarisation, where the two, three or four least significant bits of the 8-bit words are removed by clamping them at zero in the DAC. This reduces the number of analogue video signal levels, giving the displayed picture a surreal effect. While pixelation and solarisation are of little practical consequence, a PIP (picture-in-picture) feature is rather more worthwhile.

PIP

Whether or not the set has a 100Hz display system, a PIP facility calls for a digital field store of sorts – it need not have the capacity of those used for full-screen processing. The basic idea is to decode the video signal from a second source into YUV form and then AD convert it, discarding two out of every three scanning lines and two out of every three video samples. The remaining data can provide, after DA conversion, only a coarse, liny picture with about eighty lines each of which carries typically 200 luminance pixels and 32 each U and V pixels. Converting the signal to 6-bit form calls for only 230Kbits of memory to store the necessary two fields; 300Kbits or so are required with 8-bit quantisation. The memory-write operation has to take place in real time, so each field store takes 20msec to fill. The readout can be much faster, with the lines of YUV information read out in about a third or a quarter of the time occupied by the original scanning lines, be they at 15·625kHz (conventional TV) or 31·25kHz (flicker-free).

If the PIP memory's 'fast' readout is geared to the display scanning rate and the input to the YUV-to-RGB matrix is switched to the PIP DAC's output whenever this is taking place, the auxiliary picture will be inserted into the main one at a point that's determined by the line and field phasing of the electronic PIP switch (in practice the memory control chip). The little picture is generally positioned in one corner of the screen. With a TV set the YUV outputs from the PIP section can go straight to the RGB matrix. With a VCR or video effects unit however the PIP picture must be restored to composite encoded form. This calls for the use of a colour (e.g. PAL) encoder that uses the main picture's colour subcarrier as the reference.

Fig. 15 shows in block diagram form a PIP processor for use with a 100Hz TV set. The secondary picture signal, in composite video form, is first fed to a TDA9140 colour decoder that produces YUV outputs. These are fed to a TDA8706 chip that contains a clamp, a triple analogue

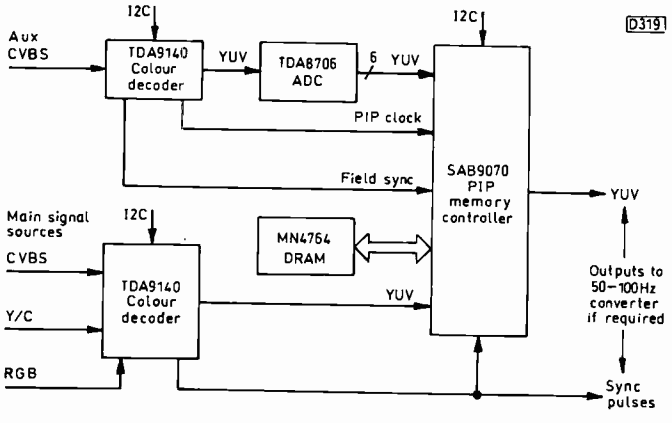


Fig. 15: PIP processing prior to the main scan-rate converter. A separate DRAM is used for storage and time-compression of the PIP data.

multiplexer and a single 6-bit ADC. The MN47464 DRAM that's used as the PIP memory is a 64K x 6-bit device that's governed by the SAB9070 PIP memory controller under I2C control.

Meanwhile the main picture signal, whether in composite video, Y/C or RGB form from a scart socket, is separately decoded, entering the memory controller chip in analogue

YUV form. Within this chip the reassembled, time-compressed PIP data is DA converted and inserted into the main picture signal. What emerges is the composite PIP/main picture, in analogue YUV form at the 50Hz field rate. It can be fed to a flicker-free processor.

The SAB9070 chip used in this particular arrangement has many built-in features. Amongst them are multistandard (PAL/SECAM/NTSC) capability, user control of the PIP contrast and saturation via the I2C bus, and luma key, pixelation and solarisation effects.

100Hz Teletext

In earlier 100Hz sets the RGB outputs from a conventional teletext decoder character generator chip had to be up-converted. There's now a teletext processor chip (type SAA9042) that generates output signals in 100Hz form for feeding directly to the wideband RGB stages in a flicker-free TV design.

Similarly, chips have been developed to generate the 100Hz/32kHz timebase waveforms required. In principle they are no different from those described in Parts 10 and 12 of this series.

In Conclusion

Well, that's it! The present series has run for longer than any other one in this magazine and has gobbled up lots of pages. I hope that it has achieved its object and not been too difficult to digest. Maybe the next time that we undertake anything on this scale we will be concerned wholly with digital TV broadcasting and reception – with not a capacitor or coil in sight except maybe at the input to the tuner!

Help Wanted

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

Wanted: Manual/photocopy/info on the Custom Sound CS700A mixer amplifier. C. Faulkner, 10 Bryngoleu Avenue North, Holyhead, Gwynedd LL65 1AD. 0407 740 070.

Wanted: LOPT for the Sanyo CPT3131. M. Grant, J & M Electronics, Unit 16, Centenary Business Centre, Hammond Close, Attleborough Fields Industrial Estate, Nuneaton, Warks CV11 6RY. 0203 325 761.

Wanted: RGB module for the Huanyu 37C-3 (on tube base). Also first anode preset (RV831) for the Ferguson TX10 chassis. V. Jeremy, 7 Tai Penyard, Penyard, Merthyr Tydfil, Mid-Glamorgan CF47 0LP.

Wanted: Scrap or damaged JVC GRS505 camcorder with serviceable mechanism. Robert Scarfe, 2a, Portland Street, Norwich NR2 3LF. 0603 622 792.

Wanted: LOPT for the Binatone Model 01/9014 – the type with serial number ending CF82. E. Longton, 47/49 Back Victoria Street, Fleetwood, Lancs FY7 6EJ. 0253 778 338.

Wanted: Help with getting a Heathkit AO1U waveform generator to work (no sinewave output). J. Stephens, 108 Dudley Road, Grantham, Lincs NG31 9AB.

Wanted: Remote control unit for the Osume Model CTV1484R. Peter Ward, Petgra, Forest Corner, Ringwood, Hants BH24 3JW. 0425 475 445.

Wanted: Line output transformer for the Atari SM125 monitor. Harry Hughes, 16 Dalton Drive, Goose Green, Wigan, Lancs WN3 6TQ. 0942 824 417.

Wanted: 30M-P23 output pentode (B7G – 42 – base) for a Sony TC200 tape recorder. The 30A5 seems to be a near equivalent. Loan of a circuit diagram and user instructiones for the Cossor CDU150 scope. A mains transformer for the EMI RE301/E tape recorder. Gordon Madgwick, Thursdays, Whitmore Vale, Hindhead, Surrey GU26 6JA. 0428 604 942.

Wanted: Small panel with eight square buttons and six wires to one plug – behind the touch-button unit – for the Ferguson 20A2 (TX9 chassis). Whole unit would do. C.F. Walker, 3 Stevenson Place, Littleover, Derby DE23 7EX. 0332 772 460 (evenings).

Wanted: LOPT for the Hitachi Model 1455 and base connector 14157/3CC for an A51X427X tube. Donald Bills, 69 Greenfields Road, Kingswinford, DY6 8EG.

Wanted: Programming information for the Connexions CX8520R satellite receiver/positioner, especially V/H switching and a.f.c. offset. C. Thorne, 27 Edgcumbe Green, St. Austell, Cornwall PL25 5EE. 0726 67 585.

Wanted: Non-working but complete Toshiba V73B VCR. K.L. Skilton, 119 Mill Road, Burgess Hill, West Sussex RH15 8AY. 0444 235 086.

Wanted: Akai RC-V77A universal remote control unit. PCBs for the Akai VSA77 VCR (or complete machine). Remote control unit for the Sony C9. Dave Hodgkinson, 42 Victoria Avenue, Cliftonville, Margate, Kent CT9 2UB. 0843 297 276.

Wanted: Instructions for assembly and alignment of the tape loading gear in the Amstrad VCR4700. The manual doesn't help. L.P. Watkinson, Regent House, Week St. Mary, Holsworthy, Devon EX22 6UJ. 0288 84 254.

Wanted: NTSC video player, preferably Panasonic NVJ45 or a machine with similar specification. Duncan Werner, 4 Lea Crescent, Riddings Alfreton, Derby DE55 4AQ. 0773 602 601.

Wanted: Manual/circuit or any information on the Bradley Model 234 frequency counter/timer (1973 vintage). S.J. Sheppard, 12 Bedford Road, Harrow, Middx HA1 4LZ. 081 863 5150.

Wanted: Working power supply panel for the Akai VS25EK. Working mains bottom board for the ITT VR3905. Mains transformer for the Ferguson TX90 chassis. Keith M. Twamley, 25 Davena Drive, Weoley Castle, Birmingham B29 5UL.

What a Life!

Donald Bullock

I woke up early one morning. The sun was shining, the birds were singing and it felt good to be alive. Then I remembered that I was in TV/VCR repair, and that Walter Windpipe had called the night before, at half past ten, with a Samsung VCR.

"Sorry to call so late Mr. Bodger" he slurred. "I've had this in the car a couple of days and remembered it only when I left the, er, club. It's the wife's Sing-Song. Can't be much – it was all right before it seized up."

Walter's Sing-Song

When I got to the workshop I opened Walter's Sing-Song, an SI1260 that was quite new. Its carriage had jammed because the brittle plastic cog assembly had been stripped by the coarse-toothed metal slider that meshes with it. The two never did mesh well in this series of models. A look in the manual gave the part number as 65203-605-310, but it proved to be no longer available. The recommended replacement is part number 65203-605-330, which costs 63p. Samsung have a £3 minimum order charge so, in view of the potential business out there, we ordered six. The spares came quickly and we had the machine right in no time. I have to say that Sing-Song certainly try harder and their service people have always been good to us.

I've referred on previous occasions to a pair of troublesome diodes in this machine, D109 and D110, both type O54001. They go leaky or short-circuit. As a result the voltage on the 5V line falls, the consequences being loss of the E-E vision (the sound remains) and no drum or capstan drive. If they are only slightly leaky the symptom is intermittent cassette ejection. Specimens like Windpipe then force the carriage. So while we were at it we replaced these diodes with some tougher ones.

A Ferguson A51F

My first caller that day was Mrs. Simper. She swept in followed by a scruffy lad with a TV set in his arms.

"Put it down there" she ordered him. As he put it on the bench he knocked down our drawer of assorted screws. "You oaf" she said. He stood there blinking and I started to pick up the screws.

"Smokes" she said, "all the bloody time". I looked at the fellow. "Not him" she continued, "the set. He's a telly addict, not a smoker. Can't be much wrong with the set. Snoddies said it was a condenser and quoted a quid."

I straightened up. "Perhaps you should take it there then?" I suggested.

"They can't do 'em."

So I ended up with the set, which is fitted with the IKC2 chassis. This frightens me to death. When I plugged the set in it made three spirited attempts to start then smoke began to belch from beneath the line output transformer, close to the core. Like the ICC5 and ICC7, this chassis seems get through line output transformers – and they're not cheap. We paid up, got one, fitted it and to our relief the set worked.

When Mrs. Simper returned with her lad to collect the set we told her that the charge was £40. She looked at us with contempt and said to him "pick it up, you dummy – wish you could make money like these people instead of watching telly all day."

While Mrs. Simper was attending to the payment he picked the set up, gave us a wink and made a disgusting sign behind her back.

The Philips K35 Chassis

Half an hour later I noticed that Steven was grunting and rubbing his eyes as he worked on a set. "What's up?" I asked.

"Partial field collapse with this K35 set of Rupert's" he said, "but the BD437/BD438 field output pair TS530/TS532 test perfectly after being removed."

"Nevertheless, try a new pair" I said. He did, and up came the picture.

"Aren't I clever?" I added. Then we stopped for our tea break. I made the tea – it's one job I can do well without having to use my tired brain. As we were finishing, two odd fellows came along in quick succession. One had tiny eyes and a permanent leer, the other looked like the hunchback of Notre Dame.

Strange Fellows

I'm Terence Stoate" leered the first, "of Stoate, Weasel and Fleecem, solicitors. I've a 20in. Ultra Model V2001 in the car. TX90 chassis, you know. I've made a note of the serial number. Can you get it out? – I have back trouble. It just groans."

That I understood. As I struggled in with the set Steven was accepting a Panasonic NVL20 VCR from the other man. "Call back this afternoon, Mr. Huckmore" he smiled.

"Er – how come the new confidence?" I asked.

"It's dead, no functions or display" he replied. "I think it'll be the 1µF, 400V electrolytic in the switch-mode power supply down to about 0·005µF." He was right.

I went to the house for some Asprins, then put Mr. Stoate's set on the bench and opened it up. The chassis was immaculate. He'd been into it and removed every speck of dust. Some of the larger components had a red felt-pen spot on them. When I plugged the set in nothing happened apart from a groan from the speaker. I decided to make a few cold checks, but there was nothing obviously amiss. Steven boxed up the NVL20 then came over as I plugged the set in again. While he was peering at the chassis the line output transformer suddenly exploded, covering him with a sticky resin.

"What was it?" he asked when his ears had stopped ringing, "and how do I get all this off?"

"It's the first time I've had a line output transformer explode" I said. "Phone HRS for another – ask for a TX90 white spot."

When it arrived Steven got busy fitting it while I looked out the manual and linked the set to the mains supply via the variac. We connected a d.c. voltmeter across the h.t. line and turned the set-h.t. control to minimum. Then we wound up the set slowly, standing well back – me behind Steven. As the voltage rose the set pulsed two or three times and up came a raster. After plugging in an aerial we had a picture. It wasn't bad, except for the verticals on the right-hand side – they were wobbling and rippling. We tried to adjust the h.t. voltage, which was low, but the control had no effect. So we switched off quickly and checked around in the power supply/line output stage circuit. Sure enough the BD839 boost voltage regulator transistor TR107 was short-circuit. All was well when we fitted a replacement. We took care to set the h.t. correctly, boxed up the set and put it on soak test. Later we pronounced it fit.

Mr. Huckmore subsequently called to collect his NVL20. "Funny-looking chap that was here last time I came in" he said.

"So many are, Mr. Huckmore" I said.

As he departed Mr. Stoate came in.

"Odd cove that one" he commented.

"We seem to attract all the oddballs" I said, smiling thinly.

A Grundig CUC60

There was only one job left to be done that day, a Grundig TV set fitted with the CUC60 chassis. Apparently there was occasional field collapse and "the line gets brighter and brighter".

"Shall I have a go at it or will you?" asked Steven.

"You have a go" I said.

The chassis has subpanels mounted on the main PCB. Steven pulled out the field timebase panel and checked D2758, a pretty little SKE2F diode. It was open-circuit. He fitted a new one, checked the panel for dry-joints and resoldered C2758 (100µF, 35V). "That'll put it right" he said. It did.

He was just lucky.

Test Case 378

Mr. Miles cussed his remote control zapper for the twentieth time that week. Stabbing irritably at the keys, and lining the unit up exactly with the front of the TV set, he at last got ITV. He was on his second new set of batteries this year. Later he arrived at the Test Case service department with his zapper in his hand. After fitting two new AAA cells we tested the handset with one of those magic mirrors and sent him on his way – with the advice that he might be buying stale batteries and that it was best to get them fresh from a shop with fast-moving stock.

It wasn't many weeks before Mr. Miles was back in service reception with the same problem. This time we kept the zapper for investigation and supplied a loan handset which, a subsequent phone call confirmed, worked perfectly. So the set (an Hitachi C2875TN as it happened) was all right and the problem was with the handset. It's similar to most modern types, with a matrixed keyboard, a single encoder/driver chip and a single transistor to drive the IR transmitting LED. Power is provided by a pair of series-connected AAA cells that supply 3V. It was here that Roger started to make his checks. The way we test these batteries is to connect them directly, but momentarily, across the probes of an Avo Model 8 switched to its 10A d.c. range. Both produced well over 1A and were thus perfectly well able to drive the circuit. To be doubly sure, we checked them in another handset. They worked perfectly.

By using a little photodiode gadget that plugs straight into the oscilloscope's Y input socket Roger was able to check directly the amplitude of the invisible IR output pulses. The faulty unit produced pulses that were of about half the amplitude of those provided by a known good handset at a similar range and angle. So there was no doubt that a problem existed, and it wasn't cleared by cleaning the front filter window. A set of brand new cells produced some improvement, but the pulses were still not up to the standard of those from the comparison handset. Roger next selected a replacement LED from a huge box of scrapped, polluted and broken zappers and fitted it to the problem unit. There was no perceptible improvement in the emission power. A new driver transistor made no difference either. Maybe the chip lacked drive power? An oscilloscope check showed that it saturated the driver transistor's base-emitter junction, and that the transistor, which acts purely as a switch, bottomed on each pulse – the reading across its collector and emitter leads was over 3V peak-peak, so the transistor was switching on and off hard and clean.

What else was there? The battery contacts were found to be free of corrosion, and the wires from them to the PCB were in good condition and firmly soldered at each end. Time to do a current check. A known good zapper drew an imperceptible current in the quiescent state and over 20mA when transmitting. The faulty unit produced a strange result indeed. Off-load there was no measurable current consumption: when a key was pressed the Avo 8's needle read a mere 2·5mA. The IR light output virtually disappeared, the scope recording only a few random low-level pulses. With the meter disconnected the handset returned to its previous condition: correct but low-power code emission. The mains-driven bench power supply was next brought into operation. Its output was set to 3V with the croc-leads connected to the battery contacts. When the zapper was activated the power supply's built-in digital current meter flickered uncertainly, never registering more than 3-4mA. Once again the IR output had virtually disappeared.

What was happening here? This little bunch of electronics seemed to be breaking all the rules! In a flash of inspiration Roger realised what the cause of the trouble was, and had the handset working correctly a few minutes later. The solution? See page 579.

Servicing the Hantarex MTC9000 Monitor

Peter Hubbard

One industry that didn't seem to suffer much from the recession was games arcades. While some television engineers may not be familiar with the technology used on games logic boards, such things as monitors, power supplies, lamp and reel driver boards should be well within the scope of the average TV workshop.

The larger arcades employ their own engineers, who repair logic boards and keep the machines running but often prefer to leave the monitors with their nasty high voltages to someone else. Smaller arcades generally don't employ engineers at all. Both like to have repairs done locally, as this saves time and money. The postage and insurance costs for items returned to the supplier can easily double the cost of a repair. Sometimes the item won't work after so much travelling, so the process has to be repeated at further cost.

A wide range of monitors has been used in arcade games machines, but one of the most commonly encountered ones is the Hantarex MTC9000, the subject of this article. We'll consider first the equipment required if you propose to service these monitors

Equipment Required

Two items are essential, a 120V a.c. supply with a suitable plug to match the tiny power connector on this chassis, and a tube assembly. The monitors are difficult to remove from the machines, so you usually get just the chassis. I use a Hantarex chassis frame and tube from a discarded machine. Having the 120V transformer mounted on the baseplate where the chassis belongs adds stability by balancing the weight of the tube face. The transformer feeds a bridge rectifier on the PCB.

One other item that's sometimes missing from the chassis is the panel with the line and field timebase controls. It plugs into a socket on the main board, but can be used with an extension lead. This enables the panel to be mounted in the games cabinet, where you can make adjustments from the normal viewing position. Either make sure that the panel comes with the chassis or acquire a spare one – the monitor won't work without it.

Inputs

Don't overlook the fact that there's no video drive once the monitor has been disconnected from the logic board, so you'll not see a raster unless you either provide an input signal or advance the setting of the screen (first anode) control on the line output transformer until a raster appears. This is not as bad as it sounds (see set white procedure later, under RGB output stages).

RGB video input signals should be between 1V and 5V peak-to-peak; line and field sync, positive- or negative-going, either composite or separate, between 1·5V and 5V peak-to-peak. The ganged potentiometers P1 adjust the video input level (switches may be used in some versions) while switch SW4 caters for positive- or negative-going sync pulses.

Connections

The chassis has both 240V and 120V inputs. Ignore the 240V input, which is used to power the degaussing circuit, feeding your 120V supply to the inner pair of pins of the four on the power connector.

There are also two sockets for the deflection yoke plug. Either can be used – this arrangement allows the picture orientation to be changed to cater for different games formats.

The Power Supply

The output developed by the bridge rectifier is fed to a conventional series regulator circuit. It's always worthwhile carrying out a visual check for any obvious faults. If the 2AT input fuse F1 is well blackened it's likely that one or more of the bridge rectifier diodes D19/20/21/22 or the series regulator transistor TR20 is faulty. Type 1N4004 diodes make suitable replacements. The transistor is type TIPL762.

Another frequent and obvious fault is a swelling around the middle of the line output transformer, indicating that a replacement is required.

