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## Servicing the Samsung VI710 786

John Coombes provides servicing know-how on the mechanical and electronic sections of this popular VCR.


## Intro to the Internet

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Ray Meadows describes the signal processing sectionsof the receiver, including the optional teletext module.
Get a Life! ..... 816
Donald's daughter Rebecca tells us how kind,
courteous and ever patient he is with his many devoted customers. .

## Capacitance Tester/ Comparator

818Ian Rees devised this bridge circuit to enable highvalue capacitors to be compared and leakage detected in one simple operation.

## Time-Iapse VCRs

Time-lapse VCRs are widely used in surveillance work to provide extended recording time. Joe Cieszynski

describes the ways in which time-lapse VCR operation differs from that of a standard model and the special servicing needs of these machines.

## Long-distance TV

DX conditions and reception, the satellite scene and news from abroad. Roger Bunney reports.

## An RGB-VGA Monitor <br> Conversion

Ray Porter on how a Microvitec Series 7 RGB monitor can be modified to accept VGA drive signals.

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| LM431 | 50p | STK. | ${ }^{680}$ | STK | ${ }_{\text {375 }}$ | STR3 |  | TAT |  | TDA | $125 p$ | TDA |  | TDAB170 |  | UPC1158H |  | 2SA937 | 20p |
| LM710 LM723 | 40 p | STK443 STK457 | 470p | STK5431 | $\begin{aligned} & 550 \mathrm{p} \\ & 570 \mathrm{p} \end{aligned}$ | $\begin{aligned} & \text { STR } 30120 \\ & \text { STR } \end{aligned}$ | $400 \mathrm{p}$ | TA8132AN TA8205 | $200 \mathrm{p}$ | TDA1576 <br> TDA1578A | $\begin{aligned} & 170 p \\ & 210 p \end{aligned}$ | TDA3590 | $300 \mathrm{p}$ | TDA8172 TDA8173 | $250 \mathrm{p}$ | UPC1178H UPC1180C | $250 \mathrm{p}$ | $254939$ $2 S A 940$ | 140p 50p |
| LM741DIL | ${ }^{48 p}$ | STK459 | 560 p | STK5436 | 500p | STR30125 | 550p | TA8210 | 300p | TDA 1578 － | 2100p | TDA3592a | 360p | TDAB174 | 300p | UPC1180C | 200p | 2SA940 | 50 p 60 p |
| LM741ME | 45 | STK460 | p | K5441 | 400 p | STR30130 | 250p | TA8215 | 300p | TDA1596 | 200 p | TDA3640 | 350 p | TDAB175 | 300 p |  | 80 p | 2SA949 | 70 p |
| LM747 | 30 | STK461 | 620 p | STK5451 |  | STR40090 | 350p | TA8216H | 375p | TDA1598 | 250 | TDA3651 | 200p | TDAB178 | 400p | UPC118 | 150p | 2SA950 | ${ }^{18 p}$ |
| LM1894N | 200p | STK465 | 720p | STK5462 | 500p | STR41090 | 400p | ${ }_{\text {TA8869 }}$ | 250p | TDA1600 | 275 2300 | TDA36552T | 500p | TDA8185 | $300 p$ $200 p$ | UPC1188H | 350p | 2SA952 | 30p |
| LM3900 | 40p | STK501 | 550 p | STK5464 | 300p | STR45111 | 550p | TA8718N | 550p | TDA1675 | 250p | tDA3653 | ${ }^{150}$ | TDA8191 | 425p | UPC1 198H | 200 p | 2SA954 | 30 p |
| LM3909 | 100p | STK561 | 450 | STK5466 | 500 p | STR50020 | 450p | TAA550 | ${ }^{25 p}$ | tDal701 | 3000 | TDA3654 | 90p | TDA8192 | 275 | UPC1222 | 130 p | 2 2SA958 | 60 p |
| LM3914 | ${ }_{\text {160p }}^{160}$ | STK563 STK583 | 415 p 500 p | STK5467 STK5468 | 400p | STR50092 STR50103A | 550p | ${ }_{\text {TBA396 }}^{\text {TBA }}$ | 40p | TDA1771 TDA1870 | ${ }_{200 p}^{250 p}$ | TDA3710 | ${ }^{300 p}$ | TDAB196 TDA8214B | 1250p | UPC1225H | ${ }^{2200}$ | 2SA963 | ${ }^{120 \mathrm{p}}$ |
| LM3916 | $270 p$ | STK760 | 600 p | STK5471 | 330 p | STR50113 | 500p | tBA520 | 120p | TDA1872A | 275p | tDA3724 | 500p | TDA8215B | 300p | UPC 1238 | 120p | ${ }^{\text {2SA966 }}$ | p |
| L200 | 200 p | STK770 | 400 | STK5473 | 480p | STR50115 | 500 p | tba530 | 100 p | TDA1904 | 80p | tDa3725 | 500p | tDab303 | 350p | UPC1270 | 250p | 2SA968 | 55 p |
| M49188 | 600p | STK772B |  | STK5476 | 350p | STR51041 | 500p | tBA540 | 90p | TDA1905 | 80 p | tDa3730 | 400p | TDAB304 | 600p | UPC1274V | 250p | 2SA970 | 25p |
| M49481 | 7000 | STK780 | 575p | STK5478 | 3800 | STR50213 | 500 p | tba560 | 90 p | TDA1908A | ${ }^{90 \mathrm{p}}$ | TDA3740 | 480 p | TDA8305 | ${ }^{5000}$ | UPC1277 | 240 p | 2SA979 | 35p |
| M50115P | 52 | STK1039 | 460p | STK5479 STK5481 | 300 p 520 p | STR53041 STR54041 | $500 p$ 350 p | TBA800 | 40 p | TDA1910 | ${ }^{2250}$ | TDA3750 | ${ }^{4500}$ | TDA8340 | 200 p | UPC1278 | 240 | 2SA984 | 25p |
| M50119P | 52 | STK1049 | 70 | STK5482 | 285p | STR55041 | 500p | tBab20 | 55p | TDA1940 | 300p | TDA377 | 350 p 460 p | TDA8341 | ${ }_{200 p}^{250 p}$ | UPC1288V | 230p | 2SA985 | ${ }^{650}$ |
| M50784 | 300p | STK1050 | 650 p | STK5483 | 440p | STP56041 | 550p | тва820м | ¢ | tDA1950 | 175p | tDa3791 | 300 p | TDA8390A | 650 p | UPC1318 | 300 p | $2 \mathrm{SA992}$ | 30 p |
| M50786 | 50 | STK1060 | 700 p | STK5486 | 450p | STR58041 | 325p | TBA920 | 100p | TDA2002 | 50 p | TDA38 | ${ }^{350}$ | TDA8405 | 550p | UPC1335V | 320 | 2SA993 | 50 p |
| M50790 | ${ }^{6000}$ | STK1070 STK1080 | ${ }_{9}^{850}$ | STK5488 STK5490 | 4880 | STR59041 | 350p | TBA950 | ${ }^{100 p}$ | TDA2003 | 65 p | TDA3803A | 500 p | TDA8415 | 650p | UPC1350 | 115 | ${ }^{2 S 5 A 999}$ | 30 p |
| M51161 M51381P | 300p | STK1080 | 940p | STK5490 STK5632 | ${ }_{450 \mathrm{p}}^{450}$ | STR60001 STR61001 | 5250p | ${ }^{\text {TBA }}$ TC5020 | ${ }^{200 p}$ | TDA2004 | 150p | TDA3810 | ${ }^{2200}$ | TDA8417 | 5500p | UPC1363 UPC1363C | 190p | $\begin{aligned} & \text { 2SA1006 } \\ & \text { 2SA1008 } \end{aligned}$ | 0p |
| M51387P |  | STK2028 | 500 | STK5725 | 450 p | STR80145 | 550p | TC5081AP | ${ }_{80}{ }^{\text {p }}$ | TDA2006 | 70 p | TDA3840 | 300 p | TDA8245 | 500 p | UPC 136 | 350p | 2SA1009 | 200 p |
| M51544 | 150p | STK2029 | 480p | STK5730 | 450p | STR81145 | 600 p | TC9106 | 500 p | tDa2007 | 120p | tDA3843 | 200p | TDA8432 | 550 p | UPC1365 | 250p | 2SA1090 | 225p |
| M5184 | 1500 | STK2038 | 700 p | STK6316 | 300p | STRD1206 | 600p | TC9125BP | 410p | TDA2008 | 100p | TDA3845 | 325p | TDA8433 | 600p | UPC1370C | 300 p | 2SA1011 | 30p |
| M54523P | 200 p | STK2048 | 950p | STK6324B | 500p | STRD1406 | 600p | TC9134 | 750p | tDazo | 160 p | tDA3 | 400p | TDA8 | 300p | UPC137 | 85p | 2SA1012 | 5p |
| M5 | 200 | STK2125 | 550 p | STK6431 | 850p | STRD1706 | ${ }^{4500}$ | TC9142 | ${ }^{320 p}$ | TOA2010 | ${ }^{150 p}$ | TDA3857 | ${ }_{225}{ }^{350}$ | TDA8442 | 200p | UPC1377C | 200p | 2SA1013 |  |
| M51516 | 260p | STK2129 | 580p | STK6732 | ${ }_{1000} 725$ | STRD1816 | 400p | TC9145 | 300p | TOA2030 | ${ }^{80 p}$ | TDA3 | 150p | TDA8451 | 450 | UPC1388 | 189p | （ $\begin{aligned} & \text { 2SA1015 } \\ & \text { 2SAT016 }\end{aligned}$ | 15p |
| M51518 | 2000 | STK2139 | 675 p | STK6822 | 900p | STRD3035 | 300p | TC9148 | 200p | tDA2040 | 140p | TD A4092 | 350p | tDA8452 | 200 p | UPC1384 | 425p | 2SA1018 | 100p |
| M83712 | 140 p | STK2155 | ， | STK6922 | p | STRD4412 | 500 p | TC149 | 225 | TOA2048 | 600 p | TDA4100 | $225 p$ | TDA8453 | ${ }^{350}$ | UPC13870 | 250p | 2SA1020 | 30 p |
| M83713 | 130p | STK2230 | 70p | STK6932 | 525 p | STRD4512 | 400 p | TC9150 | 425 | TDA2054M | ${ }^{110} \mathrm{p}$ | TDA4180 | $145 p$ | TDA84 | 350 | UPC1394 | ${ }^{120}$ | 2 SA 1021 | ${ }^{35 p}$ |
| M83714 | 270 p | STK 2240 STK2250 | \％ | STK6962 | 275p | TA705 | ${ }^{190}$ | TC9152 | 425p | TDA2107 | ${ }^{250}$ | TDA4190 | 180p | TDA8702 | 275p | UPC1397 | 350 | 2SA1023 | Pp |
| M83722 | ${ }^{280 p}$ | STK3041 | 370p | STK6981B | 600p | TA7066 | 120 p | TC9156 | 300p | TDA2 151 | 375p | TDA4280 | 320p | TDA8708 | 900p | UPC1420CA | 650p | 2SA1026 2SA1029 | ${ }_{60 \mathrm{p}}$ |
| M83730 | 160p | STK3042 | 375 | STK6982 | 600p | TA7089 | 300p | TC9163 | 375p | TDA2170 | 260 | TDA4282 | 360p | TDA8732 | 400p | UPC1421CA | 650p | 2SA1036 | 60 p |
| M83731 | ${ }^{2200}$ | STK3044 | ${ }^{5000}$ | STK7216 | ${ }^{420}$ | TA7119 | 150p | TC9164 | ${ }^{4000}$ | TDA2220 | 200p | TDA4290 | 200 p | TDA9045 | ${ }^{400 \mathrm{p}}$ | UPC1423CA | 550， | 2SA1037 | p |
| M83756 M 8759 | 160 p | STK3062 |  | STK7217 | 400 p | TA7120 | 55 p | TC9172P | ${ }^{3000}$ | TDA2270 | 250 p | TDa4400 | 175 p | TDA9080 | 550 p | UPC1470 | 200p | 2SA1038 | p |
| M 88719 | ${ }_{360 \mathrm{p}}$ | STK3102II | 53 | STK7226 | 500p | TA | ${ }^{60 p}$ | TCA9940 | p | TDA2320 | ${ }_{80} 8$ | TDA4420 | 120p | TDA9403 | 180 p | C1 | 150p | 2SA1048 | p |
| MC1455 | 5 | STK3152II | 900 p | STK7251 | 500 | TA7157 | 100 p | TD62308AP | 200 p | tDa2503 | 200 p | TDA4426 | 170 p | TDA9513 | 300 p | UPC1514CA | 200p | 2SA1060 | ${ }_{120 \mathrm{p}}$ |
| MC1496 | 65 p | STK3156 | 500 p | STK7308 | 350p | TA7193 | 320p | TD62382 | 200p | TDA2504 | 200p | TDA4427 | 200p | TEA1002 | 650 p | UPC1515CA | 250p | 2 2SA1069 | 150p |
| MC3401 | 45 p | STK4017 | 400 p | STK7309 | 400 p | TA7200 | ${ }^{200 p}$ | TD62506 | 200p | TDA2505 | 300 p | TDA4431 | 150 p | TEA1007 | 120p | UPC1520CA | 250p | ${ }^{2 S A 1076}$ | 30p |
| NE555 | ${ }^{20} \mathrm{p}$ | STK4019 | 480 p | STK7310 | 470 p | TA7205 | ${ }^{110} \mathrm{p}$ | TD62705 | 250p | TDA2506 | 500p | TDA4437 | 300p | TEA1009 | 100 p | UPC1536C | 550p | 2 SA1077 | 300p |
| NE556 | ${ }_{80} 40 \mathrm{p}$ | STK402 |  | STK7348 STK7356 | 400 p | TA7207 | 150 p 125 | TD6304AP | 300p | TDA2510 | 450p | TDA4439 | 220 p | TEA101 | ${ }_{130}^{280}$ | 2N423 | 100p | 2SA1081 | ${ }^{80 p}$ |
| NE565 | 110 p | STK4025 | 530 p | STK7358 | 440 p | TA7214 | 220 p | TD6350P | 200p | TDA2515 | 450p | TDA4442 | 240 p | TEA1024 | 150p | ZN425 | 320 p | 2SA1084 | 100p |
| NE567 | 115p | STK4026 | 480 p | STK7402 | ${ }^{560}$ | Ta7217 | 145p | TD6359P | 300p | TDA2530 | 450p | TDA4443 | 250p | TEA104 | 300p | ZN426 | 260p | 2SA 10 | 75p |
| NE571 | 2900 | STK4028 | 550 p | STK7404 | 400 | ta7220 | 220 p | TDA 1009 | ${ }^{2000}$ | TDA2532 | ${ }^{120 p}$ | TDA4445 | 220 p | TEA1060 | ${ }^{225 p}$ | 2N427 | 56 | $25 A 1091$ | 100p |
| NE592 ${ }_{\text {NE5 }}$ | 85p 140 p | STK403211 | $1{ }^{\circ}$ | STK7406 STK7408 | 650p | TA7222 | 20p 210 p | TDA1002 | 200p | TDA2540 | $85 p$ $120 p$ | TDA4450 TDA452 | $225 p$ 2500 | TEA1067 | 150 p 170 p | ZN429 | 215p | 2SA 1094 2SA1095 | Op |
| SAA1006 | 300p | STK4038 | 6800 | STK7410 | 900p | TA7225 | 300p | toa1005A | 175p | TDA2542 | 110p | tDA4453 | 275 p | TEA1087 | 40 p | ZN104 | 640p | ${ }_{2 S A 1096}$ | ${ }_{\text {B0p }}$ |
| SAA1008 | 450 p | STK404011 | 650 p | K7554 |  | TA7226 | 290p | TDA1010A |  | TDA25 | 210p | TDA4480 | 280 p | TEA1101 | 425p | ZNA134H | 2150p | 2SA1102 | 130p |
| SAA1010 | 40 | STK404211 | 800 p | STK7561 | 650p | TA7227 | 170p | toalol1 | 75p | tDa254 | 120p | TDA4482 | 350p | TEA13 | 65 p |  |  | $2 \mathrm{Sa1103}$ |  |
| A 102 | 25 | STK404 | 800 | STK7562 | 1000 p | TAP230 | 100 p | TDA1012 | 120 | TDA2546A | 200p | TDA4500 | 300p | TEA1511 | 150p |  |  | 2 2SA1104 | 140p |
| SAA102 | ${ }_{350 \mathrm{p}}^{250}$ | STK40 | 950p | STK7563 | 800p | TA7232 | 95p | TDA1013A | 110 p | TDA2549 | 300p | TDA4501 | 400 p | TEA2000 | ${ }^{275 p}$ | TRANSIS |  | 2 2SA1105 | ${ }^{250}$ |
| SAA1124 | 200 | STK4060 | 1 | STK8250 |  | TA7237 | ${ }_{300} 120 \mathrm{p}$ | TDA10 | 85p 140 p | TDA255 | 175p 230 | TDA4503 | 350p | TEA2018A | 200p | 2SA473 | 29 p | 2SA1 | p |
| SAA1250 | 280 | STK4065 | 650 p | STK8260 | 1200 p | TA7238 | 400 p | tDa1020 | 110p | TDA2557 | 225p | TDA4505 | 300p | TEA2114 | 200p | 2SA490 | 45 p | 2 SA1112 | 150 p |
| SAA1251 | 380 p | STK4109 | 500 p | STK8280 | 1850p | TA7240 | ${ }^{160} \mathrm{p}$ | TDA1022 | 330p | TDA2558 | 500p | TDA4510 | 270p | TEA2117 | 450p | 2SA4 | 30p | 2SA1115 | 0p |
| ${ }_{\text {SAA1274 }}$ | ${ }_{550 p}^{280 p}$ | STK4111 | 500 p | STK73410 | ${ }^{350} \mathrm{p}$ | TAT241 | 165 p | tDA1023 | 130 p | TDA2575A | 100p | TOA45 | 400 p | TEA51 | 200p | 2SA5 | 120p | ${ }^{2 S A 1123}$ | 40p |
| SAA300 | 500p | STK4121 | 500 p 480 p | STK734605 | 500p 3750 | TA7242 | ${ }_{3}^{1900}$ | TDA1024 | ${ }^{150}$ | TDA2577A | 200 | TDA4556 | P | TL．431 | 45p | 2SA509 | 35 p | 2SA1124 | p |
| SAA5000 | 200 p | STK4122 | 560 p | STR370 | 300 p | TA7245 | 225 | TDA1028 | 175 | TDA2579A | 250p | TDA4560 | ${ }_{270}$ | TL064 | 80 | 2SA5 | 650p | 2SA1133 | 120p |
| SAA5010 | 220 p | STK4131 | 480p | STR371 | 400p | TA7267 | 220p | TDA1029 | 200p | tDA2582 | 130p | TDA4600 | 200p | TL071 | 38p | 2SA550 | 150p | 2SA1141 | 200p |
| SAA5012 | ${ }_{3500}$ | STK4132II | 600 p | STR380 | 350 p | TA7269 | 260 p | TDA1035 | 160p | TDA2590 | 170p | TDA46001 | 160 | TL074 | ${ }_{50} 8$ | 2SA562 | 30p | 2SA1142 | 00p |
| SAA5030 | 340p | STK4142 | ${ }^{430}{ }^{\text {5 }}$ | STR383 | ${ }_{410}$ | TA7271 | 270p | TDA1041E | 180p | TDA2593 | 300p | TDA4601 | 120p 220p | TL083 | 55p | 2SA571 | 650p | 2SA1145 2SA1152 | ${ }_{150 \mathrm{p}}^{40 \mathrm{p}}$ |
| SAA5040A | 2800 | STK4151 | 68 | STR384 | ${ }^{350} \mathrm{P}$ | TA7272 | 260 p | TDA1044 | 110p | TDA2595 | 200 p | TDA4610 | 370 p | TMS 1000－0 | 41400 p | 2SA606 | 200 p | 2SA1156 | 90p |
| SAA5040B | ${ }_{6500}$ | STK4152 | 650 p | STR440 | ${ }_{520}$ | TAP273 | 300 p | TDA1047 | 200 | TDA2600 | 250p | TDA4660 | 370 | TMS100 | PM 200p | 2SA608 | 15 p | 2 SA1162 | 30p |
| SAA5231 | 300p | STK4162 | 55 | STR450 |  | tal274 | 210 p | TDA1048 | 30 | TDA2611A | 100 | TDA | 350 | TM | 3 |  | 150p | 2SA1 | p |
| SAA5243P | 800 p | STK 4171 | 90 | STR452 | 600 p | TA7281 | 200 p | TDA1054 | 180 p | TDA2640 | 220p | TDA4940 | 325p | TMS1025 | 350p | 2SA636 | 50 p | 2SA1175 | 30 p |
| SAB3013 | 200 p | STK417211 | 680 p | STR453 | 500 p | TA7282 | 160p | tDA 1059 B | 40 p | tda2653A | 225p | TDA4950 | 120p | TMS3617NS | 350p | 2SA640 | 60 p | 2SA1184 | 120 p |
| SAB3035 | ${ }^{600} \mathrm{p}$ | STK4181 |  | STR454 | 400 p | TA7283 | ${ }^{200}$ | TDA1060 | 140p | TDA2554 | 200 p | TDA5330T | 300 | TMS37018N | 300p | 2SA642 | $50 p$ | 2SA1186 | 500p |
| STA301 | 2200p | STK418211 STK4191 | 75 | STR455 STR456 | ${ }_{4700}^{50}$ | TA7288 TA7299 | ${ }_{200 \mathrm{p}}^{220}$ | TDA1062 | 140p | TDA26 | 150 | TDA566 | 450p | TMS3712 | 35 | 2SA673 | 5p | A | p |
| STA403A | 270 p | STK4192 | 700 | STR457 | 600 p | TA7310 | 1000 | TDA1074 | 280\％ | TDA2730 | 200 p | TDA5700 | 200 p | TPU2732 | 1200 p | ${ }^{254678}$ | $26 p$ | 2SA1208 | p |
| STA405A | 280 p | STK42311 | 700 p | STR470 | 400 p | TA7312 | 120 p | TDA1077 | 250p | TDA2760 | 400p | TDA5708 | 400 p | TPU2735 | 900p | 2SA683 | 25p | 2SA1209 | ${ }^{100} \mathrm{p}$ |
| STA431 | 250p | STK4241V | 12050 | STR1096 STR1195 | ${ }^{2750}$ | TA7313 | ${ }^{\text {pp }}$ | TDA1082 | 275p 985 | TDA2780 | 600 p 2750 | TDA5709 | ${ }^{4500}$ | U1118 U2118 | ${ }^{2500}$ | 2SA684 | ${ }_{100 p}^{25 p}$ | 2SA1210 | 20p |
| STA434A | 270 | STK4272 | 500p | STR1229 | 325 p | TA7315 | 200 | TDA1085 | 170p | TDA2795 | $275 p$ $200 p$ | TDA58820 | 600 p 370 | U254B | 300p | 2SA698 | ${ }^{100 p}$ | 2SA1215 | 600p 550 p |
| STA435A | 270 | STK4273 | 550 p | STR2005 | 400 p | TA7317P | 120p | TDA1087 | 60p | TDA2822M | ${ }^{60 p}$ | TDA5850 | 175p | U3318 | 350 p | 2 2SA711 | 280p | 2SA1217 | 100p |
| STA441C | 220 p | STK4301 | 500 p | S | 4000 | TA | 75p | TDA1092 | 100p | TDA2840 | 200 p | TDA6200 | 750p | U321M | 450 | 2SA715 | 50 p | 2SA1220 | 75p |
| STA471 | ${ }_{210} 240 \mathrm{p}$ | STK4332 | 650p | STR2013 | 300p 550p | TA7325 | 110p | TDA1097 | 475p | TDA3047 | ${ }_{130}{ }^{100}$ | TDA7000 | 170p | U329M | 350 p 300 p | 2SA719 | ${ }_{20 p}^{50 p}$ | 2SA1232 | ${ }^{180 \mathrm{p}}$ |
| STA901M | 2800 | STK4352 | 500 p | STR2105 | 600 p | TA7335 | ${ }^{85} \mathrm{p}$ | TDA1154 | 50p | TDA3082 | 200p | TDA7050 | 200 p | U4208 | 70 p | 2SA725 | 80 p | 2SA1244 | 120p |
| STK0025 | 420 p | STK4362 | 450 p | STR3113 | ${ }^{2250}$ | TA7336 | 180 p | TDA1170 | 85p | TDA3083 | 200 p | TDA7052 | ${ }^{1200}$ | U4278 | 70 p | 2SA726 | 20 p | 2SA1246 | 80p |
| STK0029 STK0039 | 360 p 600 | STK4372 | 4900p | STR3115 STR3123 | 400 p 400 | TA7341 | ${ }_{120 \mathrm{p}}^{250 \mathrm{p}}$ | TDA1180 TDA1180a | ${ }^{1200}$ | TDA3190 | 100p | TDA7053 | ${ }_{200 p}^{200}$ | U6648 | 175 | 2SA733 | 15p | 2SA | 100 p |
| STK0040 | 520 p | STK4432 | 600 p | STR3125 | 480 p | TA7357 | 340 p | TDA1190 | 80p | TDA3301B | ${ }^{280}$ | TDA7072 | 175 | U2829B | 130 p | 2SA748 | ${ }_{60 p}$ | 2SA1262 | 110 p |
| STK0049 | 510 p | STK473 | 8200 | STR3135 | 250 p | TA7358 | 85 p | TDA1200B | 80 p | tDa3310 | ${ }^{120} \mathrm{P}$ | TDA7077 | 175 | U46068 | ${ }^{600}$ | 2SA764 | 200 p | 2SA1263 | ${ }^{280} \mathrm{p}$ |
| STK0050 STK0059 | ${ }_{6200}^{440 p}$ | STK4793 STK4803 | 800p | STR3212 STR3214 | ${ }_{275}^{275}$ | TA7401 | ${ }_{200}^{250}$ | TDA1220 | 750 3000 | TDA3330 | ${ }^{500 p}$ | TDA7211 | 150 p | UC3842N | 125 | 2SA769 | ${ }^{80 p}$ | 2SA1 | ${ }^{280} \mathrm{p}$ |
| STK0060 | ${ }_{820} 620 \mathrm{p}$ | STK4813 | ${ }_{800}^{640 p}$ | STR3215 | 275p | TA7608 | 200p | TDA1235 | 300p 240p | TDA3420 | 150p | TDA7220 | 100p | UC3844 | 100 p 70 p | 2SA770 | ${ }^{200 p}$ | 2SA1265 2SA1283 | ${ }^{200 p}$ |
| STK0070 | 1100p | STK4833 | 700 p | STR3315 | 275p | TA7609 | 170p | TDA1251 | 150p | tDA3501 | 340 p | tDa7230A | 225 p | ULN2003 | 69 p | 2SA777 | 35p | 2SA1284 | S0p |
| STK0080 | ${ }^{580}$ | STK4843 | ${ }^{720}$ | STR4090A | 650p | TA7611 | 210p | TDA1270 | 150p | TDA3502 | 450p | TDA7233 | 150p | ULN2068 | 270p | 2SA778 | 100p | 2SA1286 | \％ |
| STK011 STK015 | 330 p 440 p | STK4853 | 7300 | STR4142 | 450 p 3700 | TA7612 | $\xrightarrow{300 \mathrm{p}}$ | TDA1327 | 2000 | TDA3504 | 3700p | TDA7240 | 175p | ULN2804 | 170 | 2SA781 | 150p | 2SA1290 | 50p |
| STK016 | 760 p | STK4873 | 850 p | STR4512 | 400p | TA7616 | 300 p | TDA1412 | 35 p | TDA350 | 260 | TDA7250 | 5000 | UPC55 | 130p | 2SA794 | 50p | 2 2SA1 | 500p |
| STK025 | 650 p | STK4893 | 1000p | STR5015 | 500p | TA7621 | ${ }^{300} \mathrm{p}$ | tDa1510 | 170p | TDA3507 | 450p | TDA7255 | 500p | UPC555 | 60 p | 2SA798 | 30p | 2SA1301 | 260p |
| STK050 | ${ }^{1600 p}$ | STK | ${ }_{475} 9$ | STR5100 | 550 p | TA7622 | 420 | TDA1512 | 1800 | TDA3510 | 350 p | TDA7256 | ${ }^{6000}$ | UPC556 | $8{ }^{80}$ | 2SA814 | ${ }^{60 p}$ | 2SA1302 | 300 p |
| STK078 | 580 p | STK5315 | 500p | STR5315 | 475p | TA7628 | 110 p | TDA1514A | 200p | TDA3520 | 650p | TDA7272 | 170 p 80 p | UPC574 | 220p | ${ }^{\text {2SA8 }}$ 236 ${ }^{\text {a }}$ | 20 p | 2SA1304 | 110p |
| STK080 | 550 p | STK5322 | 500 p | STR5412 | 350p | TA7630 | 200p | TDA15160 | 350p | TDA3540 | 200p | TDA7274 | 60p | UPC575C2 | sop | 2SA839 | 110 p | 2SA1306 | 110p |
| STK082 | 540 p | STK5324 | 450 | STR6020 | 325 p | TA7632 | 400 p | TDA1517 | ${ }^{250}$ | TDA3541 | 175 | TDA7275 | 75p | UPC577 | ${ }_{65}^{64 p}$ | 2SA844 | ${ }^{20} \mathrm{p}$ | 2SA1307 | 1000 |
| STK084 | 600 p 900 | STK5325 | $370 p$ $300 p$ | STR9005 STR9012 | 450 p | TA7640 | 90p | TDA1519 | ${ }_{200}^{200}$ | TDA35 | 260p | TDA7284 | 100p | UPC592 | 95p | 2SA872 | 25 p | 2SA1 | 50 p |
|  | 800p | STK5332 | 180p | STR10006 | 450 p | TA7658 | 100p | TDA1520 | 275 p | TDA3561A | 300p | TDA7359 | 300 p | UPC596 | 190p | ${ }_{\text {2SAB6 }}$ | 45p | 2 2SA1317 | 100p |
| STK0100 | 900 p | STK5333 | 1000p | STR11006 | 400 p | TA7668 | 100p | TDA1521 | 250p | TDA3562 | 260p | tDA7360 | 700p | UPC1001 | 220p | 2SA899 | 40 p | 2SA 1318 | 20 p |
| STK010011 | 1200 p | STK5335 | 350p | STR12006 | 450 p | TA7680AP | $225 p$ | TDA1522 | 110p | TDA3562TFK | 300p | TDA7770 | $225 p$ | UPC1018 | 170p | 2SA907 | 650 p | 2SA1321 | Op |
| STK420 | 40 | STK5337 | 500 p | STR13006 | 500 p | TA7688 | ${ }^{150}$ | TDA1524 | 2000 | TDA3563 | 350 | TDA8114 | 225 | UPC1020 | 200p | 2SA909 | 5 | 2SA1329 | ${ }_{200}^{200}$ |
| STK433 | 400 p | STK5339 | 400 p | STR16006 | 500 p | TA7699 | 600p | TDAI541 | 750 p | TDA3565 | 275p | TDA8140 | 200 p | UPC1025 | 230p | ${ }_{2 S A 916}$ | 30p | 2SA1352 | 100p |
| STK435 | ${ }^{3750}$ | STK5342 | 245p | 硣 | 450 p | TA7705 | 300p | TDA1542 | 250p | TDA3566 | 280p | TDA8143 | 160p | UPC1026 | 95p | 2SA921 | 40 P | 2SA1353 | 100p |
| STK436 | 4300 | STK5361 | 375 | STR20012 | 450 p | TA7750 | 200 p | TDA1543 | 300 p | TDA3567 | 3500 | TDA8145 | 120 p | UPC1028 | 90p | 2SA933 | 30 p | 2SA1356 | 100p |
| STK437 STK439 | ${ }_{500}^{460}$ | STK5372 STK5421 | 260p | STR20015 STR30110 | 450 p 400 p | TA7757 TA7769 | ${ }^{200}$ p | TDA1571 | ${ }^{300}$ | TDA3570 | 375p | TDA8153 | ${ }^{250}$ | UPC1031H | 150p | 2SA934 | 30 p | ${ }_{2}$ SA1358 | 130p |
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## JAPANESE TRANSISTORS




