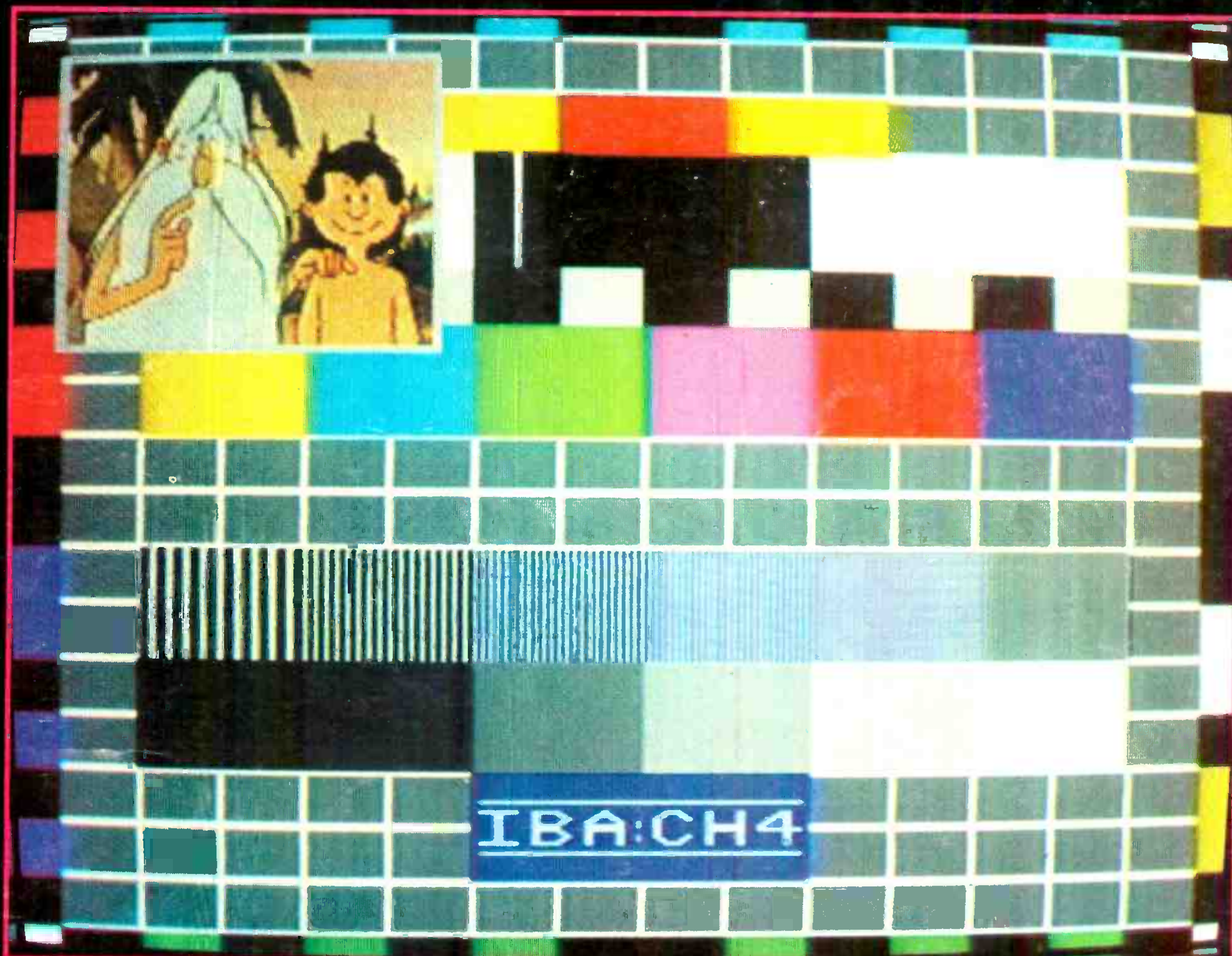
JULY 1987

Australia $2.20, New Zealand $2·95 (inc. GST), Malaysia $5·95 £1·30

# TELEVISION

## SERVICING·PROJECTS·VIDEO·DEVELOPMENTS




**The S-VHS Specification**

**TX9 Thyristor PSU Servicing**

**Series and Shunt Networks**

**Video-8 Audio Techniques**

**A Vintage TV Restoration**

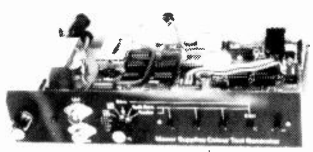
**VCR Clinic • The Glue Gun**

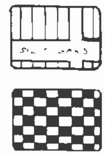
**TV Fault Finding • DX-TV**

# MANOR SUPPLIES

## MKV PAL COLOUR TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE





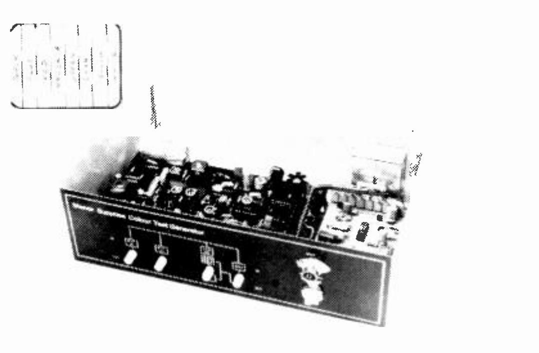
★ 40 different patterns and variations.
★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
★ Chequerboard.
★ Mono outputs with border castellations, cross hatch, grey scale, vertical lines, horizontal lines and dots. UHF modulator output plugs straight into receiver aerial socket.
★ Additional video output for CCTV & VCR.
★ Facilities for sound output.
★ Easy to build kit, standard parts. Only 2 adjustments. No special test equipment required.
★ Mains operated with stabilised power supply.
★ All kits fully guaranteed with back-up service.
★ Also available with VHF Modulator.

| | |
|---|---|
| Price of Kit | **£70.00** |
| Case (10"×6"×2¼") app. | **£8.60** |
| Optional Sound Module (6MHz or 5.5MHz) | **£3.90** |
| Built & Tested in Case including Sound Module | **£108.00** |

SPECIAL TEST REPORT 'TELEVISION' DEC. 1982

Post/Packing £2.80
Add VAT 15% TO ALL PRICES

## PAL COLOUR BAR GENERATOR (Mk4)



★ Output at UHF, applied to receiver aerial socket.
★ In addition to colour bars R-Y, B-Y etc.
★ Cross-hatch, grey scale, peak white and black level.
★ Push button controls, battery or mains operated.
★ Simple design, only five i.c.s on colour bar P.C.B.

**PRICE OF MK 4 COLOUR BAR GENERATOR KIT £30.00. CASE £8.60. BATT HOLDERS £4.20. MAINS SUPPLY KIT £4.20 (Combined P&P £2.80).**

MK 4 (BATTERY) BUILT & TESTED £58.00 + £2.80 P & P.
MK 4 (MAINS) BUILT & TESTED £68.00 + £2.80 P & P.
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £5.75.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

ADD VAT 15%

**TELETEXT DECODER PANELS (TESTED)**
Mullard VM6101 **£30.00**, Philips KT3, K30 **£30.00**, Texas XMII (TIFAX) **£28.00** (untested £5.00) p.p. £1.80

**THORN TX9 MK2/3, TX10, teletext**
Mullard Decorder panel + Interface **£35.00** p.p. £1.80
**THORN TX10, PHILIPS G11 PRESTEL, TELETEXT**
Mullard Units VM 6230, 6330 plus Line Coupler & Interface **£38.00** p.p. £2.50

# TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

LOPTS, TRIPLERS, PANELS, TUNERS, SELECTORS ETC.

**SPECIAL OFFER** Mullard/Philips quality UHF modulator (audio & video input) ex new equipment **£5.00** p.p. £1.00.
**PHILIPS G11** 6 position touch tune channel selector units **£16.00** p.p. £1.80 (can replace earlier mechanical selector unit).
**PHILIPS G11 PANELS** (tested).
Frame, IF, decoder **£18.00** each p.p. £2.00. Scan **£28.00** p.p. £2.80.
**PHILIPS G11 PANELS** ex rental (untested).
Scan **£10.00**, Frame, Decoder **£5.00** p.p. £2.00.
**PHILIPS HANDSETS (New Replacements)** p.p. £1.50.
**G11** Ultrasonic Nontext **£22.50**, Infra red Text **£22.50**.
**KT3** Non text (RC4001) **£20.00**, **KT3, K30 etc.** Text **£26.50**.
**PHILIPS HANDSETS** Ex rental, text, Untested. KT3, K30, **£3.50** p.p. £1.00.
**COLOUR MANUALS** p.p. 50p.
**PHILIPS** G11 **£3.50**, KT3 **£3.50**, CTX-E **£1.50**, CTX-S **£1.50**.
**THORN REMOTE CONTROL HANDSETS**
**TX9 ULTRASONIC** (3-button) **£15.00**; **TX9, TX10** Infra red (type 725) **£18.00**; **TX9, TX10** Infra red Teletext **£20.00**, p.p. £1.20.
**TX9** Ultrasonic remote handset transducer **£2.00**, switches 3 for **£1.50** p.p. 50p.
**TX9/TX10** Teletext interface panel (1524) **£5.00** p.p. 80p.

**THORN TX9** Ultrasonic Remote/Control Receiver panels. **£8.50** p.p. £1.50.
**TX9, TX10** Facia control panel incl. infra-red remote receiver **£8.50** p.p. £1.80.
**THORN TX9, TX10** Saw Filter IF Panel. **£5.00** p.p. 80p.
**TX9, TX10** Remote & tuning control panel (1515) **£10.50** p.p. £1.80.
**SAW FILTER IF AMPLIFIER PLUS TUNER** complete and tested for T.V. Sound & Vision. **£28.50** p.p. £1.20.
**PAL DECODER KIT** (Video to RGB) for Monitors **£27.00** p.p. £1.00.
**PAL ENCODER KIT** (RGB to Video) **£18.50** p.p. £1.30.
**CROSS HATCH UNIT KIT**, Aerial Input type, incl. T.V. sync. and UHF Modulator, Battery Operated, also gives Peak White & Black Levels, can be used for any set. **£12.00** p.p. 80p. (Alum. Case **£2.90** p.p. £1.40.) **ADDITIONAL GREY SCALE** Kit **£2.90** p.p. 45p.
**UHF SIGNAL STRENGTH METER KIT £22.00** Alum. Case **£2.90**. De Luxe Case **£8.60** (Built & Tested **£48.00**) p.p. £2.30.
**CRT TESTER & REACTIVATOR KIT** For Colour & Mono complete with Case, Panel Meter Indicator – can be adapted for latest CRTs **£29.50** p.p. £2.80.
**BUSH A823** Convergence, Time Base Panels **£5.00** each p.p. £1.80.
**GEC 20AX** Line Time Base **£18.00** p.p. £2.00.
**ITT CVC30 SERIES.** Convergence & Purity Control Panels, **£5.00** p.p. £1.50.
**ITT CVC30 SERIES PANELS SURPLUS** (untested) **£5.00 each.** CMP31, CMF31, CMA30, CM532, p.p. 80p; CMD33, p.p. £1.80.
**THORN TX9** Panels ex factory for small spares. Includes I.Cs & Semiconductors etc. **£3.00** p.p. £1.80.
**THORN TX9** Panels salvaged ex factory for spares incl. Electrolytic & Mains Transformers **£8.50** p.p. £3.00.
**THORN 8000, 8500, 8800** IF Decoder Panels Tested **£10.00** p.p. £2.30.
**THORN 8000/8500** IF/Decoder Panels salvaged **£3.20** p.p. £1.80.
**THORN 9000** IF Decoder Panel **£6.00** p.p. £2.30.
**THORN 9000** IF Decoder Panels Salvaged. For spares **£2.50** p.p. £1.80.
**PHILIPS G8/G9** IF Decoder Panels for small spares incl ICs **£2.50** p.p. £1.60.
**PHILIPS G8** Line Driver Panel incl. Equalizing Coil. **£1.00** p.p. 60p.
**GRUNDIG 8630** Series Varicap Tuners **£5.00** p.p. £1.00.
**VARICAP TUNERS** U321, U322/204, ELC1043/05 **£7.80** p.p. £1.00.
**VHF** Philips, NS - **£6.80** p.p. £1.00.
**BUSH "TOUCH TUNE"** T20/22 Series Fascia Unit **£7.50** p.p. £1.50.
**VARICAP UHF-VHF** ELC 2000S **£9.80** p.p. £1.00.
**UHF/625 TUNERS**, many different types in stock. DECCA Bradford 5 position, MULLARD 4 position **£2.50**, JAP Rotary **£4.80** p.p. £1.80.
**TV SOUND** IF Panels **£6.80** p.p. £1.00.
**LOPTS** New and guar P/P **£1.50**, Bobbins **80p.**

| | | | |
|---|---|---|---|
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| 1590, 1591, 1612, 1613, 1712 | £4.80 | **R.B.M.** 120, 122 | £9.80 |
| **FERGUSON** 3787 (Normende) | £9.80 | **R.B.M.** 120, 122 Bobbin | £5.60 |
| **THORN** 1600, 1615, 1690, 1691, 1790 | £9.00 | **DECCA** Bradford (state Mod No) | £8.80 |
| **THORN** 3000/3500 SCAN ETH | £6.90 | **DECCA** 80, 100 | £8.80 |
| **THORN** 8000, 8500, 8800 | £12.80 | **FIDELITY** ZX2000, 3000 | £14.00 |
| **THORN** 9000 to 9600 | £9.80 | **GEC** 2110 series | £10.60 |
| **THORN** TX9 | £12.50 | **ITT** CVC 5 to 9, CVC20 | £9.80 |
| **THORN** TX10 | £16.50 | **ITT** CVC 25, CVC30 series | £8.80 |
| **SPECIAL OFFER** | | **ITT** CVC 45 | £9.80 |
| **DECCA** 1700, 2001, 2020, 2401, 2420 | £3.80 | **PYE** 725 (90°) 731 to 741 | £9.20 |
| **ITT** VC300 | £4.80 | **PHILIPS** G8 | £8.80 |
| **GEC** 2040 Junior Fineline | £2.80 | **PHILIPS** G9 | £10.80 |
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| **RBM** A823 | £4.80 | **PHILIPS** K13 | £9.80 |
| **GEC** 2028, 2040, 2100 | £4.80 | **PHILIPS** K30, K35 | £18.50 |
| **PYE** 691-7 chassis type only | £5.00 | **PHILIPS** CTX-E | £21.00 |
| **PHILIPS** K9 | £6.80 | **PHILIPS** CTX-S | £21.00 |

**OTHERS AVAILABLE, PRICES ON REQUEST.**
**TRIPLERS** Full range available Mono & Colour
**SPECIAL OFFER TRIPLERS**
**THORN** 3000/3500 **£2.50**, **PYE** 725/731 (4 lead) **£1.50** p.p. £1.20
**THORN** 1500 5 Stick **£1.50**, 1500 3 Stick **£1.50** p.p. 80p.
6·3V CRT Boost Transformers for Colour & Mono **£5.90** p.p. £1.40.
**THORN TX10** focus control **£7.50** p.p. £1.00

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# TELEVISION

July 1987

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On sale June 17th




***CORRESPONDENCE***
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

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## this month



**OUR NEXT ISSUE DATED AUGUST WILL BE PUBLISHED ON JULY 15**

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|---|---|
| AN214Q | 3.91 |
| AN240 | 3.84 |
| AN318 | 6.37 |
| AN262 | 4.10 |
| AN301 | 5.15 |
| AN715Q | 3.97 |
| AN6341N | 8.97 |
| AN6344 | 7.85 |
| AN6360 | 6.81 |
| BA521 | 2.80 |
| BA536 | 3.00 |
| CA555 | 46 |
| CA556 | 84 |
| CA741 | 25 |
| CA748 | 45 |
| CA1532 | 4.20 |
| CA3065 | 1.80 |
| DIC141WF | 30 |
| CV12E | 3.07 |
| GH3F | 1.82 |
| HA1151 | 3.89 |
| HA1342 | 3.58 |
| HA1306N | 2.60 |
| HA1366WR | 2.80 |
| HA1377 | 3.20 |
| HA11219 | 4.21 |
| HA11244 | 4.04 |
| HA1741 | 23.22 |
| IS1555 | 43 |
| LA3350 | 1.59 |
| LA4031P | 3.21 |
| LA4032P | 3.15 |
| LA4102 | 3.37 |
| LA4112 | 3.25 |
| LA4422 | 3.28 |
| LA7801 | 2.20 |
| LC7130 | 5.93 |
| LC7120 | 5.87 |
| LC7137 | 5.50 |
| LM1011 | 3.25 |
| LM1340T | 75 |
| LM8361= MM5387ANN | 4.15 |
| M293 | 7.10 |
| M30790SP | 6.90 |
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| MC14493 | 8.97 |
| MN1219 | 11.43 |
| MB3712 | 2.60 |
| MC1307 | 1.99 |
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| MC1330P | 1.84 |
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| MC1349 | 1.99 |
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| ETTR6016 | 2.20 |
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| ML237 | 2.50 |
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| ML239 | 2.50 |
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| ML923 | 2.90 |
| ML928 | 2.18 |
| NSM5807 | 7.87 |
| MS1513L | 2.80 |
| MS1515L | 3.28 |
| SAA1025 | 8.50 |
| SAA1124 | 5.34 |
| SAA1250 | 4.99 |
| SAA5000 | 6.15 |
| SAA5010 | 6.30 |
| SAA5012 | 6.50 |
| SAA5020 | 5.90 |
| SAA5030 | 8.25 |
| SAA5050 | 8.50 |
| SAF1032 | 6.30 |
| SAF1039 | 7.77 |
| SAS560S | 2.07 |
| SAS570S | 2.07 |
| SAS660 | 3.25 |
| SAS670 | 3.25 |
| SAS580 | 2.90 |
| SAS590 | 2.90 |
| SG-264A | 5.12 |
| SG629 | 8.05 |
| SG-6533 | 13.20 |
| SL901B | 7.00 |
| SL917B | 9.25 |
| SL1310 | 1.80 |
| SL1327Q | 1.20 |
| SL1430 | 1.58 |
| SL1432 | 3.36 |
| SL76544 | 2.05 |
| SL490 | 1.89 |
| SN76709 | 8.00 |
| SN76115N | 2.27 |
| SN76131N | 2.00 |
| SN76226DN | 2.72 |
| SN76227N | 1.18 |
| SN76533N | 1.70 |
| SN76033N | 2.49 |
| SN76544N | 2.35 |
| SN76660N | 80 |
| SN76666N | 1.52 |
| SN76530A | 1.47 |
| STK015 | 7.36 |
| STK433 | 5.65 |
| STK435 | 9.06 |
| STK436 | 6.50 |
| STK437 | 7.85 |
| STK439 | 8.40 |
| STK459 | 9.50 |
| STK441 | 11.57 |
| STK461=465 | 12.60 |
| STK463 | 14.30 |
| STK2129 | 17.27 |
| STR441 | 6.50 |
| STR454 | 4.73 |
| STR451 | 6.50 |
| STR6020 | 8.50 |
| SW153 | 3.90 |
| TA7050P | 95 |
| TA7051P | 95 |
| TA7063P | 2.20 |
| TA7074P | 3.46 |
| TA7108P | 3.43 |
| TA7120P | 2.43 |
| TA7129AP | 3.76 |
| TA7130P | 1.93 |
| TA7146P | 4.67 |
| TA7193P | 5.67 |
| TA7171P | 8.90 |
| TA7172P | 8.90 |
| TA7173P | 8.90 |
| TA7176P | 2.50 |
| TA7202P | 4.27 |
| TA7204P | 3.77 |
| TA7205AP | 3.72 |
| TA7208P | 3.40 |
| TA7210P | 6.60 |
| TA7222 | 2.42 |
| TA7223P | 3.74 |
| TA7227P | 5.98 |
| TA7228P | 5.98 |
| TA7310P | 2.78 |
| TA7609P | 4.39 |
| TA7611AP | 2.92 |
| TAA570 | 3.98 |
| TAA310 | 2.83 |
| TAA320 | 2.00 |
| TAA550 | 55 |
| TAA630 | 3.90 |
| TBA120SA | 1.49 |
| TBA120B | 1.30 |
| TBA120SB | 1.37 |
| TBA120T | 1.47 |
| TBA120U | 1.49 |
| TBA1440G | 2.20 |
| TBA395 | 1.75 |
| TBA396 | 1.75 |
| TBA440N (TBA1441) | 2.75 |
| TBA440P (TBA1440G) | 2.50 |
| TBA480Q | 1.82 |
| TBA510 | 3.00 |
| TBA520(Q) | 1.68 |
| TBA530(Q) | 1.38 |
| TBA540 | 1.76 |
| TBA560(Q) | 1.93 |
| TBA570 | 1.79 |
| TBA690 | 1.50 |
| TBA700 | 2.12 |
| TBA720 | 2.64 |
| TBA750 | 2.98 |
| TBA800 | 1.62 |
| TBA810AS | 1.38 |
| TBA820 | 1.70 |
| TBA820M | 1.25 |
| TBA890 | 3.94 |
| TBA920(Q) | 3.00 |
| TBA950(2X) | 3.25 |
| TBA970 | 4.09 |
| TBA990 | 2.75 |
| TCA760 | 2.30 |
| TCA270SQ | 2.50 |
| TCA800 | 5.95 |
| TCA830 | 3.44 |
| TCA900 | 2.20 |
| TCA910 | 2.20 |
| TCA940 | 1.95 |
| TCP4621AF6 | 13.87 |
| TDA440 | 2.20 |
| TDA1002 | 1.95 |
| TDA1003A | 5.50 |
| TDA1006A | 2.50 |
| TDA1005 | 3.60 |
| TDA1010 | 3.30 |
| TDA1011 | 4.00 |
| TDA1035 | 4.70 |
| TDA1037 | 2.95 |
| TDA1044 | 4.37 |
| TDA1060A | 4.44 |
| TDA1083 | 1.68 |
| TDA1170S | 3.00 |
| TDA1190 | 3.50 |
| TDA1190P | 3.50 |
| TDA1180 | 2.91 |
| TDA1236 | 3.44 |
| TDA1270 | 3.95 |
| TDA1327 | 1.70 |
| TDA1352B | 1.60 |
| TDA1412 | 1.50 |
| TDA1415 | 1.40 |
| TDA1470 | 4.67 |
| TDA1770 | 5.60 |
| TDA1908A | 1.95 |
| TDA2002 | 2.80 |
| TDA2003 | 1.20 |
| TDA2004 | 2.52 |
| TDA2006 | 1.78 |
| TDA2010 | 2.40 |
| TDA2140 | 5.95 |
| TDA2151 | 3.25 |
| TDA2020 | 4.66 |
| TDA2030 | 2.80 |
| TDA2270 | 1.65 |
| TDA1870 | 6.46 |
| TDA2522 | 2.66 |
| TDA2523 | 3.40 |
| TDA2524 | 2.25 |
| TDA2525 | 4.00 |
| TDA2530 | 2.70 |
| TDA2532 | 2.90 |
| TDA2540 | 3.84 |
| TDA2541 | 3.84 |
| TDA2560 | 3.50 |
| TDA2576A | 3.75 |
| TDA2577 | 4.73 |
| TDA2578A | 5.12 |
| TDA2581 | 3.95 |
| TDA2582 | 2.60 |
| TDA2593 | 2.95 |
| TDA2600 | 6.90 |
| TDA2610 | 3.20 |
| TDA2611A | 2.35 |
| TDA2640 | 2.90 |
| TDA2653 | 5.90 |
| TDA2680 | 3.40 |
| TDA2690 | 2.72 |
| TDA3190 | 2.00 |
| TDA3330 | 2.21 |
| TDA3500 | 6.90 |
| TDA3560 | 6.00 |
| TDA3561 | 6.66 |
| TDA3562 | 8.60 |
| TDA3571 | 3.75 |
| TDA3651A | 4.50 |
| TDA3652 | 6.00 |
| TDA3810 | 3.86 |
| TDA3950 | 4.37 |
| TDA4420 | 5.55 |
| TDA4500 | 5.84 |
| TDA4503 | 5.68 |
| TDA4600 | 2.95 |
| TDA4600-2D | 2.95 |
| TDA8180 | 4.00 |
| TDA9503 | 4.21 |
| TEA1009 | 1.86 |
| TL494CN | 6.57 |
| UPC554 | 2.63 |
| UPC566H | 2.95 |
| UPC575C2 | 3.40 |
| UPC576H | 2.60 |
| UPC585 | 3.06 |
| UPC587C2 | 2.34 |
| UPC1025H | 2.95 |
| UPC1026H | 1.24 |
| UPC1028H | 2.52 |
| UPC1032H | 94 |
| UPC1042C | 1.56 |
| UPC1156H | 4.26 |
| UPC1158H | 3.50 |
| UPC1163H | 2.48 |
| UPC1167C2 | 2.70 |
| UPC1168C | 3.20 |
| UPC1176C | 2.53 |
| UPC1177H | 3.15 |
| UPC1178C | 4.21 |
| UPC1180C | 1.84 |
| UPC1181H | 1.62 |
| UPC1182H | 2.95 |
| UPC1183H | 2.48 |
| UPC1185H | 3.66 |
| UPC1186H | 1.60 |
| UPC1188H | 4.99 |
| UPC1190G | 1.20 |
| UPC1198C | 4.00 |
| UPC1200V | 1.18 |
| UPC1211V | 2.70 |
| UPC1212V | 1.34 |
| UPC1215V | 1.66 |
| UPC1216V | 1.20 |
| UPC1217G | 2.24 |
| UPC1218H | 1.80 |
| UPC1223C | 2.20 |
| UPC1225H | 2.00 |
| UPC1226C | 1.50 |
| UPC1227V | 1.20 |
| UPC1228H | 54 |
| UPC1230H | 4.39 |
| UPC1238 | 2.50 |
| UPC1245V | 1.35 |
| UPC1277 | 4.81 |
| UPC1350C | 4.15 |
| UPC1353C | 4.76 |
| UPC1365C | 6.38 |
| UPC1356C2 | 2.08 |
| UPC1367 | 2.00 |
| UPC1358H | 1.88 |
| UPC1360C | 2.20 |
| UPC1363C | 2.16 |
| UPC1368H2 | 2.15 |
| UPC1370C2 | 2.58 |
| UPC1382C | 1.08 |
| UPC1384 | 3.78 |
| UPC1394C | 3.07 |
| UPC1447H | 58 |
| UPC41C | 2.80 |
| UPC577H | 2.46 |
| UPC585C | 1.28 |
| UPC1167C2 | 2.70 |
| UPD553C1 | 20.76 |
| UPD7519G | 17.13 |
| UPD7538C | 11.06 |
| UPD546C107 | 22.28 |
| UPD547C049 | 11.18 |
| U05G | 1.27 |
| V11N | 1.27 |
| 10E2 | 43 |
| 10 Volt TUS | 8.74 |