If all seems to be well, switch on and check for 130V at the link in the deflection yoke plug. If you get a reading of only about 18V here this usually means one of three things: the line output stage is drawing excessive current or TR20 is either open-circuit or held cut-off. In all cases the 330Ω, 30W resistor which is connected in parallel with TR20 and is mounted on the side of the chassis will be getting very hot. I've never found one of these resistors that has gone open-circuit, but they get very black and the silica falls out when they overheat. If you find that the resistor is in this condition it should be replaced to ensure future reliability.

TR20, an npn device with the input at its collector and the output at its emitter, is easy to check with a meter. If it is all right check the value of the 33kΩ, 0·5W resistor R110 – it has a habit of going high. Do this with the resistor out of circuit. If not you will get a false sense of security – R110 always has the right value in circuit!

Apart from this the power supply is very reliable. Note however that the two 16kΩ resistors R113 and R114 in the error-sensing network are 1% types: they must be of correct value to obtain an h.t. voltage of 130V – there's no manual h.t. adjustment.

The Line Output Stage

If the power supply is working but the h.t. is low, check the BU508A line output transistor TR15. If this device is o.k., check that only pins 5, 6 and 10 of the line output transformer TH2 are connected to chassis. The transformer has a habit of shorting between windings. If you get a reading from any of the other pins, carefully remove all the solder from pin 5 with solder braid and check for continuity between pins 1, 3 or 9 and pin 5. If there's a reading replace the transformer. The transformer pins are numbered clockwise from the gap when looking at the underside of the PCB.

No Line Drive

An h.t. voltage reading of between 60V and 90V usually

means that there is no line drive. Rectifier diode D18 (BYD33G) sometimes goes open-circuit: it's hidden between the line output transformer and the heatsink near TR20 and is very difficult to get at. The trick here is to switch off, then switch on while monitoring the voltage at pin 15 of the TDA2595 chip IC2. If there's no brief voltage rise from the kick-start circuit, suspect either the 12V zener diode ZD1 (ZPY12) or the 470µF, 16V electrolytic capacitor C16. If there is a rise, carefully remove all solder from pin 14 of the TDA1670A field timebase chip IC1 and try again. If you are lucky, the monitor will then come on with the proverbial white line across the screen. If not, get your long-nose pliers out and struggle with D18.

A rare cause of no line drive is operation of the over-voltage (X-ray) protection circuit. This operates as follows. A reference voltage obtained from the line output stage is fed via a resistor chain to pin 8 of the TDA2595 chip where it's compared with an internal reference voltage. If the e.h.t. is excessive, the line oscillator is inhibited. This state continues until the fault is rectified. The power has to be switched off to reset the protection circuit. The usual cause of excessive e.h.t. is a slightly leaky line output transistor (TR20). On one occasion R113 in the power supply proved to be the culprit (see previous note under the heading Power Supply).

No Field Output

Loss of field output is a common fault. The TDA1670A field timebase chip IC1 dies and sometimes, as mentioned above, takes the 26V supply with it.

RGB Output Stages

The only other regular faults we've had have been dry-joints on the tube base, usually around the RGB output stages. Sometimes one of the output transistors goes open-circuit. The BF459 is a suitable replacement.

To set the white level after working on the output stages, proceed as follows:

Remove any input signal then adjust the preset brightness control RV7, which is hidden inside the heatsink near a 2·2Ω, 17W resistor, for maximum brightness.

Set the black-level controls RV203 (red), RV204 (green) and RV205 (blue) to minimum (clockwise).

Reduce the brightness, using the G2 (screen/first anode) control on the line output transformer, until only the dominant colour shows.

Adjust the black-level controls for the best white.

The G2 potentiometer acts as the brightness control!

In Conclusion

As these monitors lead a hard life it's worthwhile, in the interests of increased reliability, changing any components that look tired. You will find the customer happy to pay to get his machine back earning its living – though he might do so with 50p pieces from the coin box!

Spares are available from Hantarex UK Ltd., Unit 7, 243 Kangley Bridge Road, Sydenham, London SE26 5BA (telephone 081 778 1414, fax 081 659 9348). Compatible line output transformers are available from CPC Ltd., Component House, Faraday Drive, Fulwood, Preston, Lancs PR2 4PP (0772 654 455).

Cable & Satellite '94

Ian Martin

This year's Cable and Satellite Show took place in the Grand Hall, Olympia on April 11-13th. As on previous occasions there was a record number of exhibitors and visitors. The show seems to have matured to become a more businesslike affair, with more solid information and equipment and fewer glossy presentations.

Satellite Channels

Most of the current satellite channels were represented, many on the large stands of the satellite operators. In addition some new channels were being introduced, including the Travel Channel which has already started to broadcast via Intelsat 601 and hopes to move to Astra later this year. Another new Astra broadcaster, the Chinese Channel, revealed that its transmissions are to be scrambled later this year, using Cryptovision. Decoders, developed in conjunction with Tandberg, will be available from Pace. The Children's Channel and rival Nickelodeon both had high-profile displays.

Over at the Eutelsat stand the programme schedule of the revamped NBC Superchannel was revealed, along with the schedules for MBC and the other operators. More new channels are promised at 13°E with the launch of a new Eutelsat Hot Bird later this year.

Digital radio was again being promoted by DMX. This service is currently available via Intelsat and many cable systems: Astra services, in conjunction with BSkyB, are promised by the end of the year. Music Choice revealed its plans for a fifty-channel Digital Satellite Radio service via Intelsat, again due to start this year. To enable the channels to share a single transponder, Dolby ADM digital compression will be used.

Information on the long-awaited Orion Atlantic satellite was released at the show. The plan is to launch the satellite this October, stationing it at 37·5°W. This mid-Atlantic position will suit simultaneous transmissions from Europe and the USA, mainly for news and commercial feeds. Transatlantic TV signals intended for cable distribution will use digital compression. Advanced services such as high-definition TV are also planned.

Satellite Receivers

As last year Pace had one of the largest stands, situated right inside the entrance. The centre-piece of the display was again the MSS1000 integrated receiver-decoder with a built-in Dolby Pro Logic decoder and a four-channel audio amplifier. Although this model has only recently become available variants are already appearing. The first is Model MSS500, a full-feature receiver with the same styling but without the Dolby and extra amplifier circuits. Two new 'basic' receivers are the MSS200, in versions with and without VideoCrypt, and the MSS300 which has a large fluorescent display to indicate the programme name and other information. The ever-popular PRD800 and PRD900 were on show in their new 'Plus' versions. All Pace Astra receivers are now 1D compatible, using the SES agreed 22kHz LNB switching signal. An add-on positioner panel for the MSS1000 was shown: it fits inside the receiver. I hope to test it in a follow-up review. A D2MAC/Eurocrypt SM module is to be made available later. It's not intended as an upgrade.

Amstrad showed a similarly-specified Dolby Pro Logic IRD with built-in four-channel amplifier. This sleek unit, the SRD2000, features dual 'enhanced wideband' i.f. inputs, a large fluorescent display and true Wegener Panda 1 sound de-emphasis. A non-VideoCrypt version, Model SRX2002, will also be available. More information is due to be released soon.

Amstrad showed a range of world satellite receivers on its stand and in a special 'enhanced wideband' brochure. They are aimed at the growing East European, Middle East and Far East markets. Enhanced wideband means an i.f. input range of 700-2,050MHz. This ensures that the receiver's front-end is suitable for Astra 1D reception whether it's used with a standard 10GHz LNB or an enhanced 9·75GHz type. The new UK Models SRD540 and SRD545 have this feature along with a 22kHz switching signal.

A new player in the UK satellite receiver market is Grundig, whose Select receivers are being made at Llantrisant in South Wales. There are three models, the GRD150, GRD250 and GRD350, the numbers indicating the programme presets available. All models have a low-threshold tuner (6dB or better), an integrated VideoCrypt decoder, on-screen displays and channel naming and Astra 1D compatibility. Model GRD250 will also be available in a stylish white- or wood-finish cabinet. A review of this receiver is also intended.

Cambridge showed its ARD200 series receivers, which have 200-position programme memories. The standard model has an integrated VideoCrypt decoder, a 2GHz i.f. input and on-screen displays. Model ARD200T also has the 22kHz switching signal necessary for Astra 1D switched LNBs while Model ARD200E has a VideoCrypt II decoder suitable for Filmnet via Astra transponder 63. Models ARD250 and ARD350 are similar but have larger programme memories.

Echostar's new SR5700 receiver has a built-in dish positioner and an optional VideoCrypt decoder. Its 2GHz i.f. input makes it suitable for use with an enhanced Astra LNB (for 1D) or a triple-band LNB (for multi-satellite reception). A D2MAC/Eurocrypt version is to be introduced. The popular Model SR70 receiver is to be replaced by the SR70 Plus, which again has a 2GHz tuner to add Astra 1D capability.

Other receiver manufacturers present at the show included Chaparral, Digital Vision, Drake, Maspro, Mimtec, Nokia, Palcom and Strong. There were many new offerings.

Aerials and Accessories

Satellite aerials from around the world were on show. Exhibitors included IRTE from Italy, Metsa from Mexico, DH Satellite from the USA and the local companies Channel Master and Lenson Heath. Lenson's 98cm dish, which I reviewed in a previous issue of *Television*, is now available with a new profile. This improves the phase response and is claimed to increase the gain by more than 1dB.

LNB makers included Cambridge, Continental Microwave and Chaparral. The latter had a new ultra wideband LNB that covers the whole Ku band.

Zeta, which is famous for its Clearial transparent dishes, unveiled some new products including the Dual card reader which enables one VideoCrypt card to be used with two decoders, the Select-A-Sat motorised LNB holder and the Megasound powered sub-woofer TV stand. The latter was

being demonstrated in use with a Pro Logic surround sound system. The company also has a range of TV sets with integrated satellite receivers. Screen sizes range from 21in. to 33in.

Flat-plate TV and f.m. radio aerials were a feature of the Maxview stand. These set-top units, along with amplifiers, splitters, outdoor aerials etc., are described in the company's booklet *A Guide to Terrestrial TV & FM Radio Broadcasting*. It contains useful information about r.f. distribution in the home, showing typical systems, and a UK map of the main transmitter locations.

Global Communications continued its Astra 1D ready philosophy with the ADX Astra 1D i.f. extender, TE4 top-end i.f. extender and HOPAD i.f. shifter modules. These will enable those with standard LNBs and unenhanced receivers to tune in the new channels when they become available.

One of the few freebies at the show was available from Tratec – the company's 'Waterlock' LNB connector cover. Hirshmann had another good protection idea: a dual-output Astra LNB with an outer, snap-over weatherproof box. One of the most unusual items advertised was the Perfect 10 satellite dish from the States: it's disguised as a boulder, being available in stone grey or brown!

Test equipment on show ranged from hand-held signal-strength meters and compasses to transmission quality generating and measuring equipment. At the latter end of the market, both Rohde and Schwarz and Tektronix showed impressive product ranges.

Dealers and Other Services

Eurosat and Satellite Solutions both displayed new catalogues and product ranges. BBC Engineering was offering consultancy and uplink facilities. IDB Broadcast offered airtime and remote production. NTL demonstrated its video compression and uplink technology. Eldon Technology had a decoder which displayed an MPEG-originated digital video picture: the company considers that the MPEG compression system will be used with the Astra 1E satellite. Multichoice Developments was promoting the use of VideoCrypt II, for which it has exclusive rights.

The Confederation of Aerial Industries (CAI) invited companies to apply for membership: details of training courses, including SMATV installation, were available, also a range of technical publications. Servicing books and technical journals were available from U-View, 21st Century Publishing and WV (What Video) Publications.

Summary

Some 200 companies were present at the show: our apologies to the many we have not been able to mention here.

Forward planning for Astra 1D seemed to be the main aim of the satellite receiver manufacturers. The cable part of the show was larger than in previous years, with a greater emphasis on signal distribution and head-end equipment. Digital video compression for satellite transmissions, teleconferencing and video-on-demand is now a reality: many companies had related products and services on offer. There was almost no sign of MAC, PAL-Plus or wide-screen TV.

Such was the emphasis given to Astra 1D readiness that I feel it will soon be impossible to sell receivers without 64-programme (or more) memories, two smart-card slots and extended i.f. At any rate this should ensure a healthy demand for upgrade receivers and installations.

TV Fault Finding

Reports from Philip Blundell, AMIEIE, John Edwards, Nick Beer, Eugene Trundle,Brian Storm, Chris Watton, Michael Drandfield, Gordon Haigh and John Pitt-Francis

Sony 27XRTU

There was no synchronisation with this set. A scope check showed that there was no video input at the sync separator (pin 5 of IC501). We traced back to the teletext board where the SAA5230 chip had no video output at pin 1. In addition the chip was overheating, as a result of which the 12V regulator Q002 had gone short-circuit. Replacing these two items restored the picture. **P.B.**

Grundig CUC3500 Chassis

For no sound or vision with the +C voltage low at 80V instead of 196V, check whether D635 (BAT86) has gone short-circuit. **P.B.**

Philips GR1-AX Chassis

There was no sound or raster. The 95V h.t. supply was present at the line output stage but there was no line drive. We found that the line drive stage was inactive as its supply was missing. Coil L5524 had gone open-circuit. **P.B.**

Toshiba 199R4B

If the symptoms are intermittent loss of the sound and vision, with just a whistling noise coming from within the set, check the pins of the line output transformer for poor contact with the print. **P.B.**

Sentra STX600

My next door neighbour's TV set went to one of my competitors because of field foldover. A week later they brought it back saying that they couldn't do it! The set was now dead. . . E.H.T was present, but there was no sound or vision and a squealing sound came from the power supply. I found that R448 (4·3Ω, 1W fusible) was open-circuit while there was a short between the 11·7V line and chassis. Resistance checks enabled me to chase the cause of the short to the front end, where RV68 was leaning against the tuner's can. Bending RV68 away cleared the short, so R448 was replaced. The set now fired up but there was just snow on the screen and no sound. The 5V supply was missing because of a crack in the print leading to the emitter of Q805. I now had the original fault back, field foldover. C313 (2·2µF) was open-circuit. **P.B.**

Sony KV1612

If there's no sound or vision and the main supplies are all correct, check the 12V supply to the tuner. It's derived from the line output transformer and follows a complex path, via the surge limiter R811, the rectifier diode D811, connector D5, connector A12 (pin 1) and stabiliser transistor Q207. The most likely cause of the fault is that R811 (4·7Ω) has gone open-circuit. **J.E.**

Matsui 2890/Saisho CM2880TX

This set was dead with no channel display. Checks showed that there was no a.c. supply to the bridge rectifier as relay RY101 wasn't being energised by a low signal from pin 30 of the microcontroller chip IC103. This was hardly surprising as IC103's 5V supply (pin 52) was missing. It comes from the 5V regulator IC106 which was very hot. A resistance check showed that there was a short-circuit across the 5V line. The cause turned out to be the 5·6V zener diode D142, which is on the print side of the PCB, connected between pin 52 of IC103 and chassis. The set worked well once this item had been replaced. **J.E.**

Philips K35 Chassis

This set suffered from EW bowing because the 5Ω resistor connected to the collector of transistor TS490 was open-circuit. The position of this resistor is marked as a link on the PCB, so it doesn't have a circuit reference number. It is easy to recognise however as it's mounted on long legs well clear of the PCB. We checked the associated transistors, found them to be o.k., then replaced the resistor. This restored a normal raster. **J.E.**

Toshiba 284T8B

This set would search for a channel correctly but wouldn't stop when a channel was found. Pin 9 of the microcontroller chip QA01 was receiving line sync pulses. The other requirement for it to recognise a station, a.f.t. pulses at pins 8 and 30, was not being met however. These pulses come from pins 2 and 4 of the tuner/i.f. module, which had to be replaced. A more common cause of this symptom is D172 (1N4148). When it's leaky it distorts the a.f.t. pulses. **J.E.**

Hitachi C14-P216 (G7P Mk 2 Chassis)

There was normal sound but only a grey raster with flyback lines and a white line from the top to the bottom of the screen, about half way between the left-hand side of the screen and screen centre. Fortunately when I opened the set up I noticed that C711 (47µF, 200V), which is near the line output transformer, was bulging and had leaked. It's the reservoir capacitor for the h.t. supply to the RGB output transistors. A new capacitor and board clean up cured the fault. **J.E.**

Ferguson TX9 Chassis (PC1040)

Because of low h.t. there was lack of height and width. Someone had simply turned the set-h.t. control RV185 to maximum and still hadn't got the correct voltage. The simple cause was that R186 (12kΩ) in the potential divider network had risen in value to 15kΩ.

There was also no colour. I found that the 470Ω chroma delay balance preset RV67 was open-circuit. **N.B.**

Hitachi CPT1476R

This set wouldn't tune: there was a very low, fixed voltage at the tuner's tuning pin. The voltage rose and varied

slightly when tuner pin BT was disconnected, but the tuning still wasn't correct. Despite the fact that it measured perfectly when checked cold, resistor R1533 (39kΩ) on the remote-control PCB (PC279) was going open. It's in the tuning voltage filter circuit. **N.B.**

Panasonic TC1785 (Z3 Chassis)

There was a field scan fault with this set: the top of the raster was expanded while the bottom was compressed, but with no foldover. The cause was C458, which is listed in the manual as being 4·7µF, 50V but turned out to be 10µF, 50V. **N.B.**

Salora K Chassis

For the first ten seconds or so after switch-on there was a severe blanking fault: a large horizontal band was blanked from the picture. The band gradually shrank, leaving a normal picture. I had the feeling that this was a capacitor fault, and was right. When the super-sandcastle pulse was monitored I could see the blanked portion varying in size. Use of freezer soon narrowed the cause to C574, which is beside the field output chip. A new 100µF capacitor put matters right. **N.B.**

Solavox 141 (Nikkai TLG88/99 Chassis)

This set, which comes in many guises, was stuck in standby. A quick check showed that there was no start-up supply as R128 was open-circuit. The circuit diagram shows a single 150kΩ resistor, R110, in the start-up feed. There were two resistors here however, R110 and R128, both 82kΩ. To be on the safe side I replaced the pair. **N.B.**

Hitachi CPT2476

If you get one of these sets with a green or flashing-green picture, or with green fingers reaching out from the left-hand side of the screen, replace the caption/on-screen display generator chip. **E.T.**

Panasonic TX24T1 (Alpha 2 Chassis)

There was a text fault with this set. Initial checks showed that the channel flag was present and stable, but there were no bar graphs for colour, sound etc. When the set was switched to the teletext mix mode however a prefect text display was produced. As usual the cause of the trouble was a 10nF ceramic capacitor, this time C3526 which is connected to the base of Q3506 in the teletext contrast circuit. It was leaky. **B.S.**

Rediffusion/Doric Mk 4 Chassis

The customer complained that there was no on-screen channel display when either the recall or the programme button was pressed. In fact the display did appear, but then disappeared in the blink of an eye. As a new SAA1276 display generator chip made no difference we had to make a more detailed investigation. We found that 8C16 (1µF, 25V) in the timer section was open-circuit. It determines the time during which the display is visible. **C.W.**

ITT Digi 3 Chassis

A whistle could be heard and the channel indicator lit for a second or two, then the electronic fuse operated. We disconnected the scan coil plug, connected a 60W bulb between the 145V line (pin 4 of the scan coil plug) and chassis and switched on again. This confirmed that the power supply was working correctly. Checks in the line output stage then showed that there was a short-circuit across the –13V supply. Diode D547 (BA158), the TDA2170 field output chip IC401 and C548 (1,000µF, 16V) were all short-circuit. **C.W.**

Matsui 2190

We've had several faults with this model recently. No sound with R312 (330Ω) burning up was simply due to one of the TDA2030 audio output chips, in this case IC302. Flat out brightness was the fault with another set: the supply to the RGB output stages comes via R613 which was open-circuit – it's in the line output stage.