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## Not much cheer

News in the brown goods field has been pretty dismal of late. Take Philips, which seems to be a perennial walking wounded case. The company had appeared to be on the mend after a worldwide costcutting programme which was started five years ago when Jan Timmer took over as chairman. But, following a sharp profits fall, with the company's first quarterly loss since 1992, a further shake up is being undertaken. The difficulty is that the company operates in a mature market, in which prices are falling at an annual rate of six per cent. Manufacturers are competing by cutting costs to gain a larger share of static demand. It's not a situation in which any firm that does its own manufacturing can achieve much.

Philips' latest plan involves an overall loss of 6,000 jobs in its consumer electronics business, with far greater reliance placed on a group of external suppliers which are referred to as "a cluster of dedicated subcontractors". This is an approach that was pioneered many years ago by major Japanese manufacturers. Rather than make everything yourself, you rely on subcontractors who, in return, rely on you for their main source of work. It is hardly a cosy arrangement: the whole point seems to be that the major firm can exert pressure on its subcontractors, thereby - in theory - achieving optimum efficiency and cost-effectiveness. What happens when lower and lower prices are demanded for subcontracted work is not made clear. The whole edifice could collapse. However that might be, this is the course on which Philips has now embarked. The company is also to carry out distribution, sales and marketing on a regional rather than a national basis, and has said that it will not support

Grundig's losses after this year. But Philips' chief financial officer Dudley Eustace has said that it has "no intention of abandoning the television and audio business".

One has to assume that the subcontracting will also be done on an international basis, as major Japanese firms have had to do. There is a sense of déjà vu about this, though one wishes Philips well it is still one of the major contributors to research and development in our industry.

Toshiba, which has also just appointed a new top man, Taizo Nishimoro, provides an interesting contrast. Mr Nishimoro thinks that the western emphasis on sales and marketing rather than engineering is the way to go. So the whole industry seems to be moving full circle. Taizo Nishimoro has become the first non-engineering president of Toshiba. Where the company cannot compete effectively on its own, he intends to seek international alliances or go for closures. He put it as follows. "The technology and the businesses we are engaged in are getting more complex. In these circumstances, if we try to do everything ourselves we are making a mistake." Here's how Minoru Makihara, who became head of Mitsubishi Corporation four years ago, sees it. "Technologies are now moving so fast that it is impossible for the top manager to know all the details. Companies are now looking for generalists who can understand broad changes, delegate and provide leadership." Corporate change indeed amongst our oriental colleagues.
Major firms the world over are facing similar problems and having to adopt similar policies. In a mature market such as consumer electronics, you have to rely on marketing to squeeze the last little bit of
advantage from such developments as Dolby sound and other added value features.

The consumer electronics industry has been hoping that the digital video disc would come to its aid and get sales and profits moving ahead. The DVD was due to be released this month, but we are unlikely to hear much more about it yet awhile. There's no problem with the technology: the difficulty is with licensing and software. There is obviously no point in launching it without adequate software support. But the movie companies, which control most of the required supply of software, are concerned that a recordable version of the disc, due in a couple of years' time, would be a gift to pirates worldwide. Concessions have been made by the electronics industry, in particular that different disc formats should be used in different parts of the world. But a curious problem has arisen. The other main use of the DVD is as a ROM in computer systems. For this application flexible copying facilities are a major requirement. But the movie companies are unwilling to agree to this. At present the situation is deadlocked and the great hope of an autumn launch, all important for sales, has had to be postponed. Next year maybe? It's a great pity, since the DVD has much to offer.

There's a lot of sad news on the retail side as well. Colorvision has been placed in administrative receivership, with a threat to 800 jobs at its 76 stores, while the Rumbelows shops that were taken over by computer retailer Escom have suffered a similar fate. The receivers have closed down the UK chain with the loss of 850 jobs at some 150 stores.

Nothing seems to be going right just now.

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## Digital set-top box technology

The BBC has asked the government to license digital settop box technology to ensure that universal decoders become available for digital TV services from satellite, cable and terrestrial sources. It wants digital operators to declare in advance the conditional access system they propose to use, and legislation to guarantee that the industrial property rights for the manufacture of a decoder box and encryption system are offered under licence to all manufacturers and broadcasters on fair, non-discriminatory terms. The legislation should, the BBC adds, be enforced by Oftel, with the ITC given extra powers to ensure digital standardisation.
In a move endorsed by the BBC and the ITC, the Voice of the Listener, the National Consumers Council and the Consumers' Association have written to Ian Lang, the President of the Board of Trade, asking for standardisation of digital TV equipment. Major

European pay-TV companies have met the European industry commissioner Martin Bangemann to discuss the prospects of a single digital decoder. The meeting included Bertlesmann, BSkyB, Canal Plus, CLT, Deutsche Telekom and Vebacom.
Meanwhile BSkyB has sent a confidential digital decoder specification to manufacturers and has said that it expects decoders to be available in quantity by September 1997, when it proposes to launch a 200 -channel UK satellite TV service. The company is considering expansion to 500 channels in the longer term, giving near video-on-demand in addition to a large number of different channels. BSkyB's decoder specification includes forecasts on decoder demand in each year following the start of its service. There are no plans to appoint exclusive manufacturing rights. BSkyB is particularly interested in the prices that
manufacturers can suggest. It hopes that the decoder boxes can be made available for around $£ 200$. The specification is understood to include compatibility with terrestrial TV services.
BSkyB has been in touch with various groups, including British Telecommunications and Barclays Bank, to establish whether they would be prepared to subsidise the initial retail cost of the decoder boxes in return for an involvement in developing interactive services such as home shopping and banking.
It seems that the two leading digital satellite TV groups in Germany, Kirch and Bertlesmann, have reached agreement on a standard digital TV decoder. The two groups had previously been working on the technology separately. Kirch's service, DF1, in which BSkyB has a 49 per cent stake, is already in operation. Bertlesman plans to start its digital TV service this autumn.


The Konig DKM 190 digital capacitance meter, which is available from SEME LId., Unit 2, Saxby Road Industrial Estate, Melton Mowbray, Leicestershire LE13 1BS (phone 0166465 392, fax 0166463 976). The newlydeveloped meter can check capacitance values from IpF to 20,000 $\mathrm{\mu F}$ with an accuracy of 5 per cent. It comes complete with carry bag, test leads, 9 V battery, fuse and instruction manual for $£ 73$.

Latest news on Channel 5

Channel 5 Broadcasting is to employ some 7,000 engineers to carry out retuning in areas where the service will use ch. 37. Retuning has already started and is expected cost rather more than C5B originally estimated - the figure is now put at around $£ 70 \mathrm{~m}$. Following the trial run covering an area of 10,000 houses in Wallington, Surrey, C5B has conceded that its original plan required amendment.
The retuning exercise will be backed by an extensive advertising campaign which will include 3,000 "Give Me 5" posters and promotions in Blockbuster Video and Thorn and Granada rental outlets. Retuners will wear a branded uniform and carry a special identity card. C5B has reached an agreement with the Association of Chiefs of Police to vet all retuners to ensure that none have a criminal record.
A seminar on C5 was held at the Confederation of Aerial Industries' recent trade fair. The CAI has a video of the seminar available at $£ 15$ plus

VAT. The CAI can be contacted at Fulton House Business Centre, Fulton Road, Wembley Park, Middx HA9 0TF (phone 0181902 8998, fax 0181903 8719).

Multiview (UK) Ltd., 12 Thorkhill Road, Thames Ditton, Surrey KT7 OUE (phone 0181398 6663, fax 0181 398 0177) has launched two products to help with Channel 5 retuning problems, a signal generator and a "tune in module". The signal generator, which has a trade price of about $£ 150$, generates a test pattern and has one button preset to ch .37 . The tune in module is an external modulator for use where existing equipment has a limited tuning capability. It has a tuning range of ch. $32-49$ and is preset to channel 44. There are two versions, for use with satellite IRDs and VCRs. The former has a trade price of about $£ 11$ and uses the LNB supply. The latter, with a trade price of about $£ 13$, uses an external power supply.

## Terrestrial digital TV trial

The BBC, BT and Pace Micro Technology are conducting live trials of a terrestrial digital multiplex TV system, claimed to be the first working system of its type in the world, using the Crystal Palace and Pontope Pike transmitters. BBC-1, BBC-2 and BBC World are being transmitted as a multiplexed digital signal that includes data for an electronic programme guide. The signals
conform with the relevant European standard and are being received using prototype receivers developed by Pace in conjunction with BBC Research and Development - the trial service will not be made available to the public. BT is using the transmissions to test interactive services.
The test transmissions started with widescreen coverage of Trooping the Colour.

## Busimess news

Philips is to reorganise its consumer audio and video businesses with a loss of some 6,000 jobs. The idea will be to employ a group of external specialist producers for capital-intensive parts of its manufacturing operations. Distribution, sales and marketing will also be affected - they will be run on a regional basis. As an example of what will be involved on the manufacturing side, there's a plan to reduce the number of current TV chassis from twenty five to just six.
The company has emphasised that it has no intention of abandoning the television and audio fields - an interactive TV set that gives access to the Internet is to be launched in
the USA this October.
Talks that were to lead to a takeover of Amstrad's digital telephone business by Psion, the hand-held computer manufacturer, have been called off following consideration of a report from the company's financial advisers.
The Lit-On Technology Corporation of Taiwan, which is the world's fifth largest computer monitor manufacturer, is to build its first European plant in Lanarkshire, creating over 1,000 jobs in the next two years. Planned output is a million units a year. The recent decision by fellow Taiwanese company Chunghwa Picture Tubes to establish a plant in Lanarkshire contributed to Lit-On's decision.

## Magneto-optical discs

Fujitsu plans to start production of a new generation of computer memory discs with increased storage capacity next year. The magneto-optical discs will mainly challenge the DVD-ROM disc, which is due to become available next year. Fujitsu's discs will be able to store between 6-7Gbytes of data,
which can include video, in comparison with the DVDROM's $2 \cdot 6$ Gbytes. The company hopes that the discs will be used for multimedia services such as video-on-demand and interactive TV. Seven other electronics companies, including Hitachi, Philips, Sharp and Sony, are to manufacture the discs.


## Teletest for PC Monitors

The newly-released Teletest PC monitor test pattern generator (right), which is available from Ozan at $£ 149.95$ plus VAT. This makes it cheaper and more convenient than carrying a second-hand computer around! Hand-held and battery powered, the Teletest PC generates six different test patterns and plugs into the monitor directly.
Ozan has also relaunched the Teletest 2 test pattern generator (left) for TV sets and VCRs. It now provides six test patterns with $S$ video as well as composite video, RF and line AV outputs.
For a free information pack, Freecall Ozan on 0500009070 - or check out the new web page at ozan.co.uk.

## Sharp's Surround Sound

In addition to models that feature Dolby Pro-Logic Surround sound, Sharp is about to launch several models that use a surround sound system called SRS (Sound Retrieval System). This was developed by the Californian company SRS Labs. The system works by combining the left and right channels of a stereo signal to produce a sum signal ( $\mathrm{L}+\mathrm{R}$ ) and also subtracts one signal from the other to create two difference signals ( $\mathrm{L}-\mathrm{R}$ and $\mathrm{R}-\mathrm{L}$ ). The processed sum signal includes all direct and centred sound (such as dialogue) and provides spatial information while the difference signals provide directional cues. The result is surround sound from a two-speaker system, with a wide listening area.
Sets using the system will be labelled " 3 -D Surround Sound". Models will include the 21 in . 51 CS 05 H at $£ 430$, the 25 in .59 CS 05 H at $£ 530$ and the 28 in .66 CS 05 H at $£ 630$ (suggested retail prices).

## New Type Service Manuall

The significant feature of the first of a new type of service manual just released by Grove Farm Publications is the fact that it has been prepared for the service industry by a service engineer (Steve Beeching). It covers most of the Grundig satellite receivers that were made in the company's UK factory between 1994 and 1996, including models in the Grundig, JVC, Matsui and Philips
ranges, and was produced with the co-operation of Grundig International - for those who do not have a Grundig account.
The aim is to present the technical information in a way that will be of greatest help to service engineers, with technical specifications, circuit descriptions and block, circuit and layout diagrams. The circuit and layout diagrams are clear and are
gridded so that the engineer can find what he wants with the minimum distraction while working on the equipment.
The manual costs $£ 15$ plus post and packing and represents good value. Enquiries to Grove Farm Publications, Grove Farm, Long Lane, Barnby In The Willows, Newark, Notts NG24 2SG (phone 01636626 829, fax 01636626 767).


## Reports from

David C. Woodnott and Eugene Trundle

## Sanyo VMD3P

There was no viewfinder picture though the machine was otherwise OK. We traced the cause of the fault to leakage in the line drive coupling capacitor C9911. This was a very misleading fault, because the waveform at the base of the line output transistor seemed to be good while the waveform at its collector was ragged. This could lead one to suspect the line output transformer and its periperal components. E.T.

## Canon E200E

This one came in because there was playback picture mistracking. The cause was a loose slant pole, something that's not uncommon with this model. It was easy enough to put right: we reset the pole's position, then secured it with a Loctite product. After this the machine seemed to work fine.
When we tested it however there was a problem at tape end. The machine entered the caution mode, with a flashing symbol in the viewfinder. No functions were available until the tape had been ejected and reinserted. At the end of rewind the same fault recurred.
This prompted a suspicion that the cassette LED had failed - rare perhaps, but not impossible. The lamp and the connecting ribbon cable were both OK however. Use of another camcorder to view the LED confirmed that it was working. What next? - there were still no outputs from the tape-end sensors. The only other item in the chain, the gooseneck baseplate which carries a clear plastic lens assembly to direct

Camcorner
the light from the LED into the cassette, turned out to be the cause of the trouble. The plastic lightbending unit was deformed, probably because of heat during a previous soldering operation. Beware! D.C.W.

## JVC GRM3F

There was no camera operation. This was simply because the camera head section had become detached from the deck section, no doubt as a result of an impact. Refitting the connector restored all functions. D.C.W.

## Canon UCIOE

Playback was OK with this 'upright' model, but there was no camera E-E picture. The cause of the fault lay with the sensor PCB assembly which, having a ceramic-based substrate, is unfortunately not repairable. Capacitor failure had caused print damage. The problem is becoming a serious one with models that use this form of construction. We've had similar faults with Model E6E and others. A new board is required, at around $£ 120$ trade! D.C.W.

## Panasonic NVS500

All functions except for zoom and autofocus worked correctly. The cause of the fault was a damaged ribbon cable at the connection to the zoom motor, possibly the result of impact damage. A new cable put matters right. D.C.W.

## Sanyo VEMS $1 P$

As with several models these days, electrolyte leakage can cause various fault symptoms, necessitating replacement of all the surfacemounted can electrolytics on the main PCB. A quick check on the situation, without need to remove the case, is to examine the video signal waveform while playing back a previously recorded tape: note especially any rounding off or crushing in the sync pulse area - this is a sure sign that all is not well.
It's easy to get confused when replacing the capacitors in this model as there is an extra, marked space for a capacitor that's not
fitted. Note this position before you start removing the old capacitors the layout detail in the manual is not too clear (both sides of the PCB are shown as seen from the same side, requiring some mental agility in getting things right when you turn the board over). D.C.W.

## Sanyo VMD90P

The reported fault was that the camera E-E picture flashed on and off erratically, and that an E-E picture was seen dimly even in the playback 'stop' mode, which is normally blank. Tape playback was OK. Internal inspection showed that the iris motor had moved from its normal position, doubtless because of an impact - it sits only a few millimetres behind the front of the case. We had to fit a new lens assembly, as the motor is not available separately. The result was a fairly expensive repair.
Note that the lens assembly for Model VMD90R has a different iris motor. A few days after this repair another Sanyo came in with an E-E picture showing in the VTR mode! Another lens unit was required. D.C.W.

## Chinnon VC1500

Mechanical failures are common with this mechanism, which is very similar to the Amstrad VMC100 and various JVC decks. One we had in recently had failed during eject, and as a result had damaged the intermediate gear. The cause of the failure had been the spring plate beneath the take-up guide becoming loose. The mechanism had then jammed, causing the fault and the damage to the intermediate gear. Although the gear costs only a few pounds, you have to dismantle most of the loading ring gear and head drum assembly to fit it. Retiming is straightforward - in comparison with : some later mechanisms! D.C.W.

## Sony FX Series

For no power up, check the connections between the DC-DC converter and the main PCB. Impact damage can detach the socket pins from the PCB. D.C.W.

# VCR BELT KITS / REPLACEMENT VIDEO LAMPS 



## VIDEO SERVICE KITS

## AMSTRAD

VCR700
BELT SET. PINCH ROLLER REEL IDLER. VIDEO LAMP Order Code: SK41

FERGUSON \& JVC
3V42/43
$\begin{array}{ll}\text { HRD455/HRD725 } & \\ \text { Contents } & \text { Econony Rit Contents } \\ \text { BELTSET. PINCHROLLER } & \text { BELT SET. PINCH ROLLER } \\ \text { CLUTCH MECHANISM. TENSION } & \text { SUPPLY CLUTCH. TAKE UP }\end{array}$
BAND
Order Code: SK37 £16.00 Order Code: SK38 $\mathbf{£ 9 . 0 0}$
3V58/59/64/65
HRD170/180/210/230/300/320/370/400/430/530/700/750 HRS5000
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HR7200/7300/7350
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$£ 5.00$
3V35/36.38/39/49
HRD110/111/120/225
Contents
Comtents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES Order Code: SK04

3V31/3V42
HR7600/7610/7650/7655
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BELT SET TM REEL TABLE
TYRE, PINCH ROLLER. REEL IDERL. T/UCLUTCH. T/U IDLER TENSION BAND. VIDEO LAMP Order Code: SK33 $\quad \$ 11.00$
3V35/36/38/39/49
HRD1 10/111/120/121/225
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TYRE SUPPLY REEL TABLE
TYRE. PINCH ROLLER. T/U
CUER TENSION BAND
ON BAND
Order Code: SK
3V29/3V30
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TYRE SUPPLY REEL TABLE
TYRE PINCH ROLLER. REEL
DLER. T/UCLUTCH. T/U|DLER
TENSION BAND. VIDEO LAMP Order Code: SK31 $£ 10.00$

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Economy Kit Contents Economy Kit contents
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CLUTCH. TNIDLER TYRE. REEL CLUTCH. T/UIDLER TYRE. REEL
IDER TYRE $\mathbf{\$ 1 0 . 0 0 ~ O r d e r ~ C o d e : ~ S K 3 6 ~}$
f5.50

V444/45/48/53/54/55/57
HRP50/HRD140/150/158/160
HRD250/257/565/566/755
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CLUTCH MECHANISM. TENSION
$\begin{array}{llll}\text { BAND } \\ \text { Order Code: SK39 } & \text { £15.00 } & \text { Order Code: SK40 } & \text { £9.50 }\end{array}$ FISHER
FHP905/906/907/908/910/911/916/918
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FVHP615/618/620/622/710/711/715/716/720/721/722/725/ 730/830/840
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BELT SET. PINCH ROLLER
IDLER GEAR IDLER UNIT.
TENSIONBAND
Order Cade: SK68 £11.00 Order Code: SK69

## HITACH <br> T11NT33

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## VIDEO SERVICE KITS (Cont.)