## COMPUTER ICs

| | |
|---|---|
| 74LS260 | 55 |
| 2732 | 3.30 |
| 2764 | 1.87 |
| 27128 | 3.13 |
| 27256 | 4.75 |
| 4116 | 1.10 |
| 4532/20NL | 3.00 |
| 4164 | 1.60 |
| 6264 | 2.75 |
| 6522 | 4.09 |
| Z80A CPU | 1.70 |
| 8271 | 60.00 |
| ZTX213 | 17 |
| ZTX313 | 27 |
| ZTX650/1 | 35 |
| LM1889 | 2.00 |
| 74LS260 | 0.55 |

## COMMODORE ICs

| | |
|---|---|
| 6510 CPU | 5.66 |
| 6526 CIA Keyboard Int. | 5.11 |
| 6561 | 7.74 |
| 6569 Col. Vid. Cont. | 20.77 |
| 6581 Sound Gen. | 7.79 |
| 901225 Char. ROM | 3.37 |
| 901226 Basic ROM | 6.45 |
| 901227 Kernel ROM | 3.52 |
| 906114 PLA | 4.51 |
| 4164 RAM | 1.60 |
| Timer | 84 |
| 8701 Clock Chip | 5.46 |

## THYRISTORS

| | |
|---|---|
| DEC1 | 2.20 |
| DEC2 | 2.20 |
| THY15/80 | 2.40 |
| THY15/85 | 2.40 |
| Transistor mounting kit TO66, TD3, TO220AB | 30 |

**LARGE RANGE OF ICs/SEMIS FOR SINCLAIR/AMSTRAD PRODUCTS AVAILABLE**

## SEMICONDUCTORS

| | |
|---|---|
| AC107 | 35 |
| AC126 | 34 |
| AC127 | 34 |
| AC128 | 34 |
| AC128K | 40 |
| AC141 | 62 |
| AC141K | 39 |
| AC176 | 35 |
| AC176K | 35 |
| AC186 | 41 |
| AC187 | 38 |
| AC187K | 46 |
| AC188 | 35 |
| AC188K | 46 |
| AD143=OC28 | 82 |
| AD145 | 85 |
| AD161 | 54 |
| AD162 | 54 |
| AD161/62 MP | 1.15 |
| AF106 | 49 |
| AF114 | 89 |
| AF121 | 75 |
| AF124 | 48 |
| AF125 | 53 |
| AF126 | 53 |
| AF127 | 53 |
| AF139 | 63 |
| AF178 | 1.54 |
| AF239 | 60 |
| AF279 | 1.56 |
| AL102 | 4.90 |
| AU110 | 3.01 |
| BC107 | 20 |
| BC108 | 20 |
| BC109 | 20 |
| BC114 | 12 |
| BC115 | 17 |
| BC116A | 35 |
| BC117 | 30 |
| BC118 | 24 |
| BC119 | 36 |
| BC139 | 32 |
| BC140 | 32 |
| BC141 | 30 |
| BC142 | 30 |
| BC143 | 31 |
| BC147 | 13 |
| BC148 | 13 |
| BC149 | 12 |
| BC157 | 16 |
| BC158=BC558 | 16 |
| BC159 | 15 |
| BC160 | 52 |
| BC161 | 32 |
| BC170B | 15 |
| BC171 | 15 |
| BC172 | 15 |
| BC173 | 16 |
| BC174 | 10 |
| BC177 | 27 |
| BC178 | 26 |
| BC182L | 15 |
| BC183L | 15 |
| BC184L | 15 |
| BC186 | 35 |
| BC187 | 25 |
| BC204 | 10 |
| BC208 | 13 |
| BC209 | 10 |
| BC212 | 15 |
| BC212L | 15 |
| BC213 | 15 |
| BC214 | 15 |
| BC237 | 14 |
| BC238 | 14 |
| BC251A | 18 |
| BC252 | 12 |
| BC261 | 33 |
| BC262 | 30 |
| BC300 | 50 |
| BC301 | 51 |
| BC303 | 33 |
| BC307 | 20 |
| BC308 | 25 |
| BC323 | 99 |
| BC327 | 22 |
| BC328 | 18 |
| BC337 | 18 |
| BC338 | 18 |
| BC461 | 42 |
| BC527 | 35 |
| BC547 | 13 |
| BC548 | 13 |
| BCX32 = BC637 | 39 |
| BC549 | 10 |
| BC550 | 10 |
| BC557 | 10 |
| BC558 | 9 |
| BC635 | 19 |
| BC637 | 39 |
| BC638 | 33 |
| BC639 | 30 |
| BC640 | 32 |
| BCY72 | 13 |
| BC372 | 58 |
| BD115 | 45 |
| BD116A | 90 |
| BD124P | 84 |
| BD131 | 50 |
| BD132 | 49 |
| BD133 | 60 |
| BD135 | 38 |
| BD136 | 38 |
| BD137 | 38 |
| BD138 | 35 |
| BD139 | 35 |
| BD140 | 44 |
| BD144 | 1.70 |
| BD150 | 60 |
| BD159 | 65 |
| BD160 | 1.60 |
| BD166 | 52 |
| BD179 | 70 |
| BD182 | 1.20 |
| BD183 | 1.18 |
| BD201 | 85 |
| BD202 | 91 |
| BD203 | 80 |
| BD204 | 99 |
| BD222 | 46 |
| BD223 | 56 |
| BD225 | 47 |
| BD232 | 82 |
| BD233 | 66 |
| BD234 | 63 |
| BD235 | 60 |
| BD236 | 55 |
| BD237 | 57 |
| BD238 | 55 |
| BD243 | 85 |
| BD244 | 85 |
| BD410 | 79 |
| BD434 | 74 |
| BD437 | 86 |
| BD438 | 94 |
| BD507 | 69 |
| BD508 | 80 |
| BD509 | 86 |
| BD510 | 86 |
| BD278A | 81 |
| BD517 | 60 |
| BD519 | 1.08 |
| BD520 | 75 |
| BD535 | 82 |
| BD536 | 91 |
| BD696A | 1.49 |
| BD697=701 | 1.63 |
| BD698=702 | 1.50 |
| BD701 | 1.63 |
| BD707 | 1.50 |
| BDX32 | 2.10 |
| BF115 | 38 |
| BF117 | 36 |
| BF125 | 26 |
| BF127 | 47 |
| BF154 | 15 |
| BF158 | 18 |
| BF160 | 27 |
| BF167 | 24 |
| BF173 | 37 |
| BF177 | 52 |
| BF178 | 46 |
| BF179 | 42 |
| BF180 | 39 |
| BF181 | 39 |
| BF182 | 36 |
| BF183 | 29 |
| BF184 | 42 |
| BF185 | 36 |
| BF194/394 | 16 |
| BF195 | 16 |
| BF196 | 16 |
| BF197 | 16 |
| BF198 | 18 |
| BF199 | 21 |
| BF200 | 35 |
| BF224 | 40 |
| BF241 | 38 |
| BF256 | 60 |
| BF257 | 34 |
| BF258 | 34 |
| BF259 | 34 |
| BF262 | 84 |
| BF263 | 81 |
| BF271 | 24 |
| BF273 | 24 |
| BF274 | 24 |
| BF336 | 40 |
| BF337 | 41 |
| BF338 | 41 |
| BF355 | 56 |
| BF362 | 68 |
| BF363 | 72 |
| BF371 | 30 |
| BF392 | 35 |
| BF422 | 34 |
| BF423 | 46 |
| BF457 | 35 |
| BF458 | 43 |
| BF459 | 58 |
| BF460 = BF462 | 86 |
| BF469 | 63 |
| BF470 | 66 |
| BF597 | 16 |
| BF757 | 54 |
| BF758 | 54 |
| BFR39 | 27 |
| BFR40 | 30 |
| BFR79 | 85 |
| BFR90 | 1.74 |
| BFT42 | 42 |
| BFT43 | 42 |
| BFW10 | 60 |
| BFX29 | 40 |
| BFX84 | 42 |
| BFX85 | 30 |
| BFX86 | 30 |
| BFX88 | 46 |
| BFY50 | 32 |
| BFY51 | 32 |
| BFY52 | 32 |
| BFY90 | 95 |
| BR100 | 34 |
| BR101 | 95 |
| BR103 | 83 |
| BR303 | 1.46 |
| BRC4443 | 1.94 |
| BRC4444 | 1.98 |
| BRY39 | 56 |
| BRY55 | 45 |
| BRY56 | 57 |
| BSV57B | 89 |
| BT100 | 1.65 |
| BT101 | 1.20 |
| BT106 | 1.60 |
| BT108 | 1.69 |
| BT109 | 1.31 |
| BT116 | 1.87 |
| BT119 | 3.66 |
| BT120 | 3.66 |
| BT151/800 | 2.07 |
| BU104 | 2.00 |
| BU126 | 1.75 |
| BU204 | 1.50 |
| BU205 | 1.87 |
| BU206 | 1.80 |
| BU208 | 1.60 |
| BU208A | 1.65 |
| BU208D =BU800 | 2.20 |
| BUW81A | 3.84 |
| BU208/02 | 2.10 |
| BU326A | 2.00 |
| BU407 | 1.70 |
| BU426 | 3.07 |
| BU500 | 2.50 |
| BU526 | 2.46 |
| BU508 | 3.20 |
| BU58D | 2.77 |
| BU806 | 1.40 |
| BU807 | 2.94 |
| BU826 | 4.95 |
| BUT1L | 2.58 |
| BUW84 | 1.45 |
| BUX84 | 1.50 |
| E1222 | 40 |
| BX342 | 5.12 |
| CX104A | 6.57 |
| CX136A | 9.23 |
| CX143A | 9.23 |
| CX186 | 6.57 |
| BUT11 | 2.58 |
| GL4850 | 14 |
| ME0411 | 20 |
| MJE340 | 68 |
| MJE520 | 50 |
| MJ3000 | 1.98 |
| MPSA92 | 35 |
| MR814 | 45 |
| MR854 | 55 |
| MR475 | 4.85 |
| MR479 | 4.85 |
| MR477 | 4.90 |
| OT121 | 1.91 |
| R2008B | 1.90 |
| R2010B | 1.92 |
| R2265 | 1.50 |
| R2322 | 84 |
| R2323 | 67 |
| R2461 | 1.60 |
| R2540 | 3.20 |
| RC4558 | 2.20 |
| RCA16334 | 90 |
| RCA16029 | 1.18 |
| RCA16039 | 1.18 |
| RCA16092 | 1.18 |
| RCA16040 | 96 |
| RCA16041 | 84 |
| RCA16334 =ON447 | 90 |
| RCA16335 =ON448 | 90 |
| RCA16957 | 2.88 |
| TIC45 | 1.18 |
| TIC46 | 60 |
| TIC47 | 72 |
| TIL32 | 65 |
| TIL78 | 48 |
| TIP29C | 43 |
| TIP30A | 47 |
| TIP30C | 43 |
| TIP31C | 55 |
| TIP32C | 42 |
| TIP33B | 75 |
| TIP34B | 1.06 |
| TIP41C | 47 |
| TIP42C | 50 |
| TIP47 | 93 |
| TIP11211 | 69 |
| TIP120 | 65 |
| TIP161 | 2.15 |
| TIP2955 | 90 |
| TIP3055 | 63 |
| TIS91 | 32 |
| TU106/02 | 1.80 |
| 15051V | 3.43 |
| T6069V | 38 |
| T6071 | 5.95 |
| T9063V | 4.70 |
| T9064V | 1.14 |
| T9022W | 43 |
| T9053/4 | 4.50 |
| 2N696 | 21 |
| 2N918 | 82 |
| 2N2904 | 51 |
| 2N2905 | 28 |
| 2N3055 | 79 |
| 2N3702 | 16 |
| 2N3703 | 16 |
| 2N3705 | 10 |
| 2N3706 | 10 |
| 2N3708 | 17 |
| 2N5294 | 48 |
| 2N5296 | 48 |
| 2N5298 | 69 |
| 2SB337 | 1.86 |
| 2N5496 | 53 |
| 2N6107 | 75 |
| 2N6109 | 81 |
| 2SA715 | 1.98 |
| 2SA771 | 3.04 |
| 2SA835 | 1.82 |
| 2SA1027R | 1.27 |
| 2SA1175 | 40 |
| 2SB733 | 1.18 |
| 2SB740C | 1.24 |
| 2SB856 | 1.84 |
| 2SC403C | 32 |
| 2SC867A | 3.07 |
| 2SC1034 | 6.57 |
| 2SC1061 = 2SC1986 | 3.07 |
| 2SC1114 | 6.57 |
| 2SC1124 | 1.27 |
| 2SC1316 | 8.05 |
| 2SC1362-7 | 43 |
| 2SC1364 | 43 |
| 2SC1413A | 9.23 |
| 2SC1475 | 43 |
| 2SC1962 | 1.84 |
| 2SC2009 | 32 |
| 2SC2278 | 1.24 |
| 2SC2335 Kit | 11.18 |
| 2SC2369 | 4.14 |
| 2SC2551 | 1.27 |
| 2SC2785 | 43 |
| 2SC3153 | 5.12 |
| 2SC495 | 1.10 |
| 2SC496 | 1.31 |
| 2SC643A | 1.82 |
| 2SC1096 | 1.72 |
| 2SC1172Y | 5.50 |
| 2SC1173Y | 1.69 |
| 2SC1306 | 2.73 |
| 2SC1307 | 3.00 |
| 2SC1449 | 1.67 |
| 2SC1520 | 68 |
| 2SC1678 | 2.67 |
| 2SC1909 | 2.90 |
| 2SC1953 | 1.44 |
| 2SC1986 =2SC1061 | 2.94 |
| 2SC2028 | 1.82 |
| 2SC2029 | 2.60 |
| 2SC2078 | 2.90 |
| 2SC2091 | 1.34 |
| 2SC2166 | 2.73 |
| 2SD870 (Sony) | 8.05 |
| 2SD257 | 3.04 |
| 2SD725 | 11.18 |
| 2SD773 | 32 |
| 2SD774 | 1.24 |
| 2SD1164 | 1.27 |
| 2SD1497-02 | 5.12 |
| 2SD1497-06 | 5.12 |
| 2SD1453 | 2.20 |

## VALVES

| | |
|---|---|
| 30FL2 | 1.70 |
| DY802 | 98 |
| DY86/7 | 66 |
| ECC81 | 1.08 |
| ECC82 | 98 |
| ECC83 | 1.07 |
| ECC84 | 80 |
| ECC85 | 98 |
| ECC88 | 1.35 |
| ECF80 | 1.30 |
| ECF82 | 88 |
| ECH81 | 1.60 |
| ECH84 | 1.66 |
| ECL80 | 84 |
| ECL82 | 1.30 |
| ECL86 | 1.99 |
| EF80 | 95 |
| EF86 | 2.20 |
| EF183 | 99 |
| EF184 | 1.09 |
| EL90 | 1.75 |
| EL34 | 3.50 |
| EL84 | 1.05 |
| EY86/7 | 68 |
| EY500A | 2.25 |
| EZ80/81 | 56 |
| GY501 | 1.45 |
| GZ34 | 3.50 |
| KT66 | 9.75 |
| KT77 | 8.50 |
| KT88 (alt type) | 12.00 |
| PC92 | 4.50 |
| PC97 | 1.65 |
| PCC85 | 85 |
| PCC805 | 1.40 |
| PCF80 | 1.00 |
| PCF200 | 1.35 |
| PCF800 | 1.38 |
| PCF801 | 1.13 |
| PCF802 | 1.12 |
| PCF805 | 1.80 |
| PCF808 | 1.63 |
| PCH200 | 1.45 |
| PCL82 | 1.20 |
| PCL84 | 1.20 |
| PCL805 | 1.09 |
| PCL86 | 92 |
| PFL200 | 1.86 |
| PL36 | 1.87 |
| PL81 | 94 |
| PL95 | 2.25 |
| 6L6GT | 2.30 |
| 12HG7 | 3.20 |
| 12BH7A | 2.75 |
| PL504 | 1.65 |
| PL508 | 2.90 |
| PL509/19 | 5.30 |
| PY88 | 81 |
| PY500A | 2.30 |
| PY800/1 | 69 |
| UCH81 | 2.25 |
| UCL83 | 1.82 |
| UY85 | 1.35 |
| PL802T | 4.00 |
| 40KD6 | 5.30 |
| 21LU8 | 3.00 |
| 17DW4A | 4.50 |
| 3AT2B | 5.00 |
| 12BY7A | 3.75 |

# P.V. TUBES

**TEL: 0254 36521 32611 390936**

**TELEX: 635562 GRIFFIN G FOR P.V.**

## CALLERS ALWAYS WELCOME

### VIDEO PINCH ROLLERS

| | | |
|---|---|---|
| PANASONIC | NV7000 | 4.35 |
| SANYO | VTC9300/VBS7000 | 4.35 |
| SONY | C7/J7/SL17 | 4.35 |
| JVC | TCE3V00/01/06/16/23/24 | 4.35 |
| JVC | HR2200/3320/3330/3660/1100/7700 | 4.35 |
| AKAI | VS9700 | 4.35 |
| HITACHI | VT5000 | 4.35 |
| SHARP | VC6300/6500 | 4.35 |
| SONY | TC6 GEN | 4.35 |