Two power supply faults. C808 (1µF, 63V) was the cause of a fluctuating output. R810 (100Ω) being open-circuit was the cause of a dead set. It's in the 12V supply to the TDA4601 chip once the start-up phase has been completed and runs quite hot. The correct replacement should be obtained and fitted. **C.W.**

Boots CTV14

There was no colour for the first ten minutes after which a very liny magenta cast appeared. If the channel was changed the picture would sometimes return to normal, with correct colour. On other channels there would be only a monochrome picture. The TDA3560 colour decoder chip and several electrolytic capacitors in this area were replaced, but this made no difference. Eventually we found that the chroma delay line was the cause of the trouble: resoldering the pins inside the case provided a complete cure. **C.W.**

Boots CTV10R/Nikkai Baby 10

The set was dead and a quick check at the output of the infamous potted regulator produced a reading of only 6·8V. Connecting an external 10·6V from the bench power supply still produced no results however, and on further investigation we found that the print between the regulator's output and its destination was open-circuit. When this was repaired the original regulator was found to be in order. These regulators produce a low output when unloaded. **C.W.**

Philips CP90 Chassis

There was a very bright line across the screen. Unusual these days, as field collapse usually causes blanking by upsetting the sandcastle pulses etc. In this case however the 8·2Ω safety resistor R3623 in the 163V supply was open-circuit, removing the feed to the RGB output stages and the field output stage bias. It seems odd that the same resistor should be involved with both feeds, since its failure will produce uncontrolled maximum beam current and field collapse, with tube damage unless the set is switched off pretty quickly. **C.W.**

Hitachi CPT1444 (NP84CQ Chassis)

This 14in. portable was dead with the 800mA fuse FS903, which is on a little panel between the tuner and the power supply heatsink, open-circuit. We usually find that the cause of this is a short-circuit 2SD1453 line output transistor (Q703). Unfortunately there was also a hole in the line output transformer while Q902 (BU806), Q903 (BF422),

the 36V zener diode ZD901 and the LM317T regulator IC901 in the power supply were all short-circuit. When we got the set going we found that the tube's emission was low. **C.W.**

Sony KV2217

This set was stuck on channel 6, with no sound or picture. All the supplies were present and correct, the line output stage was working and the tube's heaters were alight. Checks in the control section at the top of the cabinet revealed that the volume minus button was short-circuit. Replacing this restored all functions. **C.W.**

Osaki P21H

This set had us fooled for a while. There was sound but no picture. We noticed that the c.r.t.'s heaters were not alight, but they had continuity. Perhaps a dry-joint somewhere? Still no luck. We disconnected pin 10 of the line output transformer, which provides the heater supply, but again there was continuity. Then the penny dropped – the line output stage wasn't working! The cause was simply a dry-joint at the line driver transformer EM115. The line output transformer is obviously not the main source of l.t. voltages in this non-remote set! **M.Dr.**

Matsui 1440A

A common fault with these sets is noisy volume, colour, brightness and contrast controls, though most customers only complain about uncontrollable sound. We've found that repeated application of switch cleaner fails to cure the problem. The best thing to do is to remove the whole potentiometer bank and dismantle each one in turn, cleaning the wiper and carbon track with a powerful solvent such as RS 554-153 1.1.1. trichloroethane. **M.Dr.**

Matsui 1455

If the set is dead with no output from the power supply, check the 180kΩ start-up resistors R903 and R904 first. If these are o.k. it's likely that either C613 (0·0047μF, 1kV) or C614 (0·0022μF, 1kV) is faulty. They are both small blue disc capacitors that are connected in parallel with the h.t. rectifier D607 on the secondary side of the chopper transformer.

For no luminance, another very common fault with this set, check the luminance emitter-follower Q202 (2SA562TM-Y). If this is o.k. it's likely that either Q407, Q408 (both type 2SC1815Y) or D417 (1N4148), which are behind the AV board, is faulty. As a quick check, for a picture to be produced Q408's collector voltage must be low at 0·13V. We've never had to replace the TA7698AP colour decoder/timebase generator chip IC202. **M.Dr.**

Samsung CI347FF

There was intermittent sound that often cut off completely. By panel probing we found that the faulty area was ahead of the a.f. transistors. We then had to remove the tin screen on the print side of the PCB. Resoldering IC101 and all other joints in this area cured the fault. **G.H.**

Ferguson TX100 Chassis (Non-remote)

This set tripped when the rotary brightness control was advanced. As the on/off switch had just been replaced I checked to see whether there was something amiss in this area. There was! The four rotary customer controls have exceptionally long, bendable legs. Two of the brightness control's legs were touching. Separating them cured the fault, but it's easy to cause this sort of trouble by accidental mishandling in this area – it could happen to the volume, contrast or colour. **G.H.**

Saisho CM16R

This set was dead with the 2A fuse on the side unit blown. A visual check showed that C510 (1μF, 50V) was weeping electrolyte. After replacing this and the fuse the set worked all right.

The STK7305 regulator chip in these sets has a bad reputation for failure. Symptoms are standby indicator alight but set dead, set intermittently dead, bad power supply output fluctuations and D510 across the 103V rail going short-circuit. **G.H.**

Sony KV2756UB

There was no raster, just a black screen. The actual cause of the symptom was field collapse. A sticker on the back identified the set as being an RX chassis version, with discrete transistor field driver and output stages. I found that there was a spot burn on the 1·2Ω resistor in series with D804, as a result of which it was open-circuit. A replacement held. D804 is fed from the line output transformer. **G.H**

Matsui 2160

The power supply produced no outputs. We found that the five-legged STR58041 chip was faulty. **G.H.**

Matsui 1440A

We've had two of these sets with the same problem. They worked perfectly from cold, then tripped out after a minute. In both cases the STR50103A chopper chip IC501 was the culprit. We've also had the R2M over-voltage protection diode D508 cause tripping with this popular portable. **J.P-F.**

Ferguson TX10 Chassis

The cause of white spots on the picture and loud screeching on sound was traced to a hairline crack in the track leading from the earth point on the c.r.t. base PCB. **J.P-F.**

Akashi 1450/Etron EC142

This ageing portable out of the Network/Nikkai camp had failed during a thunderstorm. We found that the regulating thyristor Q811 was short-circuit. It happily accepted the TAG626 we fitted – it's slightly more rugged than the original SF8J41. **J.P-F**

Hitachi CPT2216

There was a severe field linearity fault – stretching at the top and no scan at the bottom. The cause was traced to C614 (2·2μF), a blue tantalum! **J.P-F.**

Luxor 6159

Our customer asked us whether the tube was faulty. The focus had been poor since a previous repair. Good contrast and the focus potentiometer at one end gave the game away. The previous repairer had fitted the 20AX instead of the 30AX version of the e.h.t. tripler assembly! **J.P-F.**

Camcorner

Reports from Brian Storm, Keith T. Keeton and David C. Woodnott

Panasonic NVFV1

When powered up this laptop model would just spool and switch off. It's basically an NVM10 in a different box, with a 5in. LCD screen tacked on top. This led us to conclude that the M54543AL loading motor drive chip IC6005 was faulty. When a replacement was obtained and fitted the mechanism shuffled, the laptop stayed on and all things were bright and beautiful. **B.S.**

Sony TR75

This model is very similar to the TR45 and TR55 and is subject to similar faults. The following faults are additional to those listed on Model TR55 (see *Television* March 1994).

No E-E colour, playback o.k.: Replace IC201 on board VS72.

No playback, head rotating in reverse direction – all fuses may be blown: Replace d.c.-d.c. converter and fuses.

No playback or record colour: Signal o.k. at IC203 on board VS67, no voltage at pin 14 of IC204 (colour killer). Caused by faulty capacitor(s) – C352/3/4 – usually only one. Replace capacitors one at a time to find faulty one(s). **K.T.K.**

Mitsubishi HSC35B

The report with this S-VHS machine said "dead with no functions". The customer thought that it may have been connected to an "unsuitable power source"! Investigation showed that there had been a severe overload in the power supply, with IC902, Q904/5, Z800 etc. the worse for wear. Fortunately the power supply is not the usual unrepairable d.c.-d.c. converter. Also at the time of the repair Mitsubishi had available a replacement power supply at little more than the cost of the chip! One was obtained, fitted and set up as per the note that comes with the assembly. One other item had to be replaced, the CCP2E-25 circuit protector on the main VTR PCB. No other fault was evident, the power supply having taken the brunt of the overload. **D.C.W.**

Sanyo VMD6P

There were no functions and a tape was jammed in the mechanism. It's common for one or more of the loading drive gears to loose a tooth. Usually a replacement gear is all that's required. It's a straightforward job as gear failure doesn't upset the timing of the mechanism. **D.C.W.**

Fujix P600AF/Sony CCDV50

Playback was o.k. but there was no camera picture. The cause of the fault was the camera d.c.-d.c. converter being inoperative and fuselink PS901 open-circuit. **D.C.W.**

Panasonic NVMS90

When play or record was selected there was a 'wobbling' picture accompanied by a 'screeching' noise from within. Thoughts of capstan motor failure (a flaking rotor) came to mind but the cure was much simpler. The cassette lid safety lever assembly had been fitted incorrectly and was fouling the top edge of the upper drum. Fortunately the drum hadn't been damaged, a quick refit of the offending part saving the day. **D.C.W**

Canon E110E

Everything worked apart from the fact that the viewfinder picture disappeared almost before it arrived! Checks in the relevant circuitry proved inconclusive, though the problem was persistent. A new tube cured it. Just what was going on inside the old tube remains a mystery. **D.C.W.**

Sony CCDV50E

This middle-aged machine had lost its ability to record sound from the microphone or provide E-E sound. Playback audio was fine. The UPC4522 chip IC451 on the microphone amplifier PCB was faulty. A straightforward repair: the worst bit was getting to the PCB! **D.C.W.**

Hi-8 Tapes

The reported symptoms with a Sony CCDTR705E Hi-8 palmcorder were "intermittent 'screeching' noises from the mechanism and 'wobble' on the playback picture". We've noticed these symptoms on several occasions with certain brands of Hi-8 tapes. Only ME tapes produce this effect, MP tapes performing correctly in both the Hi-8 and the 8 mode. The fact that the machine was a Sony model was not relevant to the condition. **D.C.W.**

Panasonic NVM10

Complete failure of these full-sized VHS machines to operate is often caused by a loading drive problem. Not this time! The main 2A fuse was open-circuit, indicating that a heavy overload had occurred. Indeed a near short-circuit could be measured across the main 12V line. The only thing for it was an unplugging session to try to establish the location of the fault. Eventually (it's always the last one you try, isn't it?) we arrived at the hi-fi audio PCB, where C4542, a 68µF, 16V electrolytic, had leaked. As a result there had been arcing between its pins. After removing the faulty item and cleaning the electrolyte from the PCB we had to carry out a little surgery to save the slightly charred board. A replacement capacitor and fuse (VSF6059) completed the repair, restoring the machine to its former glory. **D.C.W.**

Sony CCDTR705E

The viewfinder picture was intermittent because the cable was damaged. Abrasion had been caused by the bracket assembly that swivels as the viewfinder is moved. A new cable and removal of a burr at the edge of the bracket put matters right. It might be worth checking this when one of these models comes in for service. **D.C.W.**

Long-distance Television

Roger Bunney

Conditions during march and at the time of writing this in early April have continued to be very poor, with few signals. By the time that this is being read the Sporadic E season should have started and we can then hope for something better. My extensive Band I monitoring over the Easter period produced virtually a blank. The dismal SpE log for March is as follows:

8/3/94	TVE (Spain) ch. E3.
9/3/94	DR (Denmark) E3.
13/3/94	TVE E2.
19/3/94	RAI (Italy) IA; DR E3; TVE E3.
20/3/94	NRK (Norway) E2.
27/3/94	TVE E3; DR E3.

Low-level tropospheric signals from Spain were received on the 8th, on channels E5, 34 and 37. And that's about it!

Bandula Gunasekera reports from Sri Lanka that interference to reception of the Ekran satellite's Asianet u.h.f. programming is being experienced from terrestrial ch. E56 transmissions.

A new edition of my *TV-DXers Handbook*, long out of print, is due to be published by Babani in mid-summer. Amongst other things the satellite section has been enlarged and rewritten.

Satellite Sightings

It could be worth checking frequencies near to that of the MTV transponder (11·658GHz V) on Eutelsat II F1 at 13°E: we understand that NTL may be carrying out video compression tests at adjacent frequencies.

Eutelsat I F4 at 25·5°E has been brought back to life with CNNI taking a lease on the 11·093GHz H transponder. As an east spot beam is used, reception in the UK is weak. This seems to be a temporary measure following the loss of the Turksat satellite. While checking at 25·5°E, try tuning to 10·978GHz and 11·011GHz H for ITN news feeds. These are prime spots to monitor for late news. Another place to look is at 16°E, where Sky News has been using the 12·537GHz V transponder aboard Eutelsat II F3.

Several readers have commented on sports material from the USA via Intelsat K at 21·5°W. The signals are normally clear, though many are in NTSC form. Best checks are at 11·499GHz H (NTV), 11·532GHz V and 11·559GHz V (both Reuters). From time to time an originating OB or sat linking company may insert an identification in the field blanking interval. An example of this occurred on March 15th when the Key Biscayne tennis finals were being transmitted via the Atlantic Express transponder (11·017GHz H) aboard Intelsat 601 at 27·5°W: the NTSC signal carried the clearly visible identification 'Crawford Truck'. CNNI sometimes uses this technique for OB links.

While Maurice Hillier (Salisbury) was checking Italian election night offerings on March 28th he received via Eutelsat II F3 at 16°E a splendid caption with coloured globe and the lettering 'test transmission' for 'World Tamil Television'(see below). No further information on the signal source has come to light so far.

March 14th produced 'EBU MOGADISHU NEWSFORCE 1 625 PAL'. I've no idea who or what Newsforce 1 is: can anyone help?

News Items

Band III: Public network operators have requested that the use of the remaining Band III PMR sub-band channels be reviewed, the idea being to gain new regional licences in London, Manchester and Birmingham along with additional channels for general PMR use. New Band III and upper u.h.f. (854-862MHz) radio-microphone frequencies have been announced. The Band III channels are 191·9, 199·7, 203, 208·3 and 216·1MHz with e.r.p. levels of 10mW for handheld and 50mW for body-worn apparatus.

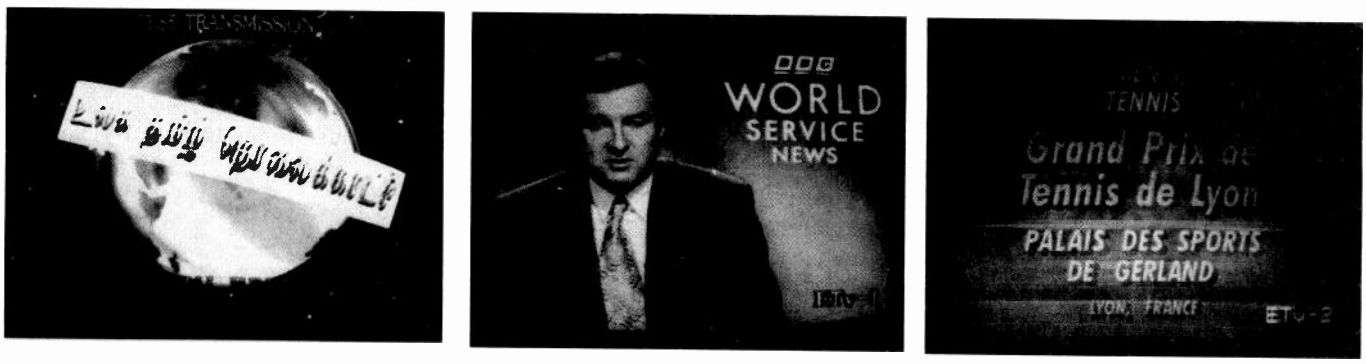
Czech Republic: A 2·5GHz microwave distribution (MMDS) system is to be started in Prague this September, with sixteen channels. Five will carry Czech material and the others satellite feeds.

Hungary: New regional commercial TV licences are being issued, covering the main towns including Budapest. Up to ten franchises will be available in the capital, including MMDS channels.

Cyprus: Since early May the Nicosia based Pay-TV channel Lumiere has extended its services, at u.h.f., to Famagusta, Limassol and Larnaca.

Finland: The YLE TV1 service is now on-air 24 hours a day with either programmes or test patterns. YLE TV2/3/4 services vary, generally starting at 0900.

Australia: Robert Copeman, 10 Cratloe Road, Mount Waverley, Victoria, Australia 3149 has formed the International Correspondence TV/FM DX Club (ICDX), with an informal news letter called Crossfire. Anyone interested should write to Roger directly: the club is mainly intended for Australasian enthusiasts though others farther afield will



Left: World Tamil Television on test via Eutelsat II F3 at 16°E, photograph from Maurice Hillier (Salisbury). Centre: BBC World Service news being broadcast via the Sri Lankan ETV-1 service, channel E31. Right: Prime Sports via Sri Lanka ETV-2, channels E35/56. Sri Lanka TV photographs from Bandula Gunasekera.

also be welcome to join.

MMDS: There is increasing MMDS activity in the 2·5GHz band, particularly in Ireland and central Europe. We would be interested in hearing from anyone with experience of DX reception at such high frequencies. In the USA the maximum MMDS range is reckoned to be about 35 miles, subject to terrain/obstructions and transmitted power.

Satellite News

Good news for satellite enthusiasts across Africa/Central Asia/Australasia. PanAmSat has changed the specification for PAS-4, which is due to be put into orbit at 68/72°E in mid-1995. It will have sixteen 54MHz bandwidth C band transponders and, for Ku band, sixteen 27MHz bandwidth and eight 54MHz bandwidth transponders.

Sony has developed a video compression standard, called SPEG, which is claimed to be an improvement on MPEG-2. It's described as being "broadcaster friendly", offers compression ratios up to 20:1 with digital component signals and should be ready by mid-1995.

The four Spanish TV channels (Canal +, Tele 5, Antena 3 and TVE) which will be transmitted via the Hispasat craft from the autumn are to use the Canal Plus type of encryption, allowing Canal Plus viewers simply to add an extra dish to their existing equipment.

The Russian GAL-S satellite is now in orbit at 44°E – test pictures have already been seen in Germany. It's to provide a six-channel Ku band DBS service for the CIS area, starting next year. GAL series satellites will have in-orbit stabilisation and an expected life of at least five years – relatively short.

GloboStar Satellite Communication Systems (CIS) is to launch three Coupon satellites giving world-wide coverage. Coupon-1 is due up in October this year, at 55°E. Coupon-2 will follow in April 1995 at 9·5°W and Coupon-3 in October 1995 at 162°E. The satellites will have transponders in the 3·7-4·18GHz, 11·096-11·2GHz and 11·46-11·7GHz bands. DTH services will have e.i.r.p.s up to 50dBW, those for broadcaster use (SNG etc.) up to 38dBW (for 1m and 1·5-2m dishes respectively).

More on Knife-edge Refraction

Knife-edge refraction (KER), or Mountain Bending, a form of propagation that allows reception of distant v.h.f. signals across paths with mid-point obstructions such as mountains, has been discussed in the last two columns. Robert Cooper (ZL4AAA, New Zealand) has sent us several papers that cover the theory and practice of KER at great depth, also his own observations and notes on his experience of the phenomenon. It seems that for UK readers KER remains something to talk about rather than see, though those in Wales/Scotland could experience the effect – if so, please let us know.

KER was first confirmed in 1950 by a radio amateur at Tanana, Alaska: he regularly received, at consistent signal levels, an Anchorage 100MHz f.m. broadcasting transmitter some 420km distant over an obstructed path. An IRE paper in 1955 confirmed KER, with the startling observation that the signal path via KER could achieve a signal gain of up to 25dB at the receiving zone as a result of the focusing action of the refraction. For KER to work there must be a line-of-sight (LOS) path from the transmitter to the mountain top and from there to the receiver. Thus if the obstruction is some gigantic peak the potential KER distance increases considerably. An example is amateur ZL3TY in Greymouth, NZ (100m a.s.l.) who receives signals from the ZL4NQ(-1) packet repeater (2,286m a.s.l.) some 356km distant, the signals being consistent with little fading. Mount Cook (3,764m a.s.l.) some 155km south of ZL3TY provides the refraction.

KER propagation can occur at v.h.f. and u.h.f. The more sharply defined the ridge, the more likely it is that there will be usable signal refraction. Bare mountains, i.e. without trees etc., provide the best refraction: snow covering reduces the effect and foliage is a further detraction. The mountain peak should be perpendicular to the signal path, with the thinner sides facing the transmitter and receiver sites. A rounded mountain peak gives less efficient refraction. It's interesting that the actual refracting edge can be small, perhaps a few wavelengths long relative to the incident signal. It seems that gain may increase with frequency – good news for u.h.f. signals! An 80km path can produce a signal lift of 25dB, a 250km path a gain of 80dB, relative to normally propagated signals without the obstruction.

During his travels across Northland, North Island Robert has carried out many KER experiments. Extensive KER reception is possible in the North Island, both TV (u.h.f. and v.h.f.) and v.h.f. f.m. radio. Auckland f.m. radio and TV broadcasts can be reliably received several 100km away, some u.h.f. TV signals being present at quite spectacular signal strengths. By marking the focus points on maps and co-relating to larger-scale ones Robert found that dual-hop refraction sometimes occurs, with two mountain peaks/ridges in the signal path. For optimum exploitation of KER signals the receiving aerial needs to be clear of 'ground clutter', which varies with frequency – not unlike a form of ducting that can be experienced with tropospheric propagation via long signal paths.

I've quoted extensively from Robert's notes and appreciate his help in providing information on this unusual mode of signal propagation.