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TENSION BAND Order Code: SK45 E13

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TENSION BAND
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TENSION BAND TENSION BAND Order Code: SK5

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NV300/NV330NV333NV340NV366

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| IDLER UNIT PLAY IDLER. | IDLER TYRE. PLAY IDLER |
| TENSION BAND | TYRE |


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| AMSTRAD SRD500 | SATPSU4 | 650 p |

Replacement Video Heads

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| SONY | SLV656, SLV715, SLV757, SLV777, SLV815, SLV825 | 4600p |
|  | SLV353UB | 3200p |
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| Maxe | models | PRICE |
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|  | NVG33, NVG45, NVG46, NVL23 NVL25, NVL28 PART ND: VEH 0417 | 2900p |
|  | NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG 130 PART NO: VEH 0416 | 2700p |

## Audio Control Head

## AMSTRAD ORIGINAL NO: 150751

Used on: AMSTRAD TVR1, 2,3, VCR4600, 4600MKII, 4700. FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000 Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD OD8900, 8904, VCR2000, 6000, 6100, 8600, 8602 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
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Replacement Audio Control Video Sound
Head for National Panasonic

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| VBR 0061 | NV777 etc | 875p |
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|  | VHSYJ2 | CH01 | 2800p |
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|  | GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200 | CH26 | 2900p |
| FERGUSON \& J.V.C. | 3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225 | CH01 | 2800p |
|  | 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755 | CHO2 | 2800p |
|  | 8948, 8950, FY10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530 | CH03 | 2600p |
|  | 3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRO170, HRD180, HRD370 | CH04 | 2600p |
|  | FV31R | CH 19 | 4300p |
|  | HRD5 15, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H | CH2O | 2400p |
|  | HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSDN FV57H | CH27 | 2400p |
| I.T.T. | VR3605, VR3905 | $\mathrm{CHO1}$ | 2800p |
|  | VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948 | CHO2 | 2800p |
|  | VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997,6948 | CH02 | 2800p |
| NATIONAL PANASONIC | NV730 | CH06 | 4300p |
| N.E.C. | N830EG, N831EG, N832, N833EG | CH01 | 2800p |
|  | N895 | CHO2 | 2800p |
| PHILIPS | CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761,6870,6970 | CH05 | 1100p |
|  | VR6443 | CH22 | 2900p |
|  | VR6448 | CH 23 | 2500p |
|  | 49SB6 | CH24 | 2500p |
| SHARP | VCA100, VCH851, VCH852 | CH22 | 2900p |
|  | VCA103, 103GV, 106, 106GVM, 254GVM | CH23 | 2500p |
|  | VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610 | CH24 | 2500p |
| TELEFUNKEN | VR2970 | CHO2 | 2800p |
| THDMSON | V320, 321, 323, 326, 4200, 4300 | CHO1 | 2800p |
|  | V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540 | CHO2 | 2800p |
| TOSHIBA | V55, V57 | CH01 | 2800 p |
|  | V65, V66 | CHO2 | 2800p |

## Service Aids

| description | volume | COBE | PRICE |
| :---: | :---: | :---: | :---: |
| VIDEO HEAD CLEANER | 75ML | SP01 | 140p |
| SWITCH CLEANER | 176 ML | SP02 | 150p |
| SILICONE GREASE | 200ML | SP03 | 170p |
| FREEZEIT | 170 ML | SPO4 | 220 p |
| FREEZEIT | 400 ML | SP16 | 550p |
| FOAM CLEANER | 400ML | SP05 | 170p |
| ANTISTATC | 150ML | SP06 | 170p |
| AEROKLEANE | 135ML | SP07 | 200 p |
| AERO DUSTER | 150ML | SP08 | 220 p |
| AERODUSTER | 400 ML | SP17 | 550 p |
| PLASTIC SEAL | 200ML | SP09 | 200p |
| GLASS CLEANER | 250ML | SP10 | 160p |
| COLDKLENE | 250ML | SP13 | 200 p |
| EXCEL POLISH 80 | 250ML | SP18 | 150p |
| ADHESIVE 120 | 400 ML | SP19 | 190p |
| LABEL REMOVER 130 | 200 ML | SP20 | 240p |
| REFURB 140 | 400 ML | SP21 | 240p |
| TUBE SILICON GREASE | 50 GRAMMES | SP11 | 200p |
| TUBE SILICON SEALANT WHITE | 75ML | SP22 | 280p |
| TUBE SILICON SEALANT CLEAR | 75 ML | SP23 | 280p |
| TUBE HEAT SINK COMPOUND | 25 GRAMMES | SP12 | 150p |
| DRIVE CLEANER | 200ML | SP24 | 150p |
| SCREEN CLEANER | 200ML | SP25 | 150p |
| COMPUTER CARE KIT | - | SP26 | 2100p |

All the above items are manufactured by Servisol If you purchase more than one Servisol Product, postage
\& package will be charged as follows.
300p for 5 cans 450p for more than 5 cans

## CD Pick Ups

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

2200p

\section*{Cassette DC Motors <br> | MOTOR TYPI | PRICE |
| :--- | :--- |
| GV MOTOR | 170 p |
| 9V MOTOR | 170 p |
| 12V CW MOTOR | 170 p |
| 12V CCW MOTOR | 170 p |
| 13.2 CCW MOTOR | 290 p | <br> Cassette Tape Heads <br> | HEAD TYPE | PRICE |
| :--- | ---: |
| MDNO HEAD | 90 p |
| STEREO-HEAD | 10 p |
| MINI HEAD | 150 p | <br> AUTO REVERSE HEAD 200p}

## Soldering Accessories

| OESCRIPTION | CODE | PRICE |
| :---: | :---: | :---: |
| ANTEX SOLDERING IRONS |  |  |
| 25 WATT 240 VAC ( XS25W 240V) | S101 | ${ }^{900}$ |
| 15 WATT 240 VAC (XS15W 240 V ) | S102 | 900p |
| 25 WATT SPARE ELEMENT | S103 | 450p |
| 15 WATT SPARE ELEMENT | S104 | 450p |
| SOLDERING STAND \& SPONGES |  |  |
|  |  |  |
| SPARE SPONGE | S109 | 55p |
| SOLDER |  |  |
| 18 SWG 500 GRAMMES | S110 | 500p |
| 20 SWG 500 GRAMMES | 5111 |  |
| 22 SWG 500 GRAMMES | S112 | 700p |
| DESOLDERING AIDS |  |  |
| SOLDER MOP STANDARD GAUGE $1.2 \mathrm{~mm} \times 1.5 \mathrm{M}$ | S107 | p |
| SOLDER MOP $1.2 \mathrm{~mm} \times 10 \mathrm{M}$ | S113 | ${ }^{400 p}$ |
| OESOLDERING PUMP | S105 | 320p |
| Spare nozzle | S106 | 60p |

## Transistors \& ICS

| BU 508A (PHIL) | 80p | MJE 13009 | 100p | 2SC 3885A | 350p |
| :---: | :---: | :---: | :---: | :---: | :---: |
| BU 810 | 110 p | MJE 18004 | $125 p$ | ${ }^{2 S D} 633$ | 70p |
| BUZ 90A | 180p | STK 6982H | 600 | 2SO 1680 | 225p |
| CXA 1044P | 550p | STK 7253 | 450p | 2SK 793 | 400 p |
| HA13408 | 350 p | TDA 2030H | 100p | 2SK 956 | 1400p |
| IRFBC40 | 400p | TEA 2019 | $200 p$ | 2SK 1023 | 550p |
| L272 | 200p | TMP 47C434N | 1250p | 2SK 1342 | 750p |
| $\underline{L 6210}$ | 250 p | SAA 1300 | 200p | 2 SK 1358 | 600 p |
| MC 3423P | 100p | 2SA 1540 | 55 p | 68000 | 500p |
| MJ 15015 | 250p | 2SC 3788 | 60p | 82S147 | 450p |
| MJ 15016 | 350p | 2SC 3885 | 350p |  |  |

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## Satellite <br> WORKSHOP

when I connect my satellite receiver to my Nicam stereo VCR via the RF cable, don't I get stereo sound?" The answer is to make the left and right audio connections via the scart or phono sockets, whichever are provided. Even then the VCR's Nicam light will not come on, because Nicam stereo is not available via satellite. Many films use Dolby Pro-Logic Surround sound however, and a suitable receiver and amplifier combination (or the MSS1000) will provide amazing sound effects.

## E-mail Blues

I've answered quite a lot of e-mail enquiries since I first offered this service in the column. It takes time, but is interesting since it brings to my attention faults that others are experiencing and quite often I can help. The only real problem is that I have a shocking memory. If someone sends me a question one day then refers to my answer a couple of days later I can't remember the original question!
A typical e-mail follow-up might go along these lines: "Dear Jack, thank you very much for your reply. Now I have another problem. Can you tell me why it causes wavy lines on the other three channels? Kind regards. . ." When this first happened I spent a fruitless hour searching through previous replies to find the original question and answer. Now I don't bother. So if you get no reply, or a very curt "huh?", you know why!
I answer between five and twenty messages a day. They come from all over Europe, and are not just in English. It all takes time. If you want to tell me about new faults and solutions, I'm very interested to know about them. If you have a problem, I am only too pleased to help: but please list all relevant details and use a separate message for each model. If you list several models and faults in one message it becomes confusing. Please don't use abbreviations: I don't always understand them. E-mail is not like Telex or Morse Code. Type full words - it doesn't cost.

Those of you who don't have email simply do not know what you are missing! It's rapidly taking over from fax. Costs are typically as follows. $£ 10$ per month plus VAT gets you an 'address' at a local computer 'point of presence' (POP). In addition to that you might spend (as I do) just five minutes each evening actually connected via the telephone modem. Five minutes is all it takes to download my new e-mail and send the replies I typed the day before. Unlike fax, the replies are sent in one batch to the local POP computer. This computer then sends each reply to the relevant address - at its leisure (usually within two hours). Meanwhile I've been connected to the telephone line for less than five minutes. That's about 10p per day. Total monthly cost, about $£ 13$ plus VAT.

## The Cambridge RD480

A customer brought in one of these receivers with the complaint that some of the channels were missing. Suspecting a polarisation voltage problem, I checked this out on the bench but could find nothing amiss. So I gave it back to him. The following day he returned, complaining that he could receive only two programmes above a certain channel number. This was so - the receiver wouldn't tune higher than Sky Sports.
Closer inspection showed that the top of $\mathrm{C} 172(2,200 \mu \mathrm{~F}, 35 \mathrm{~V})$ was bulging. The cause of this was not hard to find since the diodes that feed it also looked the worse for wear. In fact one of them was open-circuit.
For good measure I replaced all fourteen diodes in the power supply. As they are difficult to desolder without peeling tracks off the board, my usual approach is to snip the diodes flush with the top surface of the board then desolder the remaining leg sections from beneath.

For reference, the tuning voltage supply across C172 should be in excess of 32 V .
I had another RD480 in during the same week with the same fault, though this time the symptom was
that the screen would suddenly go blank five minutes before the end of a film. After cooling down, the set would work fine until five minutes before the end of the next movie - or so the customer said! It looked like a tuner fault but wasn't.

## An Amstrad SRD545

This model is based on the
SRD510, with a few circuit design improvements. The one that was brought in showed "your card is invalid" when a valid card was inserted.
Fitting known good decoder and card reader boards failed to cure the fault, which I eventually found was caused by R205 (10 ) being open-circuit. This resist or is not present in the SRD510 - it's one of the improvements for better reliability. Oh dear! You'll find it near the front left-hand corner of the main PCB.
Another problem I've been seeing with these 'improved reliability' receivers is failure of $\mathrm{C} 622(2,200 \mu \mathrm{~F}, 10 \mathrm{~V})$ in the 5 V supply. When it goes open-circuit the feedback regulation system
raises all the secondary voltages. The result is usually a line of exploded electrolytics across the main board and the power supply. You can easily be fooled, because the only one that doesn't explode is C622 itself. Unfortunately the fault usually destroys the decoder module. If you have one of these receivers on the bench, monitor the LNB supply: the first sign of the fault condition is 60 V going to the LNB which, believe me, smokes!

## Manuals

I've received a copy of a service manual, produced by Grove Farm Publications, that covers the Grundig GRD100/150/200 /250/280/300, JVC TU-C200, Matsui RD600 and Philips STU3301/3501/3601 satellite receivers. It's excellent: comprehensive, with circuits, circuit descriptions and parts lists. Price is $£ 14.95$ plus $£ 1$ postage, from Grove Farm Publications, Grove Farm, Long Lane, Barnby In The Willows, Newark, Notts NG24 2SG.
The Discus Ellipse receiver forms the basis of a budget
-
Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems via e-mail. You can reach him via the Internet at:
jackarm@netcentral.co.uk
One model per message - state make/model, fault symptom and history. Please mention Television magazine and your level of technical competence. If you have no e-mail facilities you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two stamped envelopes.
motorised system. There are plenty of them in use and they are generally quite reliable. When a fault does occur however, life becomes difficult without service information. A manual ( $£ 10$ ) and spare parts are now available from Satellite Surplus (Telford). Give
Frank Martin a call on 01952598
173 for further details. Frank is
well known on the Radio Rally
circuit, and has all sorts of satellite bargains.


The evolution of satellite TV receivers and broadcast services has been very rapid. While a four- or five-year old TV set or VCR is regarded (around here, anyway!) as relatively new, a satellite box of the same vintage seems to have come out of the stone age. The need to update satellite receivers has been forced on users by the introduction of more channels, extra transmission frequencies, stereo sound, VideoCrypt encoding and other features to which older sets cannot be adapted. In contrast, TV sets and VCRs continue to receive, record and display all that's required.
Despite this there is still some old satellite hardware about, mainly in the possession of those users who don't rent their gear. One such is Mr Todd, whose installation dates from the earliest days of Sky broadcasting. As things have progressed, Mr T has added a separate VideoCrypt decoder and has retuned his sat-box to obtain his favourite programmes within its limited channel capacity. Another problem had now emerged however, one that required our help. While most of the channels he wants were being received reasonably well some of them, particularly the premium movie channels and Sky News, had gradually deteriorated to the point where the pictures were suffused with grain and sparklies. The other channels were also affected when it rained, and retuning hadn't helped. That's what he told our Pam, who sent Doc Colin along in his big van to check things out.
Colin's intention had been to carry out a quick visual check on the installation and bring the receiver back to the workshop for attention. Everything appeared to be OK - except for the pictures on the afflicted channels of course - so the loan receiver was connected up. It was pretuned for use with a standard LNB, so there was no twiddling to be done. But the
pictures it produced were no better than those of the original set! Plainly the cause of the trouble was external to the sat-box itself: life is seldom easy these days, even for a delivery/ installation technician. Colin departed, promising that another man would come. This turned out to be none other than Colin himself (staff holidays, you know). He brought with him ladders, a field-strength meter and other items. The day was bright, and Mr Todd wondered what it would all cost as he watched our man climb the ladder.
Colin unwound the tape and disconnected the feeder cable. It seemed to be in good condition, unsullied by water ingress. He then plugged in his field strength meter, carefully loosened the dish fixings and checked its alignment. No improvement in the signal level could be achieved. So the dish was once more clamped in position and the reception tried. There was no difference. Back down the ladder then, and back up with another LNB of the same type as the original: we are awash with these, removed from installations that have been updated. The pictures on the afflicted channels were now, if anything, a little worse than before! The polarisation and position of the substitute LNB had of course been carefully checked, and it was known to be in working order.
Perhaps something was wrong with the dish, though it didn't appear to be bent, damaged or distorted. Could there be a fault with the DC supply to the LNB? A meter check atop the ladder showed that the voltage was correct and didn't vary between good and bad channel reception. None of the other faults that occurred to Colin would discriminate between channels, duffing out the Movie Channel while leaving UK Living, Family Channel and others unscathed. So where did the cause of the trouble lie? For the solution, turn to page 819.


# Servicing the <br> Samsung VI7 10 <br> <br> John Coombes on what to check when electronic or mechanical <br> <br> John Coombes on what to check when electronic or mechanical problems are encountered with these popular VCRs 

 problems are encountered with these popular VCRs}

The Samsung VI710 is a basic model, with HQ, that was on sale during the 1988-90 period. A badged version was sold as the Logik VR955.

## Power Failure Faults

If the clock display is lit up, the power switch is on but the power indicator light is not illuminated, check that the always 6 V supply is present at pin 32 of the UPD75104CW-087 microcontroller chip IC601. If this supply is missing, check whether D601 and/or D602 is open-circuit. Both diodes are type 1 N 4148 . If the voltage at pin 32 is present and correct, check at the power control output pin (56) of IC601 where the reading should be 0 V . If this voltage is incorrect, check IC601 by replacement.
If there is no clock display, check whether the always 6 V supply is present at pin 5 of connector CN101 on the power supply/regulator panel. Check the following items should this voltage be missing: the mains transformer PT101, the RBV-402 mains bridge rectifier D101 and fuses F101 ( 500 mA ) and F102 (2.5A). If F101 has blown, check the mains filter capacitor C101 which is probably short-circuit.
Should the always 6 V supply be present and correct, check for 30 V at pin 10 of CN101. When this voltage is missing, the following items should be checked: the 1N4002 rectifier diode D104, the KSC945 30V regulator transistor Q 102 , its $2.7 \mathrm{k} \Omega$ collector feed resistor R108 and zener diodes ZD101 (24V) and ZD102 (6.8V).

The next thing to check is that the display device is receiving its 5.1 V AC supply. Check back to source (at PT101) if this is missing.
There must be a 50 Hz signal at pin 8 of connector CN101. If this is missing, Q101 (KSC945) could be opencircuit, D103 (1N4148) could be short-circuit or leaky or R101 ( $10 \mathrm{k} \Omega$ ) open-circuit.
The STK5333 regulator chip IC101 could be faulty check it by replacement. If necessary check the fusible resistors FR101 ( $1 \cdot 2 \Omega$ ) and FR102 ( $2 \Omega$ ) which could be open-circuit.
Fig. 1 shows the circuitry on the power supply/regulator panel.

## No Play

Incorrect or no tape loading is the first possibility here. Check for a high state voltage ( 4.8 V ) at pin 53 of the microcontroller chip IC601 and a low-state voltage at pin 52. If these conditions are not present, check IC601 by replacement. If they are correct, check the BA6209 loading motor drive chip IC205 by replacement and then if necessary the loading motor itself, again by replacement.
If tape loading is OK, check the operation of the tapeend sensor. Its output is fed to pin 18 of IC601, where the reading should be 0 V . If the voltage is high, suspect the tape. If it is correct, check that the drum is rotating. The first things to check when the drum fails to rotate are that the 15 V supply is present at pin 1 of connector CN101 and the 5 V supply at pin 4. If these voltages are


Fig. 1: The power supply/regulator circuitry used in the Samsung Model VI710. Supply line switching is carried out on the main PCB.
present and correct, suspect the microcontroller chip IC601, the BA718 chip IC202 or the drum motor assembly. Check these items by replacement.
If drum rotation is normal but the machine cuts out quickly, check for the presence of the 25 Hz switching pulse waveform at pin 1 of IC601. It comes from pin 9 of the SD3624A servo chip IC201. If the 25 Hz waveform is not present here, check that the drum PG signal is present at pin 17. Check it back to source if missing (via C211, CN201, CN204, CN214).
If the 25 Hz waveform is OK , does the capstan motor rotate? If not and the 15 V and 5 V supplies are correct, IC601, IC201 and/or IC202 (BA718) and the capstan motor are suspect.
Another check to make if necessary is that turntable reel pulses are present at pin 2 of IC601. If these are missing, Q209 (KSC945) or R251 ( $470 \mathrm{k} \Omega$ ) could be open-circuit or the reel sensor Q005 (NJL5141EA) faulty - check it by replacement. If the pulses are present at pin 2, check IC601 by replacement.

## Failure to Record

If the complaint is failure to record, first check that the machine will play - see previous section.
Insert a tape and press record. Does the record mode symbol appear in the display? If not, check whether the record safety input at pin 9 of IC601 is correct ( 5 V ). If this is incorrect, check IC601 and/or the safety tab switch by replacement.
If the record mode symbol is present, check pin 51
(rec) of IC601 where the voltage should be 5V. If it's low, replace IC601.
If these control arrangements are OK , check the video and audio circuitry as necessary.

## No E-E Video

Check with the VCR in the stop mode. If the video signal is missing, check the following items: IC0303 (TA8605), C0353 ( $4.7 \mu \mathrm{~F}$ ), IC0302 (TA8606), Q0304 (KSA733) and low-pass filter FL0302. C0353, Q034 and FL0302 can go open-circuit. Make sure that the DC conditions around IC0303 and IC0302 are correct. C0366 ( 100 pF ) and R0359 ( $82 \mathrm{k} \Omega$ ), which are connected to pin 28 of IC0303, are possible suspects.

## Loss of Playback Video

For playback, the PB5V supply must be present at pin 10 of IC0301, pin 4 of IC0302, pin 13 of IC0303 and pin 7 of IC0307. If this supply is missing, check Q112 (KSA928), Q113 and/or Q114 (both type KSR1004), by replacement if necessary.
If still in trouble use a scope to trace the signal path through IC0303, IC0302 and IC0301. By a process of elimination you'll locate the faulty chip or associated component.
Other possibilites are the TA7772 video preamplifier chip IC0307 and the heads.

## Tuning Faults

First check that all channels can be selected. If not,
check that the strobe, clock and data pulses are present at pins 11, 12 and 13 of IC601. Suspect IC601 if they are missing - check by replacement.
Ensure that the data track between IC601 and the tuner is intact. If so, suspect the tuner.
In general, if the IF section is at fault there will be a blank screen, whereas if the tuner is faulty there will be either no picture or a snowstorm.

## Deck Faults

The most common deck fault is tape chewing or creasing because the pinch roller is worn or faulty.
If there's no picture, just snow or bent verticals, or hooking over the top third of the screen, check the tension band assembly for wear or damage.
If playback of prerecorded tapes is marred by lines, check that the guide poles are correctly set up, using the FM waveform as a guide.
Tape slowing down or not being taken up by the spools is very often caused by lack of lubrication on the take-up and/or supply spool spindles. Only a spot of oil is required to give freedom of movement.
Wear on the lower drum assembly, though not common with this machine, can be responsible for a rolling picture, picture jitter, intermittent loss of the picture and poor or jerky visual search (usually only in the reverse direction). A scope check will generally show this: loss of contact between the tape and the heads will leave gaps between the sections of the FM waveform.
If there is no play, rewind or fast forward, check the
idler clutch assembly for wear. Also the idler belt for wear or stretching.
Check the capstan belt if the picture quality varies. To prevent noisy play or record, ensure that the capstan flywheel spindle is lubricated. Sound variation can be caused by a faulty capstan motor.
If there is a loading fault that's purely mechanical, replace the loading motor assembly, which comes - complete.

A worn audio/control head will cause poor/no/low amplitude sound.
Check the front-loading cassette unit if there is no fast forward and/or rewind.
Phototransistors Q003 and/or Q004 (both type PN202S) should be checked if the tape will not start or stop after fast forward or rewind.
Should the VCR fail to function when record is pressed, ensure that the record safety switch is OK.
If the machine won't accept a cassette, check the cassette switch. Failure to accept a tape, with possible grinding of the mechanics, should lead to a check on the side arm gears, the timing gear and the arm gear. Any one of these items may have stripped teeth or broken or cracked cogs. Another cause of failure to accept a tape is a bent or misaligned lid opener. If the loading operates correctly in the manual mode, check IC601 and the loading motor drive chip IC205 - by replacement. If the cassette doesn't drop down straight, or jams, check the cassette holder assembly. It may be bent, or the guide pins may be broken or out of position.

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## The

The Internet is one of the most remarkable developments of modern times. No one knows how many people have access to it, but estimates suggest that the present number is in the region of $35-50$ million. More and more people are coming into contact with the Internet, and a growing number of consumer electronics companies are developing Internet products. They include Philips, Sony, Akai and Mitsubishi.

## What is it?

Basically the Internet is a worldwide link between computer networks. In practice however it's much more than this. The Internet is one of the largest sources of information in the world, much of it free. Almost anyone with a personal computer ( PC ), a telephone line and a modem to link the two together has access to the Internet. There is no controlling organisation, though there is an Internet Society. This consists of computer companies, academic bodies and others. It co-ordinates technical developments related to the Internet.
The Internet grew from an unlikely source, the US

> George Cole reports on how it came into existence, how to get connected and the present state of the technology

Department of Defence (DOD). In the Sixties, during the height of the cold war, the DOD drew up a plan to create a network of computers, linking military and academic sites. The network, called ARPAnet, was designed so that if a connection was destroyed by enemy action data could be re-routed via another pathway, i.e. the system itself would survive. To enable different types of computer to 'talk' to each other, a common set of communication codes (a 'protocol') was developed. This is known as the Transmission Control Protocol/Internet Protocol or TCP/IP. It's stored in every computer that's linked to the Internet.
There was spontaneous growth of the Internet during the Seventies and Eighties as more and more government departments, research centres and academic bodies linked themselves to it. During this period the Internet was essentially a communications tool for researchers and academics - users had to operate rather unfriendly Unix computers. If, in those days, you had predicted that people of all ages wound one day be using the Internet you would have been regarded as a good candidate for the men in white coats!
A development by an Englishman, Tim Berners-Lee, in 1989 opened the Internet to the public. He was at that time working at the European particle physics research centre (CERN) in Switzerland. What he came up with was a system that made it easier and more efficient to share information with other computer networks. The World Wide Web, now simply known as the Web, was born.

## The Web

The Web is based on a concept, called hypertext, which was created by computer scientist Alan Kay in the Sixties. A hypertext page on a computer screen looks like an ordinary text page, but some of the words are highlighted. This enables pages to be linked. Imagine for example that you are using your PC to read about VCR systems and come to the highlighted phrase 'audio systems'. Click on it with your mouse and you are taken to another page which explains the basic sound systems used in VCRs. While reading this page, click on the words 'depth multplex recording'. You are taken to another page which is devoted to the VHS hi-fi system. The technique gives you easy access to a great deal of related information.
The Web uses a system known as client-server. Some of the computers connected to the internet simply store information. They are called servers. Computers that request information from a server are clients. The Web makes the process of moving between servers much quicker and easier. Go back to your VCR page. The information you called up on VCR audio systems might be stored on a server in the USA while the depth multiplex recording information might be stored in Japan. Other information you might want to call up might be stored in computers in other parts of the world. The Web lets you hop from one server to another at the click of a button. It also creates 'hypermedia links', which means that while some information will consist of text there may also be sound, graphics - even video.

## System development

Web servers communicate via a system called 'hypertext transmission protocol (http). Pages are created using an ASCII-based system called 'hypertext markup language (HTML). This explains why Web sites have strangelooking addresses such as

## http://www.video.co

Many companies have Web sites nowadays, and addresses are precious things. Microsoft paid around $\$ 10,000$ for the site address "Slade", which is the name of its electronic magazine. Some people tried to make money by registering the names of large companies, but this practice has been outlawed.
The next step was the creation of a graphical Web interface, or 'browser'. The first popular browser, Mosaic, was created by the National Center for Supercomputing Applications. Other browsers have since come along, the most popular today being Netscape's Navigator. In less than two years this has acquired over 38 million users. A Microsoft browser, called Explorer, is to be built into future Windows operating systems. Browsers are popular because they are free and can be downloaded from the Internet. Browser developers make money by charging companies for the right to create Web pages that their browsers can read.
Another development that helped make the Web popular is the 'search engine', such as those offered by Yahoo and Infoseek. To use them, you type in a few words to describe what you are looking for, such as "television systems": the search engine then looks for all Web sites that are relevant. Some search engines are better than others. You very often get the names of dozens of sites, many of which have little or no connection with what you want.
The Web is only part of the Internet. There is also the Usenet, which consists of thousands of discussion groups concerned with virtually every subject under the sun! Many people use the Internet to send electronic mail. This

also involves odd addresses (e.g. joe@netco.com.uk).