### VIDEO BELT KITS

| | | | |
|---|---|---|---|
| VEKIT 1 | AKAI | VS9300/VS9500/VS9800 | |
| | JVC | HR3300/HR3320/HR3330/HR3360 | |
| | TCE | 8903/3V00/3V16/3V22 | 3.50 |
| VEKIT 2 | PANASONIC | NV7000B/NV7200B | 3.00 |
| VEKIT 3 | SONY | SLC5/7 | 3.75 |
| VEKIT 4 | SONY | SL8000/8500/8600 | 4.50 |
| VEKIT 5 | SONY | SL3000UB | 4.00 |
| VEKIT 6 | PANASONIC | NV3000B | 3.00 |
| VEKIT 7 | SANYO | 9300P | 4.25 |
| VEKIT 8 | PANASONIC | NV2000B | 3.75 |
| VEKIT 9 | PANASONIC | NV8600B/8610/V011 | 4.42 |
| VEKIT 10 | TOSHIBA | V8600 | 3.00 |
| VEKIT 11 | SHARP | VC7300 | 3.50 |
| VEKIT 12 | SHARP | VC6300/6600 | 4.00 |
| VEKIT 13 | SANYO | VTC5000 | 1.95 |
| VEKIT 14 | SANYO | VTC5300 | 2.50 |
| VEKIT 15 | JVC | HR7650 | 2.50 |
| VEKIT 17 | SHARP | 8300 | 1.76 |
| VEKIT 18 | SHARP | 9300 | 1.47 |
| VEKIT 19 | HITACHI | VT8000 | 1.12 |
| VEKIT 20 | HITACHI | VT11/33 | 2.15 |
| VEKIT 21 | HITACHI | 9500 | 1.12 |
| VEKIT 22 | SONY | SLC6 | 7.95 |

### VIDEO IDLER TYRES

| | O.Dia | I.Dia | Width | |
|---|---|---|---|---|
| SONY | 23.7 | 17.4 | 4.9 | 50p |
| SONY | 24.2 | 18 | 5.1 | 50p |
| HITACHI | 31.8 | 25 | 4.9 | 50p |
| PANASONIC | 37 | 27 | 3.9 | 52p |
| AKAI | 26 | 20 | 3.9 | 50p |
| JVC | 32.8 | 3.4 | 3.9 | 56p |
| JVC | 23.9 | 4.8 | 4 | 56p |
| NATPAN | 31.2 | | 56p | |

### VIDEO HEADS

| | |
|---|---|
| Thorn New Life (Nat Pan)* | 25.95 |
| Thorn New Life Heads (exchange)* | 22.95 |
| 3HSSV | 24.93 |
| 4HSS (3HSSN) | 24.93 |
| PS3B Sony/Beta | 28.12 |
| Philips V2000 and V2023 | 64.00 |
| Philips 1700 | 64.00 |
| Sanyo 9300/9455/9500 | 53.00 |
| Sanyo 5000/5300/5400 | 53.00 |
| Toshiba 9600 Upper Ass. | 12.50 |
| Toshiba 9600 (Rep. type only) PS3BT | 37.50 |
| Sony 8000 UB | 49.39 |
| Sony SLC9 | 49.39 |
| Sony SLC5, 6, 7 | 49.39 |
| Sharp 8300 | 58.00 |
| Sharp 3300/9700 | 56.00 |
| Sharp 3HSS (S.P.) | 40.62 |
| Hitachi HIVI/VT8000E | 35.62 |
| Hitachi VT33E/GEC 4004 | 35.62 |
| Hitachi VT11/GEC 4100 | 35.62 |
| Sharp 7300 | 49.39 |
| Hitachi 9300/4001 3HSSH | 32.12 |

* Thorn New Life heads are refurbished heads and we have types to cover most VHS types on an exchange basis

### VIDEO TAPE

| | | | | |
|---|---|---|---|---|
| SKC | E60 | 2.50 | Scotch E30 | 3.66 |
| | E120 | 2.88 | E60 | 4.00 |
| | E180 | 2.80 | E120 | 3.24 |
| | E240 | 3.78 | E180 | 3.86 |
| | L500 | 2.90 | L750 | 5.22 |
| | L750 | 3.40 | VCC360 | 6.33 |
| Philips | LVC 1700 | 17.50 | VCC480 | 7.23 |

### VIDEO SUNDRIES

| | |
|---|---|
| VHS Drum Motor | 25.50 |
| VHS Capstan Motor | 25.50 |
| Sanyo 5000 Reel Motor | 12.95 |
| Sharp Reel Motor | 19.50 |
| **Take up Idler Ass./Clutch Ass.** | |
| VHS (general purpose) Thorn/JVC etc. | 5.95 |
| Sharp 381/383/386/9100 9300/9500 | 2.97 |
| Sanyo | 6.95 |
| Hitachi F.F. Idler VT11E/VT33E | 2.90 |
| **Video Lamps** | |
| Nat. Pan. Bulb VHS | 1.30 |
| General Purpose VHS | 1.41 |
| 3V23 with plug VHS | 1.95 |
| **Video Care** | |
| Care Kit Deluxe | 5.00 |
| Universal Copy Kit | 5.50 |
| Head Cleaner | 90 |
| Beta Eccentricity Gauge | 55.00 |

### VARICAP TUNERS

| | |
|---|---|
| ELC1043-05 | 8.40 |
| ELC104305 Mullard | 12.50 |
| ELC1043-06 | 8.40 |
| ELC2003 | 19.50 |
| Philips G8/G9 | 10.50 |
| Philips G11 (U321) | 9.90 |
| U322 | 7.30 |
| U341 | 9.50 |
| U342 | 8.50 |

### PUSH BUTTON ASS.

| | |
|---|---|
| Hitachi 4 way | 12.36 |
| Philips G8 (early) | 17.82 |
| Philips G8 (late) | 18.97 |
| Philips G11 Tip Switch unit | 26.50 |
| Philips KT3 | 16.67 |
| Philips KT30 | 13.22 |
| Thorn 9000 6 way | 20.70 |
| Pye 697 repair kit | 10.35 |
| Pye 725-735 (also Red Mk.1) | 12.60 |
| Pye 725-735 tuning head with PCB | 12.50 |
| Decca 4 way | 7.93 |
| Decca 6 way | 9.17 |
| Decca 4/6 way conversion kit | 17.50 |
| Decca 7 way piano key rep. kit | 15.62 |
| GEC 2110 6 way | 10.92 |
| GEC 6 way slim | 10.29 |
| GEC/ITT/PYE 7 way | 16.67 |
| GEC Conversion kit | 16.50 |
| Rank A823 | 12.36 |
| Rank T20A | 11.21 |
| ITT CVC 8/9 (mod) | 13.80 |
| ITT 6 way with VCR | 8.90 |
| Thorn 8500 | 6.50 |
| GEC 7 B/P c neons | 10.50 |

### LINE OUTPUT TRANS.

| | |
|---|---|
| Philips 210/300 Mono | 10.00 |
| Philips G8 | 8.75 |
| Philips G9 | 9.50 |
| Philips KT3 | 15.95 |
| Philips K30 | 17.94 |
| Philips TX2 | 13.39 |
| Philips TX3 | 14.41 |
| Philips G11 | 15.58 |
| Pye 713/715 | 10.00 |
| Pye 725 90° | 10.50 |
| Pye 169 | 10.00 |
| Pye 741 | 9.90 |
| Bang & Olufson (2000,3000) | 14.69 |
| DECCA 80 | 8.58 |
| Decca 100 | 8.58 |
| Decca 1700 | 9.00 |
| Decca 1730 | 8.58 |
| Decca 2230 | 8.58 |
| GEC 2110 | 16.75 |
| GEC 2040 | 9.50 |
| ITT CVC 1/9 | 10.85 |
| ITT CVC 25/30/32 | 8.65 |
| ITT CVC 20 | 8.60 |
| ITT CVC 45 | 8.60 |
| R.B.M. T20 | 13.95 |
| R.B.M. BUSHRANGER T16A | 10.00 |
| R.B.M. BUSHRANGER T18A | 10.00 |
| Thorn 3000 EHT | 9.95 |
| Thorn 3000 SCAN | 7.95 |
| Thorn 8500 | 17.50 |
| Thorn 3000/3500 Mains | 10.00 |
| Thorn 1615 | 12.50 |
| Thorn 1691 | 9.68 |
| Thorn TX9 | 23.85 |
| Thorn 9600 (Gen Thorn) | 21.79 |
| Thorn 9000 | 25.53 |

### RECTIFIER TRAYS

| | |
|---|---|
| Thorn 1500 3 Stick | 5.20 |
| Thorn 1500 5 Stick | 5.99 |
| Thorn 3500 | 7.98 |
| Thorn 8000 | 6.95 |
| Thorn 8500/8800 | 7.15 |
| Thorn 9000 | 8.70 |
| Decca 1730/1830 | 5.48 |
| Decca 30 | 6.76 |
| Decca 80 | 7.12 |
| Decca 100 | 7.50 |
| Decca/Tatung 120/130 | 6.50 |
| GEC 2100 | 7.40 |
| GEC 2200 (20AX) | 6.50 |
| GEC 2040/2028 | 6.60 |
| GEC 2110 (pre or post Jan '77) | 7.00 |
| Philips G8 Short Focus Lead | 7.12 |
| Philips G8 Long Focus 550 | 7.12 |
| Philips G9 | 6.37 |
| Pye/Philips KT3 | 12.50 |
| Pye 691/3 | 7.58 |
| Pye 713 4 Lead | 8.79 |
| Pye 713 5 Lead | 8.79 |
| Pye 731/25 | 8.75 |
| R.B.M. A823 plug in | 8.75 |
| Rank T20/22 | 7.12 |
| ITT CVC5/9 | 7.50 |
| ITT CVC20/25/30 (Mullard) | 7.12 |
| ITT CVC45 | 8.65 |
| Universal | 6.00 |
| TV 11 Stick | 90 |
| TV 13 | 1.26 |
| TV 14 | 1.29 |
| TV 18 | 1.10 |
| TV 20 | 1.43 |

### SECURITY EQUIPMENT DIST. FOR SHORROCKS

| | | |
|---|---|---|
| B1 | Shorrock Acom 075 panel | 32.50 |
| B2 | Eurobell Comp. | 21.00 |
| B5 | "C" Polyprop. box with back plate | 4.55 |
| B6 | "C" Polycarb. box with back plate | 7.80 |
| B7 | Freidland Bell | 12.47 |
| CA15 | 4 core cable | 5.55 |
| CA16 | 6 core cable | 7.94 |
| CA17 | 8 core cable | 10.31 |
| 817S | Shorrock P.I.R. | 22.50 |
| 815S | Shorrock P.I.R. | 41.50 |
| 010 | Orion I.R. | 24.00 |
| SL8 | Infrascan | 62.94 |
| 137 | Shorrock SAB | 8.76 |
| BA9 | 1.9A battery | 7.77 |
| S3 | 712 Siren | 5.75 |

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### GEN. EQUIPMENT/TOOLS

| | |
|---|---|
| Testlead Set (AVO Type) | 2.20 |
| Degaussing Coil Stick | 19.00 |
| Signal Injector | 4.00 |
| Electric Circuit Tester | 1.50 |
| Probes (x10) or (x1) | 10.90 |
| Philips Switchable Probes | 13.25 |
| Automatic Wire Strippers | 6.95 |
| I.C. Inserters | 1.18 |
| Micro Pliers | 4.20 |
| Micro Cutters | 5.00 |
| Trim Tools Metal Ended | 30 |
| Side Cutters sm. | 1.20 |
| Long Nose Pliers | 1.20 |
| Sm. Neon Screwdriver | 40 |
| Quick Set Adhesive (Superglue) | 75 |
| Dynascan Tube Reju./testers | |
| 467 model inc. bases * | 399.00 |
| 470 model inc. bases * | 299.00 |

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**Tube Bases For Dynascan**

| | | | |
|---|---|---|---|
| No. 1 | 9.09 | No. 14 | 16.63 |
| No. 3 | 9.50 | No. 15 | 16.44 |
| No. 5 | 9.09 | No. 18 | 10.83 |
| No. 6 | 11.08 | No. 19 | 10.83 |
| No. 7 | 9.09 | No. 21 | 14.40 |
| No. 8 | 10.08 | No. 23 | 13.86 |
| No. 9 | 9.09 | No. 24 | 27.07 |
| No. 13 | 11.11 | No. 25 | 12.57 |

| | |
|---|---|
| Avo Meters Factory Recon. | 119.00 |
| Avo Battery | 2.09 |
| Solder Sucker Antistat min. | 4.50 |
| Solder Sucker Antistat std. | 5.40 |
| Solder Sucker Antistat lge. | 6.20 |
| Solder 500g | 7.00 |
| D.I.Y. Solder Small Pack | 45 |
| Solder Sucker Nozzles | 81 |
| Solda Mop Stnd. | 77 |
| For sold. irons see Antex/Weller Under Specific Spares | |
| Choc Bloc 5A | 20 |
| Fuse Wire 5A, 15A, 30A | 05 |
| Fluorescent Starter 4-80W) | 15 |
| Battery Press Studs min. | 11 |
| Battery Press Studs std. | 15 |
| Vero Board | 2.59 |
| Double Sided Adhesive Tape | 5.75 |
| Tinned Copper Wire | |
| 185 WG 45 Amp | 1.86 |
| 14SWG 100 Amp | 1.86 |
| 17SWG 60 Amp | 1.86 |
| 19SWG 45 Amp | 1.86 |
| 20SWG | 2.75 |
| 22SWG | 1.86 |
| Insulated Copper Wire | 9.11 |
| Cable Ties ALT1 per 100 (small) | 84 |
| Cable Ties ALT21 per 100 (large) | 1.69 |
| Power Adapter (12v) | 5.95 |
| Reg. 88 Power Adap. | 5.50 |
| Reg. 650 Power Adap. | 6.50 |

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|---|---|
| Screwdriver Kit | 22.71 |
| Drill Kit | 25.99 |
| Sold. Iron Kit | 16.99 |
| Rep. Tips | 2.20 |
| Rep. Bulbs | 60 |

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|---|---|
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| IR8420 KT3/K30 Text IR | 16.70 |
| IR8435 G11 8 Way Text IR | 20.85 |
| OS8263 G11 Non Text US | 19.50 |
| US8518 G11 2 Function US | 18.75 |
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| 218, 20578 KT3 K30 K35 KT4 KT40 (Non Text or Text) | 25.00 |

**REPAIR KITS INC. FOIL/BUTTON MATRIX/ INSTRUCTIONS**

| | |
|---|---|
| Philips KT3/30 1. without Text | 8.95 |
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**J.V.C.**

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|---|---|
| RTP843 Text IR (Also G11) | 13.50 |

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|---|---|
| RTP20 Telepilot 12 | 13.50 |
| RTP05 Telepilot 8 | 13.50 |
| RTP06 Telepilot 160 | 13.50 |
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|---|---|
| US8513 101 Non Text US | 20.85 |
| US8511 80/100 3 Func. US | 19.50 |

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|---|---|
| IR8442 T723 | 19.50 |
| IR8688 T725 TX9/10 | 23.00 |
| IR8864 T736 TX9/10/100 Text | 23.85 |
| IR8689 T731 TX9 | 23.85 |

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|---|---|
| FD09193 Txt. 32 butt | 15.90 |
| FD09820 15500 | 13.81 |
| FD09156 F14R | 13.81 |
| FD0911 AVS | 13.75 |
| FD09141 CTU 20R/140R (IR8876) | 13.75 |

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|---|---|
| C5 RM75T | 29.04 |
| C6 | 22.62 |
| C7 RMT200 | 42.00 |
| C9 RH2/3 | 42.00 |