ECONOMIC DEVICES 32 TEMPLE STREET, WOLVERHAMPTON, WV2 4AN

15/80H	3.83	2SC1398	0.80	2SD401	3.46	BAX14	0.28	BD189	0.48	BF870	0.23	BYV96D	0.27	LM393N	1.19	SDA2112	11.00	TA7122BP	0.63	TDA1170N	1.38	TDA9503	2.13
15/85R	3.84	2SC1413A	2.70	2SD438	0.34	BB105B	0.24	BD190	0.31	BF959	0.10	BYW56	0.46	M192B1	1.86	SG264A	10.62	TA7146P	7.70	TDA1170S	1.16	TEA1002	4.98
17052	3.85	2SC1509	0.72	2SD476	0.97	BC107B	0.20	BD201	0.48	BF960	0.27	BYX55600	0.20	M21C	1.65	SG613	10.79	TA7176P	1.78	TDA1190Z	4.88	TEA1009	1.61
17053	2.38	2SC1520	0.54	2SD525	1.27	BC108	0.15	BD203	0.46	BF966	0.61	CA1310E	0.70	M293	14.63	SGSIF344	0.93	TA7193AP	6.77	TDA1200	0.91	TEA1014	1.87
17088	2.38	2SC1573	0.36	2SD551	3.58	BC109A	0.16	BD232	0.45	BF970	0.38	CA3094	3.06	M490	15.30	SKE4F104	0.97	TA7193P	7.09	TDA1270	1.79	TEA1039	2.15
17089	3.39	2SC1573Q	0.26	2SD613	0.94	BC109B	0.15	BD234	0.34	BFR39	0.43	CD4001	0.21	M491	7.94	SKE4F210	0.87	TA7205AP	1.68	TDA1412	0.77	TEA2018A	1.49
17127	1.77	2SC1675	0.09	2SD636	0.19	BC117	0.14	BD237	0.30	BFR41	0.44	CD4011	0.21	M50115AP	3.24	SKE5F310	1.68	TA7207P	1.68	TDA1506	4.59	TEA2164	2.68
1N4001	0.04	2SC1685	0.21	2SD637	0.16	BC139	0.33	BD238	0.24	BFR90	0.61	CD4013	0.34	M51102L	1.77	SL1430	1.57	TA7210P	1.50	TDA1510	3.48	TEA2165	6.26
1N4002	0.07	2SC1740	0.14	2SD667	0.39	BC140	0.21	BD239	0.29	BFR90A	0.77	CD4016	0.14	M51231P	2.83	SL1431	1.70	TA7214P	3.74	TDA1512	3.17	TIC106D	0.82
1N4003	0.05	2SC1741	0.17	2SD669	0.63	BC141	0.34	BD241	0.41	BFR91	0.60	CD4021	0.43	M51393AP	4.84	SL1432	0.54	TA7217AP	1.37	TDA1515A	2.54	TIC106M	0.75
1N4004	0.07	2SC1815	0.17	2SD669A	0.63	BC147A	0.06	BD243	0.39	BFR96	0.53	CD4052	0.29	M51515L	2.01	SL471	1.70	TA7222	1.60	TDA1516Q	3.56	TIC45	0.59
1N4005	0.09	2SC1826	0.72	2SD716	1.46	BC148	0.12	BD243A	0.43	BFW92A	0.48	CD4053	0.39	M51521L	0.54	SL490	2.64	TA7222AP	1.07	TDA1518Q	3.32	TIL100	0.52
1N4006	0.06	2SC1827	1.00	2SD718	2.21	BC148A	0.06	BD243C	0.44	BFX85	0.55	CD4066	0.30	M5218L	1.59	SN29764AN	1.99	TA7227P	2.29	TDA1670A	2.81	TIP110	0.36
1N4007	0.06	2SC1845	0.26	2SD734	0.24	BC148B	0.04	BD244A	0.34	BFY50	0.34	CD4069	0.17	M5231L	0.55	SN7474N	0.38	TA7230P	1.80	TDA1701	3.67	TIP112	1.71
1N4148	0.04	2SC1846	0.51	2SD762	1.78	BC149	0.04	BD244C	0.42	BFY51	0.34	CD4D70	0.21	M53216P	2.70	SN76013ND	1.99	TA7233P	1.95	TDA1870	3.37	TIP112H	0.58
1N4448	0.06	2SC1923	0.14	2SD774	1.15	BC149C	0.04	BD245C	0.92	BR100	0.27	CNX62A	3.83	M54543L	1.97	SN76227N	1.87	TA7240P	2.46	TDA1904	1.21	TIP120	0.57
1N5061	0.38	2SC1942	3.57	2SD787E	0.46	BC157	0.13	BD246C	0.97	BR101	1.15	CR3CM	3.44	M54544L	2.41	SN76666N	2.28	TA7241	2.30	TDA1905	1.27	TIP121	0.42
1N5402	0.12	2SC1959	0.11	2SD837	0.90	BC159	0.06	BD278A	0.56	BR103	0.53	CRD2AM	2.17	M54548L	4.95	SN76705AN	1.70	TA7250	4.03	TDA1908A	3.42	TIP126	0.48
1N5404	0.13	2SC1969	2.46	2SD841	1.45	BC161	0.27	BD317	1.20	BR303	1.22	CV12E	4.49	M54644BL	3.38	STA341M	2.54	TA7267P	2.02	TDA1940	2.77	TIP132	0.46
1N5406	0.12	2SC1983	1.07	2SD856	1.03	BC167	0.42	BD318	1.29	BRX44	1.02	CX10910	7.05	M54648L	6.87	STA401	4.10	TA7270	1.00	TDA1950	1.86	TIP137	0.48
1N5408	0.12	2SC2001	0.22	2SD869	5.10	BC171B	0.30	BD380	0.34	BRY56	0.43	DTA124EF	0.13	M54898AP	20.45	STA441C	2.80	TA7270P	1.95	TDA2002	0.85	TIP2955	0.83
1N914	0.04	2SC2073	0.77	2SD870	3.01	BC177	0.14	BD433	0.29	BSS38	0.33	DTA144EF	0.17	M58485P	5.95	STK0029	12.04	TA7271P	2.65	TDA2004	1.44	TIP29C	0.30
1S1555	0.22	2SC2078	0.85	2SD871	5.08	BC178	0.25	BD434B	0.34	BT120	1.28	ER1400	6.45	MB3730	2.38	STK0039	7.11	TA7273	3.84	TDA2005	1.44	TIP29E	0.46
1S2076	0.29	2SC2141	1.48	2SD880	0.48	BC182L	0.06	BD435	0.38	BT129	4.38	HA11235	1.95	MB3731	2.88	STK0040	7.48	TA7274P	2.72	TDA2006	1.06	TIP3055	0.94
2N2219A	0.27	2SC2166	1.27	2SD882	0.43	BC182LB	0.06	BD436	0.32	BT139600	1.87	HA11244	5.04	MB3732	3.05	STK0059	9.75	TA7280	2.69	TDA2009	2.29	TIP30C	0.17
2N2222	0.22	2SC2168	0.85	2SD898B	7.70	BC184	0.09	BD437	0.32	BT151/500R	1.10	HA1124A	0.98	MC13002P	7.69	STK025	10.58	TA7299	2.63	TDA2020	3.72	TIP31A	0.32
2N2905	0.21	2SC2236	0.36	2SD904	5.95	BC184L	0.06	BD438	0.31	BT151800	1.15	HA11423	2.01	MC1310P	0.85	STK3042	7.19	TA7313AP	0.62	TDA2030H	1.94	TIP31B	0.30
2N2926G	0.37	2SC2271	0.36	2SD973	0.38	BC184LC	0.10	BD441	0.34	BU205	1.07	HA11440	3.46	MC1327AP	1.62	STK3062	8.88	TA7317P	0.93	TDA2030V	1.05	TIP31C	0.44
2N3053	0.36	2SC2274	0.31	74LS00	0.21	BC204	0.14	BD442	0.29	BU208A	1.44	HA1166X	3.43	MC1330AIP	1.26	STK4131	7.79	TA7325P	1.83	TDA2170	3.81	TIP32A	0.39
2N3054	0.58	2SC2274K	0.31	7805	0.49	BC207B	0.23	BD510	1.34	BU208D	1.61	HA11713	2.12	MC1350P	1.82	STK4141	12.46	TA7343AP	0.72	TDA2270	3.03	TIP32C	0.38
2N3055	0.86	2SC2314	0.33	7808	0.51	BC212B	0.06	BD529	1.61	BU326A	1.36	HA11741	9.48	MC1352P	1.45	STK4142	0.21	TA7358P	0.78	TDA2530	4.24	TIP33A	0.92
2N3442	1.00	2SC2335	1.43	7812	0.30	BC212L	0.06	BD530	1.10	BU406	0.68	HA11745	5.49	MC1358P	1.59	STK4162M	9.51	TA7535BP	0.68	TDA2540	1.12	TIP33C	0.80
2N3702	0.11	2SC2458	0.12	7815	0.82	BC213	0.11	BD535	0.43	BU406D	1.02	HA13001	1.89	MC14528BCP		STK4171	13.20	TA7607AP	2.83	TDA2541	1.10	TIP34C	0.89
2N3704	0.14	2SC2482	0.34	7818	0.41	BC214L	0.09	BD536	0.48	BU407	0.53	HA13108	3.56		1.70	STK4181 II	15.97	TA7609P	2.99	TDA2560	4.81	TIP41A	0.38
2N3773	1.27	2SC2547E	0.24	7905	0.34	BC237	0.10	BD675	0.30	BU407D	0.97	HA13118	1.87	MDA2062	3.89	STK4181A	12.46	TA7630P	0.93	TDA2576A	5.95	TIP41C	0.43
2N3819	0.55	2SC2565	6.01	7912	0.43	BC237B	0.08	BD677	0.32	BU426A	0.96	HA13119	2.83	MJ2950	0.97	STK4332	5.98	TA7640AP	0.68	TDA2577A	4.25	TIP42A	0.42
2N3904	0.11	2SC2570A	0.29	AA119	0.36	BC238	0.11	BD707	0.51	BU426E	2.13	HA13403	5.98	MJ802	2.37	STK4352	1.70	TA7676P	4.25	TDA2578A	2.55	TIP42C	0.43
2N4444	3.22	2SC2577	9.99	AA143	0.13	BC238B	0.05	BD839	0.68	BU500	2.00	HA1377	2.62	MJE13005	0.85	STK437	10.58	TA7680AP	4.58	TDA2581	7.52	TIP47	0.51
2N6292	0.62	2SC2581	3.05	AC127	0.11	BC239	0.04	BD901	0.51	BU508A	0.95	HA1388	2.63	MJE2955	0.68	STK4392	5.92	TA7698AP	5.93	TDA2581Q	14.54	TIPL791A	1.24
2SA1015	0.10	2SC2632	0.43	AC141K	0.46	BC252B	0.07	BD902	0.51	BU508AF	1.37	HA1389	2.52	MJE3055	0.51	STK441	14.43	TA7705P	1.68	TDA2582	1.95	TIS43	0.99
2SA1016	0.26	2SC2655	0.31	AC176K	0.38	BC300	0.48	BD911	0.41	BU508D	1.27	HA1392	1.81	MJE340	0.58	STK459	11.17	TA7769P	3.01	TDA2591	2.27	TL011CP	1.36
2SA1020	0.43	2SC2671	0.68	AC187	0.16	BC301	0.28	BD912	0.83	BU508DF	1.67	HA1397	2.83	ML923	14.76	STK461	12.29	TA8205	3.89	TDA2593	0.75	TL071CP	0.38
2SA1020Y	0.43	2SC2688	0.52	AC187K	0.33	BC302	0.36	BDV65B	1.16	BU508V	1.85	HA1398	2.33	MN1405VKF	14.58	STK4843	15.46	TA8210H	4.74	TDA2594	2.21	TL494	1.61
2SA1095	7.44	2SC2785	0.36	AC188	0.36	BC303	0.22	BDW84C	1.28	BU526	1.61	HA1452	4.88	MN1435VX	14.35	STK5211	15.78	TA8215	4.57	TDA2595	3.19	TMP47C432AP	
2SA1102	2.54	2SC2791	5.44	AC188K	0.82	BC307	0.06	BDW93C	0.50	BU536	1.80	HM6232	10.46	MN1435VXB	10.88	STK5322	0.35	TA8691N	7.81	TDA2600	5.98		11.24
2SA1143	0.17	2SC3150	1.53	AD149	0.52	BC307A	0.06	BDW94C	0.80	BU608	1.44	HM6251	0.52	MN650	3.23	STK5325	58.15	TAG626	1.35	TDA2611A	0.84	TMP47C434N–	

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BU208A x 5	3.99	TDA 3654 x 2	2.50
BU 426A x 5	3.75	TDA 4601 x 2	2.55
BU 508A x 5	3.60	STANDARD VIDEO SENSOR LAMP x10	2.50
BU 508AF x 5	5.00	STANDARD VIDEO SENSOR LAMP PLUG x10	4.00
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VIDEO FAULT FINDING GUIDE	9.99	3V35/6 ETC. BELT KIT x 5	4.25
SATELLITE FAULT FINDING GUIDE	14.95		
CO AXIAL AERIAL PLUGS x 25	3.75		

2SA1175	0.25	2SC3153	2.37	AD161	1.82	BC307B	0.06	BDX32	1.70	BU705	1.81	HM7103	16.44	MPSA42	0.23	STK5326	6.76	TBA120	0.53	TDA2611AQ	2.57	3555	17.87
2SA1186	7.20	2SC3156	6.61	AD162	0.96	BC308	0.11	BDY20	2.13	BU806	0.82	ICH28I	0.26	MPSA56	0.12	STK5331	2.31	TBA120AS	0.98	TDA2640	4.13	UC3844	4.19
2SA1208	0.34	2SC3182	2.49	AF124	0.77	BC308A	0.09	BF115	0.41	BU806A	0.88	KA2101	0.83	MPSA93	0.80	STK5332	2.99	TBA120S	0.89	TDA2652	14.32	UPA81C	1.12
2SA1265	2.96	2SC3225	0.50	AF127	0.77	BC308C	0.06	BF179	0.31	BU80796	0.51	KBL08	0.47	MR854	0.65	STK5333	12.63	TBA120T	0.51	TDA2653A	3.26	UPC1181H	6.80
2SA1286	0.55	2SC3795	1.95	AF139	0.29	BC327	0.10	BF184	0.41	BU826A	2.48	KSR1004	0.09	MSM5840H	15.36	STK5372	3.48	TBA120U	0.39	TDA2680	5.10	UPC1182H	5.95
2SA473	0.71	2SC380	0.12	AF239	0.43	BC327B	0.17	BF185	0.29	BU908	1.17	L200CV	2.19	MVS240	0.53	STK5421	2.60	TBA2800	3.30	TDA3190	1.27	UPC1185H	10.20
2SA562	0.17	2SC388A	0.59	AF279	0.34	BC328	0.07	BF194	0.22	BUK444	2.38	LA1201	0.56	NE545B	3.20	STK5422	6.38	TBA395	0.68	TDA3190P	1.36	UPC1188	3.83
2SA634	0.54	2SC458	0.10	AL102	6.35	BC337	0.09	BF196	0.15	BUT11	0.89	LA1230	1.95	NE555	0.21	STK5451	5.77	TBA520	0.85	TDA3300B	20.88	UPC1212C	0.83
2SA639S	0.83	2SC536	0.14	AN3821K	7.23	BC337L	0.22	BF197	0.34	BUT11A	1.05	LA1385	2.51	NE555N	0.37	STK5466	5.66	TBA540	1.97	TDA3330	10.78	UPC1228HA	0.56
2SA673	0.09	2SC710	0.12	AN5265	1.75	BC338	0.06	BF198	0.17	BUT11AF	0.85	LA3161	0.48	NE592	1.85	STK5471	4.87	TBA540Q	0.77	TDA3541	0.95	UPC1230	2.82
2SA684	0.60	2SC867A	5.25	AN5435	1.45	BC368	0.25	BF199	0.04	BUT12A	1.13	LA4140	0.37	NE646N	3.39	STK5476	5.00	TBA560C	2.02	TDA3560	3.65	UPC1230H	3.95
2SA733	0.17	2SC945	0.12	AN5512	1.83	BC369	0.17	BF200	0.39	BUT56A	1.19	LA4182	1.75	NP1106	11.86	STK5481	7.55	TBA570A	1.77	TDA3561A	4.79	UPC1278H	2.66
2SA769	1.27	2SD1051	0.48	AN5515	2.79	BC372	0.62	BF240	0.11	BUW11	0.99	LA4192	1.59	OA47	0.25	STK5482	6.41	TBA651	1.01	TDA3562A	4.91	UPC1318	2.96
2SA798	0.56	2SD1128	1.02	AN5521	2.14	BC546A	0.06	BF244	0.43	BUW11A	0.90	LA4220	N/A	OA90	0.59	STK6962	4.91	TBA750Q	5.10	TDA3565	2.85	UPC1335V	3.91
2SA872	0.14	2SD1138	0.94	AN5612	4.15	BC547	0.11	BF245A	0.19	BUW41B	1.02	LA4261	2.29	OA91	0.15	STK7216	7.28	TBA800	0.51	TDA3566	3.40	UPC1351C	1.70
2SA872A	0.28	2SD1207	0.35	AN5900	1.44	BC547A	0.04	BF245B	0.41	BUW81A	2.29	LA4270	2.73	R2540	2.98	STK7226	8.14	TBA810P	1.66	TDA3571B	3.40	UPC1353	1.34
2SA940	0.82	2SD1265	0.77	AN6310	4.69	BC547B	0.11	BF255	0.11	BUW84	1.11	LA4282	2.65	R2540X	1.92	STK7308	5.50	TBA810S	0.66	TDA3576	11.90	UPC1363C	1.06
2SA952	0.17	2SD1273	1.14	AN6326	5.08	BC548A	0.29	BF256	0.24	BUX84	0.44	LA4422	1.36	R2M	1.15	STK7348	4.91	TBA820	0.85	TDA3640	5.92	UPC1363CA	2.13
2SA958	1.44	2SD1275	0.88	AN6341	3.20	BC548B	0.18	BF256LC	1.67	BUX85	0.92	LA4440	2.48	R3297	6.06	STK7356	0.31	TBA820L	0.55	TDA3650	11.11	UPC1365C	1.70
2SA966Y	0.41	2SD1276	0.85	AN6610	0.93	BC548C	0.12	BF257	0.36	BUZ71	0.52	LA4445	1.61	R4050	2.38	STK7358	5.81	TBA820M	0.44	TDA3653AQ	1.92	UPC1378H	2.52
2SA970	0.36	2SD1279	7.62	AN6671K	8.66	BC549	0.11	BF258	0.04	BY127	0.17	LA4460	1.48	R4051	3.19	STR1096	4.67	TBA920	2.75	TDA3653B	1.86	UPC1391H	0.52
2SA984	0.38	2SD1292	0.41	AN7158	3.30	BC556B	0.15	BF259	0.31	BY133	0.08	LA4461	1.48	RB156	2.24	STR40090	0.71	TBA950	1.68	TDA3654	1.89	UPC1394	1.55
2SB1010	0.34	2SD1308	0.94	AN7161	3.56	BC557	0.07	BF324	0.12	BY164	0.67	LA4475	3.09	RGP15	0.41	STR4090	16.36	TBA970	4.08	TDA3810	2.55	UPC1420CA	7.69
2SB546	0.94	2SD1397	1.89	AN7171K	4.68	BC557B	0.06	BF337	0.34	BY179	0.80	LA4476	2.79	RGP15J	0.35	STR4211	4.72	TCA270S	1.03	TDA4420	1.27	UPC1488H	1.78
2SB633	1.31	2SD1398	2.13	BA145	0.11	BC557C	0.11	BF338	0.43	BY184	0.42	LA4500	2.17	RGP30M	0.30	STR440	11.54	TCA440	2.73	TDA4427	3.18	UPC2002	2.08
2SB643S	0.29	2SD1426	2.54	BA156	0.06	BC558B	0.06	BF355	0.48	BY206	0.20	LA4505	2.52	RM11C	1.71	STR441	15.95	TCA660B	0.43	TDA4442	3.49	UPC324C	4.03
2SB644	0.34	2SD1427	2.89	BA157	0.07	BC559	0.11	BF392	0.23	BY207	0.18	LA4508	2.29	S2000AF	1.46	STR451	15.13	TCA800Q	1.65	TDA4500	4.66	UPC4558C	0.65
2SB688	1.61	2SD1432	4.88	BA158	0.07	BC560C	0.21	BF393	0.17	BY210400	0.19	LA4520	1.49	S2055AF	1.81	STR50020	9.02	TCA910	1.21	TDA4501	5.08	UPC574	1.07
2SB772	0.43	2SD1439	3.05	BA159	0.25	BC635	0.19	BF422	0.19	BY224600	5.10	LA4700	4.27	2530A	1.98	STR50103	6.92	TCA940	3.40	TDA4503	3.38	UPC580C	2.55
2SB772Q	0.43	2SD1453	1.87	BA317	0.19	BC637	0.15	BF423	0.14	BY226	0.16	LA5112	5.80	SAA1004	N/A	STR54041	5.99	TD3F900H	6.57	TDA4505E	4.64	UPD1937C	3.15
2SB793	0.43	2SD1497–02		BA318	2.03	BC639	0.14	BF435	1.97	BY227	0.14	LA5512	0.61	SAA1121	11.22	STR5412	6.15	TDA1004A	4.35	TDA4600	2.29	X0065CE	2.20
2SB819	0.48		8.03	BA5102A	2.00	BC640	0.06	BF450	0.19	BY228	0.38	LA7223	2.54	SAA1174	5.10	STR58041	6.35	TDA1011	1.27	TDA4600/2	2.72	X2402	4.62
2SB861	1.10	2SD1497–06		BA536	2.00	BC879	0.39	BF458	0.30	BY229	1.64	LA7520	2.75	SAA1250	2.92	STR6020	10.15	TDA1011A	1.47	TDA4600D	3.54	ZPY120	N/A
2SB891	0.52		7.06	BA5406	2.12	BC880	0.38	BF459	0.29	BY229600	0.92	LA7800	1.44	SAA1251	6.30	STR6020KIT	15.05	TDA1013A	1.56	TDA4600F	1.70	ZTX650	0.51
2SC1008	0.24	2SD1541	5.56	BA6109	1.85	BCY70	0.07	BF469	0.34	BY229800	1.02	LA7801	1.27	SAA1351	0.23	T6064V	2.63	TDA1015	1.37	TDA4601	1.80	ZTX753	1.12
2SC1061	0.83	2SD1555	2.80	BA6209	1.46	BD131	0.28	BF470	0.33	BY238	0.31	LA7820	2.71	SAA3027P	7.62	T6076V	5.45	TDA1020	1.27	TDA4601D	2.42		
2SC1096	0.50	2SD1577	4.64	BA6219	1.76	BD132	0.21	BF480	1.10	BY255	0.14	LA7830	1.27	SAA5010	4.60	T9013V	9.33	TDA1035SB	4.15	TDA4605	3.00		
2SC1114	1.16	2SD1649	2.03	BA6222	1.61	BD135	0.33	BF493S	N/A	BY298	0.15	LM1303N	0.88	SAA5012	4.85	T9034V	1.45	TDA1035T	1.87	TDA4950	1.71		
2SC1162	0.31	2SD1650	2.47	BA656N	0.84	BD136	0.20	BF597	0.16	BY299	0.19	LM1877	1.45	SAA5050	6.42	T9035V	1.50	TDA1037	0.50	TDA7240A	2.36		
2SC1213	0.14	2SD1876	6.07	BA718	0.77	BD137	0.45	BF757	0.43	BY476A	0.68	LM317T	0.52	SAA5050	0.49	T9038V	6.09	TDA1044	1.43	TDA7270S	10.17		
2SC124	0.44	2SD1877	2.12	BAS11	N/A	BD139	0.41	BF758	0.32	BYD14J	0.31	LM324N	1.48	SAB3013	5.81	T9053V	0.92	TDA1060	1.73	TDA8140	2.38		
2SC1306	1.16	2SD1911	5.06	BAV18	0.07	BD140	0.24	BF759	0.36	BYD33G	0.68	LM339N	0.15	SAB3021	6.15	T9054V	1.65	TDA1082	4.25	TDA8153	3.61		
2SC1318	0.19	2SD234	0.89	BAV20	0.26	BD168	0.76	BF760	0.24	BYD33J	0.27	LM358	0.68	SAB3035	6.35	T9064	1.39	TDA1083	1.19	TDA8170	2.58		
2SC1364	N/A	2SD313	0.56	BAV21	0.19	BD175	0.29	BF762	0.29	BYV10–40	2.20	LM358N	0.42	SAF1032P	11.11	T9065V	6.06	TDA1151	0.51	TDA8180	4.07		
2SC1384	0.34	2SD350A	1.73	BAW62	0.17	BD179	0.34	BF869	0.25	BYV95C	0.44	LM380N	1.03	SAF1039	2.44	TA7063P	1.14	TDA1170	1.95	TDA8190	3.30		