## Getting connected

For most people, access to the Internet involves the use of an Internet Service Provider (ISP) such as Pipex or Demon, or going via an online service such as CompuServe or AOL. ISPs tend to charge a flat rate (around $£ 10-15$ a month) and give unlimited access to the Internet. Online services generally give you several hours of free access to the Internet per month, then charge by the hour. Most people use a local telephone number to get on to the Internet. Despite this, the phone bills can soon mount up!

## Using the Internet

You'll find almost anything on the Internet. Libraries, government agencies, commercial companies, advertising agencies, newspapers, television programmes and NASA are just some of the organisations with Web sites. The Internet reflects life, so you'll find good and bad things on it. Some governments, including the Chinese, are trying to restrict the public's access to the Internet in order to control free speech and political debate. This has proved to be difficult, as there are so many pathways into and out of the Internet.
The main concern of many parents is pornography sites. They exist, but you have to look hard for them and there are software programs that can help prevent children gaining access to unsavoury material. These packages, which have names like Net Nanny and Cyberpatrol, work by either blocking particular sites (which parents can designate) or looking for particular names. The latter can cause problems. For example Scunthorpe had to change its Internet name to Sconthorpe - I'll leave you to work out why!
The 'Platform for Internet Content Selection' (PICS) was formed by the Massachusetts Institute of Technology's World Wide Web Consortium. It has over forty members, including AOL, AT\&T, CompuServe, IBM, Microsoft, Netscape, Time-Warner and Viacom. PICS is a technical standard for labelling Internet sites with respect to violence, sex and language. The idea is to create a universal labelling system that will be recognised by different hardware system and software packages. Labels can be created when a site is being put together, or added by a third party at a later stage. Computers can be set up so that they have access only to sites that are rated say zero for sex and violence.
There are also shopping sites on the Internet, but as things stand few people are making much money out of them. The reason for this is partly the culture of the

Sofa surfing access to the Internet using the Philips CDOnline system.

## Mitsubishi's

Net $T V$, which incorporates a Web browser and modem.


Internet - freedom, universal access and paying nothing for the information! Most Internet transactions tend to be between commercial companies rather than members of the public. For example, company X sells company Y content to be displayed on the latter's Web site. Advertising and marketing companies are looking at ways of using the Internet, and a number of brands have Web sites. But the amount of advertising is so far very small - in May 1996, less than $£ 13$ million was made from Internet advertising.
Part of the reason for this is the profile of the typical Internet user - male aged $16-25$, though the $30-50$ age group is growing as more and more parents decide that the Internet can help with their children's education. Stories about hackers stealing credit card numbers have put many people off buying via the Internet. Visa and MasterCard are developing SET (Secure Electronic Transactions), a system that encrypts data to make bank card transactions over the Internet secure. The Dutch company DigiCash has produced an electronic cash system for Internet payments, and Olivetti has developed an Internet home banking system.

## Hardware

Most people use a PC for Internet access, but a number of companies are developing products that use a television set for the display. Database giant Oracle has developed the 'Network Computer' (NC). This is a box that can be linked to a TV set or monitor and uses the Internet for access to and storing data. It has a RISC (Reduced Instruction Set Computer) microprocessor, a few megabytes of RAM but no hard disc - all the software is downloaded from Internet servers. Any documents created by an NC are also stored on the Internet. An NC could be used for wordprocessing, sending e-mail and for access to databases. Its advocates say that it should be much cheaper than a PC, since it uses fewer components - the first NCs will probably cost around £300-500.
Apple, IBM, Netscape, Oracle and Sun were to introduce a Network Computer reference profile this summer, to ensure that different makes of NCs provide a common set of features and facilities. VGA resolution or better was expected to be included, a pointing device, text input capability, audio and various telecoms and Net protocols. A security feature would make it safe to use credit cards and electronic cash with the Internet.
Those working on NCs include BT, Fujitsu, Hitachi, GoldStar, Lotus and Master Card. The UK company Acom Networks (a spin-off from Acorn Computers) plans to be one of the first to manufacture and distribute NCs, which could be on the market this month (September). Akai has announced an NC called the Internet Connection. It will use a RISC processor from ARM, 4-6 Mbytes of RAM, a 28.8 modem - faster ISDN and cable modems will be used when these become available - and will link up with a TV set, being operated by a remote control handset or an infra-
red keyboard. Akai plans to launch it in the USA by the end of the year and says that the cost will be less than $\$ 300$ (£200).
The computer industry is divided over the prospects of the NC - some wonder whether consumers will want a cutdown version of a PC. But many believe there is a considerable market for products that enable consumers to gain access to the Internet via their TV sets.
Philips was one of the first companies to enter this market, with CD-Online, which was launched about a year ago. The system uses a CD-i player and a connection kit that consists of a modem, a software disc and connecting cables. The disc contains browser software which has been specially developed to improve the presentation of text and graphics on a TV screen. It also caters for music, animations and video clips - media that are slow to download from the Internet. The limitations of the system are that users cannot download and store data from the Internet, while sending e-mail is a slow and tedious business without a keyboard (Philips demonstrated a plugin keyboard earlier this year however). Unfortunately CDOnline has not been very successful: Philips has closed down its UK operation, though the service is still in operation from the Netherlands.
The lack of commercial success for CD-Online may be more to do with CD-i's failure to sell in quantity than the idea of viewing Web pages on the TV screen. Philips certainly thinks so, and with Sony has licensed technology from the US company WebTV Networks. This will lead to the development of set-top boxes giving TV viewers access to the Internet.
Microsoft and NBC have joined forces to develop a news system that combines TV pictures with Web pages. Earlier this year Mitsubishi demonstrated the Net TV, a set that includes a built-in Web browser and a modem. Companies such as Philips, Nokia and Hitachi have also developed TV . sets that can display VGA or SVGA computer graphics.

## The future

One thing is certain: the Internet will continue to grow and develop. Web pages will become more sophisticated and interactive, largely because a new programming language developed by Sun Microsystems, called Java, allows developers to create applets - miniature programs that run inside a Web page. As a result, it will be easier to add to Web pages features such as video clips and animations.
HTML was designed for static text and pictures. To view animation or video clips today, you have to download extra programs called plug-ins. Java will enable this to be done seamlessly. If you call up a Web page with a video clip, the applet for tuning it will be downloaded to your PC automatically. When you've finished looking at the page, the applet will be automatically removed from your computer.
One thing on which everyone agrees is that the Internet's data speed is at present far too slow. Even with the fastest telephone modem ( 28,800 bits/second), it can take many minutes to download pictures, sound or video. Compression systems like JPEG have helped, but use of the Internet will improve when more of us have access to ISDN or fibreoptic telephone links. Some cable TV companies are already installing cable modems that run at rates of tens of Mbits $/ \mathrm{sec}$. Some of us might even link up with the Internet via satellite: companies such as Eutelsat, Pace and SES (owner of Astra) are developing satellite data systems.
Even today there are some people who believe that the Internet will prove to be a short-liven phenomenon, like CB radio. But the wealth of material on the Internet, and the relatively low cost of gaining access to it, make this unlikely.


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# TV Fault Finding 

## Reports from <br> Keith Evans, John Edwards, Glyn Dickinson, Christopher Nunn, Michael Dranfield, Paul Hardy, Graham Colebourn and Richard Newman

## Amstrad CTV 1000

When the customer complains about a thin white line across the screen we usually assume that there's a field timebase fault. This time the line was vertical, which is much less common. Line collapse is usually confined to faulty scan coil connections or a faulty component in the feed to the coils. In this case the dry-joints were at the connections to the line linearity coil L7702, which is in series with the coils and does not have any damping components in parallel with it. K.E.

## Sharp CV2123H

When power was applied to this set the red LED came on and the standby relay operated when asked, but the set remained dead. The chopper power supply was inoperative because the STR41090 chip had failed. K.E.

## Sony KVX2532U (AE1B Chassis)

Two of these sets appeared in the workshop within hours of each other. The symptoms with the first one were intermittent loss of video, preceded by a broken up negative picture. Once again there were dryjoints in those IF transformers (T1 and T2). In this second-generation version of the AE1 chassis however
the transformers are burried in the IF module, adjacent to the tuner. The second set had a different intermittent fault, loss of right-hand channel sound. Dry-joints at the audio chip IC261 were the cause. K.E.

## Tatung 140 Chassis

This tired looking set came in with no picture and uncontrollable motorboating and screeching from its loudspeaker. The power supply seemed a good place to start, and replacing the electrolytics around the TDA4600 chip is always a good idea. We found that the value of C808 ( $100 \mu \mathrm{~F}$ ) had dropped dramatically. A replacement restored the picture and sound. K.E.

## Toshiba 2812 DBT

This set was tripping because the line output transformer was faulty. A replacement produced sound and a picture, but there was lack of width and the set wouldn't go to standby. My thanks to Toshiba's technical department, which enabled me to solve the problem in minutes although I'm not an account holder. Correct standby operation was restored by replacing the 2SC2023 transistor Q845 in the power supply: it's in series with the HT feed to the LOPT. The width problem was resolved by adjusting the factory set parameters, using the handset. It would take rather a lot of space to describe this here, but Toshiba technical will explain if you give them a call. Well done Toshiba! J.E.

## Ferguson TX9 Chassis

When I switched this set on I thought it was suffering from a luminance fault. Blotches of colour relevant to the scene were present, but the raster was very dark, i.e. there was no picture detail. All was clear when I turned up the tube's first anode voltage control - it had no effect.

Although these sets use a diodesplit LOPT, the first anode voltage is obtained from a separate rectifier fed from the transformer. R232 ( $1 \mathrm{k} \Omega$ ), which is in series with this rectifier, was open-circuit. J.E.

## Toshiba 285T8BZ

Field collapse was the complaint with this set. I found that the TDA8170 field output chip IC303 had a diagonal crack across its body. As the 27 V supply was present at pin 2, a new chip was fitted. About two hours later, while the set was being soak tested, it returned to the field collapse condition. This time the $2.7 \Omega$ feed resistor R327 had burnt out.
I decided to refer to my trusty but tattered 'rotten faults' notebook. Sure enough there was a note about a modification. I removed D305 and fitted a $47 \Omega, 1 \mathrm{~W}$ resistor in its place, then refitted the diode on the copper side of the board. I also replaced the 6.8 V zener diode D303, and of course R327. There were no more problems after this. J.E.

## Sharp C1430H

This set would shut down suddenly four minutes after being switched on. You could almost set your watch by it! Increasing the tube's first anode voltage slightly would immediately instigate the fault. This suggested that there was an excess beam current protection circuit fault. Investigation here showed that R623 ( $1.2 \mathrm{M} \Omega$ ) was open-circuit. J.E.

## Ferguson TX 10 Chassis

The customer said that this set "went bang then dead". The bang had been caused by C732 ( $10 \mu \mathrm{~F}$, 63 V ) exploding. It's the reservoir capacitor for the -40 V supply, which is derived from the line output transformer (T721). When a replacement capacitor had been fitted the set worked but tripped intermittently. On investigation I
found that T721's chassis connection pin was dry-jointed. It seemed best to resolder all the pins. After this the set was OK. J.E.

## Philips 2A Chassis (110 )

"Line on screen" was the complaint with this set, meaning slight top foldover. We had replaced the field output chip IC7570 some months previously, also the associated electrolytics C2571 and C2575. The new parts were checked just in case but were blameless. We eventually found that R3573 in the linearity feedback network had fallen in value. It should be $51 \mathrm{k} \Omega$ in $110^{\circ}$ sets. G.D.

## Matsui 1455

The cause of a dead set is usually R603/4 or C613. Not this time! There was 300 V across C604, and no distress in the power supply. We decided to check the transistors in the discrete-component chopper power supply and discovered that Q602 was leaky. As a precaution, the chopper transistor's base drive coupling capacitor C607 was replaced with a high-temperature component. G.D.

## Orion W310

This old set displayed a good picture but there was field cramping and reduced height. Although we had no service information I decided to take a quick look and found that a small $4 \cdot 7 \mu \mathrm{~F}, 50 \mathrm{~V}$ capacitor behind the field output transistors looked a bit poorly. A replacement restored the full field. scan. G.D.

## Philips CP90 Chassis

A dead set with the 95 V HT supply present was the unusual fault with this remote control model. The start-up 22 V supply was found to be very low because C 2691 ( $330 \mu \mathrm{~F}$, 25 V ) was open-circuit. G.D.

## Solavox 141

This set produced a snowy black and white picture with lack of height. It seemed reasonable to suspect problems with the multifunction TDA 4505 chip IC101, so we started off by checking its supply which was low at 9 V . The 12 V supply was OK however. The cause of the problem was R104 in the feed to IC101. This $3 \cdot 3 \Omega$, fusible resistor had gone high in value. G.D.

## Philips CP 110 Chassis (early version)

The owner described all the symptoms of a very poor tube: the
picture took several minutes to appear, and when it did it was very dull - even with teletext. Our tube tester disagreed however. We soon found that the contrast control had very little effect on the voltage at pin 6 of the TDA3562A colour decoder chip, but disconnecting the beam limiter made no difference.
A transistor (T7672) that's not shown in the manual is connected to pin 6. It's fed from the 143 V rail via a pair of resistors that are also not shown. Ripple on the HT line was switching this transistor on, and hence the beam limiter. Replacing the $22 \mu \mathrm{~F}$ HT reservoir and smoothing capacitors C2670 and C2621 cured the trouble.
We've since had the fault with another of these sets. Later versions appear to have this circuit deleted. G.D.

## Samsung C15061

"Black band on the left" said the customer. Sure enough, the picture was shifted a couple of inches to the right. There's a phase preset control which is linked to the TDA8361 chip via R420 ( $820 \mathrm{k} \Omega$ ), with C404 $(2.7 \mathrm{nF})$ for decoupling. These two components tested OK, but replacing the capacitor restored the correct picture position. G.D.

## Toshiba 285T8B

This set was stuck in standby but would apparently come on after several hours. It has two switchmode power supplies. The main one wasn't starting up despite being asked to do so. There was a supply at pin 9 of the TDA4601 chopper control chip but no output at pin 6 . When a replacement was fitted the power supply merely chirruped. It seems that the chip has to be of a certain standard. When a Siemens one obtained from Toshiba was fitted the set worked normally. G.D.

## Alba CTV3400

Intermittent audio was the problem with this set. Naturally as soon as I went anywhere near it with a scope or meter the fault disappeared. After some careful flexing, heating and freezing I discovered that the cause of the fault was the loudspeaker. The last thing you would expect with a fairly new set. C.N.

## Ferguson D59F (ICC9 Chassis)

A blank raster with no sound was the complaint, though the on-screen graphics were present and pictures were obtained when a video signal was injected at the scart socket. I
didn't have a manual, and horrible thoughts of expensive ICs ran through my mind. I decided to try scope checks, starting at pin 6 of the IF unit. The signal was present up to transistor TX07, which is a chip device, but it produced no output. A replacement cured the fault. C.N.

## Sharp DV5103H

The chrominance information was displayed about one and a half inches to the right of the luminance information - just as if there was a luminance delay-line fault. The cause of the problem was the small plug-in non-volatile memory chip on the digital PCB. C.N.

## Sanyo CBP2 148

No power up was the complaint. The set came on in standby but refused to come out. A check on the mains switch's momentary contacts suggested that they were OK, so attention was turned to the standby circuit. As I had no luck here I changed the mains on/off switch, though the old one measured correctly. The replacement brought the set back to life! In this set the momentary contacts have to make before power is applied, not after as with many sets. Don't get caught out like me. C.N.

## NEI 1451 ITX (Indiana 100 Chassis

This set powered up but there was no line drive. R $605(5 \cdot 6 \mathrm{k} \Omega, 3 \mathrm{~W})$ in the HT feed to the line driver transformer was open-circuit. C.N.

## Grundig CUC220 Chassis

If the tuning voltage is at 30 V and the set won't tune in, the usual cause of the trouble is the U264B prescaler chip in the tuner/IF block. It's now no longer available, but a U644B can be used as a replacement.
To find this item, look under the small screening can. Pin 9 is the output at the edge connector. M.Dr.

## Hinari TVAI

Intermittent loss of sound was the complaint with this TV/clock/alarm. The set is very similar to the Hinari CT4, but as the TVA1 has a headphone socket a $1: 1$ isolating transformer is required. This item was the cause of the fault. One of the transformer's pins had been wrapped but never soldered. M.Dr.

## Grundig CUC2800 Chassis

This set produced low, distorted sound. We traced the cause to the U2829B dual sound intercarrier
chip. It's available from Willow Vale. M.Dr.

## Sharp DV5150H

If the set trips back to standby after two seconds, replace the $3.3 \Omega$ safety resistor R612 right behind plug H, which is connected to the tube base PCB. R612 supplies 28 V to the field output stage and seems to go opencircuit for no reason. M.Dr.

## Bush 3114

There was some sort of field blanking fault with this set: the top part of the picture would be blanked out intermittently, and in addition black lines would run across the picture. A slight tap on the PCB would cure the fault.
A long time was required to sort this one out. It transpired that the field output chip's heatsink earth connection wàs dry-jointed. Problems of this sort are quite common with the Luxor SX9 chassis, in which use is made of heatsinks to link PCB lands. M.Dr.

## NEI 1601R

The chopper transistor had blown, also the fuse. As I couldn't find any other obvious fault I replaced these items and sent the set on its way. About a month later it came back with the same fault. A very helpful NEI technical department suggested that I check RP36 ( $33 \Omega$ safety) in the snubber network associated with the rectifier diode that produces the 26 V supply. When it fails the result can be excess current in the chopper transformer. Sure enough it was open-circuit, though it showed no physical signs of distress. A replacement restored reliable operation. P.H.

## Osaki P141

The customer complained about very poor, distorted sound. I replaced the 6 MHz ceramic filter and the TDA4505E chip without improving matters, then found that the sound coil T101 could be adjusted over the whole of its range with virtually no effect. I reckoned that it must be faulty, but spares for these sets are like hens' teeth. A check on several circuit diagrams suggested that a coil from the Nikkai TLG100T would be a suitable replacement. This proved to be the case. After fitting one I was rewarded with the sort of audio you expect from a small portable. P.H.

## Proline 360TT (Tatung 170 Chassis)

The complaint with this set was
"loss of colour and going to lines". It was an extremely intermittent fault but did respond to tapping. Lots of bad joints were made good and the tuner was checked as the cause of the trouble seemed to lie in this area. With the scope in action and further tapping I found that the video was being lost after the teletext board. When this board was removed some of the edge connectors were seen to be badly soldered. Reflowing all suspect joints and refitting the board cured the problem. The fault was miles away from the tuner! P.H.

## Huanyu 37C-3R

The set would intermittently go off, with the mains switch release solenoid operating. I checked the solenoid circuit but it seemed to be OK. What was actually happening was that the power supply was intermittently failing to provide any output. A new STR4011 chip put that right. The mains switch popping out is a characteristic of the circuit. The 40 V supply to the solenoid circuit decays more slowly than the 5 V logic supply: if the power supply cycles up before the 40 V has disappeared, the micro reset caused by the arrival of the 5 V supply trips the solenoid. P.H.

## Philips G1 10 Chassis

This set was totally dead with the 148 V HT supply low at only 20 V . A replacement line output transformer restored the set to life, but the picture was far too wide. In addition the width varied with the brightness of the scene - this turned out to be a vital clue.
Disconnecting or shorting out the EW modulator driver transistor Tr7533 proved that the EW modulator was working. The culprit turned out to be the 6.8 nF chip capacitor C2526 in the EW antibreathing bias circuit. It was leaky. We fitted a 100 V polyester replacement - the original capacitor was rated at 50 V . G.C.

## Philips CP90 Chassis

This set would sometimes fail to turn on. In the fault condition a whistle was just about audible from the chopper circuit and the voltage on the 95 V HT line was only 1.5 V . These symptoms arose because the crowbar thyristor Thy 6696 was conducting. A check on the three zener diodes in its gate circuit showed that they were all OK, and a new thyristor made no difference. Replacing the electrolytic capacitor C2700 ( $4 \cdot 7 \mu \mathrm{~F}$ ), which decouples its
gate, put matters right - even though the capacitor's value measured correctly when checked. G.C.

## $B$ and $\mathbf{O} 7423$

Every few minutes the picture would gradually lose its colour, fading out to black and white. Then full colour would suddenly be restored. Saturation is controlled by the DC voltage at pin 5 of the TDA3300 colour decoder chip. We found that the voltage at this point fell from the normal $3 \cdot 1 \mathrm{~V}$ to only 1V when the fault was present. The cause of the trouble was intermittent contact in the $100 \mathrm{k} \Omega$ saturation preset potentiometer R42.
Incidentally some B and O manuals show the customer brightness and colour controls interchanged. G.C.

## Matsui 1440A/Saisho CT142RX

The picture suffered from flickery horizontal banding and patterning. This was being caused by HF oscillation in the UPC1378 field output chip. C417, a 15 nF capacitor which is connected between pin 4 of the chip and chassis, was found to be open-circuit.
Other models in these ranges use the same circuit and chip, but the component reference and capacitor values differ. G.C.

## Sony KVM14U

The customer complained about a burning smell and said that the picture had become dim and blurred. Once the back had been removed we saw that $\mathrm{R} 852(1 \mathrm{k} \Omega)$ in the first anode (G2) supply had fried to a crisp. The cause was D852, which was leaky. As diode types seem to be very critical with Sony sets, we obtained the correct type from CPC. This and a new $1 \mathrm{k} \Omega$ resistor restored a really excellent picture. R.N.

## Philips 2B Chassis

No matter how familiar you are with some chassis you can still come across faults that lead you a merry dance. "Fizzing and smoke" was the complaint with this set. Its cause was the $1.5 \mathrm{nF}, 2 \mathrm{kV}\left(110^{\circ}\right.$ version) capacitor across the line output transistor - it had split. A replacement restored life to the set, but there was field collapse.
As I could find nothing amiss initially I replaced the field output chip. This made no difference. I then did what I should have done in the first place and carried out some meter checks around the TDA8370 timebase generator chip IC7550. It
soon became apparent that there was no 12 V supply at pin 22 , which meant that the chip was running on its start-up supply. R3535 (10 2) was open-circuit because C2536 $(100 \mu \mathrm{~F}, 25 \mathrm{~V})$ was short-circuit. Replacing these two items brought everything back to normal. R.N.

## GoldStar CIT2 190

This set was brought in because it was dead. All that was wrong was a very bad dry-joint at D803 in the mains bridge rectifier circuit. R.N.

## Philips CP90 Chassis

There was no picture at all, because the tube's first anode voltage was missing. The line output transformer was faulty. It's the first time I have had one fail in this way. R.N.

## Goodmans 2180

Sound but no picture was the complaint with this set. The HT voltage was correct, but further checks showed that there was no voltage at the collector of the line driver transistor - the primary winding of the transformer was open-circuit. A replacement cured the problem. Spares for this set seem to be available only from Comet. When I asked about the
transformer I was told that I was the third person to enquire that day. So maybe this is a stock fault. R.N.

## Hitachi G8Q Chassis

I've not had much experience with these sets. This one had a dead power supply. Q901 (BUZ71A), Q902 (SGSIF344) and a couple of diodes were short-circuit while R910 ( $0.5 \Omega$ ) was open-circuit. A colleague showed me an Hitachi service bulletin that recommends replacement of TH902, Q901, D905, D907, IC901, ZD902, Q902 and R910. Whenever the power supply fails it's essential to replace TH902.
CHS supply a repair kit (KIT HIT 1) that contains all the components required. It's not cheap, so make sure that you allow for this in your estimate. R.N.

## Ferguson TX99 Chassis

The cause of this set's failure was traced to a short-circuit line output transistor. When a new R4050 had been fitted it worked perfectly. Ever mindful of intermittent drive faults however, I left the set on soak test. After about an hour the width would jump in and out intermittently. The eventual cure
was to resolder all the legs of the TDA4505 chip. R.N.

## Telefunken 617 Chassis

This set had been to another dealer who had quoted a ridiculous figure to repair it. I hadn't seen one before, but found a
Ferguson/Thomson ICC5 chassis inside. The set thumped three times before it shut down. After checking the usual items in the EW correction circuit I began to suspect the line output transformer. As there appear to be several different types, I decided to order one from a specialist.
With the new transformer fitted, I was rewarded with line collapse and realised that I had accidentally left the scan coil plug disconnected. After refitting this I expected the set to work, but it screamed in a most alarming way. I hastily switched off. A check across the scan coils revealed a dead short. On examining the coils more closely I found that a piece of fuse wire had been very neatly soldered across the tags, thus shorting them out. When this had been removed the set produced an excellent picture. Why this act of deliberate sabotage had been carried out remains a mystery. R.N.


# HELP WANTED 

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

Wanted: Emiscope 5in. 3/l CRT for pre-war TV set. At worst a dud one will do - mine is missing. Also information on the Defiant Model TR947's EHT transformer and a black 9in. CRT mask for this set. Robin Howells, 40 Minster Road, Stourport, Worcs DY13 8AR or leave message with Clive on 01384 872744 after 6 pm .
Wanted: Circuit diagram for the monochrome CCTV camera supplied by Bull Electrical - in particular details of the pin connections (16) to the CCD image sensor. A. Turner, 25 Partridge Green, Pitsea, Basildon, Essex SS13 3EF.
Wanted: Complete, working field output/line oscillator panel for the Philips G9 chassis. Paul Proctor, 22 Toll Bar Road, Christleton, Chester, Cheshire CH3 5QX.
Wanted: Power transformer or panel for the Matsui Model MB10. W. Simmons, 2 Marston Crescent, New Lodge, Barnsley S71 1SY. 01226 732404.

Wanted: Leader LCT910A CRT tester/rejuvenator for parts, a LOPT

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for the Ferguson 350000 and a Data Precision 1350 digital multimeter for spares. Pat Foran, Crag, Castleisland, County Kerry, Ireland.
Wanted: IC701 (SC111281) or scrap board, also circuit diagram (photocopy OK), for the Sony D131 personal CD player. Also a capstan PCB for the Hitachi VT410. J. Thomas, 113A Parkgate, Darlington, Co. Durham DL1 IRZ. 01325487 628 after 6pm.
Wanted: Panel M and LOPT for the Panasonic TC2051 (U5 chassis). Also front display panel for the Matsui 1422 and remote control units for both these sets. R. Kusz, 130 McCracken Drive, Viewpark, Uddingston, Glasgow G71 5ND. 01698321037.