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|---|---|
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|---|---|
| AA117 | 9p |
| AA119 | 9p |
| AAY32 | 9p |
| AC107 | 40p |
| AC126 | 25p |
| AC127 | 21p |
| AC128 | 21p |
| AC128K | 26p |
| AC141K | 30p |
| AC142K | 30p |
| AC153K | 23p |
| AC176 | 22p |
| AC176K | 28p |
| AC187 | 21p |
| AC187K | 28p |
| AC188 | 21p |
| AC188K | 26p |
| ACY18 | 48p |
| ACY19 | 48p |
| AD142 | 100p |
| AD149 | 60p |
| AD161 | 35p |
| AD162 | 35p |
| AD164 | 200p |
| AF124 | 30p |
| AF125 | 30p |
| AF126 | 30p |
| AF127 | 30p |
| AF139 | 30p |
| AF239 | 30p |
| AF201 | 70p |
| AL100 | 450p |
| AL112 | 300p |
| AM150 | 28p |
| AM151 | 30p |
| AM154 | 35p |
| AM156 | 35p |
| AM158 | 50p |
| ASZ15 | 100p |
| ASZ17 | 100p |
| AU113 | 600p |
| BA145 | 10p |
| BA148 | 10p |
| BA154 | 6p |
| BA157 | 12p |
| BAY78 | 250p |
| BAY82 | 20p |
| BB101 | 13p |
| BB103 | 16p |
| BB105B | 18p |
| BB205B | 24p |
| BC107 | 8p |
| BC108 | 8p |
| BC109 | 8p |
| BC109C | 10p |
| BC115 | 10p |
| BC118 | 11p |
| BC140 | 20p |
| BC141 | 20p |
| BC142 | 20p |
| BC143 | 20p |
| BC147 | 8p |
| BC148 | 8p |
| BC149 | 8p |
| BC157 | 8p |
| BC159 | 8p |
| BC182 | 7p |
| BC182L | 7p |
| BC183 | 7p |
| BC183L | 7p |
| BC184 | 7p |
| BC184L | 7p |
| BC212 | 7p |
| BC212L | 7p |
| BC213 | 7p |
| BC213L | 7p |
| BC214 | 7p |
| BC214L | 7p |
| BC237 | 7p |
| BC238 | 7p |
| BC300 | 20p |
| BC301 | 20p |
| BC302 | 20p |
| BC303 | 20p |
| BC327 | 7p |
| BC328 | 7p |
| BC337 | 7p |
| BC338 | 7p |
| BC446 | 8p |
| BC449 | 15p |
| BC489 | 20p |
| BC490 | 18p |
| BC516 | 22p |
| BC528 | 22p |
| BC537 | 25p |
| BC546 | 8p |
| BC547 | 8p |
| BC548 | 8p |
| BC549 | 8p |
| BC550 | 8p |
| BC556 | 8p |
| BC557 | 7p |
| BC558 | 8p |
| BC559 | 8p |
| BC560 | 8p |
| BC637 | 20p |
| BC638 | 20p |
| BCY32 | 200p |
| BCY33 | 200p |
| BCY34 | 200p |
| BCY42 | 20p |
| BCY56 | 16p |
| BCY70 | 16p |
| BCY71 | 16p |
| BCY72 | 16p |
| BD111 | 99p |
| BD112 | 95p |
| BD115 | 30p |
| BD124P | 50p |
| BD124 | 110p |
| BD128 | 35p |
| BD131 | 25p |
| BD132 | 25p |
| BD133 | 50p |
| BD135 | 20p |
| BD136 | 20p |
| BD137 | 20p |
| BD138 | 20p |
| BD139 | 20p |
| BD140 | 20p |
| BD144 | 90p |
| BD150 | 30p |
| BD157 | 38p |
| BD158 | 38p |
| BD166 | 30p |
| BD175 | 30p |
| BD177 | 30p |
| BD179 | 32p |
| BD181 | 45p |
| BD182 | 60p |
| BD184 | 60p |
| BD187 | 30p |
| BD201 | 33p |
| BD202 | 38p |
| BD203 | 42p |
| BD204 | 42p |
| BD222 | 31p |
| BD225 | 31p |
| BD232 | 31p |
| BD234 | 32p |
| BD235 | 28p |
| BD236 | 30p |
| BD237 | 21p |
| BD238 | 24p |
| BD244 | 50p |
| BD245 | 50p |
| BD278 | 50p |
| BD331 | 40p |
| BD332 | 40p |
| BD370 | 30p |
| BD371 | 30p |
| BD433 | 28p |
| BD434 | 30p |
| BD435 | 31p |
| BD437 | 28p |
| BD438 | 36p |
| BD439 | 40p |
| BD440 | 40p |
| BD441 | 40p |
| BD442 | 40p |
| BD533 | 50p |
| BD534 | 38p |
| BD535 | 38p |
| BD536 | 38p |
| BD537 | 40p |
| BD538 | 40p |
| BD675 | 40p |
| BD676 | 40p |
| BD677 | 38p |
| BD678 | 40p |
| BD679 | 40p |
| BD680 | 40p |
| BD681 | 45p |
| BD682 | 45p |
| BDX32 | 100p |
| BDX65 | 80p |
| BDW23 | 55p |
| BDW24 | 55p |
| BDY20 | 100p |
| BDY92 | 100p |
| BF137 | 35p |
| BF154 | 25p |
| BF167 | 30p |
| BF173 | 40p |
| BF178 | 30p |
| BF180 | 16p |
| BF181 | 18p |
| BF183 | 20p |
| BF184 | 20p |
| BF185 | 20p |
| BF194 | 7p |
| BF195 | 7p |
| BF196 | 8p |
| BF197 | 10p |
| BF198 | 10p |
| BF199 | 8p |
| BF200 | 16p |
| BF240 | 16p |
| BF241 | 10p |
| BF254 | 15p |
| BF255 | 12p |
| BF256 | 18p |
| BF257 | 18p |
| BF258 | 16p |
| BF259 | 18p |
| BF262 | 25p |
| BF263 | 25p |
| BF270 | 18p |
| BF273 | 15p |
| BF311 | 21p |
| BF324 | 25p |
| BF336 | 20p |
| BF337 | 20p |
| BF338 | 20p |
| BF355 | 28p |
| BF362 | 30p |
| BF367 | 13p |
| BF371 | 17p |
| BF391 | 18p |
| BF392 | 18p |
| BF414 | 18p |
| BF420 | 16p |
| BF421 | 18p |
| BF422 | 21p |
| BF423 | 15p |
| BF440 | 16p |
| BF451 | 17p |
| BF455 | 14p |
| BF458 | 19p |
| BF459 | 19p |
| BF461 | 60p |
| BF462 | 62p |
| BF469 | 30p |
| BF470 | 28p |
| BF471 | 28p |
| BF472 | 28p |
| BF479 | 30p |
| BF493 | 18p |
| BF494 | 16p |
| BF506 | 25p |
| BF595 | 16p |
| BF596 | 16p |
| BF597 | 10p |
| BF615 | 30p |
| BF758 | 41p |
| BF869 | 22p |
| BF870 | 22p |
| BF871 | 22p |
| BF872 | 23p |
| BF960 | 38p |
| BF961 | 35p |
| BF963 | 40p |
| BF964 | 38p |
| BF966 | 40p |
| BFR40 | 25p |
| BFR51 | 21p |
| BFR62 | 21p |
| BFR79 | 25p |
| BFR90 | 52p |
| BFR91 | 99p |
| BFR94 | 500p |
| BFT37 | 130p |
| BFT42 | 30p |
| BFT43 | 30p |
| BFW84 | 30p |
| BFW92 | 35p |
| BFX29 | 20p |
| BFX84 | 20p |
| BFX85 | 20p |
| BFX87 | 15p |
| BFX88 | 15p |
| BFX89 | 60p |
| BFY17 | 30p |
| BFY18 | 40p |
| BFY41 | 28p |
| BFY50 | 14p |
| BFY51 | 14p |
| BFY52 | 14p |
| BFY56 | 25p |
| BFY57 | 25p |
| BFY64 | 25p |
| BFY90 | 45p |
| BLY48 | 85p |
| BLY49 | 85p |
| BR100 | 14p |
| BR101 | 43p |
| BR103 | 37p |
| BRY39 | 55p |
| BRY49 | 38p |
| BRY56 | 33p |
| BSS74 | 33p |
| BSX20 | 15p |
| BSX26 | 18p |
| BSX29 | 19p |
| BT100A | 70p |
| BT106 | 120p |
| BT109 | 90p |
| BT116 | 80p |
| BT119 | 100p |
| BT120 | 100p |
| BT138 | 60p |
| BT146 | 99p |
| BT151 | 58p |
| BTY79 | 140p |
| BU100A | 110p |
| BU104 | 100p |
| BU105 | 80p |
| BU108 | 100p |
| BU110 | 110p |
| BU111 | 140p |
| BU124 | 60p |
| BU126 | 70p |
| BU204 | 75p |
| BU205 | 70p |
| BU206 | 100p |
| BU208 | 75p |
| BU208A | 80p |
| BU208D | 100p |
| BU209 | 140p |
| BU225 | 190p |
| BU226 | 190p |
| BU325 | 55p |
| BU326 | 85p |
| BU406 | 85p |
| BU406D | 95p |
| BU407 | 75p |
| BU407D | 95p |
| BU408 | 85p |
| BU408D | 95p |
| BU409 | 95p |
| BU426 | 120p |
| BU500 | 110p |
| BU508A | 120p |
| BU526 | 80p |
| BU546 | 140p |
| BU801 | 95p |
| BU806 | 120p |
| BU807 | 95p |
| BUX80 | 180p |
| BUX84 | 65p |
| BUX85 | 65p |
| BUY69A | 200p |
| BUY70C | 160p |
| C106D | 28p |
| J174 | 38p |
| J300 | 50p |
| MCR220 | 120p |
| MEO411 | 38p |
| MEO414 | 125p |
| ME3001 | 12p |
| ME4103 | 12p |
| ME6001 | 12p |
| ME6002 | 15p |
| ME8001 | 15p |
| ME9021 | 12p |
| MJ10012 | 300p |
| MJ15001 | 325p |
| MJ15002 | 300p |
| MJ15003 | 325p |
| MJ15004 | 370p |
| MJ15022 | 400p |
| MJ2500 | 100p |
| MJ2501 | 110p |
| MJ2955 | 55p |
| MJ3000 | 115p |
| MJ3001 | 115p |
| MJE29A | 30p |
| MJE30A | 30p |
| MJE340 | 25p |
| MJE350 | 80p |
| MJE520 | 30p |
| MJE2955K | 90p |
| MP8111 | 40p |
| MP8112 | 45p |
| MP8113 | 55p |
| MP8512 | 50p |
| MPN3404 | 30p |
| MPS6571 | 20p |
| MPS9012 | 20p |
| MPS9013 | 20p |
| MPS9014 | 20p |
| MPS9015 | 20p |
| MPSA06 | 15p |
| MPSA13 | 15p |
| MPSA20 | 15p |
| MPSA65 | 25p |
| MPSA66 | 25p |
| MPSA70 | 15p |
| MPSA92 | 20p |
| MR510 | 35p |
| MR856 | 36p |
| MRF479 | 350p |
| MV1622 | 80p |
| MV209 | 48p |
| MV2209 | 48p |
| OC28 | 150p |
| OC29 | 80p |
| OC35 | 100p |
| OC36 | 120p |
| OC45 | 50p |
| OC71 | 30p |
| OC72 | 50p |
| OC200 | 180p |
| OT121 | 90p |
| R2008B | 100p |
| R2010B | 100p |
| R2030 | 100p |
| R2306 | 55p |
| S2800D | 52p |
| S2800M | 72p |
| T2800D | 52p |
| T2800M | 72p |
| TAG4442 | 76p |
| TAG4443 | 76p |
| TAG4444 | 76p |
| TIP29 | 15p |
| TIP29A | 22p |
| TIP29C | 25p |
| TIP30 | 25p |
| TIP30C | 30p |
| TIP31A | 24p |
| TIP31C | 30p |
| TIP32 | 24p |
| TIP32A | 24p |
| TIP32C | 28p |
| TIP33 | 50p |
| TIP34 | 50p |
| TIP41A | 22p |
| TIP41C | 25p |
| TIP42A | 22p |
| TIP42C | 25p |
| TIP47 | 40p |
| TIP48 | 40p |
| TIP50 | 60p |
| TIP51 | 120p |
| TIP52 | 120p |
| TIP53 | 120p |
| TIP54 | 140p |
| TIP105 | 65p |
| TIP106 | 65p |
| TIP107 | 65p |
| TIP110 | 47p |
| TIP111 | 50p |
| TIP112 | 40p |
| TIP115 | 45p |
| TIP116 | 45p |
| TIP117 | 50p |
| TIP120 | 43p |
| TIP121 | 46p |
| TIP122 | 47p |
| TIP125 | 47p |
| TIP126 | 56p |
| TIP127 | 56p |
| TIP141 | 90p |
| TIP142 | 90p |
| TIP145 | 65p |
| TIP146 | 90p |
| TIP147 | 100p |
| TIP2955 | 42p |
| TIP3054 | 45p |
| TIP3055 | 42p |
| TIS43 | 45p |
| TIS44 | 40p |
| TIS61 | 15p |
| TIS88A | 45p |
| TIS90 | 15p |
| TIS91 | 18p |
| TIS93 | 20p |
| VK1010 | 88p |
| VN.10KM | 60p |
| VN.46AF | 88p |
| VN.66AF | 100p |
| VN.88AF | 115p |
| VN.89AF | 110p |
| Y723 | 75p |
| Y827 | 75p |
| Y860 | 22p |
| Y969 | 65p |
| ZTX107 | 11p |
| ZTX108 | 11p |
| ZTX109 | 12p |
| ZTX212 | 27p |
| ZTX300 | 13p |
| ZTX301 | 16p |
| ZTX302 | 16p |
| ZTX303 | 24p |
| ZTX304 | 17p |
| ZTX320 | 29p |
| ZTX326 | 29p |
| ZTX500 | 13p |
| ZTX501 | 13p |
| ZTX502 | 18p |
| ZTX503 | 18p |
| ZTX504 | 25p |
| ZTX550 | 24p |
| 2N.696 | 26p |
| 2N.697 | 22p |
| 2N.698 | 40p |
| 2N.699 | 45p |
| 2N.706 | 22p |
| 2N.708 | 22p |
| 2N.914 | 28p |
| 2N.918 | 36p |
| 2N.930 | 18p |
| 2N.1131 | 28p |
| 2N.1132 | 28p |
| 2N.1613 | 24p |
| 2N.1711 | 24p |
| 2N.1893 | 30p |
| 2N.2102 | 50p |
| 2N.2160 | 300p |
| 2N.2218A | 24p |
| 2N.2219 | 24p |
| 2N.2221 | 23p |
| 2N.2222 | 23p |
| 2N.2369 | 15p |
| 2N.2484 | 20p |
| 2N.2646 | 40p |
| 2N.2904 | 20p |
| 2N.2905 | 20p |
| 2N.2906 | 18p |
| 2N.2907 | 18p |
| 2N.2926 | 8p |
| 2N.3019 | 28p |
| 2N.3053 | 18p |
| 2N.3054 | 40p |
| 2N.3055 | 38p |
| 2N.3055H | 50p |
| 2N.3440 | 58p |
| 2N.3442 | 85p |
| 2N.3525 | 150p |
| 2N.3583 | 90p |
| 2N.3585 | 120p |
| 2N.3702 | 9p |
| 2N.3703 | 9p |
| 2N.3704 | 9p |
| 2N.3705 | 9p |
| 2N.3706 | 9p |
| 2N.3707 | 9p |
| 2N.3708 | 9p |
| 2N.3710 | 12p |
| 2N.3711 | 12p |
| 2N.3771 | 85p |
| 2N.3772 | 90p |
| 2N.3773 | 110p |
| 2N.3799 | 18p |
| 2N.3819 | 29p |
| 2N.3866 | 68p |
| 2N.3903 | 11p |
| 2N.3904 | 11p |
| 2N.3905 | 11p |
| 2N.3906 | 11p |
| 2N.4031 | 25p |
| 2N.4036 | 25p |
| 2N.4037 | 25p |
| 2N.4058 | 13p |
| 2N.4058 | 13p |
| 2N.4062 | 12p |
| 2N.4064 | 100p |
| 2N.4240 | 150p |
| 2N.4248 | 130p |
| 2N.4401 | 12p |
| 2N.4403 | 12p |
| 2N.4443 | 76p |
| 2N.4444 | 76p |
| 2N.4904 | 75p |
| 2N.5061 | 20p |
| 2N.5062 | 28p |
| 2N.5088 | 20p |
| 2N.5163 | 45p |
| 2N.5192 | 50p |
| 2N.5241 | 500p |
| 2N.5245 | 45p |
| 2N.5294 | 30p |
| 2N.5296 | 30p |
| 2N.5303 | 200p |
| 2N.5320 | 90p |
| 2N.5321 | 60p |
| 2N.5366 | 25p |
| 2N.5401 | 12p |
| 2N.5448 | 12p |
| 2N.5496 | 80p |
| 2N.5777 | 40p |
| 2N.6106 | 40p |
| 2N.6107 | 40p |
| 2N.6109 | 40p |
| 2N.6254 | 110p |
| 2N.6292 | 40p |
| 2N.6384 | 120p |
| 2N.6385 | 120p |
| 2N.6403 | 160p |
| 2N.6649 | 140p |
| 3N.128 | 55p |
| 3N.143 | 65p |
| **DIODES** | |
| AA119 | 9p |
| BY100 | 40p |
| BY103 | 32p |
| BY126 | 6p |
| BY127 | 8p |
| BY133 | 8p |
| BY164 | 40p |
| BY176 | 85p |
| BY179 | 35p |
| BY182 | 32p |
| BY184 | 32p |
| BY187 | 32p |
| BY196 | 20p |
| BY206 | 11p |
| BY207 | 11p |
| BY208 | 18p |
| BY210 | 22p |
| BY223 | 72p |
| BY225 | 120p |
| BY226 | 18p |
| BY227 | 19p |
| BY228 | 32p |
| BY296 | 20p |
| BY298 | 26p |
| BY299 | 28p |
| BY476 | 90p |
| BYX10 | 15p |
| BYX55/350 | 30p |
| BYX55/600 | 30p |
| BYX55/800 | 32p |
| BYX70/300 | 29p |
| BYX70/500 | 32p |
| BYX70/800 | 36p |
| BYX71/600 | 80p |
| OA47 | 6p |
| OA90 | 6p |
| OA91 | 8p |
| OA200 | 7p |
| OA202 | 7p |
| IN.914 | 2p |
| IN.4001 | 4p |
| IN.4002 | 4p |
| IN.4003 | 4p |
| IN.4004 | 4p |
| IN.4005 | 4p |
| IN.4006 | 4p |
| IN.4007 | 5p |
| IN.4148 | 2p |
| IN.5400 | 9p |
| IN.5401 | 10p |
| IN.5402 | 10p |
| IN.5403 | 11p |
| IN.5404 | 11p |
| IN.5405 | 12p |
| IN.5406 | 13p |
| IN.5407 | 13p |
| IN.5408 | 13p |
| **LOW PROFILE SOCKETS** | |
| 8pin | 6p |
| 14pin | 8p |
| 16pin | 9p |
| 18pin | 12p |
| 20pin | 14p |
| 22pin | 16p |
| 24pin | 18p |
| 28pin | 20p |
| 40pin | 25p |
| **ZENERS** | |
| 400MV | |
| BYZ88 RANGE | |
| 2V7 to 39V | 6p |
| 1.3W | |
| BZX61 RANGE | |
| 2V7 to 39V | 12p |
| **VOLTAGE REGULATORS** | |
| 7805 | 35p |
| 7812 | 35p |
| 7815 | 35p |
| 7818 | 35p |
| 7824 | 35p |
| 7905 | 35p |
| 7912 | 40p |
| 7915 | 40p |
| 7918 | 40p |
| 7924 | 40p |
| 78L05 | 28p |
| 78L12 | 28p |
| 78L15 | 28p |
| 78L18 | 28p |
| 78L24 | 28p |
| 79L05 | 40p |
| 79L12 | 45p |
| 79L15 | 48p |
| 7818KC | 100p |
| 7824KC | 100p |
| LM309K | 100p |
| LM317K | 220p |
| LM317T | 180p |
| LM323K | 420p |
| LM723 | 40p |
| 78HGKC | 670p |
| 78HO5KC | 800p |
| 78H12KC | 700p |
| 78GU1C | 190p |
| 79GU1C | 215p |
| 79HGKC | 800p |
| **VALVES** | |
| DAF96 | 60p |
| DF96 | 50p |
| DL92 | 60p |
| DY86 | 50p |
| DY87 | 60p |
| DY802 | 55p |
| EABC80 | 60p |
| E891 | 44p |
| EBF80 | 45p |
| EBF89 | 50p |
| ECC82 | 55p |
| ECC83 | 65p |
| ECC84 | 50p |
| ECC85 | 50p |
| ECH81 | 65p |
| ECH84 | 65p |
| ECL80 | 57p |
| ECL82 | 59p |
| ECL84 | 57p |
| ECL85 | 57p |
| ECL86 | 70p |
| EF80 | 50p |
| EF85 | 50p |
| EF89 | 70p |
| EF183 | 60p |
| EF184 | 65p |
| EL34 | 210p |
| EL36 | 60p |
| EL84 | 50p |
| EL95 | 60p |
| EL500 | 80p |
| EL504 | 100p |
| EY86 | 31p |
| EY87 | 31p |
| EY88 | 42p |
| EZ35 | 45p |
| EZ80 | 50p |
| EZ81 | 55p |
| GZ34 | 180p |
| PC97 | 100p |
| PCC85 | 42p |
| PCF80 | 65p |
| PCF200 | 135p |
| PCF801 | 110p |
| PCF802 | 60p |
| PCF806 | 115p |
| PCH200 | 100p |
| PCL81 | 62p |
| PCL82 | 63p |
| PCL84 | 50p |
| PCL85 | 65p |
| PCL86 | 65p |
| PCL805 | 65p |
| PFL200 | 85p |
| PL36 | 80p |
| PL82 | 45p |
| PL83 | 32p |
| PL84 | 50p |
| PL95 | 140p |
| PL500 | 110p |
| PL504 | 95p |
| PL508 | 170p |
| PL519 | 450p |
| PY81 | 70p |
| PY88 | 57p |
| PY500A | 160p |
| **LINEAR IC'S** | |
| AN-124 | 230p |
| AN-127 | 250p |
| AN-136 | 250p |
| AN-203 | 210p |
| AN-210 | 165p |
| AN-214Q | 170p |
| AN-228 | 280p |
| AN-234 | 450p |
| AN-235 | 450p |
| AN-236 | 235p |
| AN-238 | 400p |
| AN-239Q | 400p |
| AN-240P | 150p |
| AN-241 | 135p |
| AN-245 | 290p |
| AN-247 | 230p |
| AN-252 | 150p |
| AN-259 | 250p |
| AN-262 | 140p |
| AN-270 | 200p |
| AN-271 | 230p |
| AN-272 | 480p |
| AN-274 | 250p |
| AN-294 | 380p |
| AN-295 | 340p |
| AN-301 | 330p |
| AN-303 | 250p |
| AN-304 | 360p |
| AN-305 | 320p |
| AN-306 | 800p |
| AN-313 | 270p |
| AN-315 | 210p |
| AN-316 | 350p |
| AN-318 | 460p |
| AN-331 | 295p |
| AN-360 | 100p |
| AN-362 | 140p |
| AN-366 | 150p |
| AN-610 | 160p |
| AN-612 | 160p |
| AN-3320K | 900p |
| AN-5151 | 600p |
| AN-5430 | 280p |
| AN-5612 | 400p |
| AN-5620 | 330p |
| AN-5712 | 350p |
| AN-5722 | 140p |
| AN-5730 | 160p |
| AN-5732 | 160p |
| AN-5753 | 170p |
| AN-6100 | 425p |
| AN-6120 | 400p |
| AN-6135 | 150p |
| AN-6300 | 600p |
| AN-6320 | 300p |
| AN-6330 | 380p |
| AN-6340 | 830p |
| AN-6341 | 350p |
| AN-6344 | 440p |
| AN-6350 | 610p |
| AN-6359 | 810p |
| AN-6360 | 400p |
| AN-6362 | 480p |
| AN-6371 | 510p |
| AN-6387 | 560p |
| AN-6430 | 390p |
| AN-6431 | 400p |
| AN-6677 | 550p |
| AN-6811 | 130p |
| AN-6876 | 270p |
| AN-6884 | 240p |
| AN-7105 | 210p |
| AN-7110 | 130p |
| AN-7114 | 150p |
| AN-7115 | 150p |
| AN-7116 | 130p |
| AN-7120 | 130p |
| AN-7130 | 110p |
| AN-7222 | 300p |
| AN-7310 | 90p |
| AN-7311 | 90p |
| AN-7410 | 250p |
| AN-7420 | 250p |
| AN-7140 | 450p |
| AN-7145 | 195p |
| AN-7146 | 210p |
| AN-7154 | 180p |
| AN-7156 | 240p |
| AN-7158 | 310p |
| AN-7168 | 260p |
| AN-7178 | 270p |
| AY3-1015 | 290p |
| AY3-1270 | 800p |
| AY3-1350 | 450p |
| AY3-8910 | 360p |
| AY3-8912 | 400p |
| AY5-3600 | 570p |
| BA-301 | 65p |
| BA-302 | 90p |
| BA-308 | 100p |
| BA-311 | 80p |
| BA-313 | 60p |
| BA-314 | 100p |
| BA-318 | 120p |
| BA-333 | 100p |
| BA-340 | 150p |
| BA-401 | 60p |
| BA-402 | 60p |
| BA-501 | 450p |
| BA-511 | 160p |
| BA-514 | 160p |
| BA-516 | 150p |
| BA-521 | 160p |
| BA-524 | 240p |
| BA-526 | 220p |
| BA-527 | 140p |
| BA-532 | 140p |
| BA-534 | 290p |
| BA-535 | 600p |
| BA-536 | 210p |
| BA-612 | 160p |
| BA-658 | 380p |
| BA-684 | 400p |
| BA-685 | 400p |
| BA-1310 | 160p |
| BA-1320 | 110p |
| BA-1330 | 160p |
| BA-1360 | 160p |
| BA-4403 | 220p |
| BA-5101 | 500p |
| BA-5102 | 250p |
| BA-5402 | 250p |
| BA-5406 | 280p |
| BA-6104 | 250p |
| BA-6135 | 250p |
| BA-6208 | 250p |
| BA-6304 | 190p |
| CA-3011 | 110p |
| CA-3012 | 150p |
| CA-3014 | 250p |
| CA-3018 | 75p |
| CA-3019 | 75p |
| CA-3020 | 190p |
| CA-3023 | 190p |
| CA-3028A | 95p |
| CA-3035 | 230p |
| CA-3036 | 240p |
| CA-3043 | 240p |
| CA-3045 | 360p |
| CA-3046 | 60p |
| CA-3048 | 190p |
| CA-3052 | 190p |
| CA-3054 | 95p |
| CA-3059 | 300p |
| CA-3060 | 280p |
| CA-3065 | 210p |
| CA-3080E | 60p |
| CA-3085 | 135p |
| CA-3086 | 55p |
| CA-3088E | 200p |
| CA-3089Q | 250p |
| CA-3130E | 80p |
| CA-3130S | 100p |
| CA-3134E | 38p |
| CA-3160 | 85p |
| CA-3161E | 140p |
| CA-3162E | 450p |
| CA-3189E | 230p |
| CA-3193E | 230p |
| CA-3240E | 90p |
| CA-3260E | 170p |
| CA-3290E | 150p |
| CX-108 | 750p |
| CX-130 | 450p |
| CX-136 | 610p |
| CX-139A | 1150p |
| CX-143A | 580p |
| ER-1400 | 200p |
| HA-1125 | 150p |
| HA-1137W | 160p |
| HA-1144 | 380p |
| HA-1156 | 110p |
| HA-1197 | 150p |
| HA-1199 | 160p |
| HA-1306W | 170p |
| HA-1319 | 240p |
| HA-1338 | 300p |
| HA-1339A | 170p |
| HA-1342 | 170p |
| HA-1366WR | 160p |
| HA-1367 | 300p |
| HA-1368 | 160p |
| HA-1371 | 300p |
| HA-1372 | 300p |
| HA-1374 | 230p |
| HA-1377 | 210p |
| HA-1388 | 320p |
| HA-1389 | 210p |
| HA-1392 | 230p |
| HA-1394 | 280p |
| HA-1397 | 250p |
| HA-1398 | 240p |
| HA-1452 | 120p |
| HA-1457 | 120p |
| HA-11221 | 210p |
| HA-11223 | 340p |
| HA-11225 | 170p |
| HA-11226 | 410p |
| HA-11235 | 210p |
| HA-11701 | 310p |
| HA-11703 | 390p |
| HA-11705 | 620p |
| HA-11710 | 340p |
| HA-11715 | 560p |
| HA-11724 | 800p |
| HA-13001 | 260p |
| HA-13008 | 800p |
| ICL-7016 | 650p |
| ICL-7017 | 950p |
| ICL-7611 | 90p |
| ICL-7660 | 240p |
| ICM-7555 | 60p |
| ICM-7556 | 130p |
| LA-1111 | 180p |
| LA-1150 | 150p |
| LA-1201 | 80p |
| LA-1210 | 140p |
| LA-1222 | 80p |
| LA-1230 | 130p |
| LA-1231 | 210p |
| LA-1352 | 120p |
| LA-1364 | 200p |
| LA-1365 | 120p |
| LA-1368 | 220p |
| LA-1369 | 260p |
| LA-1385 | 170p |
| LA-1460 | 220p |
| LA-2000 | 150p |
| LA-2100 | 260p |
| LA-2101 | 270p |
| LA-2200 | 190p |
| LA-3100 | 125p |
| LA-3101 | 160p |
| LA-3120 | 125p |
| LA-3155 | 100p |
| LA-3160 | 120p |
| LA-3201 | 80p |
| LA-3210 | 65p |
| LA-3300 | 140p |
| LA-3301 | 110p |
| LA-3350 | 110p |
| LA-3361 | 100p |
| LA-3375 | 300p |
| LA-4030 | 180p |
| LA-4031 | 140p |
| LA-4032 | 140p |
| LA-4050 | 130p |
| LA-4100 | 100p |
| LA-4101 | 90p |
| LA-4102 | 120p |
| LA-4110 | 160p |
| LA-4112 | 160p |
| LA-4120 | 270p |
| LA-4125 | 200p |
| LA-4126 | 240p |
| LA-4135 | 250p |
| LA-4137 | 180p |
| LA-4140 | 70p |
| LA-4160 | 220p |
| LA-4180 | 300p |
| LA-4182 | 190p |
| LA-4190 | 300p |
| LA-4192 | 180p |
| LA-4200 | 130p |
| LA-4201 | 120p |
| LA-4210 | 150p |
| LA-4220 | 120p |
| LA-4230 | 175p |
| LA-4250 | 260p |
| LA-4261 | 300p |
| LA-4400 | 190p |
| LA-4420 | 140p |
| LA-4422 | 130p |
| LA-4430 | 130p |
| LA-4440 | 230p |
| LA-4445 | 260p |
| LA-4450 | 150p |
| LA-4460 | 170p |
| LA-4461 | 180p |
| LA-4500 | 230p |
| LA-4505 | 260p |
| LA-4507 | 360p |
| LA-4508 | 260p |
| LA-4510 | 160p |
| LA-4520 | 230p |
| LA-5112 | 120p |
| LA-5700 | 300p |
| LA-7520 | 500p |
| LA-7800 | 180p |
| LA-7801 | 280p |
| LA-7802 | 300p |
| LA-7803 | 400p |
| LA-7805 | 400p |
| LA-7806 | 260p |
| LA-7820 | 250p |
| LA-7910 | 150p |
| LAP-512 | 310p |
| LAG-552 | 200p |
| LAG-552 | 200p |
| LAG-600 | 200p |
| LAG-634D | 30p |
| LAM-508 | 200p |
| LC-7120 | 280p |
| LC-7130 | 280p |
| LC-7131 | 260p |
| LC-7132 | 400p |
| LC-7137 | 450p |
| LF-347 | 110p |
| LF-351 | 45p |
| LF-353 | 48p |
| LF-355 | 60p |
| LF-356 | 60p |
| LF-357 | 70p |
| LF-398 | 300p |
| LM-301 | 26p |
| LM-307 | 42p |
| LM-308CN | 70p |
| LM-310 | 220p |
| LM-311 | 35p |
| LM-318 | 120p |
| LM-319 | 165p |
| LM-324 | 35p |
| LM-325 | 45p |
| LM-334Z | 115p |
| LM-335Z | 120p |
| LM-336 | 140p |
| LM-337 | 250p |
| LM-339 | 37p |
| LM-348 | 55p |
| LM-358 | 45p |
| LM-377 | 220p |
| LM-380 | 100p |
| LM-381 | 150p |
| LM-382 | 130p |
| LM-383 | 300p |
| LM-384 | 130p |
| LM-386 | 85p |
| LM-387 | 100p |
| LM-389 | 150p |
| LM-391 | 160p |
| LM-392 | 100p |
| LM-393 | 55p |
| LM-394CH | 370p |
| LM-558 | 160p |
| LM-709DIL | 30p |
| LM-710 | 45p |
| LM-711 | 85p |
| LM-723 | 40p |
| LM-725CN | 380p |
| LM-733 | 60p |
| LM-741DIL | 18p |
| LM-741MET | 45p |
| LM-747 | 58p |
| LM-748 | 35p |
| LM-1458 | 33p |
| LM-1889 | 400p |
| LM-3900 | 40p |
| LM-3909 | 80p |
| LM-3911 | 130p |
| LM-3914 | 250p |
| LM-3915 | 255p |
| LM-3916 | 290p |
| LM-8560 | 300p |
| LM-016H | 3200p |
| M-5155 | 150p |
| M-50120 | 600p |
| M-51102 | 290p |
| M-51316B | 540p |
| M-51513L | 160p |
| M-51514 | 160p |
| M-51515BL | 220p |
| M-51516 | 280p |
| M-51517L | 240p |
| M-51518 | 200p |
| M-54836 | 600p |
| MB-3705 | 150p |
| MB-3712 | 140p |
| MB-3722 | 310p |
| MB-3730 | 240p |
| MB-3731 | 300p |
| MB-3756 | 230p |
| MB-3759 | 200p |
| MB-8719 | 340p |
| MC-1310P | 130p |
| MC-1327 | 70p |
| MC-1413 | 65p |
| MC-1455 | 45p |
| MC-1458 | 33p |
| MC-1469 | 290p |
| MC-1488 | 65p |
| MC-1489 | 65p |
| MC-1494 | 670p |
| MC-1495 | 285p |
| MC-1496 | 65p |
| MC-1569 | 210p |
| MC-3302 | 70p |
| MC-3401 | 45p |
| MC-3403 | 60p |
| MC-3423 | 75p |
| MF-10 | 295p |
| ML-920 | 480p |
| ML-922 | 380p |
| NE-531 | 115p |
| NE-544 | 170p |
| NE-555 | 20p |
| NE-556 | 40p |
| NE-564 | 380p |
| NE-565 | 110p |
| NE-566 | 130p |
| NE-567 | 115p |
| NE-570 | 360p |
| NE-571 | 290p |
| NE-592 | 85p |
| NE-5532P | 140p |
| NE-5533P | 150p |
| NE-5534P | 110p |
| SAS-560 | 110p |
| SAS-570 | 110p |
| STK-011 | 370p |
| STK-013 | 700p |
| STK-014 | 700p |
| STK-015 | 490p |
| STK-016 | 800p |
| STK-020 | 540p |
| STK-022 | 700p |
| STK-025 | 700p |
| STK-041 | 700p |
| STK-043 | 980p |
| STK-050 | 1450p |
| STK-077 | 600p |
| STK-078 | 620p |
| STK-080 | 710p |
| STK-082 | 720p |
| STK-086 | 910p |
| STK-430 | 500p |
| STK-433 | 490p |
| STK-435 | 510p |
| STK-436 | 490p |
| STK-437 | 600p |
| STK-439 | 550p |
| STK-441 | 740p |
| STK-443 | 740p |
| STK-457 | 580p |
| STK-459 | 610p |
| STK-460 | 720p |
| STK-461 | 720p |
| STK-463 | 780p |
| STK-465 | 800p |
| STK-501 | 580p |
| STK-563 | 480p |
| STK-0025 | 420p |
| STK-0029 | 430p |
| STK-0030 | 400p |
| STK-0039 | 410p |
| STK-0040 | 560p |
| STK-0049 | 570p |
| STK-0050 | 570p |
| STK-0059 | 620p |
| STK-0060 | 900p |
| STK-0070 | 1100p |
| STK-0080 | 690p |
| STK-1039 | 550p |
| STK-1040 | 700p |
| STK-1049 | 800p |
| STK-1070 | 1200p |
| STK-2025 | 800p |
| STK-2028 | 650p |
| STK-2029 | 500p |
| STK-2129 | 610p |
| STK-2139 | 800p |
| STK-2230 | 580p |
| STK-3041 | 600p |
| STK-3042 | 580p |
| STK-3062 | 600p |
| STK-3082 | 700p |
| STK-4026 | 800p |
| STK-4060 | 580p |
| STK-4211 | 800p |
| STK-4141 | 700p |
| STK-4332 | 500p |
| STK-4352 | 700p |
| STK-5315 | 650p |
| STK-7308 | 800p |
| STK-8250 | 700p |
| STK-4833 | 1200p |
| STR-440 | 520p |
| STR-441 | 480p |
| STR-451 | 500p |
| STR-6020 | 600p |
| T2800D | 52p |
| TA-7054 | 190p |
| TA-7063 | 70p |
| TA-7066 | 120p |
| TA-7072 | 300p |
| TA-7073 | 200p |
| TA-7089 | 300p |
| TA-7108 | 130p |
| TA-7109 | 220p |
| TA-7119 | 150p |
| TA-7120 | 55p |
| TA-7130 | 80p |
| TA-7137 | 83p |
| TA-7140 | 130p |
| TA-7142 | 220p |
| TA-7145 | 220p |
| TA-7146 | 400p |
| TA-7148 | 350p |
| TA-7157 | 140p |
| TA-7162 | 300p |
| TA-7169 | 420p |
| TA-7176 | 240p |
| TA-7193 | 400p |
| TA-7200 | 200p |
| TA-7201 | 200p |
| TA-7203 | 180p |
| TA-7204 | 140p |
| TA-7205 | 80p |
| TA-7207 | 150p |
| TA-7208 | 145p |
| TA-7210 | 200p |
| TA-7212 | 300p |
| TA-7213 | 200p |
| TA-7214 | 260p |
| TA-7215 | 215p |
| TA-7217 | 145p |
| TA-7220 | 220p |
| TA-7222 | 120p |
| TA-7223 | 210p |
| TA-7224 | 270p |
| TA-7225 | 300p |
| TA-7226 | 290p |
| TA-7227 | 190p |
| TA-7229 | 300p |
| TA-7230 | 170p |
| TA-7232 | 250p |
| TA-7233 | 250p |
| TA-7237 | 400p |
| TA-7238 | 400p |
| TA-7240 | 260p |
| TA-7241 | 260p |
| TA-7245 | 450p |
| TA-7247 | 800p |
| TA-7269 | 850p |
| TA-7270 | 250p |
| TA-7271 | 400p |
| TA-7299 | 400p |
| TA-7310 | 100p |
| TA-7312 | 120p |
| TA-7313 | 110p |
| TA-7314 | 210p |
| TA-7315 | 200p |
| TA-7320 | 300p |
| TA-7324 | 200p |
| TA-7325 | 90p |
| TA-7328 | 200p |
| TA-7335 | 200p |
| TA-7357 | 400p |
| TA-7358 | 200p |
| TA-7401 | 400p |
| TA-7607 | 270p |
| TA-7608 | 360p |
| TA-7609 | 270p |
| TA-7611 | 280p |
| TA-7614 | 230p |
| TA-7621 | 520p |
| TA-7628 | 240p |
| TA-7640 | 150p |
| TA-7641 | 170p |
| TA-7658 | 130p |
| TA-7668 | 160p |
| TA-7688 | 250p |
| TAA-550 | 20p |
| TBA-120S | 50p |
| TBA-395 | 60p |
| TBA-396 | 70p |
| TBA-520 | 120p |
| TBA-530 | 120p |
| TBA-540 | 120p |
| TBA-560 | 120p |
| TBA-750 | 120p |
| TBA-800 | 40p |
| TBA-810AS | 60p |
| TBA-820 | 65p |
| TBA-920 | 120p |
| TBA-950 | 120p |
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# TELEVISION