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VCR Clinic

Reports from Eugene Trundle, Colin McCormick, Ian Rees, Della Verita, Gerald Smith, Keith Evans, Graham Richards, Ronnie Boag and David Belmont

JVC HRD560

Fast forward and rewind were painfully slow – an E180 tape took over thirty minutes! Throughout this time the tape remained fully laced with the drum rotating. The cause of the fault was failure of the supply reel spool rotation sensing optocoupler, circuit reference PS2. In addition it's a good idea to change the slider mode switch and ensure that the new type of main cam is fitted – this can be identified by its black colour. **E.T.**

Hitachi VT520

We've recently had three of these VCRs in which the capstan motor would stop momentarily every few seconds when the machine had been in operation for between thirty minutes and an hour. In each case the motor-mounted coil-drive chip was too hot to touch and a new capstan motor had to be fitted. **E.T.**

Sanyo VHR4350

Unreliable cassette front loading has been the trouble with several of these VCRs we've had in. With an afflicted machine there's an even chance that a proffered tape will be drawn in then spat out again. The usual cause is simple: loss of tension in the two finger springs that hold the cassette firmly in the front-loading cradle. **E.T.**

Tatung VR8530

About every third time this Akai-based machine was asked to play or record it would lace up then shut down, with the head drum trembling and throbbing on the spot instead of rotating. There were very strange waveforms at pins 8 and 9 of the on-board drive chip (type BA6413) at all times, and even when it did get started the drum motor took a long time to run up to speed. The chip may or may not have been faulty. Since it's not listed separately as a spare a new stator assembly, including the coils, chip, Hall sensors, etc., had to be obtained and fitted. **E.T.**

Saisho VR1100

Intermittent E-E audio was the problem with this very tatty example of the VR1100. When I connected an external audio input I found that the machine switched the audio source to external while leaving the tuner as the video source. In the camera position the tuner-camera switch provides a high output to the audio switching chip: in the tuner position it provides a high output to the video circuitry. It was actually supplying a drifting voltage to the audio circuit as a result of liquid spillage on the front PCB. **C.McC.**

Sony SLC20

This smart Beta machine intermittently destroyed the tape when ejecting a cassette. A chattering noise accompanied this. Once a tape has been loaded, the machine stays laced: so it was clear that when the fault occurred unlacing was not being completed before cassette ejection. The first suspect for this sort of thing is, with many machines, the reel idler. But as the reel idler in the SLC20 is of the gear type, the friction to swing it from side to side being provided by internal magnets, I did not initially suspect it. Repeated operation of the mechanism however showed that very occasionally the idler failed to meet the supply spool for rewind during the unlace operation. Presumably the magnets had become weak – a new reel idler cured the fault. As the one supplied was different from the original, I added a spacer on the shaft so that it wouldn't collide with other deck parts. Strangely, Sony call the reel idler an 'arm block assembly pendulum'! **C.McC.**

Ferguson FV31R

For no or unstable playback check whether the insulating washer beneath the head of the screw that secures the top PCB is missing. If it is, tracks short-circuit to chassis. **I.R.**

JVC HRD700EK

If one of these machines comes in dead, check whether R1 (10Ω fusible) beneath the mains transformer is open-circuit. **I.R.**

Ferguson FV32L

There was irregular jumping between the LP and SP modes and finally the machine creased a tape. It had already received attention from someone who had resoldered several connections on the servo PCB. After a bit more resoldering around the capstan chips the machine seemed to work all right. But after an hour I gave the board a push and the fault returned. This time I was able to localise the source of the fault to the area around the LM393 capstan speed comparator chip IT45. Checks here showed that there was a jumping voltage at pin 2. When a spotlight was trained on the area I found a very small crack in the print between pin 2 of IT45 and CT48 (1μF). Repairing this finally cleared the fault. So you not only have to look out for soldering problems with this range of VCRs but also keep a watch out for cracked tracks. **D.V.**

Samsung SI3240

There was no clock display though the machine worked correctly in every other respect. Checks showed that the 3·4V a.c. supply across the end pins of the fluorescent display was missing. The cause of this was defective pads (10 and 11) at the mains transformer. Hardwiring these connections cured the fault. **G.S.**

Mitsubishi HS347

Intermittent failure to make a timer recording was the complaint with this machine. We found that this would happen when the tape was at the beginning after a rewind: after full-speed rewind the tape leader was left showing and the low-speed forward take-up didn't take the tape back in. Thus when the timer recording started the tape leader showed at the take-up end sensor and the unit stopped.

Although the take-up torque and the fast forward/rewind torque were o.k. the low-speed take-up torque was very low. A new reel idler cured the problem. **G.S.**

Toshiba V611

This machine was dead (no functions). Replacing the 400mA fuse F801 and resoldering dry-joints around Q821 got it going again. **G.S.**

GoldStar GHV1296I

The complaint with this machine was that it damaged tapes. As the capstan was inoperative there was no play, fast forward or rewind. Checks showed that the regulated 12V supply was low at around 6V. The DTC124ES transistor Q103, which is part of the power control arrangement, turned out to be faulty, a replacement restoring normal operation. **G.S.**

Grundig VS440

This machine had lost its ability to tune in stations. A defective tuner was the first thought that occurred to us, but a closer study of the circuit diagram revealed a cheaper possibility – the SDA3202-3 PLL chip. It's housed within the tuner assembly, and is fairly easy to replace. After doing this normal operation was restored. **K.E.**

Hinari VXL8

Although this machine was several years old it had hardly been used. The complaint was that the playback speed was faster than the search mode – in fact selecting fast search slowed the capstan down. There was obviously something wrong in the servo department. Several chips can influence the capstan speed, but voltage checks in this area were inconclusive in relation to the figures given in the manual. The Gods must have been smiling at us on that day however as an identical Orion machine came in for service. After making some comparison voltage checks with both machines in the playback mode we replaced the digital servo chip IC102. All was then well. **K.E.**

Akai VS422/VS425

If one of these machines won't accept a cassette or there's a cassette jammed in the mechanism, check the condition of the 'arm damper' assembly. When its spring retainer spigot breaks off you get jamming etc. The part number is ML-391745J1 – it's on the left-hand side of the cassette housing. **G.R.**

Samsung SI3260

The tuning had disappeared. When search tuning was tried it took a long time to search and when a signal was found it was very unstable with what looked like hum bars across the picture. In addition the tuning drifted. A check on the 30V tuning supply produced a reading of only 16V. The 30V regulator is fed from a 40V rail via R108 (1kΩ) and was zenering at 16V! A new 30V regulator put matters right – we replaced R108 as well as it had become discoloured. **G.R.**

Sony SLF30

There was fast, erratic tape movement and no E-E video or sound. After some time checking around we found that the 800mAT fuse PS001 on the bottom video board was open-circuit. No shorts were present and the fault occurred when the customer was removing a jammed cassette.

If one of these machines doesn't switch on, check the alignment of the cassette housing – where the switch is situated. **G.R.**

Toshiba V109

A laced-up tape was jammed in this machine. Checks showed that the on/off 9V supply was missing. The repair consisted of replacing IC811 in the power supply and, as a precaution, the mode switch. **R.B.**

JVC HRD830

There were no timer recordings with this machine. It went through the motions then, after loading up, ejected the cassette. Manual recording was o.k. A replacement record inhibit switch cured the fault. **R.B.**

GoldStar GHV1296I

There were erratic functions with < > showing in the display. A replacement mode switch restored normal operation. **R.B.**

Panasonic NV333

There was a snowy r.f.-r.f. signal, no E-E output and no reception. The cause of all this turned out to be a dry-joint at pin 1 of plug P7003 on the TV demodulator PCB. **R.B.**

Amstrad VCR4600

When a deck function was selected the mechanism started to operate then shut down. This happened whichever function was selected. A clue was that the clock would also reset. Whenever a function was selected the 5V supply went low. Replacing the bridge rectifier and the fuse to the 5V supply cured the fault. **D.B.**

Sony SLV425

This machine failed to record sound. The cause was the bias oscillator, which in these machines is separate from the erase oscillator. CY1255 (47µF, 63V) was open-circuit. **D.B.**

Aiwa VXT1010

Very intermittently this machine would shut down while playing a tape. Lack of the drum flip-flop pulses was the cause. The drum produced a good pulse output, the culprit being IC2001. **D.B.**

Hitachi VTM830

This machine would go into some rather odd modes at random. We found that the microcontroller chip IC751 was dry-jointed. After resoldering all the connections and a long soak test all functions worked correctly. **D.B.**

Saisho VR905

There was intermittent loss of reel drive. For once the reel idler and motor were blameless: Q2101 was going open-circuit intermittently. **D.B.**

The Panasonic Alpha 3 Chassis

Part 4 — *Ray Meadows*

This concluding instalment will deal with the audio and scanning circuits and the other remaining parts of the chassis, including some of the options such as the comb filter. We will be following up with some fault information later.

The Audio Path

In Part 2 we looked at the f.m. and Nicam sound circuits and the AV switching. After the switching the selected audio passes to the ambience circuit and tone controls on panel C (see Fig. 1) and finally the power amplifier on panel K. The circuitry is basically the same for the A2 and W2 versions of the chassis except that A2 models have an additional tone shaping circuit to match the frequency response of the dome speakers: this circuit is switched out to maintain a flat response when normal, external speakers are being used.

The ambience circuit is based on the Philips TDA3810 chip, which can be switched to give four different sound modes, mono, stereo, pseudo-stereo and ambient stereo. The pseudo-stereo and ambient stereo modes are produced by processing the mono and stereo signals: frequency-selective filtering is used at the input, the result of this being phase shifted then mixed with the original input signals. The effect with a mono signal is to make it sound wider, with a stereo feel. The sound can be widened further and ambience effects enhanced with a stereo source, but much depends on the original sound content.

In the Alpha 3 chassis the ambience effect is switched on and off by the main microcontroller chip (pin 20). The ambience processor chip's mono/stereo inputs are also tied to this pin, so that ambience is allowed with mono but not stereo sources. 'Stereo' sources are of course frequently monophonic, so all four modes may be encountered. Muting is applied to the inputs, by means of Q2403/4/7. When the microcontroller's audio mute pin goes high, Q2403/4/7 switch on.

In A2 models the ambient processor's outputs are passed to frequency-response shaping circuits that use operational amplifiers, usually type XRA15218N. These circuits provide considerable fixed bass and treble boost. As mentioned above a bypass switch is incorporated to obtain a flat frequency response when external speakers are being used: each switch is mechanically linked to the external speaker switch by means of a small metal strap.

The audio signals next enter a Philips TDA8184P tone control chip which contains bass/treble and volume/balance control blocks for each channel. Control signals from the microcomputer chip's bass, treble, volume and balance DACs enter the TDA8184P's control block, setting the boost and cut levels. A speech/music control signal is provided by pin 18 of the microcomputer chip. In the speech mode the frequency response is restricted. This is said to improve the clarity of the spoken word. Q2405/6 are switched on in this mode. The tone controls still operate, but their range is limited. In the music mode the tone control circuits operate normally. As the additional tone shaping for

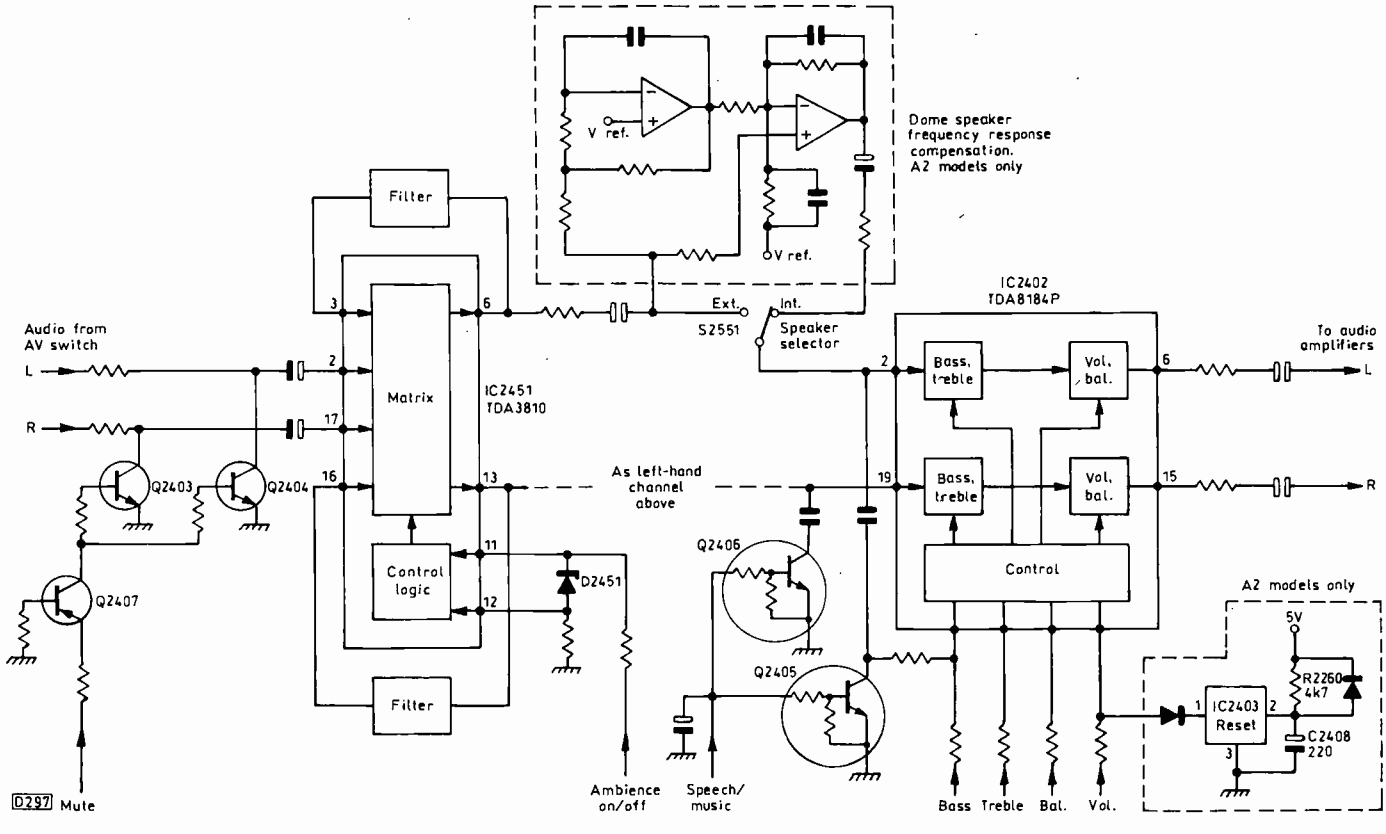

Fig. 1: The audio signal path to the output stages.

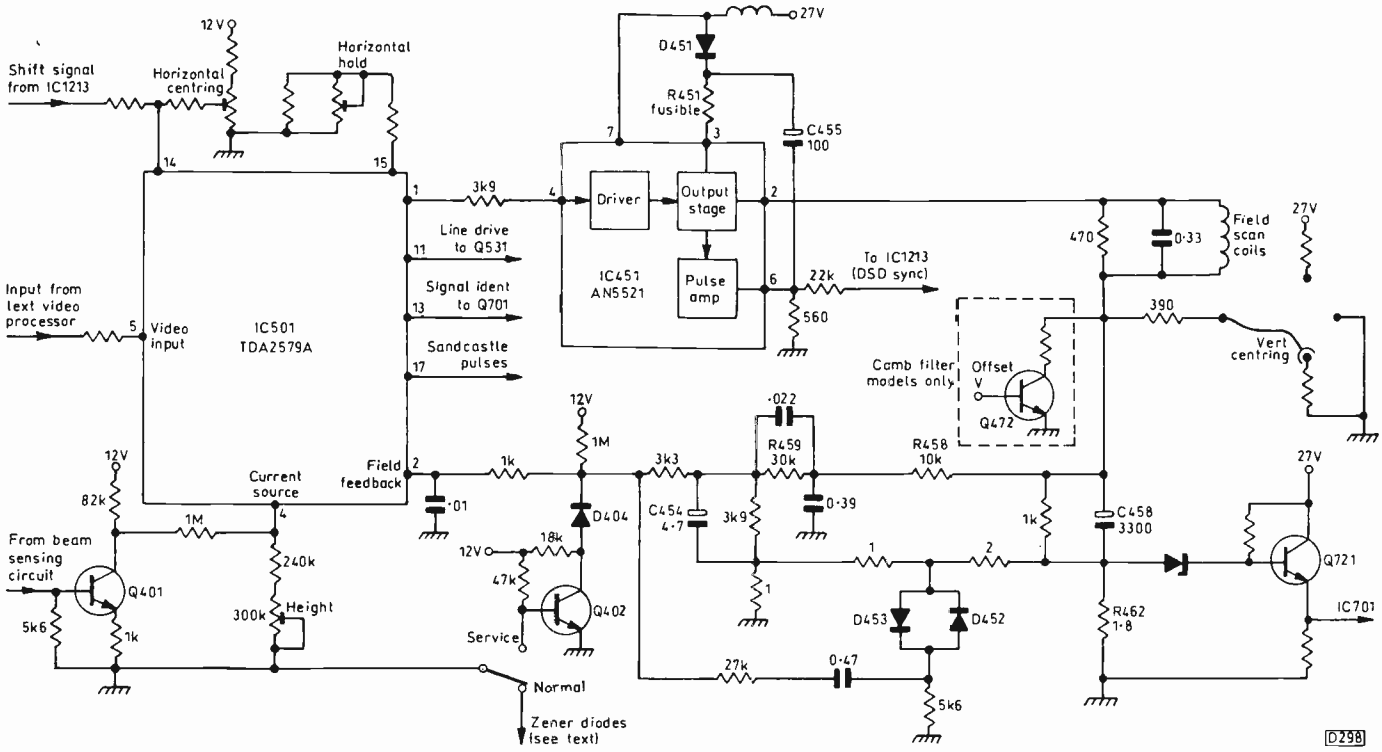

Fig. 2: Main items in the timebase generator and field output sections of the chassis.

the dome speakers in A2 models significantly increases the l.f. response, additional switch-on thump muting is provided. This is carried out by the reset chip IC2403, which momentarily holds the volume control DAC at minimum – for a time determined by C2408 and R2260.