Wanted: Flyback transformer type DCF1551 for the Bell and Howell VP1400 and any service information. B. Senior, 1 Bedale Close, Coalville, Leicester LE67 3BA. 01530832088. Wanted: FLH145 IC made by Siemens or information on it. It's a digital chip used in speed counting. Roy Brown, 44a Middle Road, Shoreham by Sea, West Sussex.
Wanted: Circuit diagram or manual for the Scopex 4D10 dual-trace scope. E.A. Coleman, 13 Hazelmere, Bedfont Close TW14 9PX. 0181890 6796.

Wanted: Circuit diagram/manual for the Pye VK4900 observation camera. Bob Green, Green Electronics, 6 Short Street, Lowestoft, Suffolk NR33 0JJ. 01502513960.
Wanted: Service manual for the ITT 3907 VCR. Dennis Leefarrs, Wigmore Cottage, Thruxton, Allensmore, Hereford HR2 9BD. 01981570409.

Wanted: Service sheet (photocopy OK) for the Memorex Model 1432R 14 in. TV receiver. R.L. Pearson, 6 Eversley, Skelmersdale, Lancs WN8 6DP. 01695721957.
Wanted: LOPT (part no. M37 421 M6-318SP) for the Matsui Model MB10, new or second hand. Or details of a possible source. Bernard Sharp, 128a Desborough Avenue, High Wycombe, Bucks HP11 2SQ. 01494465899 (home), 01844342 720 (work).
Wanted: Remote control units for the Selco 21SM. 427 CTV with text and the Panasonic NVJ30HQ VCR. R. Flitcroft, 69 Cartmel Court, Blackley, Manchester M9 7HT.
Wanted: Epson PCE and PCAX2
operating and service information. A. Livesley, Beckgatehead, Barbon, Via Carnforth, Lancs LA6 2LJ. 01524 276276.

Wanted: Program flap and remote control unit for the Akai VS-A77EK. M.A. Foster, 43 St Paul's Close, Aveley, South Ockenden, Essex RM15 4SH. 01708860265.
Wanted: An instrument for measuring the strength of magnets and magnetic fields. Have for disposal a pile of pre-1985 TV/VCR manuals. John, TV Hire, 10 Clapham Park Road, London SW4 7BB. 0171 6227762.

Wanted: Control unit and remote control for a Finlux 562 obc. A. Freeman, 414 Canterbury Road, Densole, Folkstone, Kent CT18 7BH. 01303892812.
Wanted: Circuit diagram (photocopy OK) for the Philips CTX-E chassis. S.A. Varden, 18 Drayton Way, Nuneaton, Warwickshire CV10 9ER. 01203393010.

Wanted: Circuit diagram (photocopy OK) and parts list for the Panasonic VW-AM10 camcorder AC adaptor/charger unit, also a circuit diagram for the Hinari Model CT5. R.W. Goad, G4EFA, 7 Chipstead House, Chipstead Road, Cosham, Hants PO6 3JJ.
Wanted: Source for a TEA 1064A chip for a BT answerphone and an IF panel for the Pye 725 chassis (or can anyone align the one I have?). S. Furley, 3 Ivy Place, Tantobie, Stanley, Co. Durham DH9 9PT. 01207282988.

Wanted: I have an ITT Cine Vision TV Projector with no model number. Can anyone identify it? Ron Cavalla, 74 Wendling, Southampton Road, London NW5 4QU. 01718130060.
Wanted: Service manual or circuit diagram for a Western Systems monitor, which was made in Korea. Identifying marks are KEC Model CAE14RG or WS14RGVL. John S. Prescott, 30 Bangor Avenue, Bispham, Blackpool FY2 0HB. 01253352429 (after 6pm).
Wanted: Details of the teletext power lead assembly PL615 for use with the Ferguson TX100B chassis and the PC1637-022A remote control PCB. I have a problem linking them to make a retrofit teletext kit work. Jim Doherty, 14 Lovedean Lane, Horndean, Waterlooville, Hants PO8 8HH. 01705593463.



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# Satellite notebook 

## Hugh Cocks on various satellite receiver and reception problems

## Corrosion

The owner of a Palcom SL5000 receiver-positioner called the other day with the complaint that it "didn't receive all channels". On investigation I found that the magnetic polariser had gone opencircuit, leaving only the verticallypolarised channels. Straightforward enough it seemed. As the receiver incorporates voltage-operated polarisation switching I fitted an LNB of this type and assumed that everything would be OK. Things are sometimes not that simple however.
While I was tuning through the channels the receiver suddenly stopped at around $1,540 \mathrm{MHz}$, though the on-screen display carried on merrily. Below $1,540 \mathrm{MHz}$, to the bottom of the band, tuning was normal. My first thoughts were that something was wrong with the LNB's oscillator frequency or the receiver's LNB setting. But this couldn't be so, because the frequency display was correct. Time to inspect the innards.
When I opened up this unfamiliar receiver I found that it was sturdily built, with the tuner PCB at the extreme right-hand side. Some corrosion was present at resistors on this board. The owner admitted that a glass of water had gone flying near the receiver a couple of weeks previously, but he thought that the receiver had escaped. There was no sign of any water having fallen on the main PCB, but when the tuner's covers were removed a nasty white corrosion patch was seen near the prescaler chip - on both sides of the board. Cleaning had to be done carefully, as the corrosion was quite bad. But, to cut a long story short, once cleaning had been completed the tuner refused to tune at all!
The simplest solution seemed to be to keep the tunerless Palcom unit as a dish positioner and install a new receiver. The owner readily agreed to this. Since reception from only
$19.2^{\circ} \mathrm{E}$ and $13^{\circ} \mathrm{E}$ was required, these positions were programmed into 'channels' 1 and 2 of the Palcom unit's memory. The required Astra and Eutelsat channels were then stored in blocks in the memory of a new Pace MSS138 receiver (nonIRD MSS100).

## A Modulated MTI LNB

A recent job consisted of adding Eutelsat reception to an existing Astra installation, the owner being primarily interested in the BBC World Service. To avoid sparklies with the weaker Astra channels and the non-Hot Bird Eutelsat channels (including BBC World Service) it's best to use two dishes here. The receiver was a Pace PRD800, with a Global 22 kHz tone inserter which was connected to the existing dish IF cable. Both LNBs were linked to the cable via a tone switch.
The problem was that the Eutelsat channels all suffered from good, oldfashioned co-channel type interference, the Astra channels being fine. This ruled out a modulator or terrestrial frequency clash, and was fairly easily diagnosed as 22 kHz interference.
I'd seen this before with a tone switch of Far Eastern manufacture. It had been very effective at injecting tone back into the receiver via the flying lead going to pin 8 of the receiver's TV scart socket. Indeed the tone amplitude here had been higher than that going up the cable! The unit proudly displayed a CE sticker of course. Fitting a Global switch had cured that.
But this time I was using a Global unit, which I was reluctant to condemn on site without test gear. As a check I swapped over the LNB inputs to the tone switch and returned downstairs to view the results. There was now no patterning on any of the pictures.
The cause of the problem was that the old MTI LNB, repositioned for

Eutelsat reception, couldn't filter out the 22 kHz in its DC supply. As a result, its output was modulated at 22 kHz . The new Cambridge LNB had improved filtering.
Unfortunately I couldn't leave the LNBs connected this way round, as the Cambridge LNB produced the Astra 1D frequencies while the MTI LNB didn't, and the customer specifically wanted reception of the Dutch 1D channels as part of the refit.
So I had to think of an easy modification to the MTI's power supply! I had PRD800 power supply components with me but little else by way of electronic bits and pieces.
After opening the MTI LNB I disconnected the voltage regulator's input, inserted a $1 \Omega$ series resistor and added a $22 \mu \mathrm{~F}$ electrolytic decoupler from the input to chassis. For good measure, as space was available, I also added a $22 \mu \mathrm{~F}$ electrolytic at the input to the resistor.
When the LNB had been reassembled I tested the installation and found that the additional filtering had completely removed the patterning when the tone was active. Panic over!

## More LNB Trouble

We seemed to have more LNB trouble last winter than during the previous ten years put together. Excessive rain and lightning didn't contribute to reliable operation of course, but new LNBs seem to be much less reliable than older ones. Does anyone still remember the Japanese DX DSA508 of 1984/5? It was built like a battleship, had a 3 dB noise figure, and cost in the region of $£ 500$. But it never went wrong. A fairly large dish was required to compensate for its high noise figure but I digress...
A system that's been giving us a lot of trouble recently consists of an 85 cm offset dish with a Cassegrain type feed assembly. These dishes
were installed a few years ago, and the original suppliers are no longer around. The LNB is mounted on the feed arm, pointing at the Cassegrain subreflector. In time the feed cover deteriorates and, because the LNB angle is quite high, water gets in when there's a heavy rainstorm. This produces the no picture complaint.
LNB replacement works, but the same problem will inevitably return (whether before or after LNB failure as a result of lightning is another matter).
If you explain the problem to the customer, he usually agrees to having a standard offset dish installed along with the new LNB.

## A Silent Pace SS9000

The owner of this receiver complained that the sound had disappeared the previous evening. Operation had been OK prior to this. With the unit on test in the workshop I found that sound was present at the output from the demodulator chip U1. I then traced the signal through $\mathrm{U} 11, \mathrm{U} 12, \mathrm{U} 13$ and U14. Though both left and right channel sound was present at the input to the LM324 operational amplifier U15, almost no output
could be seen on the scope's display. A new chip restored the volume.
The receiver's power supply seemed to be perfectly OK - it obviously lived in a fairly cool environment. I changed $C 9(1 \mu \mathrm{~F})$ in the power supply as a precaution, also C29 which was the cause of faint diagonal lines on VideoCrypt channels. C416 (in the tuner), which is the major cause of "lines on the picture" in this model, had already been replaced.

## Lucky Connexions CX95A

This receiver was used in a holiday rental home where it lived on top of the TV set in a rather precarious manner. Its owner hadn't taken into account small children. As a result it ended up falling on to a hard floor while switched on. Naturally enough it refused to work after this.

Being fairly robust, the cabinet had survived well. The main mechanical problem was that the VideoCrypt decoder had become detached from the plastic spacers which secure it to a metal plate on top of the main PCB . I replaced the 1.6 A fuse F 2 , which had blown, and switched on. Fortunately everything worked. The plastic spacers for the VideoCrypt
decoder were then glued on to the metal plate.
I returned the receiver and installed it on the floor beneath the TV set. At least gravity wouldn't cause any damage! When I plugged it back in however there were virtually no signals from the dish. In all likelihood this was the original reason for the kids pushing the front panel buttons so hard that it fell down.
The 1.2 m fixed Astra dish was suffering from the aftermath of near hurricane-force winds the month before. It had blown off course, while in addition spiders had taken up residence in the prime-focus feed, helping to attenuate what little signal was present there. After repeaking the dish and clearing out the spiders I sealed the feed with a thin piece of polystyrene, to stop them entering again.

The Connexions remote control unit has too many tempting buttons for holiday rental use, and no tuning lock facilities. I solved this problem by dismantling the unit and sticking insulating tape on all the PCB areas concerned with tuning. This provided normal use but with the tuning buttons inactive.

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## Toshiba V254

This machine produced some odd symptoms. There was no E-E sound, and with its own recordings the head switching line floated up and down the screen. The playback picture and sound with a known good tape were OK.
A check at the audio mute test point BS004 showed that the mute line was active (the reading was 5 V ). So attention was directed to the main microcontroller chip IT001. As expected, the voltage at the audio mute pin 16 was high. Checks on the video inputs to the chip showed that there was no signal at pin 70, the composite sync detect pin. This input comes from pin 42 of IV001 on the other side of the board, where the signal was present. When we traced along the track we found that the signal was lost after the wire jumper above RV139 (by the cut out in the PCB for the drum motor). Bridging the break with fine wire restored normal operation. P.B.

## JVC HRD540

This VCR was apparently dead with no clock display. Checks

## VCR Clinic

showed that the unswitched 12 V and 5 V supplies were present but not the switched 12 V and 5 V supplies, and there was no poweron signal to the main micro IC601. If the power-on line was taken low manually, the switched supplies appeared but there was still no go. The microcontroller chips seemed to be getting all their supplies, but there were no strobe pulses from micro IC1 to the clock display. I took a chance and ordered a UPD725216ACW-A35 from JVC. Fitting it restored normal operation. E.B.

## Panasonic NVJ30

If the problem is dark/pulling E-E and playback pictures, check for dry-joints at the RF converter. E.B.

## Samsung VI711

There was no sign of life - no display or operate light. All the power supply output voltages were present, but the /power control signal at pin 5 of CN101 was, at $2 \cdot 4 \mathrm{~V}$, in neither the high nor the low state. I tried replacing the STK5333 power chip and digital transistor Q103 before delving into the microcontroller circuitry.
IC601's supply was present, but there was no oscillation at pins 46 and 47. It was possible to instigate oscillation, sometimes briefly and sometimes for a longer period, by holding crystal X601 with one's fingers. When oscillation was present the machine worked normally.
I assumed that the crystal was faulty and fitted a replacement. A soak test suggested that everything was now OK, but a few days later the machine was back with the same symptom - dead. It could still be coaxed back to life by touching the crystal, or by briefly shorting
the 5 V supply (Vdd) to chassis. This led me to suspect that the cause of the trouble was in the reset switch stage. Transistor Q601 wasn't faulty, but C612 ( $22 \mu \mathrm{~F}$, 35 V ) certainly was! A further soak test proved that this time my diagnosis was correct. E.B.

## JVC HRD540

This VCR was completely dead: no LED display, no clock, nothing! Full HT was present at C12, but there were no outputs on the secondary side of the chopper transformer. Q1 (2SC4517) was open-circuit. Replacing this item restored the machine to life. D.C.

## Akai VS248, 249, 250

If the complaint is poor quality recording and playback, before you change the drum check that the small earthing screw in the middle of the PCB, under the metal screen that covers the video preamplifier, is fully tightened. C.H.

## Samsung VB920

This machine would sometimes cut out after a couple of minutes for no apparent reason. On other occasions it would run perfectly for hours. Replacing the 12 V and 5 V regulator chips, IC1 (S3122) and IC2 (AN7805) respectively, put an end to the trouble. C.H.

## Akai VS18, 19, 22, 23, 24, 34, 35

If the drum motor takes off at high speed, or play stops after a few seconds, suspect the BU2375 digital servo chip IC503. It tends to be damaged when the voltage at pin 28 (5V) goes high because of a power supply fault. As this chip is expensive, it's a sensible precaution to add a $6.2 \mathrm{~V}, 1.3 \mathrm{~W}$ zener diode across $\mathrm{C} 9(100 \mu \mathrm{~F}, 6.3 \mathrm{~V})$ in the
supply to pin 28 . There's room on the reverse side of the power supply PCB, near connector P1. C.H.

## JVC HRD600, 620, 650/ Ferguson FV37H, FV43H

 There was no problem about getting the tape around the heads, but the machine refused to give the tape back unless it was disconnected from the mains supply. It seemed that either the mode switch or the servo chip was the cause of the trouble, but before we dived in at the deep end we sent a search party to look at the lower deck during tape loading. The cause of the problem became apparent after several atternpts at loading. Because the toothed part of the plastic sliding bar (item 39) didn't engage correctly at the end of its run, the full loading sequence could not be completed. Plastic circlip item 40 was the cause of the trouble: it had gone on holiday. C.H.
## Matsui VX1000

The customer complained that "half the old programme showed". We found that the tape failed to make proper contact with the full erase head because the back-tension arm didn't move to its correct position. The cure was to grease the operating lever that contacts the back-tension arm and check the back tension. M.M.

## Panasonic NVJ35

There was a display problem with this machine. Several segments were permanently lit up. Our experience has been that this fault is usually caused by the display itself or one of the diodes connected to it. Not on this occasion however: the microcontroler chip IC7501 was faulty. M.M.

## Sanyo VHR350E

This unit was dead. We found that the two $560 \mathrm{k} \Omega$ start-up resistors R5005 and R5006 were both opencircuit. Replacements restored the machine to life. M.M.

## Akai VSG64

The customer's complaint was that most tapes wouldn't play properly the off-tape pictures rolled. Her husband, who is a computer engineer, mentioned that if he twiddled the left-hand guide this would sometimes temporarily stop the rolling. My rule is that if the guides are tight, why should they have moved from the manufacturer's settings? In fact the cause of the fault was poor head-to-tape
contact. The user confessed that the machine led a hard life, being constantly in use. A new upper drum, together with slight realignment of the entry guide, restored normal working. M.M.

## Mitsubishi HSB2O

This machine had been to another dealer who, despite replacing the loading belts, had failed to cure the fault - intermittent failure to accept a tape. The cause of the trouble was the cassette-in switches on the front of the loading unit. A replacement, part no. 439C021010, cured the fault. M.M.

## Osaki VCR33

The following note illustrates what can happen when incorrect parts are fitted. Intermittent tape chewing and going into the fault mode was the complaint. Now this model is a GoldStar clone and uses a deck that bears an uncanny resemblance to the Panasonic D mechanism. On inspection we found that the gear which is part of the plate assembly A10 had split. So we ordered one and fitted it. The machine then appeared to work correctly - until the bottom cover was fitted, when the fault returned.
To cut a long story short, we discovered that the loading motor from a Panasonic deck had been fitted. Its pulley fouled the bottom cover, which was minus some of its screws, thereby stalling the motor. All was well when the correct GoldStar loading motor was obtained and fitted. M.M.

## JVC HRD230/Ferguson FV12L

Intermittent failure to play or record was the complaint with this machine: the tape would lace up, but the drum wouldn't rotate. Voltage checks showed that the Motor 12 V supply and the motor drive and motor run voltages were all present. When I removed and dismantled the lower drum I found that the ICP on the drum motor's PCB was dry-jointed. Resoldering provided a complete cure. M.M.

## Hitachi VTF770

This machine wouldn't eject tapes. Fortunately the cause was simply a slipping belt. M.M.

## JVC HRD230/Ferguson FV12L

This machine would intermittently stop while in the play or record mode. On test it appeared that the capstan motor was stalling. As there
was no stiffness in the motor I came to the conclusion that it had a dead spot. A new motor cured the trouble. M.M.

## Samsung SI3560

This machine's carriage didn't sit properly when a cassette was loaded and ejected the tape with the force of a bullet! When faced with this problem the usual procedure is to replace the eject gear and the righthand side carriage bracket, which has been modified. All was revealed when we stripped the machine down. Another 'engineer' had tried to repair the bracket by using a large self-tapping bolt to mount the side plate's drive gear! A new eject gear and bracket restored normal operation. M.M.

## JVC HRD 150/Ferguson 3V45

This machine would sometimes fail to go into the record or playback mode, switching itself off in the loaded state. The cause of this is usually hardened grease and a worn belt on the loading block, but a replacement block failed to cure the fault. An optosensor that's fitted to the underside of the deck was the cause of the trouble. M.M.

## Samsung VI730

Dropouts were the problem with this machine - the symptom was long, black streaks that ran across the picture. As a start we decided to set up the CCD level control as laid down in the manual. Connect a scope to TP3303 and adjust VR3301 for a video level of 0.6 V peak-topeak it said. In fact the video signal was missing at TP3303, though it was present at pin 4 of the 1H delay chip IC3302. The only item in between is a 3 MHz low-pass filter, FL3303, which was open-circuit. We took one from a scrap machine and after setting up the dropout compensation operation was back to normal. M.Dr.

## Sharp VCA33

If tape spills out during play, i.e. there's no take up, try a spot of fine oil on the idler shaft, where the idler gear slides up and down. It tends to become a bit sticky and fails to reach the bottom. This note applies to all machines that use this deck. M.Dr.

## Akai VS77

This machine stopped after five seconds, indicating a take-up rotation fault. We cleaned the underside of the reel disc, but the fault remained. A scope check at the
take-up sensor showed that the amplitude of the pulses was only 3 V peak-to-peak - it should be 5 V p-p. Presumably the LED part of the sensor had lost emission. A new sensor restored the amplitude and correct operation. M.Dr.

## Samsung VIK310, 320, 350, 375

Further to my note on power supply failure with these machines (see page 658 , July), a 100 / F, 25 V capacitor rated at $125^{\circ}$ can be obtained from Farnell Electronic Components of Leeds (01132 636 311) for use in position C110. It's made by Philips and the part no. is 286-709. M.Dr.

## Saisho VRS5000

This machine appeared to be dead, as there was no clock display. But if a tape was inserted it would half load then stop. Still no display however, and eject didn't work the tape had to be wound out. The drum would sometimes rotate when a tape was inserted, and would continue for four-five minutes. The power supply seemed to be OK, though the switched outputs couldn't be checked.
Checks at the tuner/timer chip IC601 showed that the 5 V supply was present. All the display drives were at -28 V . No key scan pulses could be found. We then discovered that there was no activity at crystal oscillator X601. A new crystal restored normal operation. C.W.

## Amstrad DD8900

Various display segments flickered and the control keys were either very slow to act or produced the wrong function. The stop-eject key initiated forward wind for example. A look at the circuit diagram showed that the display drivers operate with a -27 V supply. The display outputs are also connected to the key lines. So a supply problem was suspected. A check showed that the voltage was low at only -15 V . Replacing C 27 ( $47 \mu \mathrm{~F}$, $50 \mathrm{~V}, 105^{\circ} \mathrm{C}$ ) cured both problems. C.W.

## Bush VCR 190

This double-deck machine came to us with a list of intermittent faults. They included won't accept a tape, won't eject, won't play, sometimes stops during rewind and sometimes switches off - all with the bottom deck, as is usual with twin decks. I pounced on the mode switch like wildfire, but this was a waste of
time. By watching what happened when a fault symptom occurred I saw that the capstan motor seized. Stripping it down then cleaning the bushes and oiling them cured the fault. I then lubricated all the moving bits on the bottom deck and, to be on the safe side, did the same with the top one. C.W.

## Mitsubishi HSM50

Rows of white spots marred the playback picture. We removed the deck and checked the static discharge arrangement, which appeared to be OK. The large screened PCB along the back of the deck was loose however. Three screws secure it and provide earthing. Tightening the screws solved this one. C.W.

## Samsung VI6 11

In any mode the tape would run for only about a second. The machine would then go into the 'emergency state', with the standby LED flashing. The cause of the fault was in the rotation sensor section. As cleaning made no difference, we checked at pin 3 of the sensor - you can see it when the bottom cover is removed. A squarewave was present when the disc was rotated, but its amplitude was only 2 V . A new sensor (part no. 62309110243) produced pulses of greater than 4 V amplitude, the signal now reaching pin 55 of the syscon chip. This restored normal operation. C.W.

## Mitsubishi HS551B

This machine would run for only a few seconds in any mode then stop. A check showed that the take-up reel pulses were missing at pin 92 of the microcontroller chip. When we examined the connections to the reel sensor (Q5E4) we saw that three of its legs were broken. A.F.

## Mitsubishi HSM20V (J Deck)

We've had two of these machines, both rental models, with broken loading gears. Although the fault is reasonably easy to put right, provided you are not interrupted, be careful that item C 053 plate cam B has its full complement of teeth. Is it the machines, or are the customers too rough? Time will tell. A.F.

## Ferguson FV30B

This was another machine that would run for only a few seconds in any mode. A check at test point BT15 showed that the supply reel pulses were of low amplitude and
tended to be erratic. A complete clean of the clutch assembly and the sensor cleared the fault. A.F.

## Panasonic NVSD200

Very low E-E audio was the complaint with this machine. I found that one end of C0729 in the VIF pack was dry-jointed - it's the detector audio output coupling capacitor. Interesting that the other end had clearly been soldered manually! N.B.

## GoldStar GSI 1290

The E-E sound and vision were affected by severe hum. There was slightly less hum in the playback mode. The culprit turned out to be C118 ( $470 \mu \mathrm{~F}, 25 \mathrm{~V}$ ). It took a while to find, as I didn't have a circuit diagram. N.B.

## Panasonic NVJ30

As the combined remote control/bar scanner handset (part no. VEQ1107) for these machines is an expensive item, repair is usually economic. This one seemed to be dead, though the chips were being supplied. There was no clock signal at pins 15 and 16 of the microcontroller chip IC1 however. Crystal X1 $(3.52 \mathrm{MHz})$ was faulty. N.B.

## Fisher FVHP445VK

This non-UK machine is similar to the Sanyo VHR5200E. The one brought in by a customer wouldn't come out of standby. Checks revealed that the switched 5 V supply was missing. Q5402 (2SC3070) turned out to be shortcircuit base-to-emitter. N.B.

## Panasonic NVFS90

The complaint was no S-VHS playback or record - standard VHS was fine. When I traced the luminance path through I found that the signal entered the hybrid chip IC303 (VEFH05BT) at pin 2 but nothing came out at pins 7 and 8. The cause of the trouble appeared to be that one of the aluminium can, surface-mount electrolytics in the module had leaked. A replacement IC cured the problem. N.B.

## Panasonic NVL25

When this machine was put into the standby mode the vision remained and the red LED stayed alight! The cause of these interesting symptoms was a splash of solder that shorted the cathode of D1002 to an adjacent wire link. As a result the switch line to the power supply didn't change state. N.B.

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## Installing Aerials

John Pitt-Francis (July issue) is probably a well-qualified and respected TV repair man, but I wonder whether he would appreciate an "aerial riggers' guide to branching out into TV, VCR and satellite repairs" along the lines that all you need are a set of screwdrivers and a soldering iron?
I like his rule about aerial installation being "good weather activity". In my sixteen years' experience, this would add up to about six weeks a year in which to make a living! A part-timer would have just long enough to recoup his stock investment. If you decide to align satellite TV dishes correctly - to avoid calls about "sparklies whenever it rains" - a frequencyspecific meter is required. It will mean that you can forget about any profit unless the rain holds off for a complete year!
The use of ladders is not a matter to be taken lightly. It requires consideration of Health and Safety issues and minimum insurance needs. John Breeds devotes a complete chapter to the subject in his latest book, while the Confederation of Aerial Industries has spent seventeen years evolving Codes of Practice relating to the whole business of quality aerial installations.
On January 1st 1997 Channel 5 should be available to around 74 per cent of the population of the UK. Without going into detail, a wideband masthead amplifier providing a gain of 24 dB will, in the hands of the uninitiated, provide a lot of people with a lot of entertainment - but not the public!