## Trade Wars, Phoney Wars

There are growing signs of trade wars, particularly in the consumer electronics field, though one can't help but feel that they will turn out to be phoney wars. The start of the present skirmishes was the dispute between the USA and Japan over semiconductor production, pricing and sales. Dissatisfied with the Japanese response to claims of chip dumping, in part through intermediate markets, the US government slapped a 100 per cent duty increase on a range of Japanese goods including colour TV sets and computers. Concerned about the growing trade deficit between the European Community and Japan, and the possibility of a switch of Japanese exports from the USA to Europe as a result of the US government's duty increases, the EC has threatened to do much the same (no suggested figure this time, the phrase is "punitive tariffs"). The problem here is that the EC's trade deficit with Japan is now running at an annual figure of $21 billion and shows no sign of any decrease.

One can appreciate the concern of Western governments and industrialists over these trade imbalance problems. It's less easy to see what can or indeed should be done about them. Let's first consider the Japanese situation. The country after all has it own problems, stemming in particular from its geographical constraints. Some 70 per cent of Japanese land is usable neither for industry nor for agriculture, consisting largely of mountains. The country's large population is squeezed into a small land area with little by way of natural resources. To export something or other is the only way of survival given this situation. In short, the country can support itself only by the export of saleable goods. There have been complaints that this is too much of a one way affair, that the Japanese don't buy foreign products and that their markets are not open to foreign manufacturers. But since they do so well themselves it seems a bit pointless to expect them to import manufactured goods on any scale.

In theory it shouldn't matter if Japan has a whopping surplus in the trade of manufactured goods since there are deficits elsewhere – in the need to import fuel and raw materials, and in a traditional though growingly less important reliance on the use of bought in services (banking, insurance, etc.). But of course Japan's income has steadily advanced because of the value added nature of its exports. The result has been growing monetary imbalances in favour of Japan. But what's to be done with this income? You can invest only so much of it in research and development, and the Japanese have a great deal left over. In recent years it's been going into funding the USA's government and trading deficits. Investing in dollar assets that depreciate is a mug's game however, and the Japanese have already lost a fortune in this way. They do it for want of an alternative but are aware of the nature of the problem. Hence the growing tendency of Japanese manufacturers to establish overseas production, not only in low-cost countries around the Pacific basin but in the Americas and Europe. This isn't done out of any particular altruism but because, to quote a phrase, there is no alternative. So far as the consumer is concerned, instead of getting his nice Japanese goods from Japan they come from local plants. And this means, amongst other things, that some local employment is generated.

The growing Japanese predominance in certain spheres of production is naturally of concern to industrialists elsewhere. But you can't really blame the Japanese for it nor expect them to do very much about it. The idea that they should "open up their markets" etc. is really rather futile. Since they can make most of what they want as well or better than others, exactly what is to be sold to them? The answer to this usually seems to be scotch, rollers, smoked salmon and suchlike. That's hardly a solution to the problem.

The Japanese have got where they are by working out their production plans on a global basis, assisted by a benign domestic economic climate (ready finance at low rates of interest and little by way of industrial problems). Others could have done much the same. But traditionally entrepreneurialship in the west has consisted of seizing opportunities as they arise and making the most of them. And you can hardly develop a long-term strategy when, as for so many years in the UK, you have to operate in the context of a roller-coaster, stop-go approach to economic management.

There is, when you consider it, nothing particularly special about the Japanese approach to industry other than the fact that they get their act together rather well. Where does this leave the rest of us right now? We can't undo Japanese success nor wish their industries away – and the consumer would soon feel the deprivation of not having ready access to the fruits of Japanese production. All we can do is to learn the lessons that are clearly there and try to do a bit better ourselves. The long overdue dollar depreciation against the yen, starting in late 1985, has had severe effects on the profitability of Japanese industry. You can't indefinitely maintain unrealistic exchange rates, though the markets don't operate with the efficiency one would wish. From the longer term view it already looks as though the trade imbalance problem is no longer the insoluable one it once seemed. Meanwhile the calls for Japan to import more and expand its economy, and the threats of sanctions and tariffs, are beginning to look like so much posturing.

The problem of Japan's ability to run value-added industries and benefit from substantial research and development work remains. This is not the sort of thing that can be changed overnight. In the short term the only practical solution lies in greater collaboration and more joint-venture projects.

**EDITOR**
John A. Reddihough

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**COVER PHOTO**

Our cover photo this month shows a picture-in-picture display on a Sanyo Model CBP2146. An article on PIP circuitry will appear in a later issue.

# TX9 Thyristor PSU Servicing

**Gordon Haigh**

Later versions of the Ferguson TX9 chassis (PC1044 main panel) use a chopper power supply, with all the advantages this brings, such as lower component count, reduced weight and simplified operation. The circuitry will also in general provide automatic protection in the event of an overload or other malfunction without necessarily blowing the mains fuse. With the earlier thyristor type of power supply (sets with main panel types PC1001 or PC1040) this is not so – any distressful situation in the power supply is likely to blow mains fuse FS1. This article deals with the earlier type of power supply circuit since this is the one that's more likely to give you problems. The complete circuit of the earliest version (PC1001 panel) is shown in Fig. 1: there were several minor modifications in the PC1040 version and in this the diodes have D instead of W reference numbers, the transistors have TR instead of VT reference numbers, while the thyristors have CSR instead of SCR reference numbers.

## Quick Checks

The block diagram in Fig. 2 shows how the various voltage supplies are distributed through the set. All these voltages as well as the 22-26kV e.h.t. depend on the power supply producing the correct stabilised h.t. of 115V at the output side of R197. A 120V tuning supply is tapped from the other side of R197. It's a relatively easy task to do some quick spot checks on these voltages – all readings shown are taken with respect to chassis. Chart 1 gives a quick guide to supply line faults.

Chart 2 shows a more detailed approach to adopt when the symptoms are a dead set with FS1 intact. Note that the line oscillator will not receive its start-up supply if the line driver transistor VT67 has failed – this is a weak link. If R223 is burnt the replacement should be a 470Ω, 5%, 0·5W fusible type and with this value fitted R216 must be 1kΩ, 5% 0·5W.

## Mains Fuse Blown

We come next to the bit we all like best – wondering whether there will be enough 1·6AT fuses in stock. It's important to appreciate that the circuit incorporates a crowbar thyristor (SCR2) which fires when the h.t. exceeds 130V or the current demand is excessive. As a starter, follow the procedure given in Chart 3.

A severely blackened fuse suggests that the crowbar trip has operated. A replacement fuse may restore normal operation, but for only say a couple of days – this prompted one contributor (see *Television* July 1984) to design an electronic circuit breaker. Fortunately Ferguson have compiled another fault-finding procedure – see Chart 4 – using a 2A thermal cutout. This second approach should be used when the first has been exhausted or proves to be inconclusive. A 100$\mu$F capacitor and 3A fuse are also required when doing battle in this way with the more sticky or subtle faults.

Intermittent fuse blowing should direct attention to zener diodes W85 and W83, transistor VT66 and the crowbar thyristor SCR2. The regulating thyristor SCR1 can blow the fuse without measuring short-circuit, so as with any suspects it's best to fit a new replacement part, if only for elimination purposes to save time. R184 (220kΩ) in the set-115V control network can go high in value to cause fuse blowing.

Ferguson state that if EW modulator diode W96 goes short-circuit the crowbar thyristor will fire, blowing FS1, and that this fault can damage VT72/3/4 and R251 in the EW modulator drive circuit.

The degaussing thermistor must be replaced with the

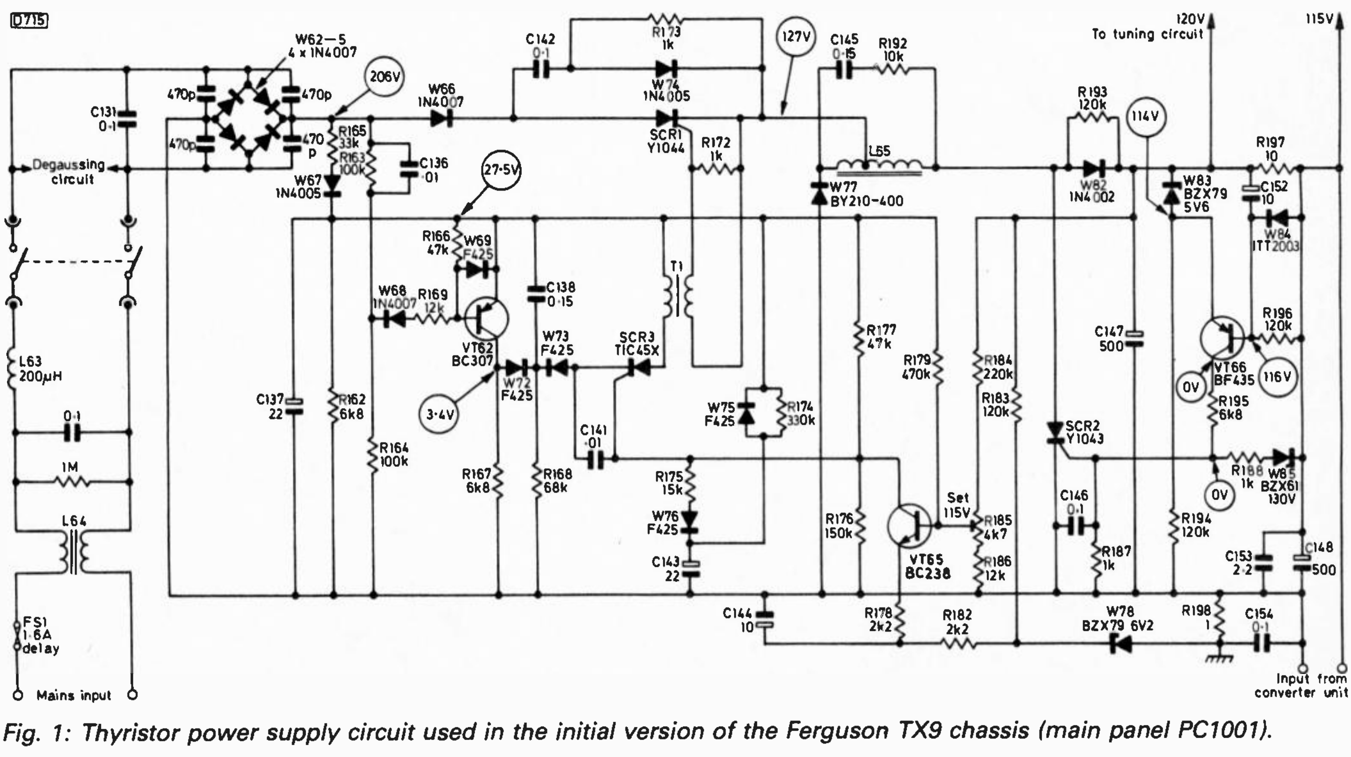


*Fig. 1: Thyristor power supply circuit used in the initial version of the Ferguson TX9 chassis (main panel PC1001).*

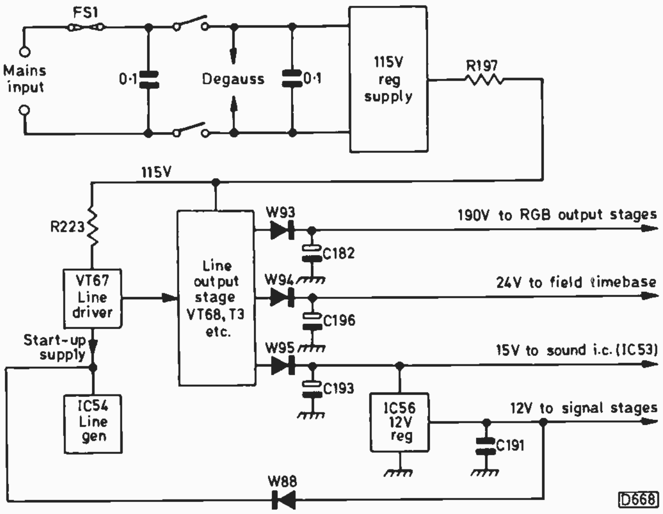


*Fig. 2: Block diagram showing the origin of the various supply lines in the TX9 chassis.*

correct type – the wrong type can go up in smoke, with perhaps fuse failure.