After tone control processing the signals head for the audio amplifier on panel K. Although the dome speakers in A2 models are rated at 10W while the speakers in W2 models are rated at 20W, the same amplifier circuit is used in both versions, with an STK4392 chip in 25 and 28in. models and an STK4432 chip in 33 and 37in. models. Model TX33A2 has a slightly different circuit providing 15W per channel through its dome speakers. There are a few differences between A2 and W2 models in the peripheral circuitry, and further changes were introduced during the life of the chassis. This was partly a cost-saving exercise, with the deletion of filter inductors in series with the main speakers.

The output signals make the final trip to the speakers via panel L, where the headphone socket is situated. Early models had the inductors just mentioned and crossover components mounted on this panel. The signals then go back to the internal/external speaker switch on panel C. After this they at last go to the speakers themselves!

Sync and Scan Generation

The video signals from the AV switch on panel H are passed to the SAA5231 teletext video processor chip IC3501. In the TV mode this chip provides a composite video output: in the teletext mode it provides locally-generated composite teletext sync. These signals are passed back to pin 5 of the TDA2579A sync/timebase generator chip IC501 on panel E (Panasonic call this the 'jungle i.c.'). It's one of the oldest parts of the set, the chip first being used in the U5 chassis. Fig. 2 shows the main components in this area.

IC501 contains a sync separator and line oscillator, the field-frequency signals being generated by dividing down from the line frequency. A phase detector locks the generated signals to the video signal, with the aid of line and field flyback pulses. The phase detector has three modes, to cater for the different requirements of normal and weak off-air signals and VCR signals. Internal black-level detection reference signals and noise inversion ensure stable operation of the sync separator. There are only three adjustments: vertical output gain, line frequency (horizontal hold) and horizontal phase (horizontal centring). Pin 14 receives a horizontal shift signal from the microcomputer chip: this centres the picture in the text and external RGB input modes. Outputs include line drive (pin 11), field drive (pin 1), signal identification (pin 13) and sandcastle pulses (pin 17).

Field Output and EW Correction

The field drive output from IC501 is fed to pin 4 of the AN5521 field output chip IC451 on panel D. Although this device is operated at 27V, use of the voltage doubler formed by D451 and C455 enables it to generate a field output waveform of around 50V peak-to-peak amplitude.

Gain is set by the feedback circuit which runs back to pin 2 of IC501. There are both d.c. and a.c. paths, providing linear and non-linear correction. The d.c. path is via R458/9 while the a.c. path is via C458. D452/3 provide a simple form of NS correction. In the event of failure of the field scanning there's no feedback to IC501 and the drive is cut off. The service switch is also connected to pin 2. In the service mode Q402 is switched off, forward biasing D404: the field feedback is then blocked, resulting in field collapse. The beams are enabled however, via zener diodes connected to the RGB outputs from panel E. Vertical centring is adjusted by a plug and socket arrangement with three positions. This varies the d.c. level at the earthy side of the scan coils, introducing a small vertical offset.

The height control is connected to pin 4 of IC501. This pin is also connected to Q401, whose base is linked to the beam current sensing circuit (at pin 2 of the line output transformer). Large increases in beam current cause slight

breathing: the action of Q401 counters this effect, stabilising the height.

A field-frequency signal is tapped from the junction of C458/R462, buffered by Q721 and used to drive the SGS-Thomson TDA8145 EW correction processing chip IC701 on board D (see Fig. 3). This drives a conventional diode modulator circuit. Although parabola (R704) and keystone correction (R713) controls are provided it's seldom possible to eliminate scan distortion completely, particularly at the extreme top and bottom of the screen. R708 provides width adjustment: it varies the amplitude of the line flyback pulses fed to the rectifier circuit D701/C705. A switching transistor, Q701, is connected to the pulse feed. It's controlled by the ident output from IC501 (pin 13) via Q504 (not shown) and is used to adjust the width when a 60Hz signal is being received.

The Line Output Stage

The line driver and output stages are conventional, with Q531 the driver transistor and Q551 the output transistor. Fig. 3 shows the main components in this area. The circuit has proved to be quite reliable, though there have been a number of cases of failure of the line output transformer T551. If you have to replace the transformer note the orientation of the two leads to connectors D19 and D20 (see Fig. 2, page 320, March). If these leads are reversed the power supply will not receive the correct synchronising pulses and will not run. In addition take care not to knock the linearity coil L553 which is near the edge of panel D: it is quite easy to snap its top off!

Model 33A2 has a different D panel to the 25 and 28in. models. The most obvious difference is in the position of the parabola, trapezoid and width controls. The circuitry is almost identical however, with uprated components in the power supply and scan output circuits.

The line output stage also generates some of the receiver's supplies – 6·3V for the c.r.t.'s heaters, an 8V supply for the teletext circuit (via a 5V regulator) and a 210V supply for the RGB output stages.

Protection

Excess-current protection is provided by Q543, see Fig. 4, which is powered by the 11V output from the standby power supply. Q543's base is linked to the 8V supply obtained from pin 3 of the line output transformer via rectifier D553/C557. If the load on the line output transformer is excessive, the voltage on the 8V line will fall and Q543, being a pnp device, will switch on. This will in turn switch on the standby transistor Q825, shutting the set down. In the normal standby mode Q544, which is driven by the same output from the microcomputer chip as Q825, is switched on. This reduces the supply to Q543, overriding the excess-current control.

Beam-current limiting is carried out in the video control chip IC303. The earthy end of the diode-split section of the line output transformer determines the charge on C545 (4·7µF). With excessive beam current the charge on C545 swings negatively. This negative voltage swing is applied to the contrast control circuit, thus reducing the tube drives.

Scan-velocity Modulation

The scan-velocity modulation system is similar to that used in the Euro 1 chassis (see page 18, *Television* November 1993). Positive-going video transients slightly accelerate the horizontal scanning while negative-going

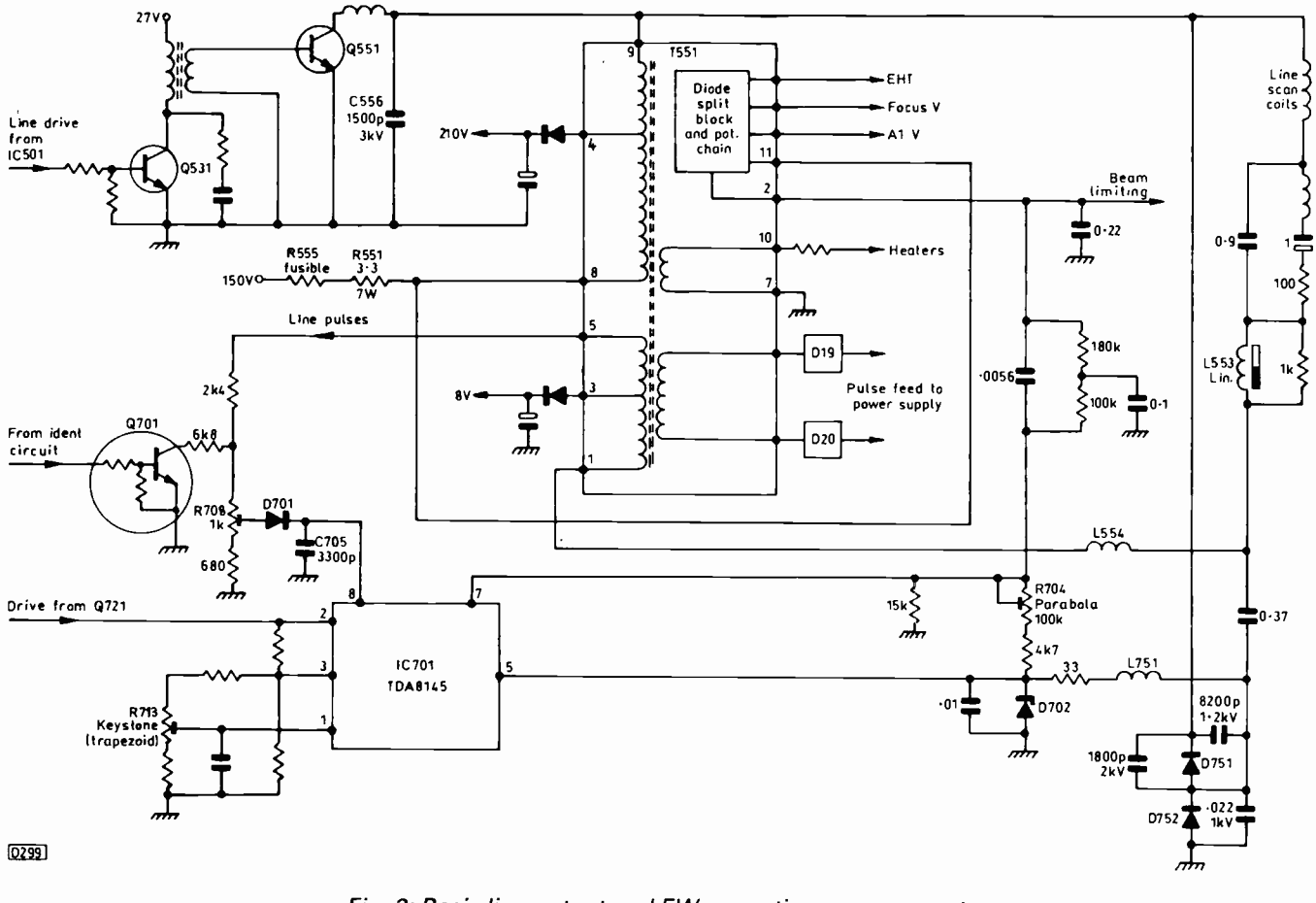

Fig. 3: Basic line output and EW correction arrangement.

transients decelerate it. This sharpens the transients by reducing their width.

The circuit, on panel S, contains a differentiating network, a high-pass filter and a push-pull output stage to drive the scan-velocity modulation coil on the tube's neck. The difference between the Euro 1 and the Alpha 3 circuits is that the latter operates with a luminance input while the Euro 1 operates with RGB inputs and thus caters for teletext and on-screen graphics displays. As the signals do not pass right through the circuit in the Alpha 3 however a compensating delay is not required.

Comb Filter

Originally all 33in. sets incorporated a comb filter for improved luminance/chrominance signal separation without the need for traps. Because of the cost however it was dropped from all but the German Model TX33A2C. The comb filter consists of an AN5346K control chip (IC1310) with filter circuits and switches, all on panel F, and four Sony CX1009P charge-coupled device (CCD) delay lines (IC1306-9) on panel FA. Both panels are completely enclosed in shield cases, the assembly plugging into sockets on panel E.

The input to the circuit is composite PAL video, which is taken from just after the AV switch on panel H (NTSC signals cannot be processed in this way and bypass the filter). The comb-filtered luminance signal is fed to the black-level expander chip while the filtered chroma signals pass to the multistandard decoder chip (compare with Fig. 3 last month). Because of the attenuation introduced by the comb-filter module the sub-colour and sub-contrast settings have to be at higher levels than in other models. And because of the improved YC signal separation the picture sharpness control is preset to have a smaller range – the picture noise reduction feature is then used to turn the comb filter on and off.

The system works by comparing successive lines of the video signal, four lines at a time being stored in the CCD chips. Filtering consists of addition and subtraction of the lines to provide selectivity. Thus there's no need for traps. The technique does however cause problems on transitions between lines with colour and those without. This can produce an unwanted horizontal dot-crawl effect, though it's much less irritating than the 'normal' PAL dot crawl. To take into account the slight vertical shift caused by the line delay a small offset is added in the field output stage (by Q472, see Fig. 2) when the comb filter is in operation.

Model TX37A2G

This Japanese made set is labelled as being fitted with the Alpha 3 chassis but there's a lot more in there! Basically it's equipped with all the options described in this series, including the comb filter, satellite tuner etc. There is also 100Hz field scanning. Dynamic focusing is used with the giant 37in. Mitsubishi tube, so a special line output transformer with dynamic astigmatism adjustment is required.

Extra panels include DD, which houses the RGB matrix, RGB switches and an extra on-screen display generator, and MM which contains the flicker-free circuit with field stores. Chips on this panel consist of the CXD2000Q flicker-free generator IC5008, the CXA1260Q DAC IC5007, the three CXD1175M ADCs IC5001-3, the three CXD2001Q noise-reduction processors IC5004-6 and the CXK1206M RAMs IC5010-5 – these are all Sony devices.

The panel processes the video signals in colour-difference form. This is not as strange as it may seem, as the comb filter works with YC signals, the chroma component being converted to colour-difference form by the decoder and digital line memory. The only problem is that text and external RGB signals must also be processed on the MM panel. So these are converted to colour-difference form by IC5501.

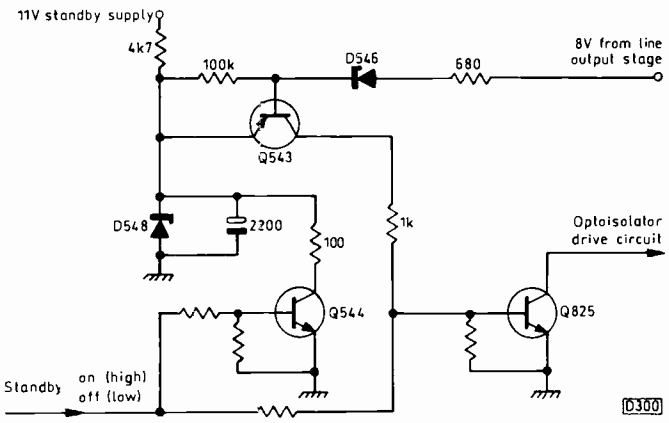

Fig. 4: The excess-current trip circuit.

After processing on the flicker-free panel the 100Hz (120Hz if NTSC) signals return to panel DD where they are converted back to RGB form and mixed with the on-screen display signals.

Conclusion

This concludes our look at the Alpha 3 chassis. Though production stopped in 1993, there are still many of these sets in the shops. Subsequent large-screen analogue models were fitted with the Alpha 4 chassis.

Answer to Test Case 378

– see page 561–

The current that flows through an IR emitting diode when it produces a 'flash' is surprisingly high – well in excess of an amp. If anything restricts the flow of current via the output stage the diode's peak current, and thus its emission, is reduced. If the batteries are in good condition and the diode and driver transistor are o.k., what could limit the diode's current? In fact the current is drawn, in the short term, from an electrically large electrolytic reservoir capacitor that's connected across the battery: a low 'average' current from the battery charges this capacitor.

Because of its internal resistance and that of the contacts, the wires (nearly a foot of wire in this case) and the soldered joints, the small two-cell battery is unable by itself to sustain the high-current pulse output. When the Avo was brought into use to check the current there were even more wires and contacts: the same was true when a test was made with the bench power supply. Hence the almost total loss of emission when the tests were being carried out. If the total source resistance seen by the LED is just 1Ω, and the required current is say 1A, 33 per cent of the battery voltage is lost outside the diode and over half its power is lost.

The reservoir capacitor had of course gone open-circuit. It's a 220μF, 6·3V type that's mounted close to the LED. When a replacement had been fitted the zapper came to life fully and Mr. Miles' TV set once more responded quickly and positively to his instructions from the armchair.

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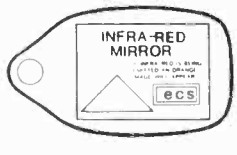

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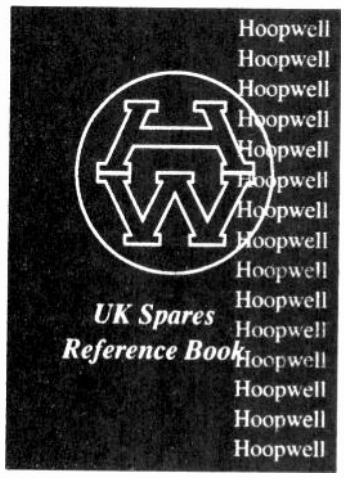

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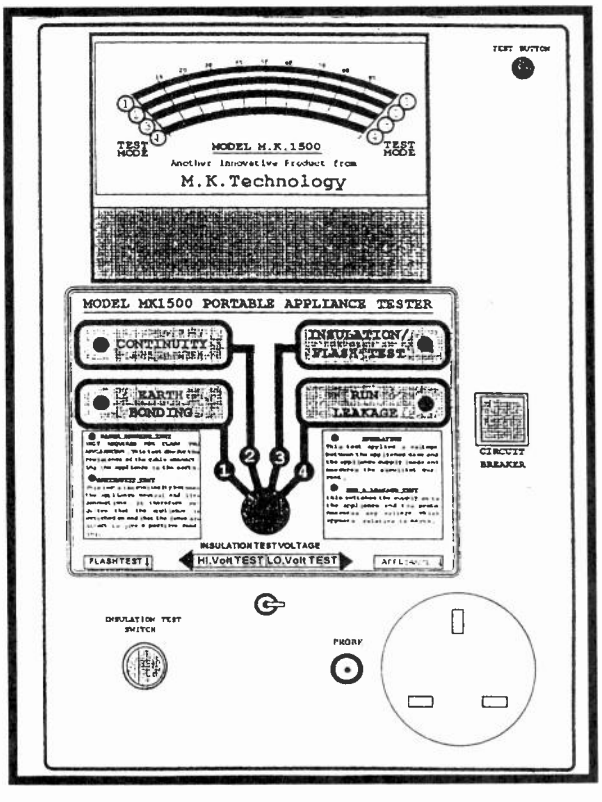

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NVQs and the Brown Goods Industry

Joe Cieszynski

A number of letters relating to training and the brown goods industry, in particular TV and VCR servicing, have been published in recent months in the correspondence pages of this magazine. While some valid points were made, it seems that those working in our industry are largely oblivious to the dramatic changes that are about to take place in training and qualification. These changes will affect us all, so I felt that it would be a good idea to outline the current situation.

How it is now

The City and Guilds of London Institute has always been the main provider of training in our industry. Until the late Seventies, C and G offered both Technician and Craft level qualifications, the technician one being the higher qualification with possible progression to HNC and HND courses. During the latter half of the Seventies a major change occurred when the government of the day set up the Business Technician Education Council (BTEC). This council became the examining body for all technician level courses, as well as HNC and HND. C and G continued as the examining body for all craft courses relating to engineering.

So it was that the C and G 224 Electronic Servicing course became the most widely recognised qualification in the fields of TV, VCR and audio servicing. Although BTEC options are available, 224 is by far the most popular course – no doubt because of its high-profile practical element allied to a sound theoretical content. To sum this up, 224 is the BTEC technician course without the maths and with a far greater practical content.

Mention should also be made of the Electronics Examination Board (EEB – formerly the RTEEB). This body provides essential practical tests at all levels of the 224 course: a 224 candidate cannot obtain a C and G certificate unless he/she passes both the theory papers and the EEB test.

How it will be

To be honest it's difficult to say exactly how training in our industry will be organised in say five years' time, because some of the bodies I'll be mentioning in a moment are still in the process of devising the new course. What I can provide is a clear outline of the direction in which all training in the UK is moving, and the general form of the new training initiative.

The key player in England and Wales is an organisation known as the National Council for Vocational Qualifications (NCVQ). It was set up by the Department of Employment in 1986, with the job of unravelling the labyrinth of qualifications and standards on offer from some 300 awarding bodies. An equivalent body called SCOTVEC was set up in Scotland for the same purpose.

The NCVQ has not simply merged the present examining bodies however. The old bodies remain, but must accept and fall into line with a wholly different approach, put forward by the NCVQ, to assessing the ability of individuals. What has emerged is the National Vocational Qualification (NVQ), which is to replace all other craft/technician qualifications. It's not an updated C and G or BTEC syllabus: the award is based on a quite different philosophy.