Letters

We welcome letters from our readers and try to publish as many as we can. You can send them typed, hand written, or on disc - addressed to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

The stock list suggested by John is going to look a bit sick in many areas of the UK, not to mention the disasters that can occur with his list of splitters.
John's article has made some of us who have devoted a lot of time and effort into raising the standards and respectability of the aerial industry a touch cross. The CAI spends a great deal of time meeting broadcasters, regulators and now MPs to discuss how new technologies will affect our industry. A TV set is only as good as the signal it receives. The public is being educated by the media on how to complain - so don't set yourself up as a target. Leave our profession to the true professionals. Tim Jenks, CAI Inspector, Wolverhampton, W. Midlands.

I feel that John Pitt-Francis's article on aerial rigging may have created the wrong impression, suggesting to readers that it's a simple, mechanical business that requires little scientific understanding. Aerial installation without a signal strength meter for example is highly dubious - how would you check all channel levels, to ensure a reasonable balance, or the sound-vision ratios? There are many things that the TV set won't tell you. Because signal conditions can vary, you may get a call back when, for example, the pressure changes. A correctly sited and aligned aerial will minimise such possibilities. When it comes to a satellite dish, how on earth can this be set up accurately without a meter?
Reception in poor-signal areas in particular requires skill. In a recent case I was asked for advice where reception in a valley location had not been improved despite fitting a larger aerial atop the nearby hill and a higher-gain masthead amplifier. I discovered that a local relay was being received from the back of the aerial, despite the polarisation being incorrect! Because the masthead amplifier was a wideband type, these four extra channels made the amplifier work flat out. The solution was to fit a channelised amplifier.

An omni-FM aerial sounds a good idea - but only where you have very good signals.
In my opinion set-back amplifiers are a bit like head-cleaning tapes: a great seller as a consumer item, but of little or no use to the professional aerial installer. The amplifier should be close to the sigrial source, i.e. at the aerial. One use for a set-back amplifier is to drive a splitter, or overcome cable loss with a long feed used to pipe say a VCR's or a satellite receiver's output around a property.
Insurance and regulations are important matters that were not covered in John's article. Ladders must meet the regulations for industrial rather than domestic use, and must be of a type approved by your insurance company, which will need to be informed should you decide to take on extra types of work, especially anything as hazardous as aerial rigging. The insurance company will place restrictions on maximum working height and the types of weather in which you can work (wind speed etc.). This will apply to your public liability insurance, which may well need to be extended, and your personal accident insurance.
There are now also regulations relating to vehicle ladder racks their strength and mounting. Police have in this area been stopping drivers and checking racks. Some vehicles that are popular in this industry do not, in standard form, meet the mounting requirements for the ladders we typically use.
In omitting so many things, John's article could be very misleading. The true professionals in this field deserve every respect. There is no short cut to becoming a competent aerial installer.
Nick Beer,
Bideford, N. Devon.

## Going It Alone

It was good to see both positive and negative reactions to my two articles. I agree that an inspection fee is the right approach, which I adopted
from the start. New customers have to pay this up-front. I didn't mention insurance but did, in my first article, strongly recommend getting the free business advice offered by the
Training and Enterprise Council, as explained at all jobcentres. This covers the legal aspects of running your own business as well as many other topics. Public liability insurance and carriage of goods are legal requirements. Planning consent is a greyer area: it applies to an exclusive change of use, which is another reason for my suggestion of shared use.
On the subject of aerial rigging, I cannot go along with the suggestion that a meter is essential for alignment. Easier perhaps, but it's unlikely that the dozen or so nearby aerials are all pointing the wrong way! This, along with a geographical knowledge of where the transmitter masts are, has never yet failed me. Excessive signal strength is the most misleading situation I encounter. In my locality, Stockland Hill has in recent months been pumping out Ch. 23 (ITV) at about 9 dB higher than the weakest channel in the group, BBC-1 on Ch. 33. This can cause overloading, particularly with the low-power relays such as Honiton and Beer, which do not appear to equalise the error.
Newcomers to the trade will find it helpful to rig up a system to demonstrate the effects of overloading, so that they can spot it. See Fig. 1. BSS 1984 recommends input signals between 1 mV and 10 mV (peak), which is a swing of roughly 20 dB . Your test TV set will be taken well above this limit as you remove the attenuators from right to left, one by one, though some sets will handle it quite well. So you may need an extra cascade! Space all amplifiers well apart.
On one occasion I received a call to a very prestigious house in Sidmouth, where this problem was present. A professional rigging company had gone overboard in providing a cascade amplifier and top-of-the-range distributor to many rooms. The result was messy pictures, because of co-channel and coastal radar interference. Removal of the head-end amplifier was all that was required to obtain excellent results. Knowing this earned me a customer for life. Do I make my point?
John Pitt-Francis,
Honiton, Devon.
I read with interest John Pitt-
Francis's article (June) on starting
your own repair business. Having run my own business for some years now, I consider that the advice given was very helpful and informative. There are however a couple of suggestions I would like to add to help the new-comer.

First, 'street cred' is all important these days. Creating a good image from initial contact with the customer right through to his paying the bill will mean that he is likely to spread the word, bringing in more customers. I've found that referrals from satisfied customers are by far the most common way in which my customer base has been built up. In this respect I've also found that being able to offer payment by Credit Card is a facility that many customers look and go for, especially with the more expensive repairs. It adds a bit to the overheads, but is well worthwhile. I've also been told that being VAT registered, even though you might not need to be because you do not meet the turnover requirement, adds to credibility. This is a big step to take however and shouldn't be done lightly.
Secondly, John mentions various options for obtaining service information. I had the same bad experience with a manuals library some years ago but, recognising the value of such a facility to repairers, I decided to start my own manuals library. This has been running successfully for some three years, with hundreds of members to date. Joining a library is probably the most cost-effective way of gaining access to thousands of manuals, many of which may not be available elsewhere, especially for equipment that's getting on a bit.
Another benefit is that it can help to have a 'sparring partner' when the fault is an elusive one. Being in the trade myself, I can offer such a service to members and can obtain help from other members, particularly dealers for specific manufacturers.
More and more manufacturers are closing their doors on technical support (and, in some cases, even spares supply) to anyone who is not an authorised dealer, making it even harder for the independent repairer to run a successful business. But there remain many of us willing to help in whatever way we can. Keith Harvey,
Harvey Electronics, 43 Loop Road, Beachley, Chepstow, Gwent NP6 7HE. Phone 01291623086 fax 01291628786.


Fig. 1: Amplifier/aftenuator arrangement to demonstrate the effects of overloading. The aerial input is assumed to be noise-free and at least $6 d B$ up from threshold.

## Monitor LOPT Query

In his note on the Philips CM1,1342 monitor (August, page 754) Edward Branch asked why the LOPT with which he was supplied was wired differently from the original. I'm tempted to say "because it's a Philips", but I suspect that he may have used the CPC TF027. I did this and was presented with the same symptoms for the same reason - pin 7 being connected to chassis. My solution was to fit the HR replacement, HR7533, which although apparently delisted from the CPC catalogue was still available at the time of writing. This has pin 7 wired correctly for beam limiting.
Incidentally I'm told that CPC intends to stock the entire range of HR transformers in the near future. Now there's a bit of good news. Adrian Spriddell,
Micomicon Electronic Services,
Diss, Norfolk.

## NEXT MONTH IN TELEVISION

## Test Equipment Supplement

The test equipment required for today's TV/video servicing - a guide to what you need for efficient work as we approach the twenty first century.

## Multi-safellite Reception

There comes a time when reception from one satellite leaves something to be desired. After all, there are many alternative sources of satellite signals. So dish positioners and actuators have to be considered. Next month J. LeJeune describes what this involves, the technology and how it operates. Our new series deals with practical installation and maintenance.

## VCR Take-up Problems

The tape take-up mechanism in a VCR gives rise to many different problems, some obvious others less so. Nick Beer considers take-up configurations and failures, also the principles involved.

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| 254608 | 0.24 | 2501441 | 5.88 | BC141 | 0.36 | 80437 | 0.28 | BUT12A BUT12AF | 0.91 1.87 | LA4445 | 3.45 | STK5421 | 9.52 | TDA 2040 H | 4.34 | TIC105D | 0.62 |
| 254673 | 0.18 | $2 \mathrm{SO1453}$ | 3.85 | ${ }^{8 C 147 A}$ | 0.4 | 80438 | 0.38 | BUT12AF | 1.81 1.37 | L44700 | 4.27 | STK5471 | 4.87 | TDA2050 | 4.56 | IC225M | 1.02 |
| 254733 | 0.18 | $2 S 01497$ | 4.74 | 8C148A | 0.35 | 80826 | 0.35 | BUI18AF BUT56A | 1.37 1.19 | LA6358S | 0.60 | STK5481 | 8.12 | T02170 | 0.000 | TCP106D | 0.60 |
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| 254933 | 0.36 | ${ }_{2}$ SO1548 | 5.85 | 8C182L | 0.14 | BD902 | 0.60 | BUV48A | 1.52 | LA7800 | 1.61 | STK7348 | 5.74 | TDA2541 | 1.12 | TP110 | 0.35 |
| 254966 | 0.41 | 2 SD1554 | 3.25 | 8C184A | 0.12 | 80939F | 1.61 | BUV48A | 1.52 1.63 | LA7830 | 1.88 | STR11006 | 7.37 | TDA2576A | 5.95 | TP1 12 LH | 0.95 |
| 254970 | 0.19 | 2501555 | 265 | 8C184L | 0.06 | 8DT65C | 1.68 | BUWH18 | 1.63 1.39 | LA7835 | 2.99 | STR4211 | 9.40 | TDA2577A | 2.99 | TP121 | 0.50 |
| 254984 | 0.38 | 2501556 | 5.11 | BCIBHLC | 0.10 | $8 \mathrm{BF180}$ | 0.38 | BIWRE1A | 1.11 | LA7837 | 2.40 | STR451 | 23.41 | TDA2578A | 2.91 | T1P122 | 0.48 |
| 2581010 | 0.35 | 2 S01651 | 2.36 | 8 BC 212 | 0.08 | $8 \mathrm{BF194}$ | 0.22 | BUWBIA BUWB4 | 3.103 | LC7132 | 4.70 | STR50020 | 9.38 | TDA2579A | 4.91 | TP127 | 0.47 |
| 2581143 | 0.11 | 2 SD1710 | 2.52 | $8 \mathrm{BC2128}$ | 0.19 | 8 EF 199 | 0.04 | BuN84 Bux84 | 1.03 0.60 | LED3G | 0.10 | STR50103 | 4.48 | TDA2581 | 4.27 | T1P137 | 0.48 |
| 2581243 | 0.60 | $2 \mathrm{SD1877}$ | 2.14 | 8 C 212 L | 0.18 | 8 F 224 | 0.21 | ${ }^{\text {Bux }}$ BU271A | 0.60 1.03 | LED3R | 0.10 | STR50103A | 5.56 | TDA25810 | 1.99 | TIP29E | 0.62 |
| 258641 | 0.21 | 2501878 | 2.63 | 8C213L | 0.04 | 8 F 240 | 0.11 | BUZ780a | 1.97 | Ledzy | 0.10 | STR54041 | 10.52 | TDA2582 | 3.85 | T193055 | 0.93 |
| 2S8649A | 0.71 | $2 \mathrm{SD1884}$ | 3.35 | 8C2378 | 0.15 | 8F244 | 0.43 | BUZ80A BUZ90A | 1.97 | LM317T | 1.29 | STR5412 | 3.68 | TDA2594 | 2.21 | TIP30C | 0.17 |
| ${ }^{2 S 8686}$ | 2.05 | 2 SD1887 | 3.56 | 8C238 | 0.11 | 8F245A | 0.19 | ${ }^{\text {BY127 }}$ | 2.55 | LM324N | 1.40 | STR58041 | 3.42 | TDA2595 | 3.18 | TIP3IC | 0.00 |
| 258698 | 0.35 | 2501911 | 5.98 | 8C238C | 0.07 | 8F2458 | 0.41 | ${ }_{8}^{8 Y 133}$ | 0.18 | LIT339N | 0.50 | STR59041 | 8.11 | TDA2600 | 7.69 | IIP32A | 0.45 |
| 258716 | 0.43 | 250350 A | 1.97 | 8C307 | 0.06 | 8 F 2568 | 0.23 | 8 BY 179 | 0.17 | LM358N | 0.52 | STR6020 | 6.07 | tDar611a | 0.64 | TIP32C | 0.40 |
| 258764 | 0.30 | 250800 | 0.34 | ${ }_{86} 8078$ | 0.15 | 8F258 | 0.04 | $8 Y 179$ $8 Y 227$ | 0.13 | M99481 | 11.85 | STR61001 | 10.86 | TDA2611AO | 1.32 | TIP3SC | 1.82 |
| 258772 | 0.50 | 25D801A | 0.17 | BC308 | 0.09 | BF324 | 0.18 | 8 Y 228 | 0.26 | M5218L | 0.69 | STRD1816 | 1.69 | TDA2653A | 4.70 | TIP36C | 2.14 |
| ${ }^{258774}$ | 1.61 | 250468 | 0.18 | 8C3088 | 0.19 | 8F391 | 0.18 | BY2291000 | 1.31 | M54544L | 2.04 | STRDA420 | 11.49 | TA33018 | 6.75 | TIP41C | 0.65 |
| 258891 | 0.60 | 2S0669A | 0.64 | 8c309C | 0.14 | 8F420 | 0.21 | 8Y229800 | 1.08 | M58655P | 4.98 | T9053y | 1.35 | TDA3505 | 2.40 | T1P42C | 0.50 |
| 258892 | 0.35 | 2 2S716 | 1.63 | 8 C 327 | 0.10 | BF421 | 0.24 | - $\times 255$ | 0.14 | MC13022P | 7.69 | T9064V | 1.81 | TDA3560 | ${ }_{5}^{3.86}$ | TIPL760A | 2.57 |
| $2 \mathrm{SC1213}$ | 0.14 | 2SD756 | 0.47 | ${ }^{86328}$ | 0.14 | 8 FF 422 | 0.19 | BY299 | 0.18 | MC140668 | 0.21 | TA7205AP | 2.81 | TDA3561A | 5.30 | TIPL761A | 1.85 |
| ${ }_{2}{ }^{\text {SCL124 }}$ | 0.48 | 2508378 | 1.12 | BC337 | 0.14 | 85423 | 0.14 | BY398 | 0.18 | ${ }^{M} \mathrm{Cl} 14426 \mathrm{P}$ | 1.29 | TA7227P | 2.29 | TDA3562A | 3.80 | TPP791A | 1.25 |
| ${ }_{2 S C 1318}$ | 0.19 | 250855 | 6.78 | 8C338 | 0.65 | BF458 | 0.31 | 8Y399 | 0.12 | MDA2062 | 13.74 | TA7270P | 2.72 | TDA3562ATF | 8.97 | 71072 | 0.00 |
| ${ }_{2 S C 1573}$ | 0.35 | ${ }^{25089888}$ | 6.41 | ${ }^{8 C 368}$ | 0.18 | 88459 | 0.43 | 8Y448 | 0.30 | W2955 | 0.98 | TA7271P | 2.70 | TDA3565 | 2.74 | T1082CP | 0.21 |
| ${ }_{2 S C 1740}$ | 0.16 | 250965 | 0.67 | 86369 | 0.18 | BF460 | 4.82 | BYD14] | 0.35 | MU4052 | 3.34 | TA7274P | 4.93 | TDA3566 | 6.41 | TMP47C432AP8189 | 15.18 |
| ${ }_{2 S C 1815}$ | 0.17 | $25 \times 1118$ | 3.40 | 6C372 | 0.40 | 85469 | 0.34 | BYD33D | 0.12 | M8802 | 2.91 | TA7280P | 2.14 | TDA35768 | 10.31 | TMP47C43AN3555 | 16.69 |
| ${ }_{2 S C 1827}$ | 0.58 | 7406 | 0.69 | BC517 | 0.16 | 85470 | 0.38 | 8Y033J | 0.16 | WEL13005 | 0.86 | TA7281P | 3.20 | TDA3592A | 4.21 | TPU2732 | 10.05 |
| ${ }_{2 S C 1959}$ | 0.18 | 7407 | 0.69 | BC546A | 0.11 | 8F471 | 0.37 | BYD33m | 0.26 | MEE 18004 | 2.05 | TA7698AP | 5.97 | TDA3640 | 5.88 | U28298 | 240 |
| $2 \mathrm{SC2001}$ | 0.23 | 74HCO4 | 0.34 | 8 C 5468 | 0.12 | 85487 | 0.57 | BW10-40 | 2.55 | WUE3055T | 0.14 | TA8201 | 3.93 | TDA3650 | 12.02 | UC3842 | 1.46 |
| 2 SC2023 | 3.18 | 7805 | 0.78 | BC547 | 0.11 | 87759 | 0.38 | Brv958 | 0.21 | WUE340 | 0.45 | TA8205AH | 4.50 | TDA36538 | 1.54 | UC3884 | 1.20 |
| 2 SC2060 | 0.30 | 7808 | 0.72 | BC547A | 0.04 | 86763 | 0.3 | BW95C | 0.21 | MUF18004 | 2.05 | TA8207 | 2.14 | TDA3653C | 2.55 | UC3844N | 1.91 |
| $2 \mathrm{SC2078}$ | 1.00 | 7809 | 0.69 | 8 C 5478 | 0.11 | 87788 | 0.52 | BW960 | 0.27 | MN650 | 3.30 | TA8210AH | 4.10 | TDA3653CO | 2.51 | UPC1230H | 3.40 |
| 2SC2120 | 0.33 | 7812 | 0.52 | BC548 | 0.06 | 87869 | 0.25 | Brv96E | 0.53 | MPSAO6 | 0.35 | TA8210H | 4.79 | TDA3654 | 1.88 | UPC1318AV | 3.85 |
| $25 C 2230$ | 0.55 | 7815 | 0.82 | BC5484 | 0.11 | 8F869S | 0.40 | BWW56 | 0.31 | MPSA42 | 0.23 | TA8215 | 4.96 | TDA36540 | 2.82 | UPC1365C | 1.70 |
| 25 C 2235 | 0.36 | 78105 | 0.35 | ${ }^{86} 5488$ | 0.05 | 85871 | 0.41 | BWMSC | 0.11 | MPSA56 | 0.23 | TA8220H | 9.82 | TDA4500 | 4.66 | UPC1378K | 1.68 |
| ${ }^{2 S C 2236}$ | 0.36 | 7912 | 0.35 | BC548C | 0.09 | 8 89959 | 0.18 | 6WH96E | 0.46 | MPSA92 | 0.18 | Ta8221H | 7.26 | TDAA501H | 5.95 | UPC1394C | 1.92 |
| 25 C 2240 | 0.21 | 7915 | 0.62 | BC5498 | 0.11 | 85960 | 0.30 | BY10 | 0.38 | NE555 | 1.03 | TA8403K | 2.31 | TDAA502A | 5.47 | UPC1488\% | 2.99 |
| ${ }^{2 S C 2271}$ | 0.67 | AC127 | 0.52 | BC550C | 0.09 | BF961 | 0.26 | B7x56600 | 0.23 | NE592N | 1.91 | TAA5508 | 0.26 | ${ }_{\text {TDA4503 }}$ | 4.00 | UPC574] | 0.85 |
| $25 C 2274$ | 0.35 | AC187K | 0.59 | 8C556A | 0.11 | BFR90A | 0.60 | 日2vid | 1.34 | PGKE130A | 2.55 | TBAI20S | 0.69 | TDAASOSE | 1.35 | UPD1937C | 3.85 |
| ${ }^{2 S C 2314}$ | 0.38 | AC188K | 0.71 | 8C557 | 0.09 | 8FR91 | 0.50 | CA3189E | 3.12 | PGIE180A | 4.65 | TBA120T | 0.51 | TDA4505M | 8.97 | VD1054 | 0.60 |
| 2 SC2335 | 1.12 | AD149 | 0.52 | 8C5578 | 0.06 | BR100 | 0.18 | CD4001 | 0.24 | R2M | 0.84 | tBasios | 0.65 | TDA4600 | 2.14 | X2402P | 3.75 |
| 2SC2482 | 0.35 | AF127 | 1.51 | BC557C | 0.14 | BR103 | 0.62 | C04011 | 0.38 | R4050 | 3.04 | TBAB20M | 0.24 | TDA4600/2/3 | 2.82 | [1K338 | 0.12 |
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## A look at the

# Panasonic Z5 

## In the second article in his latest series Ray Meadows describes the signal processing arrangements used in this small-screen chassis

Fig. 1:
Simplified block diagram/circuit, showing the arrangement of the VIF section of the receiver.

This month we will deal with the signals circuitry used in the Z 5 chassis and the optional teletext module. The obvious place to start is with the tuner unit and the IF section.

## Tuner and IF

Unlike its predecessor, the Z 5 chassis uses frequencysynthesised tuning. This is normally a more costly option than the alternative, voltage-synthesised tuning, but it does provide more accurate tuning, particularly where many broadcasts are packed into adjacent channels. On a recent trip to Belgium I found that some block-converted UHF channels shrink when down-converted for cable system use at VHF, with the result that they become less than the standard 8 MHz bandwidth. This means that it is possible to squeeze more channels into the same space. In this particular case there were actually two channels
corresponding to channel E12, one at the low end and the other at the high end. The latter was found only whilst search tuning. But I digress.
The tuner fitted in UK Z5 models is an Ecom type ENV87877G3, which is connected to the 30 V tuning supply as well as the 12 V and 5 V lines and is thus powered down during standby. Tuning is controlled by the main micro chip IC1202, via an I2C bus - see Fig. 1. The tuner provides an unbalanced IF output which is passed to the SAW filter X101. Continental models that have a balanced-output tuner incorporate an additional buffer circuit, formed around Q101, to drive the SAW filter. The signal then passes to a Philips TDA8361 chip, IC601, which handles all the vision and sound IF, the sync, the colour decoder and timebase generator functions.
As far as the vision signal is concerned, IC601 contains an IF amplifier and demodulator, with full AFC and AGC



Fig. 2: The SIF system, including the modified arrangement for dual-sound PAL operation. For PAL I X203 has a centre frequency of 6 MHz ; for PAL B/G and D/K X203 has a centre frequency of 5.5 MHz and $X 202$ a centre frequency of 6.5 MHz .


Fig. 3: The Secam sound IF/audio arrangement.
functions. The RF AGC output is fed direct to the tuner, while the AFC output is fed via buffer transistor Q102 to pin 18 of the microcontroller chip where it is interpreted, coded and sent to the tuner via the I2C bus to adjust the tuning. IC601 is not itself connected to the I2C bus.
The output from the demodulator within IC601 is fed to a video amplifier, to the AGC circuit and to a sync detector circuit. The latter provides an output at pin 4, which is connected to pin 19 of the microcontroller chip. When this
pin is low, the micro knows that there is no IF signal present. It therefore mutes the sound via the PWM volume control output. The input at pin 19 of IC1202 is also used in the search tuning mode: the search continues until pin 19 goes high.
IC601's video output (with sound) leaves at pin 7, passing to the emitter-follower transistor Q301. From this point the signal is split. Ceramic filter X301 in the composite video signal path removes the sound signal. The

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Fig. 4: The audio amplifier and mute system.
video is then passed back to IC601 (non-text models) or to panel T (text models - see Fig. 6 last month). There is also a recording output to the scart socket.

## Sound IF

The path to the sound IF circuit, which is also in IC601, starts with the bandpass filter X203 (see Fig. 2). This passes the 6 MHz signal to coil T 201 , which in turn feeds pin 5 of IC601. In countries where both PAL B/G and PAL D/K signals can be received there are two bandpass filters in parallel, X202 and X203, to cater for the 5.5 MHz and 6.5 MHz sound carriers. The output from the appropriate filter is selected via a pin diode system which is controlled by the $\mathrm{SC} 1 / \mathrm{SC} 2$ output from the micro chip (pin 8). IC601 produces an audio output at pin 50.

## Secam Sound

Secam L/L' models incorporate an additional SIF circuit to handle the AM sound, see Fig. 3. This is built on a small subpanel which is referred to as board A. There are two chips here, IC201 and IC202. The AM demodulator chip IC201 is a Philips TDA3843. A 'quasi-parallel' sound demodulation system is used, the output from the emitter of Q101 being taken to a dual-frequency SAWF, X204, which can pass the 32.4 MHz and 40.7 MHz Secam L and L' carriers. Note that with Secam L (Band III) the sound
carrier is below the vision carrier whereas with Secam L' (Band I) it is above the vision carrier.
Once again pin diodes are used for signal selection, under the control of transistors Q205/7/8. As the sound mode depends on the Band, the VHF low/other switch signal at pin 8 of IC1202 is used to control these transistors. After demodulation the audio signal is passed to the CMOS chip IC202 which contains two switches. The first selects an input from either the AV1 connector or IC201 to pass to IC601. The second selects either demodulated PAL or Secam sound to pass to the AV output. Fortunately this complication does not apply to sets from Panasonic UK.

## Audio Circuitry

The selected audio from IC601 is amplified by Q251 (see Fig. 4) and is then fed to the Matsushita AN5265 audio amplifier chip IC251. This is the same device that was used in the Z4 chassis. Thanks to the simpler speaker cabinet design, it produces a cleaner, resonance-free sound with the $\mathrm{Z5}$.
There are no tone controls. Volume is controlled via pin 4, using the PWM output at pin 23 of IC1202 after filtering, with Q1205 acting as a buffer.
The power-off mute circuit is also connected to this pin. The circuit uses transistors Q1201 and Q1208 and diodes D1202, D1212 and D1217. With the set in normal


Fig. 5: One of the RGB output stage circuits (red).
operation, C1205 is charged via R1203 and D1202 from the 11V +B 4 supply. At switch off, because of the charge stored by C1205 (D1202 will now be reverse biased) the
voltage at the emitter of Q1201 will be higher than the voltage at its base. Thus Q1201 and Q1208 conduct, linking the volume control line to chassis. D1217 provides a path through which C1205 can discharge, so that the mute is removed should the set be switched on again quickly.
D1212 connects the power-off mute to the AV output mute circuit formed by Q3104 and Q3103. Thus the scart audio output is linked to chassis at power off. This circuit also receives a mute output from pin 4 of IC1202 to mute the scart audio during channel change.
The audio output from IC251 is at pin 8 , where it goes to the headphone socket and loudspeaker. IC251 provides a 5 W music power output.