If SCR1 goes short-circuit the momentary rise in h.t. before FS1 blows can damage the following components: the line output transistor VT68, the 24V rectifier W94, W103 and the TDA1170S chip in the field timebase, the 15V supply reservoir capacitor C193 and the 12V regulator chip IC56.

There are several official modifications for dealing with the problem of random mains fuse blowing. These are as follows. PC1001 panel: (1) change C146 to 22$\mu$F, 16V; (2) change R223 to 470$\Omega$ and R216 to 1k$\Omega$ – these two changes must be implemented simultaneously (see above); (3) change the line driver transistor VT67 to the correct Ferguson approved type (part no. 00TR-029-701-1TG). PC1001/1040 panels: (4) change L65 to the later type; (5) change W85 to the correct Ferguson approved type (part no. 02V4-718); (6) change C134/5 to 0·001$\mu$F, 1kV.

## Displaced Picture

A problem that sometimes arises with these sets is horizontal displacement of the picture to the left. The cause is either R212 or R217 (both 220k$\Omega$) in the line generator feedback loop going high in value or open-circuit. Originally carbon-film resistors were used in these positions. They were changed to metal glaze resistors in later production.

## Set's Label

Finally, don't forget the label pasted in the set. It carries enough information to locate and carry out quite a few preset adjustments, which is helpful in the field.

### Chart 1: Supply line checks.

In the event of a dead set, can you hear the line start up? If not check for 115V at R197 then refer to Charts 2-4. If the line start up is audible, is there a slight buzz from the speaker? If there is, check for 12V at C191 – if this supply is absent suspect IC56.

For no sound check whether 15V is present at the cathode of W95. If o.k. check R156 and IC53.

For field collapse with normal sound check for 24V at the cathode of W94. If o.k. suspect IC55 stage.

If there's a bright raster with flyback lines and normal sound check for 190V at C182. If o.k., suspect IC52.

### Chart 2: Set dead, FS1 intact.

Check the voltage at the cathode of SCR1.

If 120V, check whether R223 is burnt. If so check IC54 and VT67. If not check W82, R197, VT67 and VT68 (could be open-circuit).

If the voltage at the cathode of SCR1 is approximately 12·5V check W78.

If there's 0-2V at the cathode of SCR1, check for about 210V at its anode. If there's zero voltage here check the mains bridge rectifier, W66 (if in series with SCR1) and the mains input. If the 210V supply is present check the a.c. voltage at the anode of SCR3, via an 0·1µF capacitor. If the reading is 0·2V a.c. check SCR1 and T1. If the reading is 0V check for 30V at the emitter of VT62. If the reading here is approximately 20V VT62 is short-circuit. If the reading is 0V check W67 for being open-circuit and C137 for being short-circuit. If the 30V is present, check VT65, C138, C143, C144, W73 and SCR3.

### Chart 3: Dead set, FS1 blown, Method 1.

Switch off at the mains. Replace FS1. Turn R185 fully anticlockwise (minimum h.t.) and the volume control to the half-way point. Switch on.

If the sound comes up then the fuse blows check VT62 and VT65.

If there's sound but no raster, check the 115V line at R197: adjust R185 to increase the h.t. slowly to exactly 115V. If FS1 blows go to Method 2.

If FS1 blows, disconnect the mains lead and fit a replacement fuse. Disconnect the degaussing coil. Then check the resistance across the mains lead both ways, using the middle ohms range.

If the reading is 1kΩ one way, check for shorted bridge rectifier diodes.

If the reading is 100kΩ both ways, check SCR1 for being short-circuit. If its resistance is greater than 1MΩ anode to cathode, check the resistance of SCR2 from anode to chassis (red lead to chassis, black to SCR2 anode).

Check SCR2 and W77 if the reading is a short-circuit.

If there's an initial short-circuit, rising to 20kΩ as C147/8 charge, check W93, W94 and W95 for being short-circuit and for shorts across the 15V and 24V lines.

If the reading is 3-4kΩ, check VT67 for being short-circuit or for a short across the 190V line.

If the reading is 1kΩ, disconnect VT68's collector and remeasure. If the reading is still 1kΩ there's a short-circuit across the 115V supply. If the reading rises to greater than 20kΩ, check VT68.

### Chart 4: Dead set, FS1 blown, Method 2.

Switch off at the mains. Connect a 2A thermal cutout (as used in Thorn 3000/8000 series chassis) in series with the live side of the mains supply. Replace FS1 with a 3A fuse. Solder a 100µF capacitor across C143 to increase the slow-start action. Switch on.

If FS1 blows immediately, check W62-5, SCR1, C130, C131 and W72 for shorts.

If FS1 blows after a few seconds, switch off and reset the cutout. Monitor the voltage at the cathode of W82. Switch on. Note the voltage indicated by the meter before the cutout operates.

If above 115V, check VT65, VT62, W66, W69, W68, W72 and W78. The h.t. could be set too high.

If the reading is 50-100V, check W77, W83, W94 and W95 and for shorts across the 24V and 15V lines.

If the voltage is below 2V check W85, SCR2 and C147, and for a short across the 115V line.

If the reading is 5-15V, switch off and disconnect the collector of VT68. Reset the cutout and switch on. If the cutout holds, check VT68 and W96. If it operates, check C148, VT66 and for a short across the 190V line.

# Letters

## SERVICING CHARGES

I've been a regular reader of your magazine for some years now and find it a great help – being self-employed, I have little time available to go on up-dating courses or anything of that sort. One thing bothers me however. There never seems to be any discussion on the subject of pricing repairs. Prices are often given in your test reports and other items relating to pieces of equipment, but when it comes to repair prices – nothing! Anyway, I'd like to start the ball rolling on this topic.

It's a fact that our trade has been adversely affected by retail discounting. Many small businesses have had to cut down on retail sales to such an extent that their main turnover now comes from servicing. Conversely, the discount merchants have their problems when it comes to servicing. They've got themselves a very poor reputation as a result of the poor wages they pay (how can they pay more when they make so little on sales?). Poor wages mean that they end up with substandard engineers. I'm not saying that all their engineers can be so described, but when I worked for two large discount houses some years ago I was disgusted with the quality of many of their engineers. It seems that the best engineers at such organisations have to be confined to benchwork – a good man is seldom sent out on housecalls. These discount firms tend to have a discount service. They are poorly organised and costs run high. It's not uncommon for them to charge over £25 for a call out.

Let's consider the possibilities this opens up for the smaller firm. I'm not suggesting that we enter into a price war with respect to call-out charges – it would be counter-productive to do so – but I feel that by being more efficient we can charge similar rates while making a better profit. We have two big advantages. First, we are local and know most of our customers on sight. Secondly we can be available more quickly and for more hours than the large groups.

I used to send customers packing when they came in carrying their Hinsho, hi-mo or Flymo come to that, but I then came to my senses. These people deserve all that comes their way. So I'll repair their equipment, but at a price: they are charged at a higher rate than I charge my faithful customers. I can hear you saying "what a rip-off merchant this man must be". Not so. Just think how often you have taken on unfamiliar equipment and found yourself losing money on the job. Now ask yourself what these customers have done for you. Don't think you will get them to buy from you as a result of your efforts – if you're lucky one in a hundred may come back to purchase something, and that's not good odds.

So down to charges. I feel that one must have a standard call-out charge, but with flexibility to allow for regular customers. Say £20 to £25. This should cover the first half hour spent in the customer's house. If the repair cannot be completed in that time it's probably better done in the workshop anyway. Charges for workshop repairs should again be in the region of £25 an hour. It makes no difference to costs whether a transistor radio or a VCR is being worked on – the overheads, wages and costs are all the same, so the charges should also be the same.

I find it advantageous to swap service information with other small local businesses: we all help each other in this respect. Also, we don't criticise each other and we don't discount each other. In this way we find that there's a good living to be made for all of us. As a general rule in my town we all cooperate with each other and there's no backbiting to worry about.

When I suggested to a friend of mine in the next town that he should increase his prices he said he'd lose all his customers. Two years later he's doubled his prices and trebled his number of customers! In fact he's expanding in the service field and closing down his retail shop.

Let's face facts. We are keeping what must seem like the eighth wonder of the world in good condition and deserve payment to suit. I spend a lot of money on equipment, and pay my staff well. We have to be qualified to a high standard not only in being able to diagnose and repair faults in electronic equipment but also in rally driving, plumbing, joinery, building, bottany and coffee sampling! We are expected to listen to the customer's family history and smile whilst attending to a set next to a bloody great fire while the kids empty the tool kit, the dog gets in the way and the customer wants to make you a cuppa. All you want to do is to get out as fast as you can! As engineers, we must surely be worth more than an electrician or a plumber, a motor mechanic or even a refuse disposal man.

In conclusion, if we are to pay ourselves a respectable wage for a respectable trade, we must charge respectable prices.

*D. Tasker,*
*Harrogate, Yorkshire.*

## CHECKING CRT HEATER SUPPLIES

J. LeJeune's novel approach to the problem of assessing c.r.t. heater voltage when the supply is non-sinusoidal (c.r.t. heater voltage checker, January 1987 issue) interested me for a couple of reasons.

First, I had occasion in the past to tackle this problem and found a simple solution: I used a car dashboard type voltmeter. This type of movement – in common with others used on the instrument panel – has as its basis a bimetal strip which is heated by a coil of resistance wire (see Fig. 1). The strip is coupled to the pointer in such a way that its small displacement is amplified. This displacement is a function of the true r.m.s. value of the current flowing in the coil, irrespective of its waveform. The bimetal strip is U shaped, with the winding on one leg only. The direction of displacement in each leg due to the ambient temperature is such that these displacements cancel at the pointer coupling. Thus the meter registers

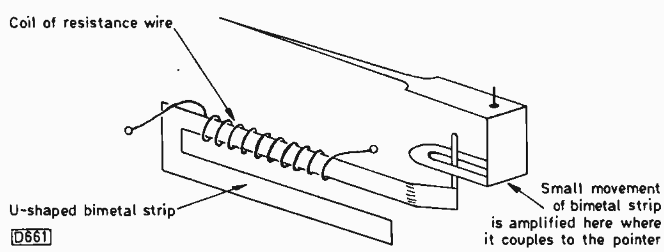


*Fig. 1: Basic mechanism of a car instrument panel meter.*

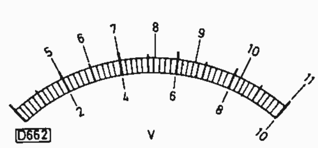


*Fig. 2: Recalibration of the tube tester/booster heater supply voltmeter. Original markings are the lower ones, true r.m.s. equivalents are those above.*

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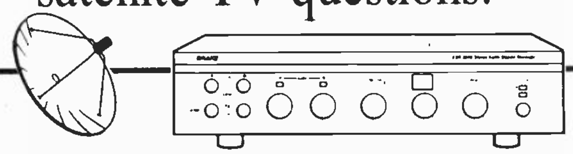

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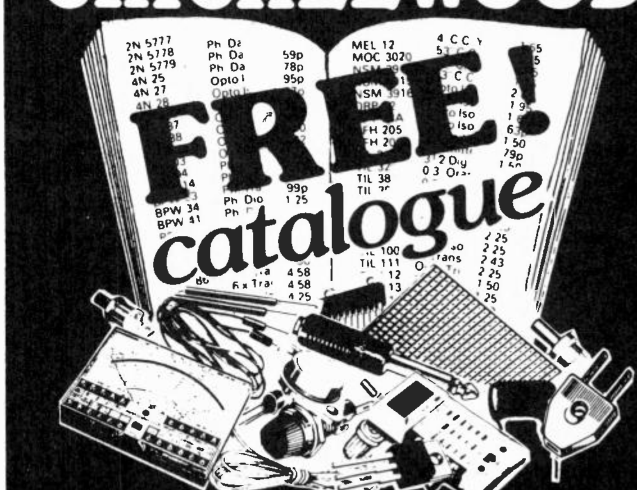


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only the difference in temperature between the legs due to the coil current.

The particular voltmeter I used had a coil resistance of around 400Ω and drew only 15mA at 6·3V. The original scale was marked from 6-17V. When this was carefully recalibrated at 1V intervals, using the bench power supply, it was found to start indicating at 5V. The one snag with this type of meter is that it's very slow to respond and has to be left connected for several seconds until the pointer finally settles.

It's possible to boost the heater of an ageing tube by introducing a turn of wire around the core of the line output transformer in series with the existing heater supply. By using a true r.m.s. meter you can then tailor the value of the series resistor in the supply to give a heater voltage in the region of 7·5V, a figure which shouldn't really be exceeded. If the extra turn is in the wrong direction the heater voltage will of course be reduced.

All this has made me aware of an oversight on my part – in my c.r.t. tester/booster article (February 1987). The heater voltmeter in this tester/booster measures the average voltage of a rectangular waveform. Now this is different from the r.m.s. value, which is what really counts. The difference is greatest when the voltage is low and comes closer to the r.m.s. value as it increases. The relationship between the two in this particular case is $V_{rms} = \sqrt{(V_{ave} \times 12)}$. Fig. 2 shows how the meter dial should look. With the unit as it stands tubes are tested and boosted at a higher voltage than that shown.

*Alan Willcox,*
*Cardiff, South Glamorgan.*

## PORTABLE PUZZLE

A great number of traded-in monochrome portables fitted with the Thorn 1590 have come my way over the years. I find that the worst trouble is inability of the 11·6V regulator to stabilise. In some cases I've changed every component in the power supply and have even changed the line output transformer on the assumption that it might have been loading the supply, but all to no avail.

Have other readers experienced this difficulty? And would it, with hindsight, have been better to arrange for all the circuits to run off the 11·6V rail rather than having some of them run off the 25V boost rail?

*K.J. Treeby,*
*Plymouth, Devon.*

## CUSTOMERS' DIAGNOSES

Although I've not been in the trade for as long as Colin Goodman (Letters, April) I've heard all those diagnoses from customers – and several others as well. In the event of an intermittent fault that clears as you arrive, it's "you've got the magic touch" or "it's like when you visit the dentist and your toothache goes" – if I'd had a quid for every time I've heard that one I'd be able to retire. Other customer cliches include "we didn't touch it, it just went like that" – what they mean is that the transmitter went off the air for ten seconds, in which time they twisted all the tuning knobs from ch. 21 to ch. 68.

Then there are the "famous names", rental customers who call in about ghosting whenever a tanker is anchored in the Solent, or for co-channel interference, and it's always the same – "it's never done it before", "our old set didn't do it", and "we don't get you out for nothing you know". But the records show that engineers have spent enough time at these addresses to be almost able to set up residence there. Do such customers really expect engineers to believe them, especially when the same engineer calls each time, or do they think TV engineers have just swung down from the trees? "Famous names" can progress to become "really famous names": with these people you can be 90 per cent certain of what you'll find wrong (usually nothing) and what they'll say to you.

*Alfred Damp,*
*Ryde, Isle of Wight.*

## HIGH-VOLTAGE FILAMENT VALVES

Your recent article on vintage mains supplies makes me wonder how many readers remember the OSDA-GANZ valves of the early thirties? If I recall correctly these valves ran their high-voltage filaments directly off d.c. mains supplies: you could read a book by the light they emitted.

*R.E.D. Mathews,*
*Christchurch, Dorset.*

## PANASONIC U2 CHASSIS

Recently another Panasonic TC2205 (U2 chassis) came my way with a low-emission c.r.t. and an EW fault. The tube was changed, after removing the boost transformer from the circuit, and I then set about checking the electrolytics, four of which came away in my hand. I finally tackled the EW fault. The usual trouble-makers here are the BD237 EW modulator driver transistor Q753 and the 4·7Ω resistor R770 in its collector circuit. The resistor turned out to be faulty, but after replacing both these items the fault persisted. Further investigation revealed that there was only a slight negative voltage at the junction of the modulator diodes instead of the usual 12-15V. This led me to check the resistance across the lower diode, which gave a correct reading of 4·8kΩ – replacing both diodes made no improvement. In desperation I resorted to swapping all the components in the circuit, using those from an identical set. The faulty item turned out to be the last one changed – the loading coil L752. I hope this note will be useful to other readers.

*John L. Howard,*
*Barnstaple, N. Devon.*

## NO MORE FUN?

Mr. Kendall's letter (March) took me back a few years further. I first became interested in electronics about sixty years ago, at the age of eight, when I built my first crystal set. I remember saving for weeks to buy a valve, and building a set which eventually had a loudspeaker made from an earphone with a paper cone attached to the diaphragm!

In 1948 I started on TV with a set much like Mr. Kendall's, only I had built a simple oscilloscope with a 3in. tube which provided the display. I remember watching the trade programmes in the mornings – Petula Clark was on one piece of film that appeared regularly, and an extract from William Walton's Facade also comes back.

When the *Wireless World* design appeared I set to work to build it. Lots of EF50s and wind not only your own r.f. coils but the scan coils and the line output transformer as well. A visit to Lisle Street, in those days a feast of radio junk shops and not, as now, Chinese food stores, produced a pre-war 9in. Mazda tube, new, for about £10 and

I was in business. The set was in advance of its time in some ways – flyback e.h.t. for example (though only about 5kV if I remember) – and with modifications gave yeoman service for about ten years, when the tube gave up. By then it had had a Haynes line output transformer and scan coils fitted and incorporated a regulated power supply of about 300mA at some 300V, black-level clamping, flywheel sync and lots of other things which were luxuries in those days. I still have the original hand-wound scan coils.

The set and its immediate successor gave me a lot of fun and entertainment, but I feel that the fun is no longer there in the hobby. So much of what we do is now contained in little black chips. When you build something it's a matter of putting the right chips into the right places on the PCB, and unless there's a defective chip it works. Designing is now much more difficult for the amateur without a lot of reference books. I'm not against chips: I built the *Wireless World* teletext adaptor (around 100 chips!) and I also have a computer which I pull to pieces at intervals, but again it's mostly a matter of just plugging in chips!

*M.C. Matthews,*
*Dorchester, Dorset.*

# The Super-VHS Specification

**Steve Beeching, T.Eng.**

It's almost ten years now since I saw the first VHS video cassette recorders – the JVC Model HR3300. Some of these early machines are still in service, having stood the test of time.

## Comparisons

In all VCR systems the luminance signal to be recorded is first frequency modulated on to an h.f. carrier. It's recorded on tape as the lower sideband of the spectrum produced by this f.m. process. Fig. 1 shows the signal spectra for various VCR systems, (a) standard VHS, (b) Beta super hi-band and (c) the new Super VHS (S-VHS). As you can see, the luminance signal bandwidth, and hence the picture resolution, depend on the extent of the lower sideband frequency spectrum that can be recorded on the tape.

The advent of the 8mm video system has led to claims that this will become the new domestic VCR standard. I don't agree with this, nor do I agree that Video-8 is significantly better than the standard VHS system. The Video-8 system has been able to take advantage of developments in video tape recording technology. What if the VHS system was to take advantage of these same developments? This is where the S-VHS system comes in.

In the past, certain Betamax machines gave rather better performance than their VHS contemporaries. This was basically because the Beta system's luminance carrier deviation is slightly wider at 3·8-5·2MHz than the standard VHS carrier deviation of 3·8-4·8MHz. Whilst this higher specification didn't increase the resolution much it did significantly reduce the video noise content. As a result, greater enhancement could be used for the same signal-noise ratio than with VHS. So Beta machines could provide an apparently better bandwidth and resolution.

With the Video-8 system the luminance f.m. deviation is 4·2-5·4MHz. Since the carrier is at a higher frequency than with standard VHS or Beta, the result will be a wider lower sideband f.m. bandwidth and thus improved resolution. The wider deviation of 1·2MHz compared to standard VHS will give an improvement in signal-noise performance, but this is offset by higher density recording on the narrower 8mm tape. Further improvement is allowed for however by the use of higher grades of metal tape.

Thus to achieve improved performance with a video recording system, three factors require attention. First a higher luminance carrier frequency to enable the bandwidth and thus the resolution to be improved. Secondly a wider frequency deviation to improve the signal-noise performance. And thirdly an improved type of tape is required to enable the first two factors to be implemented.

The Super Beta standard is shown in Fig. 1(b) for comparison. The luminance carrier frequency of 4·8-6MHz gives increased resolution (370 lines) compared with standard Beta while the 1·2MHz deviation provides a good signal-noise ratio. Overall the performance is much better than with standard Beta.

## Super-VHS

The new Super VHS specification pushes the luminance bandwidth even farther up the scale, the carrier deviation being 5·4-7MHz. This results in a massive resolution increase from 250 to 400 TV lines while the wider 1·6MHz deviation improves the signal-noise ratio. The bandwidth of the down-converted chroma signal is increased to over 500kHz, centred on 627kHz, giving enhanced colour. The luminance white and dark clip levels have been increased to 250 per cent and 70 per cent respectively.