The NCVQ Approach

The NCVQ frequently quotes the driving test as being the best example of the direction in which it intends to take training and assessment in the UK. During the driving test you have to perform to a certain standard. If you do you are a competent driver: if you don't you have yet to reach the level of competence and have to try again on a later occasion. The driving test includes a small amount of oral questioning: the purpose of this is not to test your knowledge of theory but to cover circumstances that might not have arisen during the test. There is no syllabus for driver training, and the examiner is not interested in whether you were trained by a large motoring school or your next door neighbour.

The government's decision to make NVQs the only valid qualifications means that the NCVQ has been able to impose its philosophy on all aspects of training and thus on the entire prospective UK workforce. No one else has a voice in this. If you challenge the NCVQ, as the BTEC tried to do, you will simply be wiped out (the BTEC almost was, eventually capitulating and adopting the new GNVQs).

"The NVQ framework will send shockwaves through the whole system. We have turned the educational model on its head". That's how Dr. Gilbert Jessup, the Deputy Director of the NCVQ, put it in *All Our Futures*, a Channel 4 dispatches report on education.

It certainly has. You may have noticed that I've used the word 'training' rather than 'education' above. This is because education, in the opinion of many including myself, will no longer take place. Individuals will be trained to undertake specific sets of tasks and will be assessed on their ability to do so, with no written examinations. Assessment will consist of checking whether a person can do a particular job to a set standard on a number of occasions. If he can, he's regarded as being competent. But what about testing his understanding of what he's doing? Not necessary, says the NCVQ: if a person can do a job correctly, he knows what he's doing.

How it will be Applied

The NCVQ has divided the UK's training needs into eleven sectors, within each of which there are five NVQ levels. The sectors are as follows: tending animals, plants and land; extracting and providing natural resources; construction; engineering; manufacturing; transportation; providing goods and services; providing health, social care and protective services; providing business services; communication; developing and extending knowledge and skill. Our industry comes under engineering.

Each of these sections can be broken down into specific trades or professions. For example under engineering there are consumer electronics and domestic appliance servicing (that's us!), motor vehicle servicing, electrical installation,

intruder alarm installation and so on.

For each award there are five levels: foundation; craft; technician/supervisor; higher technician/junior management; professional/managerial. And for each industry the NCVQ has set up an Industry Lead Boby (ILB). This consists of people from the particular industry invited to write what, in simple terms, can be called an assessment plan for their industry. It's made up primarily of company managers and training officers, with representatives of the traditional awarding bodies such as C and G having a voice, albeit a rather small one. The list for our industry is as follows: Thorn EMI UK Rentals; Grundig International Ltd.; Vestel (UK) Ltd.; R.F. Electrics; Philco Ltd.; AMDEA; Scholtes Ltd.; Appliance Care Ltd.; Electrolux Ltd.; D.R. Cooker Hoods Ltd.; VAX Appliances Ltd.; Mitsubishi Electric UK Ltd.; Sony UK Ltd.; JVC Ltd.; Mastercare Ltd.; R.H. Plumb and Sons Ltd.; BREMA; AEG (UK) Ltd.; NVCS; D.H. Haden Ltd.

The point to note is that the ILB doesn't write a syllabus: it simply decides what should be assessed, practically. As Dr. Jessup explains: "Take a plumber. First you think of what a plumber needs to do, then you specify the functions and finally you devise a training programme. No longer can second-rate educational courses stand in for the real needs of employers. The important things we learn in life are not done in classrooms." It is up to the tutor (trainer) who provides the course to decide what an individual needs to know, or be taught, to achieve the standard.

I must agree with Dr. Jessup when he talks about second-rate courses. Although there have been some excellent courses/syllabuses with some trades and industries, with others the syllabuses have been loaded with irrelevant subject matter. An advantage of the new initiative is that tutors are no longer tied to what may be out-of-date syllabuses: they can teach what is up-to-date and relevant. On the other hand however there was nothing to prevent the old syllabuses being upgraded.

The main problem about being without syllabuses is that huge differences between the academic levels at different colleges are bound to arise. But the NCVQ is not interested in academic levels, its argument being that academic knowledge is largely irrelevant. To quote Dr. Jessup again: "Nobody uses precisely the knowledge they've gained in A levels or degree courses. It doesn't matter too much what you know, but you do need to show that you can operate at an intellectual reasoning level."

The problems that arise from having no syllabuses are further compounded by the changes introduced by the government in the way in which colleges are funded. From April 1st 1993 all colleges became independent of local education authorities. They are now paid on a sort of productivity basis. Money is awarded for every student that enrols, then more money is awarded for each student that leaves with an NVQ level 2 within two years. This means that there's pressure to teach the bare minimum so that the 'productivity' of the system is maximised.

The ILB is to appoint awarding bodies, whose responsibilities are to record candidate entries for particular NVQs, to appoint the army of assessors, internal verifiers, external verifiers and a national chief verifier to oversee the assessment process, and at the end to award the certificates. For our industry the awarding body will probably be the C and G, in conjunction with the EEB.

The Assessment Process

The assessment procedure will be as follows. Each candidate will have a log book in which his/her progress is recorded. At the time of writing no such log book has been devised for the TV industry. I can however provide a good guess as to the form this book will have from my experience with the 1864 Intruder Alarm Installation NVQ, with which I became closely involved three years ago.

We won't go into the boring details here. Basically, the job for which a person is being trained is broken down into 'units' and 'elements': a unit might be something like VCR mechanism servicing; an element is one part of a unit, say replacing a video head. Every step in this process is identified in the log book, and at assessment time the assessor checks that the step has been performed. If a single step is missed, or performed incorrectly, the individual hasn't 'achieved the standard' (we can't use the word 'failed' – it's supposed to make people feel bad) and the whole process must be repeated on another occasion.

To prove their competence candidates have, for example, to fit the head more than once. With intruder alarm installation each task has to be performed correctly four times on four different occasions. For our industry the number of times has still to be decided.

To get an idea of the enormity of the assessment process, just consider the number of different tasks there are with a VCR – including fault-finding on the PCBs. Bear in mind that each of these tasks has to be assessed on a number of occasions.

The NCVQ decided that only a limited amount of assessment could be simulated in the intruder alarm field. It has to be done for real at the workplace. As a result, any unemployed person is automatically excluded from ever becoming qualified in any way. The NCVQ does however emphasise that NVQs must be open to everyone. Its solution to the unemployment problem is that each industry should offer work placements for the unemployed so that they can be assessed. I'm not sure that this will work on a large scale. I hope, for the sake of the many who wish to train or retrain but are currently unemployed, that I'm proved to be wrong.

Work-based assessment has merits. It's far more realistic. You can never simulate the real world of TV/VCR servicing in a college or training institution. However many faults you introduce you can't simulate a power supply that's blown up and taken half the rest of the circuitry with it, or say intermittent chroma caused by spillage in a VCR. Nor can you introduce awkward customers easily, or the pressures that so often go with field servicing.

A disadvantage is that work-based assessment can be costly: an assessor coming to a place of work could cost as much as £100 a day. But the assessor doesn't have to come from outside: he could be someone, such as a workshop manager, who has undergone special assessor training approved by the NCVQ. Then again the cost of this training, plus the cost incurred by the company in applying for centre approval, can exceed £1,000 (I base this on my experience with the intruder alarm NVQ). For large companies such as Comet or Granada this might not be too bad. It would hardly be acceptable for smaller companies.

Why Bother?

Many engineers who work for small- and medium-sized companies will probably ask this. In reply, to start with there's no alternative to the NVQ. No other examination offered by any body will be acceptable in the EC as a qualification. So trainees will have to be assessed to NVQ

level. This doesn't mean just engineers: it includes secretaries, typists, managers, service managers, installers – in fact the entire workforce.

Why can't you just ignore it? Many will be able to do so. It depends on whether or not government and industry leaders implement certain ideas which, at the moment, remain just ideas. In some countries it's illegal to work on services such as electricity, water, gas etc. unless you are qualified, and fines can be heavy. There's been talk of implementing the same laws in the UK. Once you adopt this approach, where do you stop? Maybe make it illegal for someone to service a TV set unless he's qualified to do so? Possibly this wouldn't be too bad an idea. But we'd all be unqualified initially.

Is this scaremongering? I hope so! But in the intruder alarm industry pressure is being put on all companies to have their engineers NVQ assessed. Insurance companies won't cover premises that don't have an alarm system which has been fitted by a company with trade association approval. Many trade associations are looking for BS5750 quality assurance approval. Put simply, an alarm company can't get the big contracts, which is where the money is, unless it's qualified. I recently spoke to the manager of a small company desperate for NVQ assessment. When I quoted him £450 he simply said "when can we begin?" And that £450 was just to assess himself.

Perhaps the pressures in our industry won't be so great – we don't have Big Brother insurance companies looking at our work so intently. But only time will tell.

Summary

I've attempted to highlight the good things about the NVQ system, primarily the emphasis on being able to prove that you can actually do the job and not just talk about it, also the removal of irrelevant syllabus content. But after being involved with NVQ training and assessment for about three years I find it difficult to overcome my misgivings about the overall NCVQ philosophy. These stem from a genuine concern that the long-term result of having a workforce trained to a minimum level of understanding will be stagnation as individuals won't be able to adapt to new technology. They will have to be retrained virtually from scratch, involving more costs.

No doubt an NCVQ person who might read this will write me off as an oldie who's past his best. Would they really be convinced that those trained (not educated) to an NVQ level have the reserves of understanding to be able to tackle the new and novel technology they'll inevitably encounter?

No doubt those who have read this far will be forming their own opinions about the NVQ approach. Some may disagree with my personal reservations. But I hope at any rate that I've prepared you for what lies ahead when the NVQ in electrical and electronic equipment servicing arrives.

Service Briefs from Toshiba

Continued from the April issue: further TV items and notes on older and newer Toshiba VCRs

TELEVISION

Model 289T6B

Brightness flicker at the top of the screen: Reduce the value of C205 from 0·47µF to 0·027µF.

Model 1400TBT

Intermittent field collapse (h.t. voltage fluctuates when set is warm): Replace Q803 (2SC3425) in the power supply. Part no. A6361601.

Low h.t. voltage or stuck in standby: Q803 faulty (see above).

Model 1510RB

Dead set with buzzing noise: Replace Q803 (2SC3425), part no. A6361601.

Model 1721TB

Set stuck in standby: Replace transistors Q803 (type 2SC2023, part no. 23314246) and Q804 (2SA1321, part no. A6547303).

Models 2100RBT/2100TBT

Set dead, chopper transistor Q802 fails repeatedly at switch on: R810 (330kΩ) is either open-circuit or high in value.

Hum on chroma (varies with setting of colour control): Replace C515 (22µF, 50V, part no. 24636220).

Models 2112DB/2512DB/2812DB

Power supply trips in any mode: Replace D807 (BYD33J, part no. 23118479) which is open-circuit.

Power supply trips in normal operation, o.k. in standby: Replace the 13V zener diode D812 (part no. 23316337) which is leaky or short-circuit, reducing the voltage at pin 5 of IC801 below the standby threshold.

Set won't go into standby: Replace transistor Q845 (2SC2023, part no. 23314246) which is short-circuit.

Field jitter and picture breathing: Replace transistor Q833, type S1854, part no. A6907751.

Loud crack from both speakers when set is turned off (Model 2112DB only): C639 (100µF, 25V) in the audio mute circuit is open-circuit. Fit a replacement.

Models 2505DB/2805DB

Set won't come out of standby: Replace memory chip ICA07, part no. 23319016. At power on voltage at pin 37 of the microcontroller chip drops low then reverts to 5V.

Models 2527DB/2927DB/3327DB

Set dead, power and timer LEDs flashing, h.t. at 40V and varying: Replace transistor Q828 (type 2SC2230A-Y, part no. A6325067).

Set stuck in standby: Replace circuit protector ZP82 (part no. 23144450) which is open-circuit, removing the supply to pin 40 of IC501 and thus the line drive.

Crackle on Nicam, f.m. and external audio: Replace the TA8776N audio processor chip ICG07 on the back terminal PCB. Part no. B0383935).

No audio from the rear speakers in the DSP, Dolby Surround or pseudo-surround modes: Replace CG25 (10µF, 16V).

VCRs

Information on some of the following machines will also be found on pages 52-3 of our November 1993 issue.

Models V55B/57B

Intermittent recorded sound: Check for poor plug/socket contact at the audio-control-erase head assembly.

Intermittent recorded sound with coloured patterns on the picture: Check for open-circuit leads at the full erase head. If the bias/erase oscillator doesn't start, increase the value of C27 to 8,200pF.

Noisy playback – looks like worn heads: Q504 in the E-E supply is leaky, allowing about 3V to reach the head amplifier chip during playback.

Distorted verticals/poor sync, changes with E-E picture content: The i.f. a.g.c. decoupling capacitor C7 (0·047µF) is open-circuit.

Playback speed slow: Check whether the voltage at pin 6 of IC401 is low – this won't show with use of a DMM. If so D206 is leaky.

Drum servo slow to lock: Drum discriminator adjustment potentiometer R463 is noisy.

Intermittent stopping in rewind/review: C1 across the start sensor is short-circuit.

Intermittent stopping and reverting to rewind in play/fast forward: C1 across the end sensor is short-circuit.

Machine dead with no clock display or function lights: Check whether circuit protector CP2 on the servo/logic PCB is open-circuit.

Stops intermittently in play or record: Replace the take-up reel sensor (optocoupler).

Models V65B/66B

Machine won't switch on – channel lights only: If the switched 5V and 12V supplies are low, check D3. Note that when this diode is only slightly leaky the machine will work but the counter runs in stop. If there's no switched 5V supply at pin 6 of CN3, CP4 is open-circuit.

No standby mode with the take-up spool and capstan running: If there are no switched 5V and 12V supplies and pin 9 of CN3 (CTL in) is at 3·2V instead of 1·8V, IC602 is faulty.

Intermittent drum rotation: Check for a dry-joint at Q1.

No clock display: If the –30V supply is missing, fusible resistor R2 in the power supply is open-circuit.

Half loads then unloads: D408 leaky.

Drum doesn't rotate but twitches backwards and forwards: D408 leaky.

Intermittently ejects and switches off: Replace loading mode sensor part no. 70673470.

Remote control unit doesn't work when near an ordinary light: Add an extra IR filter. Details available from Toshiba Technical

No record, o.k. on OTR and remote: IC101 faulty.

Intermittent stopping in rewind/review/play/fast forward: See notes on these faults under Models V55B/V57B.

Drum runs backwards: R501 open-circuit and D408 leaky.

No CTL pulse amplification (TP401): C405 is open-circuit.

Plays for three seconds then stops, with counter not working: Replace the take-up reel sensor.

Intermittent recorded sound: See notes under Models V55B/V57B.

Models V71B/73B

Earthing screw problem: Always ensure that an earthing screw is fitted to the reel motor plate to prevent static charge from the reel pulley. This charge can damage the following i.c.s on the logic/servo PCB.

Servo chip IC501: Symptoms no servo lock in record (unlocked head switching point) and no playback servo control (varying speed and poor tracking).

Logic chip IC601: Symptoms no fast forward or reverse reel rotation because of incorrect logic levels at pins 19 and 20. Note: When replacing a TMP4746N5758 chip with a TMP4746N5759, remove and discard the logic-2 unit fitted to the i.c.

Loading drive chip IC602: Symptoms no motor functions, the power supply shuts down after ten seconds and IC602 draws excessive current (the motor +B and switched 12V supplies are over-current sensed.

Reel switching chip IC603: Symptoms no reel rotation in any mode. The i.c. may show signs of overheating, and drive transistor Q625 should be checked.

Reel sensor chip IC604: Symptoms no fast forward/rewind tape count, returns to the stop mode; no play/record taoe count, returns to the stop mode and the power supply shuts down.

Cam switch faults: The following very intermittent faults can be caused by a defective cam switch. (1) Fast play operation with pinch roller not engaged (sound is fast). (2) Runs fast in the record mode, hence playback is slow. (3) When review is selected the machine goes to pause. (4) Arms stop in the half-loaded position. The switch is part no. 70901769.

Reel motor fault: A defective reel motor can be the cause of intermittent stopping in play or record. In the play mode a new reel motor should take a current of 90mA (350mV across R643). The take-up torque will then be correct.

Servicing note: If a machine is operated with the cassette housing removed and not earthed, (1) the auto switch won't work, (2) power on inserts a tape but the power supply then shuts down, (3) power on ejects a tape then reinserts it and the power supply shuts down.

Models V71B/73B/81B/83B/85B/86B/93B, DV80B/90B

To reduce mechanical noise a new head drum earth brush, part no. 70903022, was introduced.

To overcome reel idler stop post damage, a new stop post assembly, part no. 70901865, was introduced. Fitting instructions are available from Toshiba Technical.

Models V81B/83B/85B/86B/DV80B

Intermittent stopping in the play/record modes: Faulty reel motor – this is more common with Model V83B.

Intermittent cam switch problems: A modified cam switch was introduced.

Low-gain E-E signals in weak reception areas: Readjust the r.f. a.g.c. control R51.

Won't accept a cassette and returns to standby after ten seconds with the cassette indicator flashing: Replace timer chip ICX01.

Failure of F803: Cause is probably poor F802 fuseholder contact or a dry-joint at the junction of D801/2/chassis.

When the machine is switched on tape is immediately loaded around the drum then the machine returns to standby: Check for dry-joints at the cam switch socket on the main PCB and at the cam switch pull-up resistors.

Models V93B/DV90B

No display, no E-E operation (power on/off o.k.): Circuit

protector ZL62 on the timer-2 PCB is open-circuit. Check the inside of the d.c./d.c. converter Z802 as the small metal cap on the transformer can become unglued and fall off, causing a short-circuit.

Intermittent stopping in play/record: Replace the reel motor.

Patterning with E-E signals and recordings: Check the adjustment of the r.f. a.g.c. control.

No cassette insertion, no test signal: F804 (1·6A) is open-circuit.

Models V110B/210B

Picture pulses in the E-E mode: Replace the 2·4V back-up battery XK03 on the key display PCB (part no. 70010166).

Model V211B

Won't accept tapes: Replace faulty U2561B FG/CTL pulse amplifier chip IT18, part no. 70010166.

Models V212B/312B/412B

Failure to erase the previous sound track and slight coloured patterning on recorded pictures: This is a fairly common condition that may be may be permanent or intermittent. If the fault is permanent, you might find that RL02 (10Ω) is open-circuit and that transistor TL01 (BC337) is short-circuit. Whether the fault is permanent or intermittent, the following steps should be taken: fit replacement kit part no. 70903796, change the value of RT102 from 56kΩ to 39kΩ (part no. 24872393), and improve the connections at the full erase head plug and socket by soldering the wires directly to the terminals at the back of the head.

No E-E or playback pictures: Replace the MC14094BD shift register chip IW20, part no. 70010981.

Slow, jerky tape ejection. Tape reaches front flap, stops then reloads, or may stop during the unloading cycle: Loading motor has dead spots on its commutator. Test by removing the belt. Motor part no. is 70011062.

No playback colour, record colour o.k.: Standby 12V supply is low at 9·6V because the 10V zener diode DP86 is faulty and the 27Ω resistor RP86 is open-circuit. Replace these items, part nos. 70010959 (DP86) and 70041074 (RP86).

No E-E or playback sound and will not stop on station when search tuning: Audio mute is activated because of no field sync pulses at pin 31 of IA40. Replace the TDA8128 field sync pulse processing chip IA01, part no. 70010967.

No functions, goes to standby after two minutes: Replace cam 1 photosensor GT22, part no. 70010960.

Power supply tripping after half an hour: Replace the 6·2V zener diode DP08, part no. 70010958.

Snaps tape in rewind/fast forward, with no counter operation in these modes: No FG output at pin 15 of the U2565B CTL/FG pulse amplifier chip IT40 in fast forward and rewind. Replace IT40, part no. 70010979.

Model V300B

No display, no E-E outputs, playback o.k.: Circuit protector Z803 is open-circuit. D.C.-d.c. converter Z801 (logic PCB) may be shorted because of high output from IC820 (power 2). If the +6·5V supply is o.k., check whether the small metal cap on the transformer in Z802 has become unglued and fallen off, causing a short (see same symptoms under Models V93B/DV90B).

Intermittent audio erasure: The two-wire lead at either the full erase head PCB or the audio-control-erase head PCB has poor plug-socket connections.

Model V312B

Picture continually switches between play and E-E in the playback mode: Cause is corrupt control data from the servo chip IT01 to the shift register chip IW85. Replace IT01, part no. 70011398.

Model V411B

Intermittent random switching between SP and LP in the play mode: Replace the U2561B FG/CTL pulse amplifier chip IT10, part no. 70010166 (PG waveform at pin 11 has superimposed hum).