## Video Processing

Apart from the chroma delay line, which is a TDA4661V2 CCD chip (IC602), the colour decoder circuitry is all within IC601. Colour decoding follows standard practice, but there are several points of interest. The luminance delay line is built into IC601. It's followed by a peaking circuit, which provides - under the control of the main micro (at pin 14 of IC601) sharpness adjustment. The resultant processed luminance signal is then fed to the RGB matrix.
The colour-difference signal outputs from the chroma delay line are fed to the matrix at pins $28(\mathrm{~B}-\mathrm{Y})$ and 29 ( $\mathrm{R}-\mathrm{Y}$ ). To cater for Secam signals, some models incorporate a Philips TDA8395 Secam decoder chip (IC603). This takes a filtered chroma output from pin 27


Fig. 6: Block diagram showing the arrangement of the Unitext circuit on panel $\boldsymbol{T}$.

C601 and produces its own colour-difference signa puts which, as with the demodulated PAL signals, are to the chroma delay line chip. In both the PAL and cam modes the chroma reference oscillator is in 501: there are separate crystals, connected to pins 34 cam) and 35 (PAL).
n RGB switch within IC601 selects the outputs from matrix or external RGB inputs from either the scart ket or the teletext circuit.
he RGB outputs from IC601 leave at pins 20, 19 and respectively. They are fed to the CRT base panel Y which the output stages are mounted.

## 3B Output Stages

in previous Panasonic chassis, simple class A video iplifier design is used in the RGB output stages. Fig. 5 ows the red channel circuit. The RGB drive signals are 1 to three voltage amplifier transistors, Q351, Q352 d Q353 (red). A potentiometer in the emitter circuit of ch of these transistors is connected between the 8 V e and chassis to adjust the bias: these are the cut-off introls. The red and green channels also include a gain justment potentiometer.
The collector of each output transistor is connected via $12 \mathrm{k} \Omega$ load resistor and a peaking coil to the 135 V 4 in . models) or 185 V ( 21 in . models) line. Cut-off and hite balance adjustment are as described for the Alpha chassis in the May 1994 issue of Television (see page 2).

## witch-off Spot Suppression

vitch-off spot suppression is provided by Q356 and its sociated components. While the set is running C360 is arged from the 8 V supply with the result that the base d emitter of Q356 are at the same potential. At switch f the 8 V supply falls rapidly and the voltage at the pitter of Q356 becomes greater than that at its base. As result it conducts, removing the drive to the RGB tput transistors.

## letext

le $\mathrm{Z5}$ chassis uses a completely new solution mpared to previous Panasonic chassis, the Texas struments' Unitext system. This has the advantage of pviding most European language character sets via a igle processor chip. Other languages, including nonabic fonts, are available with alternative versions of chip. In addition, on-board memory means that four ges of text can be stored by the chip without the need an external static RAM. The system also provides 1 level one features (FLOP) and TOP text, which is in in the UK via German satellite TV channels, and a St' (no magazine) mode.
The main items in the circuit (see Fig. 6) are the 72306 data slicer IC3501 and the Unitext processor 3502, which is type CF70204ANW for UK models. ley are on panel T, along with the video switch 3504 and the RGB switch IC3505 (see Figs. 5 and 6 it month).
The video signal from the tuner or the AV connector is lected by IC3504 and fed to the data slicer chip 3501, which strips off the text data and clock signals d also produces a composite sync signal. An on-board 875 MHz oscillator produces a $\times 2$ data clock signal hich is used to synchronise the outputs to the Unitext bcessor IC3502. The micro in IC3502 then decodes text data stream, producing the required text pages in 4 M . The page numbers are selected by remote control a the main microcontroller IC1202 and the I2C bus. To sist with text data acquisition, the Unitext chip counts
the video lines from the sync signal and generates a 'window' gating pulse during video lines 2-22 for use by the data slicer.
When IC1202 selects the text mode, IC3504 is set to select the text-originated sync pulses instead of video. If the video signal should be lost or the text data level falls below a certain threshold, the Unitext chip decides that the video signal is poor and produces a mute signal output at pin 13. This, via Q3513, is connected to the Stop 1 pin of IC1202, which then produces a mute signal. It also means that the text display remains stable until a good video signal arrives.
The RGB outputs leave IC 3502 at pins 23, 22 and 20 respectively, passing to the RGB switch described last month (see Fig. 5, page 739). The text blanking signal is used to control the switching action, mixing the textoriginated RGB with any external RGB from connector AV1.
Other items in the text module include an MN1280R reset generator (IC3506), which is connected to the 5 V line and IC3502, and an LM78M05 regulator (IC3503) which receives its input from the 16 V line.
Text contrast control is via Q3503, whose conduction is controlled by the text contrast potentiometer R3515. This circuit is connected to each RGB channel via separate diodes.

## Next Month

In the concluding instalment next month we'll look at the timebase circuits, including the 'hot' line scan circuit.


# Get a Life! 

We all know what our Donald is really like - kind, patient, courteous etc., etc. Daughter Rebecca Bullock has hijacked his wordprocessor to fill us in on the etcetras. . . . . .

Hello! I'm Rebecca Bullock. My dad repairs TV sets and things and writes about some of them. He's a good dad, but when customers annoy him he kicks at our dogs and cat and walks over them saying "out of my way". He also gets nasty with my mum, and she says things to him that make him even more annoyed. Right now he's very annoyed, and my mum said I should write an article telling you what he's really like. I slipped into his hut to write this one.

## Likes

I like my dad, even when he's annoyed, but he doesn't seem to like people. Well, he likes some. He likes my Aunt Lillie, but not my Uncle Tom, who works at the Weights and Measures and says he's important. My dad says he's unemployed and a prat and ought to be hung.
He doesn't like Mrs Brown. She brought along a plug and asked dad to fit it to her video lead. Then she came back and said he'd blown up her video. He told her to go to a place I mustn't say, and my mum told him to stop causing trouble.

## Sundays

My dad likes to read the Sunday Telegraph. But when he opened it this morning the telephone kept ringing and apologetic people asked my mum which set is the best, and did my dad have a fuse, and was their set ready, and that their husbands thought it was a valve. My dad refused to speak to them and my mum put the phone on the table and hissed at him to grow up fast.
He always does what she says, because she's always right. So he talked to some of them. But meanwhile more apologetic people knocked on the door and came
round the back, and crouched and smiled and waved at him through the window when we were having our dinner. They told him their set still wasn't quite right, and could he sell them a plug, and tune in their new video from Crubbs Foodstore, and stop their's rolling because they were expecting visitors. He got annoyed and told them to go to the place I mustn't say.
Then he caused trouble with my mum and said she was like my gran, only worse. He asked my mum to buy him a spade and some cheap crocodiles, but I don't know why.

## It takes all sorts

Garth Palmer's mother is nice. Garth takes her radios and hairdryers to pieces, then she brings them here and my dad throws them away for her and she gives him money. My dad likes Mrs Palmer and my mum thinks he's good at being funny.
My brother Jamie asked dad why his hair is going rotten and my mum said it's because he's old. But my dad said it's because my mum nags him. He said his hair was all right before he met her, and that he was four inches taller. The chemist down the road thinks he's old too. He thinks dad is my grampie. My dad said that the chemist is a prat and can go to that certain place as well if he likes.
Herbie Millar knocked his mother's radio over at Easter and my dad had to send off for a new cabinet. Mrs Millar and Herbie came to collect it yesterday. She said a new radio would have been cheaper, but my dad said she asked for a cabinet not a new radio and he wished he lived on the moon. Mrs Millar smiled and asked him to knock up a rocket. Then her Herbie
started jumping about, making noises and saying he was a rocket. When she asked him to stop he screamed at his mother and knocked the radio on to the floor and the cabinet broke again.
Mrs Millar told Herbie he'd been very naughty and started to cry. But Herbie stamped his feet and screamed and wouldn't be quiet. Then my dad came over from the bench and smiled at him and whispered in his ear. He shut up at once. I heard what my dad said, but I don't think his soldering iron would have fitted and anyway it was very hot. Mrs Millar dried her eyes and said how good my dad is with children, and how lucky my mum is.

## Outside calls

My dad doesn't like calling at people's houses, but a man who wore a round hat and a frock sat in the workshop and talked quietly to him for two hours and said his set hadn't been right since dad had done it. In the end my dad agreed to go and took me along.
The man ran along the pavement behind our van and was puffing when he caught us up at his house. He unlocked the door and my dad went in and walked quickly round the table and out again. The man watched us drive away. When I asked my dad why he came out so fast he just said "stunk". He told my mum that the set had a
Snoddies sticker and that the man could go to the place I mustn't say.

## Holidays

When we go on holiday my dad is really happy and my mum likes him a lot. We don't tell anyone that my dad mends sets because if we do they all tell him what sort of set they've got and what was on when it went wrong and how the man
they called was a crook and it was only a loose wire. This sort of thing makes my dad nasty and he rows with my mum. She tells him to get that look off his face and he tells her she should have had a husband who clouted her. She jabs him and says nobody would clout her and his side of the family are all mental
My dad likes listening to BBC radio programmes. When we go to Spain he picks them up on our satellite dish and transmits them around our house and garden using a little home-made transmitter. My mum can hear them on her VHF radio while she's ironing on our sun roof or in the garden.

Not long ago dad mended our neighbour's radio. The neighbour called him over the garden wall, gave him two bottles of wine and said he was the best engineer there ever was, because his set now even picks up Radio 2 "all the way from Britain".
Last night we went to Paco's to have a meal. The TV set there kept going to a line. Paco started looking at my dad so we left and went to Manuel's. Half way through our dinner a bullfight came
on and the set banged and smoked and my dad said "bloody good job". He said he hoped the bullfighter had blown up too. He wished every set in Spain would blow up and that all the so-called engineers would go to the special place and stay there for keeps. He said next time we go to Spain he's going to take with him a special remote control to switch off all the sets everywhere he goes.

## At home

Our telly isn't on much when dad is at home, because the people on it annoy him and make him call my mum names. He says when he was a boy he never saw anyone like the people he sees every day on television - they were all in asylums or hung. He wants them hung now.
My dad wears sandals. He says it isn't because he cares about the world and that those who do are prats. He likes a laugh though. Once when I was with him at Mrs Blair's house he purposely told her a lie. When she made a joke about his toe poking through his sock he said "I know, but it's the only pair

"I wonder if this is going to be a god day for Donald, or am I going to be rushed off my feet". . .

I've got'. She took two pairs of socks off her clotheshorse and tossed them over to him. Her husband looked up from his paper and said "hey, hey there." But my dad kept the socks. They were good ones.
When my dad is out my mum says she doesn't know what she'd do without him. I like my dad. Even though he keeps telling people to go to the place I mustn't say.

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# Capacitance Tester/Comparato, 

This bridge circuit, devised by lan Rees, provides a quick go/no-go check on high-value capacitors. It enables capacitor values to be compared and leakage detected

With the increased reliability of electronic equipment, it's becoming less and less possible to carry out servicing on a stock-fault basis. Nevertheless certain types of components, especially when used in particular ways, are responsible for a far greater percentage of faults than others. Of these, electrolytic capacitors are amongst the least reliable items used in electronic equipment. When mounted in a position where they are subjected to heat they tend to dry out and fall in value, or develop electrical leakage. When faulty they are often responsible for the failure of other components, which they can take out domino style.
Preventive maintenance carried out by blanket component replacement can be cost effective in the short term, but won't tell you much about the true situation in a particular piece of equipment. A little more time spent checking each component as it is removed will reveal the actual condition of an ageing chassis. As experience is gained in this way, so time can be saved and the cost of replacement components reduced.
My all-singing digital multimeter will check capacitors with values up to $20 \mu \mathrm{~F}$. So anything above $20 \mu \mathrm{~F}$ had either to be replaced without question or checked using the swing time of the needle of my analogue ohmmeter. Comparing this with the result obtained with a new capacitor produced a ball-park charge estimate, which is by no means an accurate method. The capacitance comparator described in this article was devised to overcome this problem. It's very useful for quick go/no-go checks on high-value capacitors to establish their condition.

## Circuir Description

Fig. 1 shows the basic circuit, simplified to make its operation clear. The two electrolytic capacitors Cx and Cr are connected as two elements in a DC bridge circuit. At the

Fig. 1: Basic principle of the capacitance comparator bridge.
moment when voltage is applied to them, they charge exponentially via the equal-value resistors R1 and R2. When the value of the two capacitors is the same, they will charge together at the same rate and the centre-zero meter's pointer will not be deflected.
If Cx is of lower value than $\mathrm{Cr}, \mathrm{Cr}$ will take longer to charge and a lower voltage will be present across it than across Cx during the latter part of the charging cycle. As a result the meter's pointer will be deflected. If Cx is of larger value than Cr the meter deflection will be reversed. When the two capacitors have both charged fully the meter reading will return to zero. If the meter shows a standing deflection after this, it will be caused by leakage in one of the capacitors.
This is the basic principle of the comparator. Fig. 2 shows the circuit of the working prototype.
It is important that both capacitors are fully discharged before the test is started. The three-position function switch S1A/B enables the capacitors to be discharged, via R5, when in position D (discharge). Do this before and after the test. Comparison for value, as just described, is carried out with the switch in position C (compare). Leakage is indicated with the switch in position L - in this position the reference capacitor is open-circuited.
The centre-zero meter M, used to provide the indication, is protected by the back-to-back zener diodes D1 and D2 and resistors R3 and R4. This is essential to prevent it being damaged by a short-circuit capacitor or test leads.

## Construction

There are so few components that the prototype doesn't even have a PCB. Point-to-point wiring is suitable and, with a little thought, the unused tags of the function switch S1 can be used as anchor points.
A plastic box from CPC was used to house the unit, padded inside to hold the PP3 battery in place. The function switch, a three-pole, four-way type, was also obtained from CPC. Its stop was altered to give just three ways.
To keep it simple, I rely on my supply of spares instead of using switched capacitors as a reference. Two pairs of crocodile clips, correctly colour-coded for the +/connections, are connected to leads that exit from the top and bottom of the box. These pairs are labelled test and reference to ensure that I have the correct capacitor connected to the relevant leads.

In practice I use the component I'm about to fit as the
reference. But the shelf life of electrolytic capacitors is often unstated. So even a new component could be of uncertain condition. Doing things this way means that the replacement capacitor can also be checked before it's fitted. On several occasions I've found that the replacement has been faulty. This could have caused a lot of grief had it been fitted.
For logical reasons it's sensible to ensure that the meter's pointer swings right (+ve indication) when the reference capacitor has a larger value than the one being tested. This can easily be checked by shorting together the reference terminals with the function switch set to position C .
The value of R1 and R2 was chosen to provide the greatest range from $1 \mu \mathrm{~F}$ upwards. If you want to speed up the test with capacitors of $1,000 \mu \mathrm{~F}$ and above, the value of R1 and R2 can be reduced to $1 \mathrm{k} \Omega$ or less. Unfortunately with this resistance value smaller value capacitors will not be able to produce a visible meter kick.

## Use

The tester draws only a small current from the 9V PP3 battery during a test. Provided the unit is left switched to position D (discharge), it is effectively off. This is the start position for all tests, and ensures that both capacitors are discharged.
The comparator will work with capacitors of $1 \mu \mathrm{~F}$ value upwards. Do not use it with capacitors whose working voltage rating is less than 9 V . Bear in mind that high working voltage capacitors will have higher leakage currents than will be shown by a 9 V instrument.
Smaller-value capacitors give a $20-30 \mu \mathrm{~A}$ kick that's instantly seen. With large values of $1,000 \mu \mathrm{~F}$ and above a few seconds are required for the charge to start to bottom out before the meter deflects to show the comparative charge rates of the capacitors.
Non-electrolytic capacitors charge very rapidly and decay to zero with no leakage.
Electrolytics can be seen to form as they charge. For this reason, compare like with like when testing. Avoid mixing types, otherwise confusing results will be obtained.
The test procedure is as follows:
(1) Set the function switch to position $D$.
(2) Connect the new capacitor to the reference terminals, with correct polarity.
(3) Connect the capacitor being checked to the test terminals.


Fig. 2: Circuit of the prototype capacitance tester/comparator. Meter polarity shown for connections, not panel indication.

## Answer to Test Case 405

## - See page 785 -

Well, what can be wrong with a satellite installation when the dish is correctly aligned, the LNB is a known good one and the receeiver has been found to be OK by substitution? The feeder cable of course! It's a misleading situation, especially when, as here, only one channel or a group of channels is affected. You expect a cable either to work or not work. And if it has become lossy for any reason you might (naively!) expect that the loss would increase with frequency. Not necessarily, in the realm of domestic satellite reception. Damage, joints, tight bends, physical constriction of the cable, bad termination and water can all cause strange symptoms.
In this particular case it seemed that cable ageing was the sole cause of the trouble - it wasn't very good quality cable anyway, from the look of it. Certainly a new run of good-quality, double-screened satellite cable cured the problem, restoring interference-free reception of all the available channels.
Meanwhile Mr Todd, impressed by the loan receiver in spite of the short time it had been there, bought a posh new Grundig IRD and consigned the old one, complete with its descrambler box, to the dustbin where the lossy cable had gone. All that remains of the original installation is the dish, which is gently rusting in the summer sunshine.


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## How time-lapse VCRs differ from conventional ones. Features of timelapse machines. Servicing aspects. Joe Cieszynski on a good prospect for increasing the scope of your servicing activites

In recent years there has been a steady increase in the number of time-lapse VCRs used in the video surveillance industry. This growth is expected to continue, as the cost of video surveillance equipment falls and the police, insurance companies and private security firms demand video surveillance to complement intruder alarm systems.
Not surprisingly the VHS format dominates the field, mainly because of its low cost. In earlier years manufacturers simply adapted their consumer designs to meet the requirements of surveillance work. This is less often the case today, as the average domestic VCR would not withstand the punishment a time-lapse machine receives. The time-lapse VCR must be capable of providing peak performance over a prolonged period.
S-VHS quickly found a role in this market. Its higher performance was immediately appreciated by the industry, while the higher cost didn't prove to be the drawback it has been in the consumer market.
A point that should be of interest to readers is that these machines represent a new source of servicing work along with the monitors, cameras and controllers that go with them. Most engineers who install and maintain
surveillance equipment do not have an electronics background, and are not expected to open up any of the equipment when it fails. Faulty equipment is replaced and taken back to base, where it is frequently sent out for servicing. The average workshop that's equipped for VCR and camcorder repairs is in an ideal position to be able to take on surveillance equipment servicing.
What then is a time-lapse VCR, and how does it differ from a domestic machine?

## Time-lapse Operation

The need for time-lapse operation in the surveillance field is pretty obvious. No matter to what extent any of the current VCR formats are modified, they will never provide more than a few hours of continuous recording. This is totally inadequate where the requirement may be to record events for twenty-four hours a day, seven days a week. With time-lapse operation, large quantites of still pictures are recorded at short time intervals, thus making it possible to record sufficient information to provide a continuous 24 -hour record service. A full E180 cassette recorded in the time-lapse mode can be likened to a photograph album that contains 270,000 pictures!

A number of developments in recent years have improved the performance of time-lapse VCRs way beyond what was earlier expected of them. But before we look at more modern format machines, we should consider the basic principle of time-lapse operation.
The time-lapse VCR makes maximum use of the stillframe feature and the precision of a Hall-effect motor. For time-lapse operation the basic sequence is to lace up, run the drum up to speed, start the tape transport, record one frame (two fields), stop the tape transport, pause for a given length of time and so on.
While the tape is running, it moves at the normal speed of $24 \mathrm{~mm} / \mathrm{sec}$. It's the pause intervals between recorded frames that provide the extended recording time. The need for a very high-precision servo control system and capstan motor is clear when you consider that the tape speed has to accelerate to $24 \mathrm{~mm} / \mathrm{sec}$ and subsequently decelerate to stop almost instantaneously.
Fig. 1 illustrates the time-lapse track format. The numbers at the top represent TV frames. In this example I've assumed that the machine is operating in the twelvehour time-lapse mode. The machine records one complete two-field frame while the tape is being driven at $24 \mathrm{~mm} / \mathrm{sec}$, then the drive is halted for nine frames, after which the tenth frame along is recorded. Thus one frame in every ten is recorded, the cycle taking 0.2 sec (ten 20 msec frames $=0.2 \mathrm{sec}$ ). The drum continues to rotate while the tape is stopped, but the output from the heads is switched off so that it doesn't override the tracks just recorded.
The recording time in the twelve-hour mode requires a bit of explanation, because it is not actually twelve hours. An E180 cassette provides a basic recording time of 180 $\times 60=10,800$ seconds. The number TV frames recorded during this time is $10,800 \times 25=270,000$. With timelapse operation this works out at $0.2 \mathrm{sec} \times 270,000=$ 54,000 secs, which is fifteen hours.
Similar calculations in the other time-lapse modes prove that the recording time available is always three hours more than the time suggested. If we consider the twelvehour mode again, when the 0.2 sec cycle is reduced by one 40 msec frame period the recording time becomes twelve hours. But, as we shall see later, to maintain the VHS specification one frame more than the time-lapse period has to be recorded.
When the recording depicted in Fig. 1 is played back in the twelve-hour mode the machine operates in a continuous play, pause, play, pause fashion. As a result you can view the pictures in a real-time form with a duration of fifteen hours, though they are just a series of still frames. Alternatively the machine can be set to the three-hour mode, i.e. standard VHS operation, which enables the recording to be seen in fast motion. When a slower time-lapse is selected, the operator can examine each frame in greater detail.
The main drawback with time-lapse recording is that activity which occurs between the recorded fields is missed: the longer the time-lapse, the greater the amount of information lost.

## Improved Technique

The time-lapse system just outlined was used with earlier machines. A number of manufacturers have introduced a refinement that goes some way towards reducing the information loss.
In the arrangement shown in Fig. 1, both fields of each selected frame are recorded. Although this gives good quality when the recording is played back at normal speed, when the tape is played back in the time-lapse mode the machine is effectively in perpetual still and the second field is not used - the two heads scan the same


Fig. 1: Track arrangement with a frameadvance machine in the 'twelve-hour' time-lapse mode: every tenth frame is recorded.

Fig. 2: Twelvehour mode recording with a time-lapse cycle half that in Fig. 1: every fifth field is recorded.
section of the video track. This being so, why not record one field per frame and use the second field for another recording later on? The principle is outlined in Fig. 2.
Note that the figures at the top this time represent fields rather than frames. Although the machine still operates in the twelve-hour mode, the time lapse cycle has been reduced from 0.2 sec to 0.1 sec . During each pull however the tape moves for 20 msec instead of 40 msec (one frame). The tape will still run for fifteen hours, but will have recorded twice as much information $-2 \times 270,000=$ 540,000 still fields.
Fig. 3 demonstrates the advantage of recording in this manner. Consider the sequence of events being recorded by a time-lapse machine recording complete frames in a 360 -hour mode with delay cycles of 4.8 sec . If the machine recorded picture one, the next to be recorded would be picture six. The action has not been caught. Now consider the same sequence with a machine that records fields. In the 360 -hour mode the delay cycle is now only 2.42 sec . So if picture one is the first to be recorded, the next to be recorded will be pictures four then seven. Much more has been caught!

## Delay Period

The delay period cannot be selected at random. It has to take two important factors into account.
First, because of the slant-azimuth technique used with VHS machines, the tracks must be laid down in the order ch. 1, ch. 2, ch. 1, ch. 2 etc. (or A B A B as some texts call


Fig. 3: Vital information can be lost when the time between recordings is lengthy.

Fig. 4: Phasor
representotion of the recorded ch. 2 VHS chroma signal that would produce a pure magenta raster.

it). The delay time has to ensure that when an odd field which is recorded as a ch. 1 track, has been laid down the next field will be an even (ch. 2) field, and vice versa.
Secondly, the delay period has to take into account the chroma signal phase rotation used in the VHS system to cancel crosstalk. The ch. 2 chroma is phase retarded by $90^{\circ}$ on each line prior to being recorded: subsequent phase shifting and comb filtering during playback result in chroma crosstalk cancellation.
The phase shifting follows a set sequence over four TV fields. This is illustrated in Fig. 4, where the arrows represent the ch. 2 chroma signal's phase on each line after the $90^{\circ}$ phase retard. The diagram assumes that a pure magenta raster is being recorded.
Those wishing to look into this subject in greater detail should refer to my articles in the February-April 1996 issues of Television (in the VCR Signal Processing series).
For the crosstalk cancellation system to work with a time-lapse VCR, the recorded pattern must follow the basic four-field sequence. This means that in the twelvehour mode each fifth field has to be recorded. If, for example, the first field A in Fig. 4 has just been laid down on the tape, the next field that can be recorded is the next-but-one B field. This will be followed by the next-but-one $C$ field etc.
This might be more clearly explained as follows. Take the following series of fields in the twelve-hour mode:
ABCDABCDABCDABCDABCDABCDABCD
Recording each fifth field, shown in bold, maintains the format. The delay cycle is 100 msec (five fields). In the 24-hour the situation is as follows:
ABCDABCDABCDABCDABCDABCDABCD
This time every nineth field must be recorded, the delay cycle being 180 msec . This is why the actual recording time is always three hours longer than that implied by the mode selected. The delay cycles for all other time-lapse modes must also ensure that the four-field chroma signal phase is maintained.
Any attempt to play this tape back at normal speed (three-hours) will result not only in a very fast motion

| Mode | Running <br> time | Delay <br> Frame rec. | Delay <br> Field rec. |
| :--- | :--- | :--- | :--- |
| 12 h | 15 h | 0.2 sec | 0.1 sec |
| 24 h | 27 h | 0.36 sec | 0.18 sec |
| 48 h | 51 h | 0.68 sec | 0.34 sec |
| 72 h | 75 h | 1 sec | 0.5 sec |
| 120 h | 123 h | 1.64 sec | 0.82 sec |
| 240 h | 243 h | 3.24 sec | 1.62 sec |
| 480 h | 483 h | 6.44 sec | 3.22 sec |
| 72 h | 72 h | 9.64 sec | 4.82 sec |
| 960 h | 963 h | 12.84 sec | 6.42 sec |

effect but also in picture distortion, because each interlaced field is from a different frame.
Remember also that when frame advance is selected the tape is moved by one instead of two tracks.
The accompanying table (below left) lists time-lapse modes and the associated delay cycles commonly used. It is not exhaustive.
A problem that manufacturers have to deal with is accelerating the tape speed to $24 \mathrm{~mm} / \mathrm{sec}$ in a very short time. In practice this cannot be achieved, the record speed being slightly less than $24 \mathrm{~mm} / \mathrm{sec}$. Without compensation, the change would result in a shift in the angle at which the signal is laid down on the tape. The angle is very precisely set at $5.9^{\circ}$ in the VHS system, and is determined by several factors that include the tape speed - a slight reducation in speed reduces the track angle slightly.
The problem is overcome by altering the drum speed while recording. The principle is simple: if a slower tape speed reduces the angle, a corresponding reduction in the drum speed will provide correction.