The new specification also reduces cross-colour effects. If you compare Fig. 1 (a) and (c) you will see that the upper sideband of the chroma signal and the lower sideband of the luminance signal no longer overlap – in fact there's a gap of some 200-300kHz.

JVC intend the new S-VHS machines to have separate luminance and chrominance inputs and outputs so that the improved cross-colour performance and bandwidth are maintained. JVC also intend to market a high-grade colour TV set with separate luminance and chroma facilities. It will take advantage of the improved S-VHS specification, though standard r.f. and composite facilities will no doubt be provided. All this is likely to upset the Euro camp with its SCART connector.

## Tape

The whole system depends on the availability of a tape capable of handling the wider bandwidth. A new tape, intended exclusively for S-VHS use, has been developed. It uses a highly efficient cobalt iron oxide material and has the high coercivity of 800-900 Oersteds (the high grade and super high grade tapes currently available have the relatively high coercivity of 720-750 Oersteds). The cassette has an identification hole so that the VCR can identify the type of tape.

There would be no point in using the new tape with

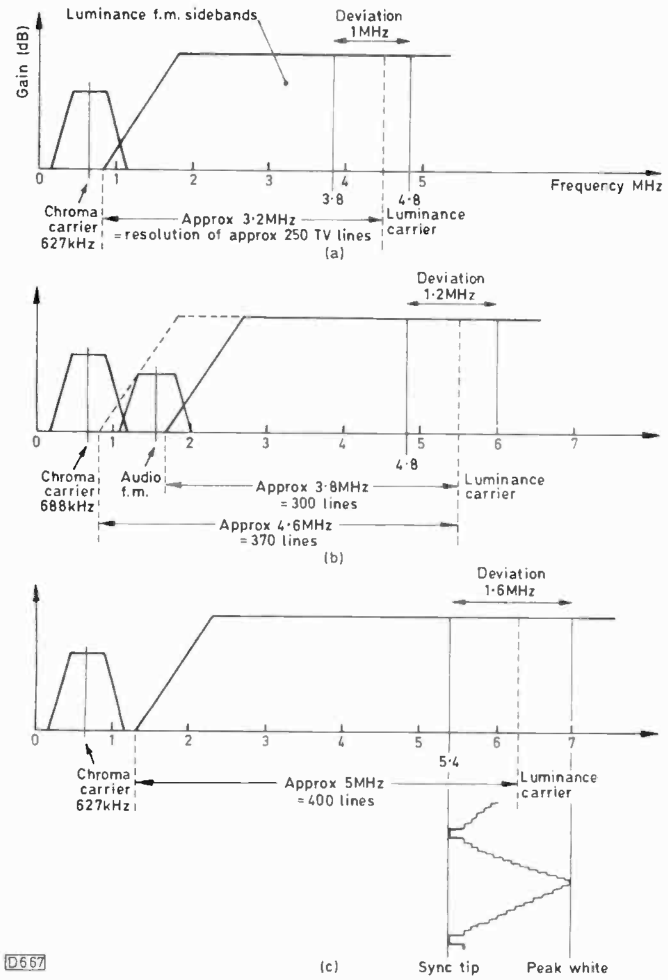



*Fig. 1: Comparison between the signal spectra for various VCR systems. (a) Existing VHS. (b) Beta super hi-band. (c) The New Super-VHS specification.*

current VCRs. They would not be able to erase it let alone record on it, though it may be suitable for use with some uprated models to be produced later this year. The new tape will be manufactured by Fuji, Maxell, TDK and Scotch in addition to JVC.

### Recorders

The new S-VHS VCRs will have dual VHS standard capability, being able to record and playback to either specification. Current models are not able to handle S-VHS tapes.

S-VHS machines will be released this summer by JVC, Panasonic, Mitsubishi, Hitachi and Sharp – in Japan. There's no PAL version as yet, though I expect some S-VHS models to be released in Europe by the end of the year or early next year. The price is likely to be in the region of £1,000. In due course Sony will no doubt announce a new super duper Beta format to handle extended definition TV signals (EDTV), with a resolution of 500 lines. When you come across references to ED Beta some time in 1988, remember that you read about it first in *Television!*

As an aside, whilst we in the UK are still stuck with standard terrestrial TV transmissions it would nevertheless seem that the designers of C-MAC satellite TV decoders should be thinking of providing a separate chroma output. I've no doubt that it would be easy enough to modify TV sets to buffer out the chrominance. Any ideas as to which SCART pin we could hijack?

# Now Read This

**Les Lawry-Johns**

I'm told that some of you who repair Ferguson videos don't recognise a fuse when you see one. Now I don't care to get involved with VCRs myself but when I was given this information I thought it would be prudent to pass it on, although the majority of you probably know what it's all about already. The point is that the fuses concerned don't look like fuses, they look more like a small diode or a transistor with two legs. They're called Wickman fuses and are rated at 150V. Close scrutiny of the list given in Table 1 reveals that the current rating is obtained by multiplying the type number by 40, for example type ICP-F10 has a rating of 400mA ($10 \times 40 = 400$). Cries of never . . . Table 2 lists the range of Wickman fuses available from Philips Service, and their code numbers for ordering purposes. I hope you find this of interest. Take a note of it, just in case.

### The Big Roberts

This large set was brought in the other day by two big fellows who puffed a bit. It turned out to be fitted with the Philips G9 chassis, which was bad news for uncle Les. There was about four inches of field scan on the 26in. tube, almost full width, no control of brightness and very little sound. Now as you know the first thing to do with this chassis is to check the condition of C138 (2,200$\mu$F) which decouples the emitter of the BU208 line output transistor, serving as the reservoir capacitor for the 42·8V supply. I didn't suspect it of being the cause of the fault conditions but checked it just the same. It was on the way out, emitting thick black fluid. I changed it and tried the set again. Still the same. The BU208's emitter voltage was low at about 20V, thus explaining the poor field scan, low sound, etc. I removed the plug connected to the timebase panel (line oscillator, field timebase, EW correction circuit etc.) and the BU208's emitter voltage rose to 40V.

Like a fool I fitted another timebase panel. The symptoms remained the same. So I concentrated on the line output panel and found a leaky diode (D176) in the beam limiter circuit. Replacing this didn't alter things one jot and I was getting fed up. After further checks I found that the "lower" diode in the diode modulator circuit, D156 (BYX55-600), was open-circuit. Heaving a sigh, I replaced this and put the panel back in. It worked. Full voltage at the BU208's emitter, a lovely field scan, full control of brightness and good sound. I would have thought that an open-circuit diode in this position would have had a more drastic effect on the width, but it didn't. Something else to remember.

**Table 1: Wickman fuses used in Ferguson video equipment.**

| Type | Rating | Part no. | Used on |
|---|---|---|---|
| ICP-F10 | 0·4A | 01X0-042-112 | 3V33/38/39/42/43/45/47/48/49/54/56 |
| ICP-F15 | 0·6A | 01X0-040-407 | 3V29/30/35/36/38/39/49/50 |
| ICP-F20 | 0·8A | 01X0-086-061 | 3V46/50 |
| ICP-F38 | 1·5A | 01X0-057-320 | 3V38 |
| ICP-N10 | 0·4A | 01X0-058-395 | 3C01, 3V44/45/48/50 |
| ICP-N25 | 1A | 01X0-085-007 | 3V44/45 |

**Table 2: Wickman fuses from Philips Service.**

| Rating | Code no. | Rating | Code no. |
|---|---|---|---|
| 63mAT | 253 10058 | 1·25AT | 253 10075 |
| 160mAT | 253 10054 | 1·6AT | 253 10046 |
| 250mAT | 253 10071 | 2A | 253 10051 |
| 315mAT | 253 10074 | 2AT | 253 10039 |
| 400mAT | 253 10064 | 2·5A | 253 10082 |
| 500mAT | 253 10041 | 2·5AT | 253 30089 |
| 630mAT | 253 20089 | 3·15AT | 253 10048 |
| 800mAT | 253 30104 | 4AT | 253 10047 |
| 1AT | 253 10052 | 5AT | 253 10065 |

Note: T after A indicates time-lag type.

### The Pye 196

This set gave me a bit of a headache. It's a small monochrome portable fitted with the Philips TX chassis. The complaint was that the picture would go off at irregular intervals, leaving a blank raster with slight radio music or talking sounds in the background. To me this meant trouble in the i.f. strip. My problem was that the fault just wouldn't put in an appearance. The picture stayed on for days. Eventually, one morning, the picture did go off, leaving a blank raster.

I leapt at it and found that the voltages at the base and emitter of the first i.f. amplifier transistor were higher than they should have been – about the same as at the collector. If I switched off to check the transistor however the fault would be gone and we would be back to normal. So I followed the base bias back to the a.g.c. amplifer transistor TS351 and found that this had no base bias. Its collector voltage was thus high and the i.f. amplifier transistor TS217 was being turned on excessively. The base of TS351 is biased by R353 (820k$\Omega$) which was open-circuit. After replacing this the set behaved itself for several days and the owner was glad to collect it.

The set was used in a caravan and had always behaved for the husband but always gave his wife trouble. She blamed him and he was glad to be out of the doghouse. It's all right for him. I live in one all the time. Tessa and Zeb are good really: it's the cat that leads me a dog's life.

### The Radio Set

This was a killer. A shop (I won't say who it was, Peter) had told this chap that the only place where he would get his radio set repaired would be here. I said I would have a look at it if he brought it in. Shortly after this he appeared with his wife, carrying a small wooden box. His wife explained the trouble.

"When we turn up the volume it screams at us."

I took the back off and looked inside. On the right-hand side there was a tall object which I took to be the dropper. Next to this there was a valve which seemed to be a 6Q7. It was obviously a double diode triode anyway. There were two further valves to the left, both with top caps connected to the tuning gang (two sections). I looked for an output valve and rectifier but they weren't there.

"Did you say this set goes?"

"Yes, but it howls at you."

I plugged it in and switched on. Something flashed and went bang underneath. I unplugged it and removed the chassis screws and the knobs at the front. The whole thing came out, including the speaker. When I turned it over I saw that the mains filter capacitor had disintegrated. So I clipped it out. "We'll fit another if a strong station has a hum behind it" I explained.

I switched it on again and was aware of an obnoxious smell.

"It's the smell that's getting us down" he said.

I sniffed around and it seemed to come from the dropper. I looked at it closely. It wasn't a dropper, though it looked like one. It was an old selenium rectifier. I disconnected one end and fitted a BY127. "It won't smell any more" I said.

"That little thing in place of that big one?" he queried.

"The march of time" I explained.

I examined the set in more detail and came to the conclusion that the double diode triode drove the speaker, that what I had assumed was the i.f. amplifier was in fact the second r.f. amplifier, and that what I had assumed was the frequency changer was the first r.f. amplifier. It wasn't a superhet at all, it was a t.r.f. receiver. This meant that the "volume control" was in fact a reactance control, hence the oscillation when it was turned up. I connected the short aerial lead to the braiding of a TV aerial and the set started to perform. With the set tuned to the h.f. end of the medium wave band I tuned the trimmers on top of the gang. The stations now came through loud and clear. I turned up the "volume control" and the set howled, so I turned it down for comfortable listening.

"How long an aerial lead do you use?" I enquired.

"About four feet, connected to a water pipe" he replied.

"Well don't connect the aerial lead to a water pipe unless you use it as an earth. Use a bloody great length of single lead and don't connect it to anything."

"Why?"

"Because the ideal length for an aerial is half a wavelength. Radio four on the long wave is 1,500 metres. The aerial length for this is therefore 750 metres. Get the drift?"

"Yes. Thanks very much."

So they went off leaving me feeling full of nostalgia for the old days. I thought I'd forgotten it all but back it came. I still wonder about that double diode triode driving the speaker.

# Product Report: Glue Guns

***Harold B. Berkley***

For some time now I've been using a glue gun for both field and bench work. It's proved to be so useful that I never venture into the field without one. Traditionally we seem to carry in our kit everything for repairing the set, but seem to overlook damage to the cabinet, knobs and other bits and pieces. Very often a second, wasteful call is needed. With a glue gun in your hand you can eliminate many of these problems.

## The Weapon

Glue guns use hot-melt adhesive sticks – many types of glue sticks are available for bonding different materials. I prefer the clear, general-purpose sticks usually provided with the gun. These will deal with most plastics, wood, fabric, paper, etc.

There's no shrinkage of the glue and the bond is ready when cool. The material is a good insulator and can be used as a sort of potting compound.

For around £10 you can pick up an electric glue gun, with glue sticks, and get started. There are two types of sticks: short, manual fed ones and longer, trigger fed sticks. Both types are o.k.

Camping Gaz have introduced a cordless glue gun. One of these (type P500) has been supplied to me for evaluation and I'll be reporting on it at a later date. It's powered by a Camping Gaz CV360 butane gas cartridge which should give around four hours' continuous use. Ignition is electronic, using one small battery. Two of the longer glue sticks (11mm × 210mm) are provided. The catalytic heating system means that there's no naked flame. The gun is good but not cheap at around £35.

## Applications

You will doubtless find many uses for your glue gun. Here are some of mine.

Cabinet repair is where the glue gun really shines – in the field instead of having to cart a set in for repair or even cabinet replacement. Repairs that are possible in the field include: cracked cabinets and fascias; internal damage to plastic mouldings; switch and push-button mountings.

The gun can be of great help with older and obsolete sets for which parts are no longer available. Have you ever been to an older set which has push-buttons that go flying across the room when you change channels? No problem with the glue gun!

The above remarks also apply to bench work and refurbishing of course.

Here are some specific uses. With whistling line coils, for example in the Thorn 9600 chassis, a quick squirt of glue will usually provide a cure. This is worth a try on other noisy chokes and transformers. Where an on/off switch has been pushed into the set, breaking the plastic moulding, a new switch can be glued in – allow to cool before testing. When the aerial socket comes away from the cabinet, for example in Korting sets, a glue gun will come to the rescue. In fact the list is endless.

## In Conclusion

In conclusion, this must be one of the few gadgets that will earn its keep very quickly. With the new cordless type giving greater convenience ever more uses will be found. If anyone finds some good ones, let us know!


*The Bostik thumb-operated hot-glue gun in blister pack.*

# The 8mm Video System

## Part 4

**Eugene Trundle**

As Fig. 1 showed, the very thin tapes used in Video-8 cassettes have a much shallower magnetic layer than that of conventional video tape. This means that the depth-multiplex audio recording technique, as used for VHS hi-fi, is not possible. Various ways of recording the sound are used in the Video-8 system. These are as follows: (1) A mono audio signal can be recorded on the tape via the video heads, using a frequency-modulated 1·5MHz carrier. (2) The audio signal (digital, stereo) can be recorded via the video heads in the form of pulse-code modulation (PCM) that occupies its own section of the recorded video track (see Figs. 5-7). (3) Provision is made for recording a mono audio signal as a longitudinal track via a stationary head – this is referred to as "auxiliary audio". All Video-8 machines are equipped with an f.m. audio system. The more sophisticated models also incorporate PCM audio. So far as I am aware no production machines to date have made use of the third (lo-fi!) technique. We'll consider the f.m. audio system first.

### FM AUDIO

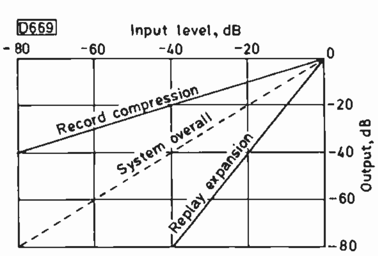
As Fig. 8 showed, f.m. audio has its own part of the Video-8 frequency spectrum. It offers a performance comparable with that of VHS and Beta hi-fi, albeit in mono only, with the frequency response limited to 15kHz.

#### *Companding*

The secret of the excellent performance of the f.m. audio system used with Video-8 equipment is the companding (compression-expansion) technique employed (this technique is also used with VHS and Beta equipment of course). While it calls for great precision in the record and playback electronics – easily implemented by using purpose-designed i.c.s – it's capable of better frequency response, dynamic range and signal-to-noise ratio than any attempt to record the audio without such processing.

The principle of companding is shown in Fig. 27. Starting with 0dB input (top right-hand corner), for each 20dB input signal decrease a gain of 10dB is applied. So a −20dB input signal level emerges as −10dB, a −40dB input signal level emerges as −20dB and so on. The result (upper line in Fig. 27) is to compress an input signal dynamic range of 80dB (10,000:1) into a recorded span of of 40dB (100:1). Hence the expression 2:1 (logarithmic) compression ratio. This total range of 40dB is very easily accommodated by the tape system.

To restore correct signal conditions during playback 2:1 expansion is applied – see the lower line in Fig. 27. The broken line shows the overall result: the original audio input and the system output levels have been equated. In the process there's a tremendous reduction in noise level, as Fig. 28 shows. Here the tape noise is shown as being at a level of about −45dB. After the playback expansion process it will be at some 85dB below the peak sound level.



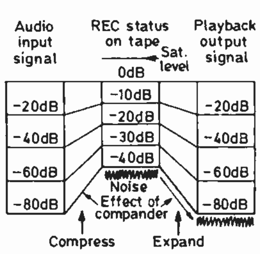




*Fig. 27 (left): Companding characteristic. The dB scale is logarithmic, so the compression and expansion effects are fiercer than this diagram suggests.*

*Fig. 28 (right): How companding reduces playback noise and keeps the "magnetic swing" in the tape small. This technique would not be practical with a "direct" tape recording system – the slightest non-linearity in the transfer characteristic would cause large-amplitude distortion effects – but can be used with a precision f.m. system.*

#### *FM Record System*

Because the sound signal is going to be used to frequency modulate a carrier, various conditioning processes are required in preparation for this – these are in addition to the amplitude compression. Fig. 29 shows the basics of the audio f.m. record system.

After passing through a sharp 15kHz cut-off filter (to avoid TV line frequency breakthrough and to ensure correct operation of the noise-reduction circuit), and in the case of a camcorder a sharp (12dB/octave) 200Hz high-pass filter (to lose wind, handling and lens-motor noise), the signal is applied to the non-inverting input of the main operational amplifier (MOA). Compression is applied by adjusting the feedback to the MOA's inverting input. As you can see, the MOA's output passes via the weighting filter to an r.m.s. detector. This is a very precise measurer of the effective signal level. The output from the r.m.s. detector is used to control the gain of a voltage-controlled amplifier (VCA) which regulates the level of the feedback applied to the MOA. The VCA's characteristic is that shown in Fig. 27: the stronger the input signal the greater the feedback and vice versa. The 2:1 compression is thus put into effect.

Weighting and pre-emphasis are also carried out via the feedback circuit. The pre-emphasis-1 block consists of a filter with a falling response of around 1·5dB/octave between 2kHz and 14kHz: by reducing the h.f. negative feedback a boost is given to the higher frequencies. Pre-emphasis-2 is carried out by a filter in the signal path to the VCA. This has a falling response at around 1kHz, and since it is again in the negative feedback path the effect is to boost the higher audio frequencies. The weighting filter in the path to the r.m.s. detector increases the VCA's gain, largely cancelling the effect of pre-emphasis-2, when the predominant audio signal components are of high frequency. This improves the linearity and ensures that with large h.f. signals the f.m. deviation limits aren't exceeded.

The result of all this is a carefully tailored, shaped and 2:1 compressed audio signal which is passed to a limiter circuit. This is included to clip any signal excursions that may cause over-deviation in the f.m. modulator. The latter consists of an astable voltage-controlled oscillator (VCO) whose output is the record f.m. signal, with a

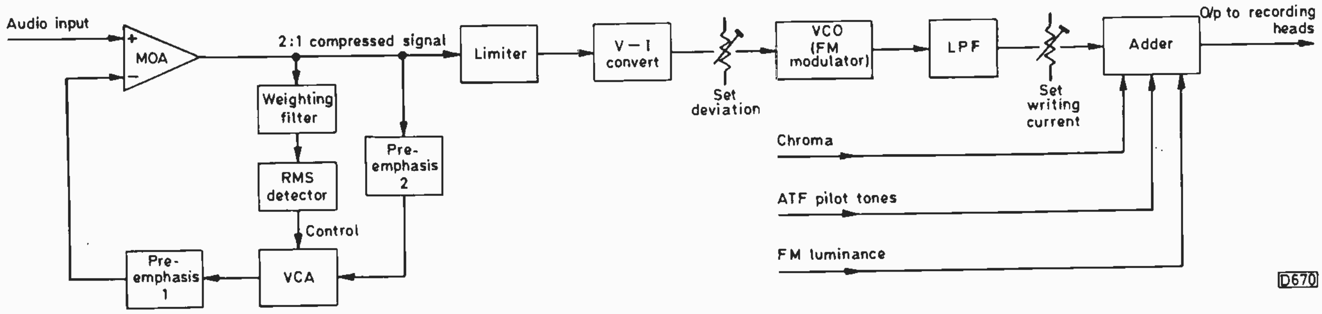



*Fig. 29: Block diagram of the audio f.m. recording system.*

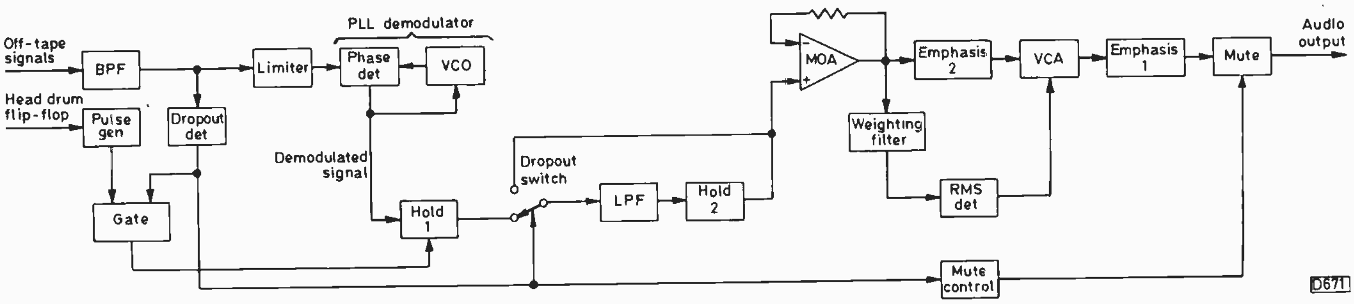



*Fig. 30: Block diagram of the audio f.m. playback electronics.*

centre frequency of 1·5MHz. This frequency is set by a "carrier" potentiometer while the deviation (nominal 60kHz, maximum 100kHz) is set by the "set deviation" potentiometer. The f.m. modulator's output is fed to a low-pass filter with a crossover frequency of around 1·7MHz, then a carrier-level preset which adjusts the audio f.m. writing current to a level about 13dB below the chroma writing current level. The f.m. audio is finally added to the chroma, luminance and ATF signals, the lot then passing to the rotary video heads for recording.