Model V703B

No test signal and no playback: Replace the ICP-N5 circuit protector ZP681, part no. 23118122. When this goes open-circuit the ever 5V supply is missing at Q688 and Q685.

Models V703B/813B

Installation problem with the Amstrad SRD400 satellite receiver: Under the following conditions it's not possible to make recordings from the receiver: (1) full scart connection using the VCR for loop-through; (2) record mode selected using line input LI; (3) TV/VTR switch is in the VTR position; (4) the sound and picture are being monitored. All you get is black and white lines with no sound. This is because, when pin 8 is enabled, the SRD400's scart socket can be used to connect a decoder: with the TV/VTR switch set to VTR the VCR supplies a +12V control voltage to both scart sockets. The remedy is to disconnect pin 8 of the scart lead between the VCR and the SRD400 or leave the TV/VTR switch in the TV position and, if you want to monitor the recording, do so by using the input select button on the TV handset.

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TALKING COINBOX STRIPPER originally made to retail at £79 each, these units are designed to convert and ordinary phone into a payphone. The units have the locks missing and sometimes broken hinges. However they can be adapted for their original use or used for something else?? Price is just £3 **REF: MAG3P1**
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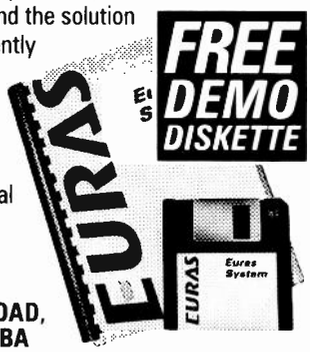

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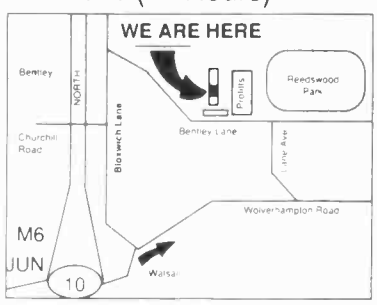

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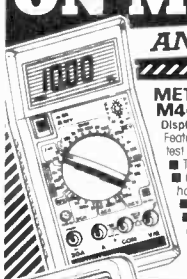

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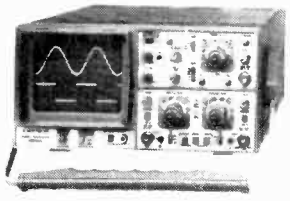

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* Sens: Ch.1, Ch.2, 1mV/cm
* Timebase: 0.1s - 20ns/cm
* Triggering: DC - 40MHz
* Active TV - Sync - Separator
* Variable hold-off
* Trigger LED indicator
* Calibrator: 1KHz Square wave
* Component tester
* Plus many features

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HM604 60MHz UNIVERSAL

SPECIFICATIONS
* 2 Channels
* Bandwidth: DC - 60 MHz
* Sens: Ch.1, Ch.2, 1mV/cm
* Timebase : 2.5s - 5ns/cm
* Triggering: DC - 80MHz
* Active TV - Sync - Separator
* After delay trigger
* Sweep delay
* Delay line
* Trigger LED indicator
* Calibrator: 1KHz & 1MHz Sq. Wave
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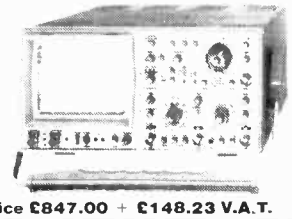
3 CHANNELS - UP TO 6 TRACES



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

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SPECIFICATION
* Digital Storage
* Analogue real time (Same as 203-7)
* Bandwidth: DC - 20MHz
* Sens: Ch.1, Ch.2, 1mV/cm
* Timebase Digital: 5s-1µs/cm
* Triggering DC - 40MHz
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* Max sampling rate: 2 x 20MHz
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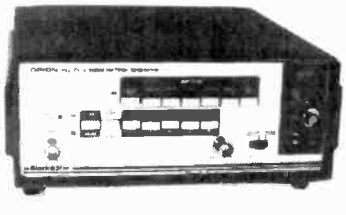

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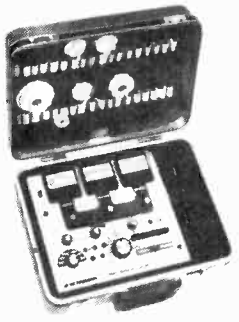

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  UHF : 450-862MHz.
* Digital display for direct frequency readout.
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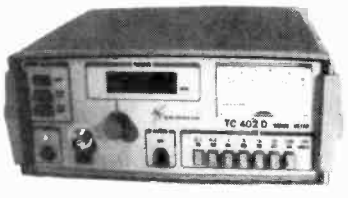

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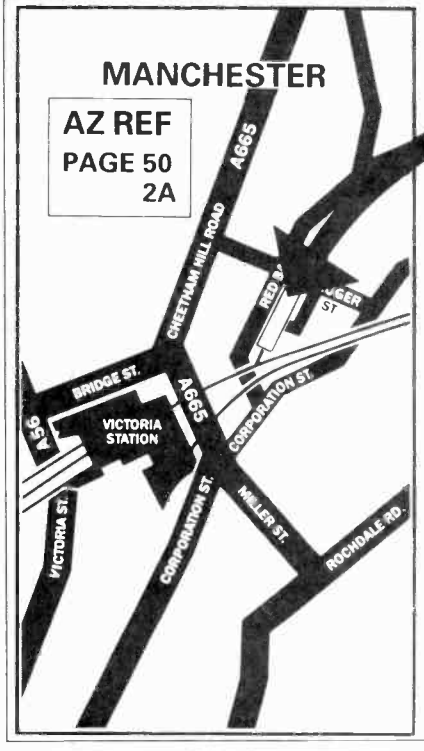

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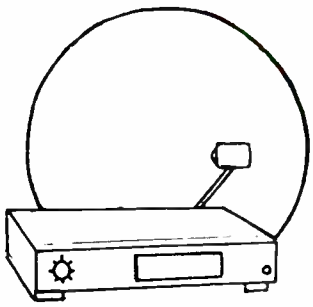

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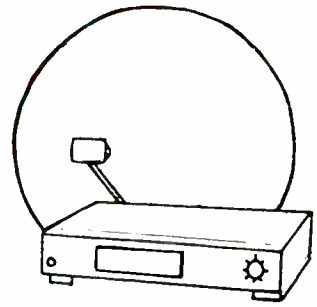

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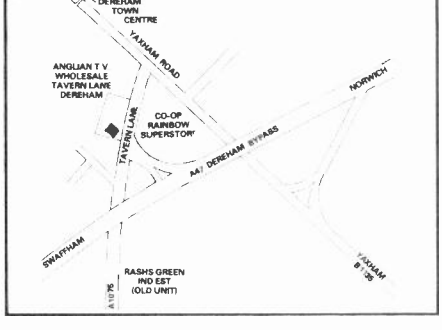

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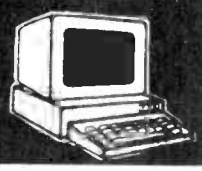

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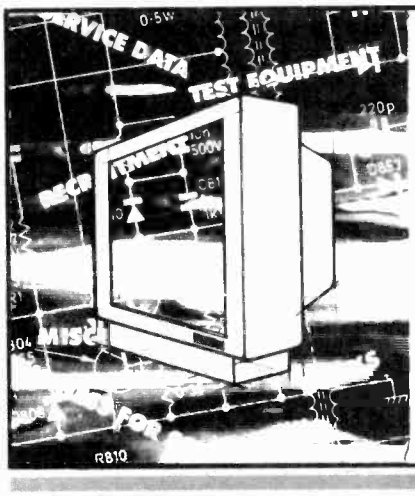

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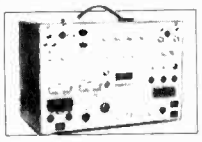

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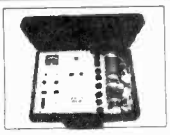

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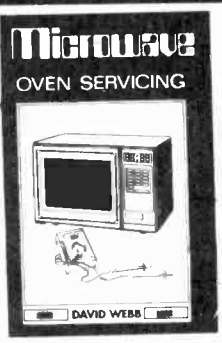

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BY 254	10p
BY 255	30p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 448	10p
BY 500 200—5 amp	8p
BY 527	10p
BY 602	10p
BYV 26C	10p
F247	10p
GP20G	5p
GRPS0G (TX10)	30p
XK 3102	50p
BYV 28 200	20p
Bridge TX10 800/3 amps	30p
KBPC35-02 Bridge	£1.50
Bridge Rec. D35B10	40p
BYT[illegible]/800	12p

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STR6020	£6.00
S.2000AF line o/p	£1.00
2SC940	£1.00
BU 105/04	80p
BU 108	£1.00
BU 124	50p
BU 126	80p
BU 180a	65p
BU 204	60p
BU 205	75p
BU 206	£1.00
BU 207	£1.00
BU 208	80p
BU 208A	£1.50
BU 208D	90p
BU 222	£1.00
BU 326	£1.00
BU 407	60p
BU 508A	90p
BU 508AF	£1.00
BU 508D	80p
BU 705	£1.00
BU 806A	£1.00
BU 807	£1.00
BU 808DFI	£1.00
BU 826	£1.00
BUK 454 600	£1.00
BU 824	50p
BUT 11	50p
BUT 11AF	£1
BUT 13 600V-28A	£1.00
BUT 18AF	£1.00
BUW 84	60p
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BYW 95	10p
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BUK 444 800	£2.00
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TIC 106a	30p
TIC 116m	30p
TIC 116n Y 1003	30p
TIC 126N	30p
TIC 226m	30p
TIC 236m	30p
TAG 226/600	30p
TIP 29	25p
TIP 30	25p
TIP 30A	25p
TIP 30B	25p
TIP 30C	25p
TIP 31	25p
TIP 32	25p
TIP 33B	50p
TIP 33C	70p
TIP 34A	50p
TIP 34B	60p
TIP 34C	70p
TIP 35B	50p
TIP 35C	70p
TIP 35D	80p
TIP 36	50p
TIP 36C	70p
TIP 41	15p
TIP 41B	40p
TIP 41D	70p
TIP 42	10p
TIP 42/BRC 6109	10p
TIP 48	40p
TIP 49	30p
TIP 57	30p
TIP 100	30p
TIP 102	30p
TIP 110	20p
TIP 115	50p
TIP 117	50p
TIP 125	35p
TIP 126	40p
TIP 127	40p
TIP 130	30p
TIP 131	6p
TIP 136	30p
TIP 140	50p
TIP 142	80p
TIP 640	50p
TIP 2955	35p
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16036	40p
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MC 7724cp	40p
MC 7824	40p

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TMP47C 634N 2685	£3.00
ST6391 B1/B2 ICC7	£4.00

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IK7 ST6391 B1	£3.00
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BYV 95B	10p
BYV 95C	12p
BYV 96D	10p
BYZ 106	10p
BPW 41	15p
BYW 56 2A/1000v G11	8p
BYW 29 50	15p
BYW 95C	10p
BYX 55/600	10p
2SC 3973B	30p
2SC4313	£1.00
2SC7350	15p
2SD150 TO3 80V/6A	15p
2SD200	£2.00
2SD401	£1.00
2SD716	£1.00
2SD787	30p
2SD789	30p
2SD820	£1.00
2SD868	75p
2SD880	30p
2SD1264	£1.00
2SD1266	£1.00
2SD1398	£1.00
2SD1415	£1.00
2SD1427	£1.00
2SD1432	£1.00
2SD1453	£1.00
2SD1556	£1.00
2SD1576	£1.00
2SD1577	£2.00
2SD1678	£1.00
2SK30A	10p
BFX29	30p
BFX84	25p
BFY50	15p
BFY52	20p
BFY90	25p
BLY39	25p
BPW41	25p
BRC 116	25p
BRX43	15p
BRX48X	10p
BRY56	30p
BSS68	10p
BSY79	10p
BSY95a	10p
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BSX19	17p
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2N3506	10p
2N3702	10p
2N3711	10p
2N3583	50p
2N3904	15p
2N4355	10p
2N4442	£1.00
2N4444	£1.00
2N5278	20p
2N5296	40p
2N5983	30p
2N6099	40p
2N6109	40p
2N6130	50p
2N6133	20p
2N6348	20p
2N6399	10p
2SA437	20p
2SA673P	10p
2SA844P	10p
2SC643A	£1.00
2SA992	10p
2SB474	30p
2SB566	10p
2SB686	75p
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2SC772	20p
2SC381	10p
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2SC940	£1.00
2SC1030	£1.00
2SC1061	30p
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MAB8420B-6	£3.00
MAB8440P-D070	£3.00
MAB8440P-DO33	£3.00
MAB8440P-D056	£3.00
MAB8441P-T001	£3.00
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BD116	25p
BD124	30p
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BD132 238	30p
BD135	25p
BD136	30p
BD138	30p
BD140	30p
BD176	25p
BD182	£1.00
BD183	70p
BD202	30p
BD204	30p
BD207	60p
BD221	20p
BD222	20p
BD228	30p
BD226	20p
BD233	30p
BD234	25p
BD235	30p
BD236	30p
BD239	15p
BD240	50p
BD243c	30p
BD244	50p
BD250a	30p
BD252	20p
BD253B	50p
BD331	20p
BD373b	20p
BD416	25p
BD433	25p
BD437	25p
BD438	30p
BD139	30p
BD439	50p
BD544D	40p
BD650	50p
BD678	30p
BD681	30p
BD682	30p
BD807	50p
BD808	30p
BD809	30p
BD510	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	40p
BD676A	30p
BD807	20p
BD826	50p
BD946	50p
BD933	30p
BD939	30p
BD948	30p
BDT31A	50p
BDX75	20p
BDV64B	50p
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BF761	30p
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M5840H-84RS	£5.00
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SAA1124	£2.00
SAA1174	£3.00
SAA1176	£2.00
SAA1250	£3.00
SAA1251	£4.00
SAA1272	£3.00
SAA1274	£3.00
SAA1276	£3.00
SAA1292	£10.00
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SAA1300	£3.00
SAA5027P	£1.00
SAA5000A	£1.50
SAA3049	£3.00
SAB3013	£2.00
SAB3205	£3.00
SAB3210	£2.00
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TBOH125	£1.00
SAA3008P	£3.00
SAA5000A	£2.00
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SAA5012A	£5.00
SAA5020	£3.50
SAA5025D	£3.00
SAA5030	£4.50
SAA5040A	£3.00
SAA5042A	£3.00
SAA5043	£4.00
SAA5050	£4.50
SAA5051	£2.00
SAA5052	£2.00
SAA5053	£2.00
SAA5240	£5.00
SAA5241 P A TEX IC	£5.00
SAE1032p	£2.50
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SASS701	75p
SAS660	£1.00
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TAA470	£1.50
TAA570	75p
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TA7108P	£1.00
TA7117	50p
TA7120P	50p
TA7315AP	50p
TA7137P	50p
TA7193AP	£3.00
TA7240AP	£3.00
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TA7227P	£1.00
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TBA120AS	40p
TBA120SA	40p
TBA120B	40p
TBA120SB	40p
TBA120T	50p
TBA120SQ	£1.00
TBA120U	75p
TBA120Q	30p
TBA120C	40p
TBA1440	£1.00
TBA1441	£2.00
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TBA396Q	£1.00
TBA396	75p
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6MHz	
8.867238	
11.059 1000	
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TBA1440C	£1.00
TBA480Q	£1.00
TBA520	£1.00
TBA530	£2.00
TBA540	£1.00
TBA560CQ	£1.00
TBA570	£1.50
TBA625	50p
TBA651	£2.00
TBA673	£1.00
TBA750Q	£2.50
TBA780	£1.50
TBA800	50p
TBA810AP	60p
TBA810S	60p
TBA820	60p
TBA820M	25p
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TBA920Q	£1.50
TBA990Q	£1.00
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(clockchip)	£1.00
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TMS9980	£4.00
TMS9900	£1.00
TMS2708JG45	45p
TMS2716JL	£1.00
TMS3529	£1.00
TMS3720ANS	£3.00
TMS3014	70p
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TMS9902	£1.20
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UPC585C	£1.00
UPC1009C	£2.00
UPC1031H	£2.00
UPC1353C	£1.00
UPC1363C	£2.75
UPC1364C	£2.00
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UPC1366C	£1.00
UPC1378H	£2.00
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UPC2002	35p
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UPD8049HC	£2.00
SN2948	50p
SN2970BN	£2.00
SN2971BN	£2.00
SN2972BN	£2.00
SN76001	£1.00
SN76013ND	£2.00
SN76018	£1.00
SN76110N	£1.00
SN76115AN	50p
SN76131	50p
SN76141N	£1.00
SN76226	£1.00
SN76227N	£1.00
SN76228N	£1.00
SN76270	£1.00
SN76532N	£1.00
SN76545N	£3.00
SN76546	£3.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76600N	40p
SN76620AN	50p
SN76666	£1.00
SN76705N	£1.00
SN76707N	75p
SN76708AN	75p
SN76720	£1.00
SN76709N	£2.00
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TCA270	£1.00
TCA270Q	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA800	£1.50
TCE120CQ	£1.00
TCE520	30p
TD6306P	£3.00
TDEA440Q	50p
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TDA1010	£1.00
TDA1013	£1.00
TDA1012	£1.00
TDA1013A	£1.00
TDA1060A	£1.50
TDA1035SB	£1.00
TDA1072	£1.00
TDA1150	50p
TDA1151	30p
TDA1154	50p
TDA1170S	£1.00
TDA1180	£2.00
TDA1190	£1.00
TDA1200	75p
TDA1270	£1.50
TDA1327A	69p
TDA1365	£3.00
TDA1512	£2.00
TDA1540P	£3.00
TDA1670A	£2.00
TDA1908A	£1.00
TDA2002	£1.00
TDA2003	25p
TDA2004	£2.00
TDA2006	£1
TDA2008	£2.00
TDA2010	£1.00
TDA2020	£1.00
TDA2030	£2.00
TDA2140	£3.50
TDA2160	£1.00
TDA2320	50p
TDA2545A	£1.00
TDA2600	£3.00
TDA2630	£2.00
TDA2522	£5.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2542	£1.00
TDA2545	£2.00
TDA2546	£2.00
TDA2556	£1.00

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MN1250BJC	£1.00
M50441-550SP	£1.00
M491BB1	£4.00
HA513385	£1.00
14DN 728A	£4.00
TDA2560	75p
TDA3565	£3.00
TDA2575A	£1.00
TDA2577A	£2.00
TDA2578A	£2.00
TDA2579A	£2.00
TDA2581	£2.00
TDA2591	£1.00
TDA2593	£3.00
TDA2560	50p
TDA2556	£1.50
TDA2600	£3.00
TDA2611A	£1.00
TDA2611AQ	£1.00
TDA3651A	£1.00
TDA2653	£4.00
TDA2630	£2.00
TDA2593	£1.00
TDA3047	£1.00
TDA3048	£3.00
TDA3083	£2.00
TDA3190	£1.00
TDA3300B	£5.00
TDA3301	£3.00
TDA3505	£3.00
TDA3806	£3.00
TDA3561	£3.00
TDA3560	£4.00
TDA3561A	£3.00
TDA3566	£3.50
TDA3564	£4.00
TDA3565	£3.00
TDA3571A	£2.75
TDA3581	£3.00
TDA3590	£3.00
TDA3591	£1.00
TDA3592A	£3.00
TDA3650	£7.00
TDA3651	£3.00
TDA3651AQ	£3.50
TDA3652	£3.50
TDA3653AQ	£2.00
TDA3654	£2.00
TDA3654Q	£2.00
TDA3710	£3.50
TDA3800	£4.00
TDA3803A	£4.00
TDA3780	£2.00
TDA4260	50p
TDA4501	£3.00
TDA4505NE	£3.00
TDA4320	£2.00
TDA4439	£2.00
TDA4600	£3.00
TDA4601	£2.00
TDA8190	£3.00
TDA8703	£3.00
TDA8349	£3.00
TDA9403	£1.50
TDA9503	£3.00
TDB2033	£1.00
TDD1610S	50p
TD6306P	£2.00
TDA1060	£3.00
TEA1009	50p
TEA1039	£2.00
TEA1060	£2.00
TEA2017	£2.00
TFA2029C	£3
TLA5114	£1.00
TDA3800B	£6.00
SL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7300	40p
MPS43A	25p
MJE3005	30p
MJE5731	25p
MJE340	28p
MJE660	25p
MJE661	25p
MJE3055	£1.00
MJE2801	30p
MJE2955	50p
MJE13005	50p

15% DISCOUNT ON ALL I.C.A. TRANSISTORS

Thorn Transformers

DT2076/78	£10.00
90D3-035-003	£10.00
90D4-106-003	£1.00
90D3-038-001	£5.00
OT2041/30	£3.00