## Linear Slow Speed

A drawback we have not so far considered is loss of the sound recording facility: any attempt to record a linear sound track while the tape is moving in these short, intermittent bursts would produce unintelligible results.
Some machines offer time-lapse recording for up to twenty four hours with a continuous sound track. The tape is driven at a very slow speed, making it possible to lay down a sound track. But the slow speed means that the HF response is poor. Remember also that the extinction frequecy falls as the tape speed is reduced. There is also considerable wow and flutter.
There are different linear slow-speed modes, for example twelve and 24 hours, but the delay period is the same as for intermittent time-lapse operation. When the first field has been recorded, the video heads are switched off for the duration of the delay period. When the time comes to record the next field the tape, which has been running continuously, will be in the correct position in relation to the heads.
In the twelve-hour continuous mode the tape speed is $4.678 \mathrm{~mm} / \mathrm{sec}$; in the 24 -hour mode it's $2.599 \mathrm{~mm} / \mathrm{sec}$ (the standard speed is $23.39 \mathrm{~mm} / \mathrm{sec}$ ).
The track format in the slow-speed mode is the same as that in the intermittent time-lapse mode, i.e. one field is recorded each time-lapse interval. The only benefit this mode provides is the facility for recording sound.
When sound is not required in the $12 / 24$-hour modes it's best to select intermittent operation - the picture quality is better. In the linear slow-speed mode the video heads play back the same scan several times as the tape passes slowly. The result is a constantly varying signal-to-noise performance, as the head moves from the centre to one side of the track and back again. Some manufacturers attempt to overcome this problem by using all four video heads during playback. A sensing circuit in the FM stage detects which head is producing the highest FM output at any time, this output being selected as the playback signal.

## Shot Mode

This is another feature offered by some manufacturers, provision being provided for an external trigger input. When the 'shot' mode is selected, the machine waits for a trigger pulse and then records a small number of frames or fields (depending on the recording format). Once about half a dozen frames/fields have been recorded the machine returns to the pause mode.
Because the machine cannot remain in the pause mode indefinitely - the tape would be worn out by the
continuous video head scanning - it records a few frames/fields every three or four minutes in the shot mode. This enables the tape to move slowly past the heads.
The shot input is usually a normally-open (N/O) one that's taken to ground for activation. The trigger switch may be a manually-activated N/O non-latching push switch, a pressure mat or even the bell output terminals of an alarm control panel with a negative applied bell trigger.
There are also passive infra-red detectors that are designed specifically to trigger a time-lapse VCR. To provide compatibility they offer selectable-polarity switch outputs.

## Alarm Inputs

Like the shot feature, alarm recording is activated by an external trigger input. The alarm input enables more information to be recorded at the time of a possible intrusion by immediately placing the machine in the threehour mode. If, for example, we look again at the theft in Fig. 3, if the intruder activated an alarm on penetrating the area the machine would go from the time-lapse mode to which it was set to the three-hour mode.
After a preset period, which may be selectable, the machine reverts to its previous mode. The running time of an alarm recording is usually at least one minute. It may be several minutes.
Some machines have a reset input that enables normal operation to be restored manually before the internal alarm timer has cut out. This is usually a N/O nonlatching switch.

## Alarm Input Markers

Many machines have an index search facility to provide quick access to alarm events during playback. A marker signal is recorded on the control track each time an alarm input is received. During fast wind or visual search, the machine can be programmed to stop at a particular alarm event and enter the play mode.
Many manufacturers make use of the VISS (Video Index Search System) which is widely used in consumer machines. The idea is to alter, for a period of four seconds, the mark-space ratio of the control pulses at the start of each alarm recording (see Fig. 5).
The control pulse mark-space ratio is normally 60:40. To generate the VISS signal, it's changed to about 27:73 for the four-second period. The tape will be unlaced from the video heads during rewind or fast wind: it will still be partially laced however, passing the audio/control head which can thus read the control track. The signal is passed to the microcontroller chip, which analyses its mark-space ratio. On detecting the 27:73 ratio the chip initiates the stop and, possibly, the play mode. The altered mark-space ratio does not affect the operation of the phase control servo, since this relies on the timing of the pulses rather than their duration.
Some manufacturers have introduced variations to the standard VIS system to improve the search capabilities of their time-lapse machines. The machine may be programmed to record a digital signal, containing a time code, in addition to the control pulses. The operator can key in a specific day and time: the machine will then fast wind until the required time is read off, using the control head for detection. When the required time is reached, the machine laces up fully and goes into the play mode.
The number of alarm events may be displayed on the monitor screen, along with a reference number. In addition the machine may have some form of indication on the front panel, or it may include an alarm output terminal to which a warning device such as a 12 V buzzer or lamp can be attached. This output is usually a


Fig. 5: Basic VHS control track pulses (a). Modification for VISS purposes
(b).
dry relay contact, so an external 12 V supply needs to be used.

## Auto Re-record

The operation of this feature is very simple. When it's selected, the machine automatically rewinds at the end of the tape and starts to make a new recording.

## Clock Output

The clock output is a very important signal. Up to now we've considered the time-lapse feature only in the context of a single camera input. What happens if there are a number of cameras, controlled by a separate switcher unit whose output is fed to the VCR? Unless the time-lapse and camera switching are synchronised, cameras may be missed out or may be switched in half way through a recorded field.
To overcome this problem, the time-lapse delay signal generated by the VCR is made available to serve as a camera controller sync output. This is fed to the controller's external sync input to override the switching signal generated by the controller.
Some machines have a built-in camera controller. The one disadvantage of this is that the built-in controller may not have the range of features required for a particular installation.

## Servicing

It's very easy for those familiar with servicing domestic VCRs to become accustomed to time-lapse machines, since in most respects they are the same. The nature of the complaints you get may vary a little however. The customer is obviously going to be more particular about the performance of the still and frame advance functions, which are essential instead of being novelty features. In addition, main microcontroller problems often produce different symptoms because of their different programming. Although basic mechanism control is the same, domestic control systems relate mainly to timing and tuning. With a time-lapse machine the programming naturally relates more to the time-lapse modes, alarm inputs and outputs and, in more modern models, clear warning to the operator of any system faults.
The thing to bear in mind is that when a machine lands on your bench for repair it could well have been operating for twenty four hours a day for the last twelve months. So don't waste time looking for individual tape path faults. Every machine that comes in must be given a full mechanical overhaul before anything else is done. Then deal with any faults that remain.
Pay particular attention to the control head. Replace it if there are any signs of wear - on most machines it does far more than simply record and play back the control pulses. As we have seen, the control head often plays an important role in various search modes. And of course frame advance will suffer if the pulses are attenuated.
One of the more common symptoms is poor tracking in the time-lapse mode. This is simply because the frame (or field) advance isn't working as it should. In most cases cleaning and servicing the mechanism solves the problem. Pay particular attention to the brake pads or braking
mechanisms on the capstan flywheel, as these are vital to the frame advance operation. Since a time-lapse machine usually spends most of its working life stopping and starting, these items can wear.
If the machine still suffers from poor time-lapse mode tracking after a clean and service, check the condition of the capstan motor. Time-lapse operation has serious implications for this item. The constant kicking action to provide the precise tape movement places an immense strain on the motor, which requires high currents to provide the acceleration and braking action. The capstan motor will be a brushless Hall-effect type, which is far more robust than a simple brush/commutator type. Any mechanical wear will impede its operation however.
The test equipment required for time-lapse VCR servicing is basically the same as for any other machine, but you should have a pattern generator with S-VHS outputs.
There is a real bonus if you are tooled up for camcorder servicing, because you can offer a surveillance camera repair service. Many of the smaller cameras are considered to be throw-away devices however. There is a drawback in offering to service the full range of equipment: you may find that motorised camera housings are delivered to your workshop. These don't seem too large when you drive past them on the motorway. They take on an altogether different appearance when seen close up on the bench!

## Test Tapes

Your alignment tapes or home-made colour-bar test tapes can be used for time-lapse servicing. You will find it helpful to make yourself a time-lapse test recording
however. In particular you should have available a recording made on a field advance (rather than a frame advance) machine. Remember that in this mode each helical track on the tape is from a different frame, so a colour-bar recording made by a standard machine won't tell you whether the time-lapse machine is advancing just one field at a time or is slipping.
A collection of tapes with recordings made in different time-lapse modes is a very useful addition to your workshop, especially if they have been made using a camera trained on an area of activity, so that movement is clearly visible (this probably rules out the manager's office!).

## Spares

As the majority of time-lapse machines are manufactured by companies that have been well known in the brown goods industry for years, spares are usually not too difficult to obtain. In fact in some cases the chassis will be shared with a domestic model.
But some companies that are very big in surveillance are not known in the consumer electronics field. You would have to approach them directly to become a service agent. With the current rapid expansion in the surveillance industry however, manufacturers are looking for competent service agents.

## Acknowledgements

My thanks to Jim Medley of the Mitsubishi Security Equipment Group and Martin Hanson of Panasonic Service UK for their valued help in providing background information for use in this article.


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# Long-distance Television 

## DX condifions and reception. Satellite sightings and news. Roger Bunney reports. Also start of a basic guide to Sat-zapping

After an active and exciting May, Sporadic E conditions became rather quiet during June. Signal reception was mundane and repetitive, with none of the gloss of the previous month. The following SpE log sums things up:

4/6/96 RAI (Italy) ch. IA, B; Video (Italy) ch. E2; TVE (Spain) E2.
6/6/96 NRK (Norway) E2, 3.
7/6/96 TVE E3, 4; C+ (France) L2; RAI IA, B; Video E2; +PTT (Switzerland) E2, 3; RTS (Serbia) E3; NRK E3;STV (Slovakia) R2; YT (Ukraine) RI.
10/6/96 C+ L2
12/6/96 RAIIA
13/6/96 RAIIA.
14/6/96 RAI IA, B; Video E2; TVE E2-4; RTP (Portugal) E2, 3.
15/6/96 RTP E3; TVE E3, 4.
16/6/96 RTS E3; TVE E2-4.
17/6/96 RTS E3.
23/6/96 RAI IA, B; Video E2;

A colourful identification received from YLE (Finland) via Eutelsat II F4 at TPE. Photo courtesy John Locker.

TVE E2, 3; C+ (Corsica) L4.
25/6/96 TVE E3.
28/6/96 NRK E2, 3.
30/6/96 TVE E2-4; RAI IA; Video E2; RTS E3

We'll keep our fingers crossed for July! My thanks to Cyril Willis (King's Lynn), Peter Schubert (Rainham) and Garry Smith (Derby) for supplementing my own meagre log.
In a letter dated 19/6/96 Ryn Muntjewerff (Holland) comments that during an SpE opening the previous week he received JTV (Jordan) ch. E3, Iran ch. E2, Syria ch. E2, RTSH (Albania) ch. IC and an unidentified ch. E3 cartoon dubbed into Arabic with an octagon-shaped logo containing a palm tree in the top, left corner. Has anyone any ideas about this? Garry Smith mentions that YT-2, the Ukrainian second network, uses a white "YT-2" identification at the top left - also that Nova TV is the replacement for the former CST-1 network in the Czech Republic.

## Satellite Sightings

June was a busy month in the Clarke belt, with numerous Euro '96 feeds and coverage of the G7 Summit talks in Lyon. Interesting sightings included signals from the Israeli AMOS-1 satellite and a mystery Russian satellite identified as Gorizont 15.
Our congratulations to Roy Carman (Sandown, IW) on the first UK sighting from AMOS -1 at $4^{\circ} \mathrm{W}$. During the afternoon of July 1st he received, at $11 \cdot 301 \mathrm{GHz}(\mathrm{H})$, weak signals using a 90 cm dish and threshold extension. I checked at

1800 on July 2nd and found a sparkly though acceptable signal, using my 1.5 m dish and an Echosphere LT730 receiver with the threshold set for 12 MHz bandwidth. A PM5544 test pattern was being transmitted, with "Amos-l" in the top panel and numbers in the lower panel. There was no audio carrier on either the 1st or 2nd. I assume that this was the East European beam. Another report the previous weekend suggested that the Israeli spot beam had been received in the eastern Mediterranean.
The normally quiet Intelsat 515 at $18^{\circ} \mathrm{W}$ has been active in recent weeks with several European feeds from Moscow. NBC and CNN were both seen running NTSC news reports following the Russian elections. Further NTSC news packages were seen via 515 later in the month, at $11.582 \mathrm{GHz}(\mathrm{H})$. An unusual sighting was the Spanish "ARGANDA RETEVISION" test pattern, far from its usual Hispasat source at $30^{\circ} \mathrm{W}$. Previous information indicated that the 702 satellite was to move from $1^{\circ} \mathrm{W}$ to $18^{\circ} \mathrm{W}$, but another report suggests that 702 is to be slotted in elsewhere. The strong signal levels tend to confirm that 702 has indeed arrived at $18^{\circ} \mathrm{W}$. Stay tuned!
The BBC units UKI-118 (Southampton) and UKI-231 (Plymouth) have been busy along the south/south west coasts, the former usually linking live into the Spotlight magazine programme. A recent UKI-118 transmission seen via Orion came from Barnstaple UKI-118 was at Modbury, South Devon on the 2nd, and on June 18th it was transmitting with SIS
(sound-in-syncs) from the BMA conference at Brighton via the French Telecom 2C. Ulster TV's UKI-120 is another Telecom 2C customer: on the 25 th it was covering the Prince Charles’ banquet aboard the Royal Yacht Brittania in Belfast harbour.
The Italian horse and trap racing that was frequently received via Eutelsat II F3 ( $16^{\circ}$ E) last winter and then disappeared (we assumed that it had gone digital) has reappeared via $\mathrm{F} 2\left(10^{\circ} \mathrm{E}\right)$ - check at around $11 \cdot 163 \mathrm{GHz}(\mathrm{H})$. The same satellite has been carrying the former Yugoslav war crimes trials in The Hague - Roy Carmen advises checking at $11.073 \mathrm{GHz}(\mathrm{H})$ for daytime coverage.
Roy Carman also received an unlisted Russian satellite of the Gorizont type at $34^{\circ} \mathrm{E}$, with
"Mockba 6" and "TC1 THROUGH T GORIZONT 34E" captions, on several June mornings. The frequency was the usual Gorizont Ku band 11.525 GHz . Ken Suddes (Welwyn) has also reported reception from this satellite, with an obviously inclined orbit.
Subsequently John Locker checked the Norsat Internet website where Roy reported reception of Gorizont 15 at $33^{\circ} \mathrm{E}$ with a $5.6^{\circ}$ inclination - it's best seen in the UK at $0800,2.000$ etc. hours. Another new sighting reported by John is a GALS Russian DBS craft at $36^{\circ} \mathrm{E}$. A weak (East spot?) downlink was visible in the Wirral at $12 \cdot 16 \mathrm{GHz}$ with RHC polarisation.
Ken Suddes surfs the text pages for satellite news. He suggests trying NBC page 171, EBN 645-8 and UK Gold 333. Can anyone suggest additions to this list?
During a typical week there are many corporate and instructional transmissions via Orion ( $37.5^{\circ} \mathrm{W}$ ), many still in the clear. On most mornings Orion airs its own promotional offering - an interesting video that's well worth viewing.

## The Middle East

Ruud Brand of the BDXC has been on holiday recently in Israel. He reports that PBC (the Palestine Broadcasting Corporation) is in operation in the Gaza strip, using ch. E25. The PM5544 test pattern and colour bars with logo are used. Programmes have a logo at the top right corner. There was no sign of the ch. E4 transmitter listed in the World Radio and Television Handbook.

The Syrian HOMS transmitter uses ch. E2, with separate services before and after 1600 GMT. Early programmes carry the top left corner logo "SYRIA": after 1600 this changes to "SYR". There is no text or VITS in the field blanking interval.
Jordanian programmes start at 0430 GMT, preceded by the PM5544/5534 pattern. There is much information in the field blanking period with JTV-1. JTV-2 opens at 1300 GMT.
There are two Israeli networks, IBA-1 and IBA-2. The top left logo for IBA-1 is either three overlapping circles or a candlestick. IBA-2 uses a large " 2 ".

## DAB

With the growth of digital audio broadcasting in Band III, though still experimental, more TV transmissions are being transferred to UHF. The Norwegian TV2 transmitters at Bergen and Oslo are to move to chs. E45 and E30 respectively. In Germany, the MDR-1 Dequede and Sonneberg transmitters are moving from ch. E12 to chs. E24 and E44. These transmitters used to give excellent Band III signals when tropospheric conditions were right, and will be missed. No definite time scale has been announced, but the changes are likely to take place during the next twelve months.

## Satellite News

As mentioned in Teletopics last month, the new Astra slot for SES's series 2 digital satellites will be at $28 \cdot 2^{\circ} \mathrm{E}$. Orders for the 2 A and 2B satellites have already been placed: 2 A is expected to be launched in August 1997.
Sony has shipped quantities of set-top decoder boxes from its Welsh plant at Pencoed to France for the start of the Canal Plus satellite digital TV service, the first in Europe. Kirch's seventeenchannel German digital TV service DF1 was due to start on July 28th. Further expansion to fifty channels is planned for late October, via Astra 1F. BSkyB has agreed to take a stake of up to 49 per cent in DF1 and will share the cost of developing the venture. The combined group envisages a 200 channel service. BSkyB is continuing with plans for a 200 channel UK service to start late next year. It has sent a technical specification to set-top decoder manufacturers and has told them that it would like to see a million

units available in shops by September 1997.

## Basic Guide to Sat-zapping

Searching the Clarke belt for exotic signals is an easier hobby than traditional DX-TV, though perhaps a bit more expensive. Anyone interested in getting started would be well advised to buy a copy of the latest (5th) edition of John Breeds' Satellite Television Installation
Guide, which is available from
Swift Television Publications, 17

This Asiavision feed from Malaysia is another offering from $7^{\circ} E$. The feed to Europe is in C band, with European distribution in Ku band. Photo from John Locker. Nofe that the signal in this and the previous photo was SIS stabilised using an EBU decoder which includes audio recovery.


[^1]

Just to prove
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come to life with Ku band transmissions, though they are rare.

Pittsfield, Cricklade, Wilts SN6 6AN (phone 01793750620 ) at $£ 15$ plus $£ 2$ postage (UK). It's a truly practical guide that will answer 99 per cent of your questions.
Our view of the Clarke belt in the UK runs from the horizon in the south east upwards to about $25-33^{\circ}$ elevation (depending on your location) when looking due south then back to the horizon in the south west. Thus for reception from as many satellites as possible we need to be able to track this section of the belt accurately. Tracking dishes are driven by either an $\mathrm{H}-\mathrm{H}$
(horizon-to-horizon) or a polar mount. The former is compact, neat and generally quiet in operation, but is more expensive than a polar mount.
The motor drive for the dish is remotely controlled by either the satellite receiver itself or a standapart controller. A multiway cable links the indoor unit to the motor, sending power and receiving back direction sensing pulses.
There are two main types of dish, offset and prime-focus. The former is the type used for about 99 per cent of Sky systems, with an LNB support arm that extends from beneath the dish. The prime-focus type is a circular dish with the LNB mounted centrally. For satzapping you should buy the largest dish you can afford, 90 cm being the minimum. The larger the dish the higher its gain and the sharper its beam width. Lenson Heath produce well-made, cost-effective systems. This company's onemetre offset dish is a good compromise solution. Remember that planning regulations allow a dish of up to 90 cm to be erected without permission in most areas.

Ideally you should be able to track from say $70^{\circ} \mathrm{E}$ to $70^{\circ} \mathrm{W}$. Select a position that gives maximum coverage. My present location offers from $24^{\circ} \mathrm{E}$ to $40^{\circ} \mathrm{W}$ in winter. In summer the coverage to the east falls to $13^{\circ}$ because of trees - your dish must see a clear sky.
Some dish motors are noisier than others. If you mount the dish on a wall, ensure that the motor is a lownoise type - otherwise neighbour problems will occur. Motor noise travels along a wall, which is bad news for sat-zapping late at night. Where possible it's best to use a garden stand for the dish. Always try to minimise the visual impact of the dish - avoid bright white when a laurel green version is available. It's a good idea to talk to your neighbours before you create your own Jodrell Bank!
I've had to deal with many domestic problems in the past relating to aerial masts, dishes etc. If you want advice on this and equipment sources I will try to help - include a stamped, addressed envelope please with any requests sent to me via the magazine's editorial office.

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# An RGB-VGA Conversion 

A way of using the Microvitec Series $\mathbf{7}$ monitor as a VGA driven unit. Ray Porter, M.Sc., C.Eng., MIEE describes the principles and practicalities

Many readily available surplus RGB monitors will, after relatively minor modification, operate with either older PCs that use TTL levels for their colour signal outputs (the CGA and EGA video standards) or the newer VGA analogue signal standard. The particular conversion described in this article was carried out to provide a colour display for a mono 486 lap-top computer, but it's also a way of providing a workshop test monitor for 8086, 286, 386 and 486 computer repairs. A Reuters CMV125MV monitor, which is a badged Microvitec 12L728NR3 (Series 7 chassis), was used as the patient. It was made in the late Eighties. The extra circuitry required can be laid out on a piece of stripboard, uses only a few standard components, and is powered by the monitor's 12 V supply. There's room to mount the extra board behind the RGB connectors.

## Standards

EGA and CGA sync and colour signals leave the PC via a 9 -pin, D-type socket, entering the monitor via an identical connector. The first step is to test the monitor, using a suitable CGA/EGA PC if possible. You'll need a pin 1-to-1 etc. connected 9-pin, D-type cable for this test. VGA output from a PC is via a $15-$ way, high-density D-type socket (i.e. the shell size is that of a normal 9-way socket).
VGA computers have separate colour, colour return, sync and sync return pins, as shown in Fig. 1, but require a combined colour plus sync signal at each of the red ( R ), green ( G ) and blue (B) BNC input connectors. The Microvitec Series 7 chassis has a duplicate set of BNC sockets for connecting monitors in parallel. It takes its sync pulses from the G signal, but for the correct dynamic colour range the other two channels also require the voltage offset produced by the sync pulses. A test showed that 900 mV of colour signal atop 300 mV of negative-going sync produced full colour saturation.

## Modification Details

Fig. 1 shows the circuitry. The line and field sync pulses are OR gated and added to the analogue colour signals as these are being fed to the monitor's RGB

BNC input sockets. These inputs go to differential amplifiers: the positive input is to the centre pin, the BNC socket's outer being the negative input.
A rear panel switch enables either a $75 \Omega$ or a highimpedance differential input to be selected. A VGA monitor's normal input impedance is $75 \Omega$, but set the switch to high Z . The reason for this is that a VGA monitor requires about 600 mV for full colour saturation while these monitors require 900 mV . A test on the computer signal levels at the end of two metres of $75 \Omega$ coaxial cable showed that for full colour saturation 1.7 V was available through a $150 \Omega$ source impedance. When a modified (220 ) cable termination was used, the required colour signal voltage was obtained without any mis-match problems being noticeable.
The sync signals in the VGA type 3 video standard ( $640 \times 480$ pixels) use negative logic, i.e. $0 \mathrm{~V}=$ true, $5 \mathrm{~V}=$ false. This means that they can be OR gated using a positive logic NAND gate (ICla). The output from this is inverted (IC1b) and then used to drive transistor $\operatorname{Tr} 1$, which switches a 300 mV source on and off at the negative amplifier inputs. Addition of the sync and colour signals is carried out by the differential amplifier action. Although I connected all three negative amplifier inputs together and drove them from the same 300 mV source, no crosstalk or noise was apparent during my tests.
The layout of the modification circuit is not critical, but the input cables (each 2 m of $75 \Omega$ coax) should be arranged so that the outers can be earthed closely together. Keep the output cables as short as possible. The 12 V supply required can be found at pins 14 (+ve) and $7(0 \mathrm{~V})$ of a 4047 DIP chip mounted on the RGB input PCB. The few mA consumed by the extra circuit is provided without any difficulty.

## Notes on the $\mathbf{1 2 L 7 2 8 N R} 3$

(1) The model number is on a paper label which is stuck to the tube's bowl. The name Microvitec appears on only the tube base PCB.
(2) The power supply is based on a TDA4601 chopper control chip. A red LED on the power supply PCB


Fig. 1: Circuit diagram of the RGB-to-VGA converter. IC1's supply pins are 14 (5V) and 7 (chassis). Pin 12 of PL1 may need to be left unconnected as it is a computer input that reads the monitor's interlacing capability.
lights when the power supply is working. The chopper transistor is an SGSIF423. It will fail should C17 ( $1 \mathrm{nF}, 2 \mathrm{kV}$ ) become dry-jointed. A BU508AF will work as a replacement.
(3) The HT for the line output stage is generated by a power switching monostable which operates with a 555 timer chip and is triggered by the line sync pulses. The monostable's output is smoothed by an $L C$ filter to provide a supply whose voltage is proportional to the line scan frequency. This ensures that the line scanning rate is proportional to the line sync pulse frequency. A check on this voltage showed that it is 45 V with CGA sync ( 15.625 kHz ) and 96 V with VGA sync ( $31 \cdot 25 \mathrm{kHz}$ ).
When there are no sync pulses the line scanning stops but the field scanning continues: this is a 'green feature', to reduce power consumption.
The EHT voltage doesn't vary with the sync frequency. It depends on the rate-of-change of the flux in the line output transformer. This is fixed by the tuning of the windings, as with a conventional TV set.
(4) EW correction is based on a pulse-width modulated parabolic waveform that's derived from a TDA4950 chip. There is no need for a power transistor, as the power loss with this digital technique is low.
(5) The sync PCB has a red LED which comes on when sync pulses are being received.
(6) It's difficult to dismantle the monitor to gain access to the bottom PCB, on which the line output transformer is mounted.
Pull off the brightness and contrast control knobs
and undo the potentiometer fixing nuts. Then undo the four CRT surround fixing screws, lift the CRT slightly and pull out the front PCB with the contrast and brightness potentiometers on it. After refixing the CRT surround you can slide out the bottom PCB, which will stand up or lie flat at the rear of the chassis, with all cables attached for servicing the module.
The side PCBs can be lifted and hooked in position to give better access generally.


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