### *FM Playback*

The playback system shares much of the record circuitry. Fig. 30 shows the arrangement in block diagram form. The audio f.m. is filtered from the other off-tape signals by a bandpass filter that's sharply tuned to 1·5MHz, having a bandwidth of about 250kHz. The main playback path is via the limiter (to remove a.m. components) then to a phase detector whose other input is a 1·5MHz signal from the same VCO that was used as the f.m. modulator in the record mode. The VCO and phase detector form a phase-locked loop (PLL) which demodulates the f.m. audio.

The demodulated audio next passes through some dropout compensation circuitry. It goes first to the block labelled hold-1 which is primarily concerned with masking the signal discontinuity at the head change-over points. The output from this block is normally routed through a low-pass filter thence via the hold-2 block to the expander circuit. In the event of a dropout however the dropout detector will sense the shortfall in carrier level and produce an output that activates the dropout switch. The hold-2 circuit then provides dropout compensation to maintain the instantaneous audio signal level until the dropout has passed. The low-pass filter has a slight delay effect on the signal with respect to the hold operation. A prolonged dropout (or lack of f.m. signal for any cause) will bring the mute control circuit into action, shutting down the audio output altogether.

The main feature of the audio playback electronics is the expander, which again uses the MOA and associated circuitry. This time the MOA has a fixed resistive feedback path and acts simply as a buffer. Its output passes through the record pre-emphasis-2 network whose falling h.f. response now provides de-emphasis. Next comes the VCA which is still controlled by the r.m.s. detector. Since the VCA is now in the main signal path rather than in a negative-feedback path, its effect is to reduce the gain as the off-tape signal decreases, giving the expansion characteristic shown on the right-hand sides of Figs. 27 and 28. Pre-emphasis filter-1, still depressing the higher frequencies, now provides de-emphasis-1. On emergence from this filter the audio signal has been fully restored and is ready to be buffered out.

## PCM AUDIO

Whereas the audio f.m. system and its main feature of companding are used for hi-fi sound in other VCR systems, the use of a domestic digital audio record/playback system (PCM) is unique to the Video-8 format – though the imminent introduction of DAT (digital audio tape) will change that. Before launching into the workings of the PCM circuitry we need to know a bit about digitising analogue signals.

Sampling and quantisation are the two processes required to convert an analogue signal into an equivalent digital bit stream. The procedure is shown in elementary form in Fig. 31. First comes sampling: a gate is momentar-

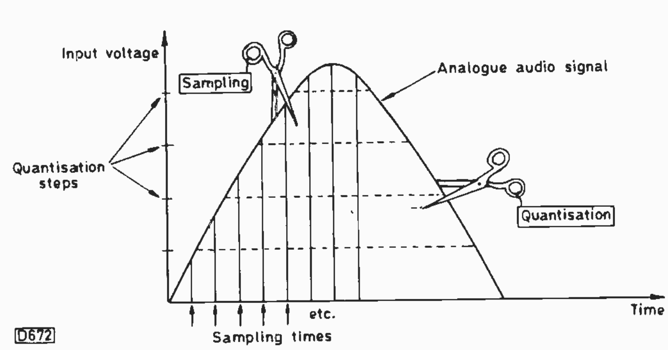



*Fig. 31: Principle of digitising an analogue signal.*

ily opened at short, regular intervals to take a "snapshot" of the signal level at each instant. With the Video-8 format the sampling frequency (for PAL machines) is 31·25kHz, twice the line rate. Now Nyquist's law states that the sampling frequency must be at least twice the highest signal frequency, so a sampling frequency of 31·25kHz implies that the highest signal frequency the system will handle is 15kHz. To avoid aliasing effects, the signal must first pass through a low-pass filter with a very steep roll-off above this frequency.

The second step is to quantise each sample in turn: its amplitude is measured and converted to the appropriate binary number. The final quality – in terms of fidelity and signal-to-noise ratio – of a signal that's processed in this way depends almost entirely on how many digits we use for this binary number, i.e. the greater the number of bits the greater the number of signal level differences we can accommodate. This quantisation is something of a compromise since (assuming real-time operation) the entire digital word has to be generated and conveyed in the short, fixed period between samples. So the more bits we use the greater the bandwidth required in the transmission circuits and the greater the storage capacity of the disc or tape. Various bit rates are used for entertainment audio: 16 bits for studio applications and the compact disc; 14 bits for the EIAJ standard as used for example in the PCM-F1 format; and 8 bits for Video-8 PCM. With Video-8 the initial sampling is done at 10 bits however: this gives some advantages, as we shall see. Ten bits offers us a total of 1024 quantisation levels. So at the output of the analogue-to-digital converter used in our PCM system we have a rapid-fire string of binary words forming a signal that has only two amplitude levels, one and zero.

## Basic PCM System

We've already seen (Figs. 5-7) that the PCM signal is recorded on a "forward extension" of the video track, and since only 30° of head rotation is available for it the sound signal has to be time compressed by about 6:1. Fig. 32 shows in broad outline the audio signal processing in the PCM mode. In the record mode the analogue audio signal first passes through the same compander/emphasis circuitry we've already described for noise reduction in the audio f.m. mode – all that technology is too good to waste! The first step after this is analogue-to-digital (A-D) conversion – to 10-bit words. This is followed by non-linear reduction to 8 bits. Error-correction words are then added to the data before it's stored in a pair of 16K RAMs, to be tone modulated and passed in turn to each of the video heads as they traverse the first 30° of the helical tracks. A slight audio signal delay is inherent in this process: the audio that accompanies field n is recorded on the tape during the PCM segment preceding field n + 2. During playback the need for processing and time expansion means that the segment of sound is reproduced during field n + 3. This 60msec delay is not perceptible to the viewer however.

The signal processing arrangements so far described are used again for playback. The modulator becomes a PLL demodulator, and the memories are loaded with off-tape digital sound data during the 2·9msec or so when each video head is connected to the PCM circuit by the switching shown. During the next 20msec or so the memory in use is read out via error correction and concealment circuits. The digital sound data is then D-A converted to amplitude-compressed audio. Noise reduction is applied in the expansion process and the audio is finally passed out of the machine.

## A-D Conversion

The A-D conversion process is based on the action of a single integrating capacitor. Fig. 33(a) shows the principle. During the first (discharge) period a gate opens momentarily to discharge the capacitor to a level proportional to the analogue input voltage at that instant: this is the sampling time. The capacitor is then recharged by a constant-current source until the voltage across it reaches reference level REF H. With a constant charging slope, the time taken for this is proportional to the initial charge on the capacitor. This period is measured in terms of clock pulses to give a rough count of the value of the analogue sample voltage. In this way the five most significant bits (MSB) of the 10-bit word are formed.

Unless the master clock rate is very high (which is expensive in terms of hardware) there's a degree of uncertainty in this process: the accumulated count depends on the chance timing of the ramp termination relative to the incidence of a clock pulse. Correction for this is carried out during the "fine integration" period, when the capacitor is charged from level REF H to a further fixed voltage REF L by a much smaller constant current – in fact 31 times smaller than that which produces the initial, steep ramp. Once more clock pulses are accumulated in a counter during this period, and the contents of the counter when the voltage across the capacitor reaches level REF L make up the five least significant bits (LSB) of the 10-bit digital word. The five LSB (maximum count 32) can influence the value of the

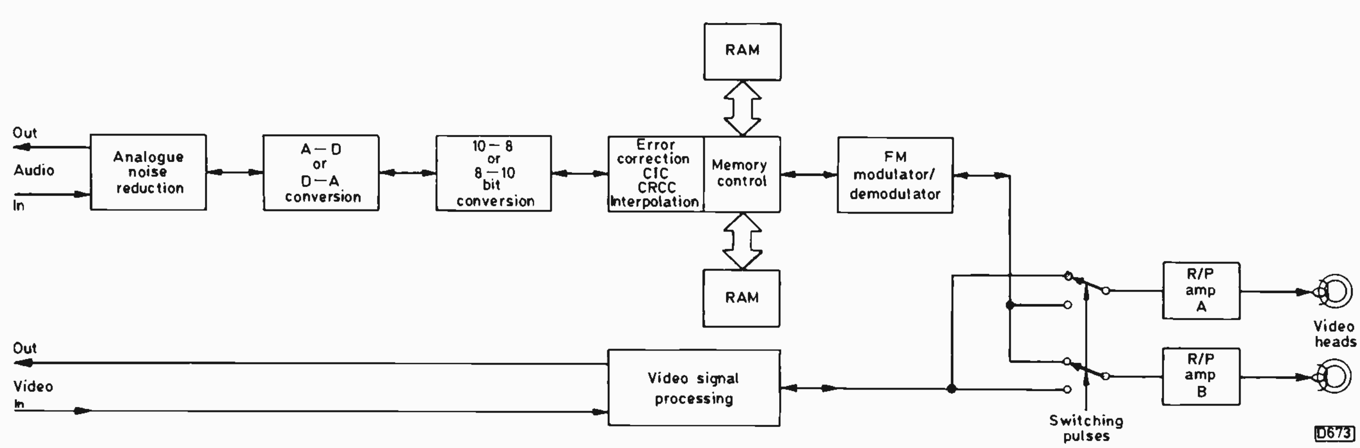



*Fig. 32: Block diagram of the PCM processing arrangement.*

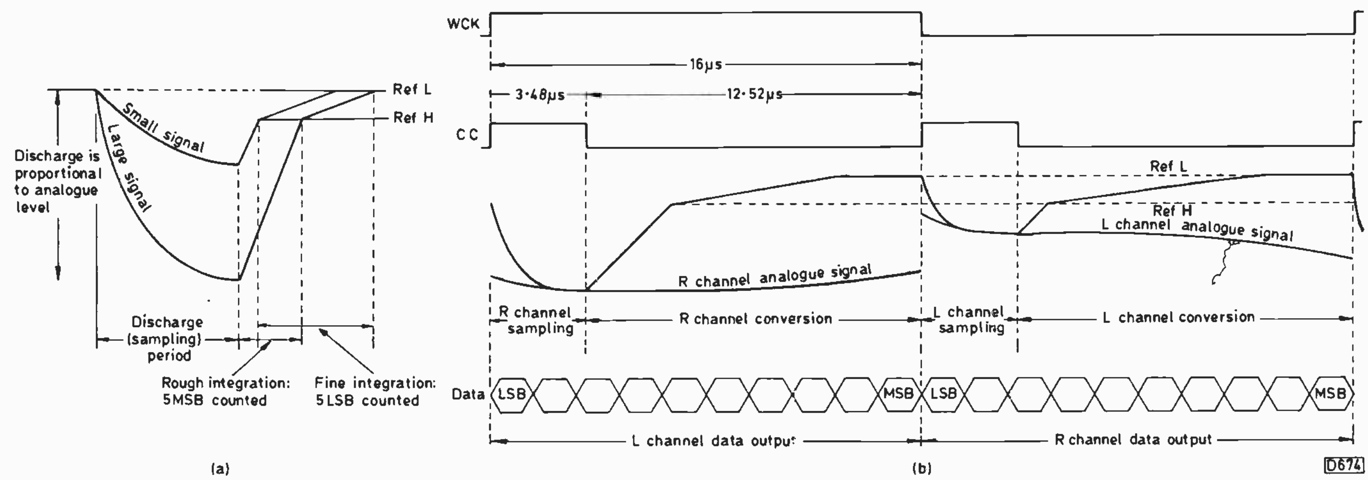



*Fig. 33: A-D conversion: (a) working principle; (b) timing diagram.*

word (maximum count 1024) by only about three per cent, so the action of the second ramp-up can be considered as a "trimming" or "vernier" process. The two 5-bit sections are assembled end-on to form the 10-bit word.

Fig. 33(b) shows a timing chart for the A-D process. Right and left audio channels are digitised in turn, each at 32µsec intervals. The top waveform is that of the word clock WCK, whose positive section lasts for 16µsec. For the first 3·48µsec of this period a gate (controlled by CC, convert command) is opened to give the R-channel audio access to the sampling capacitor. When the gate closes another one opens to pass a constant-charge current into the capacitor. A path is simultaneously opened to allow clock pulses into the 5-MSB counter. A comparator, sitting on the REF H level, detects the finishing point of the first ramp, whereupon it shuts down the 5-MSB counter, simultaneously switching over to the "low" constant-charging current and diverting clock pulses into the 5-LSB counter. A second comparator, whose reference is REF L, shuts down both these processes at the end of the second ramp.

At this point the sampling capacitor is fully charged and the A-D converter is ready to do the same job on the L-channel signal during the WCK's 16µsec "low" period. In our drawing the L-channel audio level is quite different from the previous R-channel sample, and this is reflected in the much shorter primary ramp period. The secondary ramp is of nominally the same length in both cases of course. Note that the R-channel data (bottom of diagram) is clocked out during the period of L-channel digitisation.

This "dual-slope, single-integration" method of A-D conversion is one of several that could be used. Choice of method is always a compromise between cost, accuracy and speed of performance. The choice is an excellent one in this case, giving very good results. The A-D converter chip is also capable of running "backwards" to carry out D-A conversion. We'll return to this shortly.

## *10 to 8 Bit Conversion*

The performance of a linear 8-bit audio data system is not good enough for high-fidelity reproduction. Its main drawback is "quantising noise", the "dither" experienced by signals that fall between the quantising levels. This can be overcome by non-linear conversion from ten to eight bits (see Fig. 34), in which 10-bit quantisation is used for small signals, decreasing to 9 bits for moderate signals, 8 bits for average signal levels and 7 bits for the largest signals. Thus the 512 levels initially available on each side of zero signal level are reduced to 128 levels in the 8-bit output word. The data is in twos complement form, which means that the most significant bit (MSB) indicates the polarity of the analogue signal – one for a negative sample, zero for a positive sample. 10-bit to 8-bit conversion as shown in Fig. 34 is carried out by referring to a look-up table held in a ROM in IC101 (see Fig. 36).

The effect on the audio signal of non-linear quantisation is shown in Fig. 35. As you can see, quantising noise is small at low-signal levels due to the "high definition" 10-bit conversion: it becomes progressively greater as the quantising steps get larger on signal peaks. The resultant noise is lost in the loud signal however, and the effective dynamic range of the system is an impressive 90dB. This is one example of the many bit-reduction techniques that are used in data storage and transmission systems.

## *Data Storage and Protection*

The data is stored in a pair of 16K RAMs into which it's clocked in the form of parallel 8-bit words during the

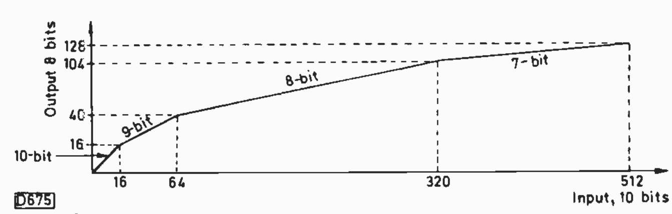



*Fig. 34: 10-bit to 8-bit conversion chart. As the graph shows, the 8-bit output signal is non-linear.*

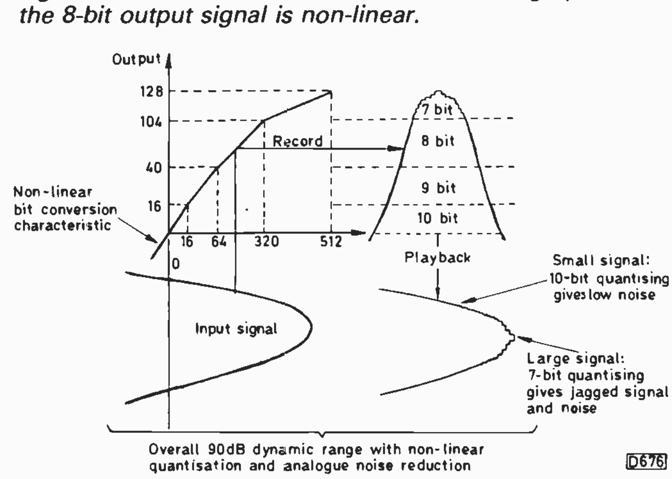



*Fig. 35: The effect of non-linear quantisation on the playback signal: quantising noise is present only with large (loud) signals.*

storage period. When the PCM write period comes round the data is rapidly clocked out – with several alterations and additions. It has ID data added to indicate the nature of the data, i.e. stereo/bilingual, reverse record, multi-PCM etc. It has P and Q parity words added to facilitate error correction. The data is "scattered" throughout the PCM record period in accordance with a cross-interleave code (CIC) which is part of the Video-8 format: this is a general precaution against the effect of a dropout, which instead of blowing a big hole in the data stream merely damages odd bits here and there, hopefully not beyond the repair capability of the parity-check system and the second protection arrangement, a 16-bit CRCC (cyclic redundancy check code). This latter is added en route between the RAMs and the PCM f.m. modulator. The bit redundancy of the PCM format used in the Video-8 system is 38·5 per cent, which is not as wasteful as it seems when the recording system is the unpredictable one consisting of magnetic tape and a tiny read/write head.

### Recorded Data

The data is finally passed to the PCM record modulator which operates in the FSK (frequency shift keying) mode: the recorded frequencies are 2·9MHz for a zero and 5·8MHz for a one. The maximum bit transmission rate of 5·8Mbit/sec may be compared with that of 2·03Mbit/sec for the CD system. The difference of course is that with CD the data transfer is in real-time whereas for Video-8 PCM data the transfer is time-compressed to about 6:1 to fit it into the tape and time slots available.

### Practical Arrangement

The foregoing explanation was of necessity a bit theoretical, and will do little to clear the waters when you examine the circuit diagram – the relevant part (pages 142-4 of the EVS700 manual) looks something of a jungle! To assist with this, Fig. 36 shows how the functions and processes are divided up between the main i.c.s used and the routing of the signals, data and control lines between them. It also gives an idea of the remarkable dual-function operation of most of the chips, which reverse their function during playback to undo, as it were, what they did in the record mode. This applies to the A-D converter chip as well, which is switchable to D-A operation using many of the same internal components.

We'll look at the record path first. The 10-bit serial data enters IC101 at pin 16 for conversion to the non-linear 8-bit format – the ROM instructions for doing this are incorporated in the chip. From pin 9 the serial data passes to pin 46 of IC102, in synchronism with the transfer clock between pins 4 and 3 respectively of the two chips. The data is passed via the serial-to-parallel and multiplex block to the RAM port control section, which is basically a manipulator of addresses. The cross-interleave code and the ID data from IC154 are also inserted at this point, the latter via a 4-bit parallel bus linked to pins 34-37. IC154 takes its instructions from the "feature CPU" chip IC001 which governs the entire PCM processing. The data storage RAMs IC105 and IC106 are read, written and addressed via parallel 8-bit buses which are linked to pins 9-33 of IC102. Also within IC102 is the ROM-based CRCC and the means of inserting it into the serial data stream. Finally, IC102 incorporates the f.m. modulator, an astable VCO which acts as a PLL f.m. demodulator during playback. The FSK f.m. data leaves IC102 at pin 8 for buffering between pins 10 and 12 of IC103 on its way to the recording heads.

The lower blocks in Fig. 36 are concerned with pulse generation and housekeeping. The master clock generator (MCK, 11·5MHz) is in IC104, the output at pin 8 being phase-locked to the 50Hz "off-air" field sync pulses via the S REF signal coming through IC153. The phase detector for this purpose is in IC101, between pins 14 and 1 with its output appearing at pin 20. IC152 delays the head flip-flop pulses for the multi-PCM mode (see later). IC151 generates timing pulses for activation of the flying erase head, particularly during the PCM-dub and multi-PCM modes. IC111 is concerned only with generating video masking signals during the PCM-dub process – the need for these will be explained later.

During playback the off-tape PCM signal is routed via the PLL section of IC103, the f.m. modulator section of IC102 forming part of the loop. After demodulation the data takes the same path (in reverse) through IC102. De-interleaving takes place at the RAM port control section, by address manipulation. Error checking and parity correction of the 8-bit word also take place in IC102: if it can't cope, an error flag is passed to pin 5 of IC101 to invoke an error-masking process. The 8-bit data is converted back to 10-bit linear form between pins 9 and 16 of IC101, again in accordance with the ROM look-up table. When it emerges from pin 16 the reconstituted data is ready for D-A conversion.

### Data Format on Tape

In all, 157 blocks of data are recorded on the tape, along with a preamble and post-amble (both at 5·8MHz), during the 2·9msec occupied by the heads' first 30° of tape scan. The preamble is there to synchronise the playback detector PLL. The post-amble's main job is to ensure that all "old" data is eliminated and all new data recorded in the PCM-mode: it accommodates any slight timing errors.

Fig. 37 shows progressive expansions of sections of the PCM data period – one of the 157 blocks is shown in detail. The first three data bits indicate the start of a block. The next eight contain an address to indicate to the RAM control section the CIC and ID status. Next comes an 8-bit Q parity word for error checking. This is followed by the first four 8-bit words of actual data, W0-W3, then an 8-bit P parity check. W4-W7 are the remaining four data samples, after which comes a 16-bit CRC error-detection code word.

One of the data words is further expanded below. No change during a bit period indicates 0; a change during a bit period indicates 1. This particular word is thus 00111010. The successive data words W0-W7 don't follow the sequence left-1, right-1, left-2, right-2 etc. because of the cross-interleave code. Typically the scattering may be as follows: Q = Q366; W0 = L0; W1 = R48; W2 = L95; W3 = R143; P = P288 etc. This would be impossible to sort out without the standard CIC held in ROM in the PCM processing chip IC102. As with CD, all Video-8 machines work to the same code book of course!

### PCM Playback

During playback the output from each head is in turn gated to the PCM processing department for the appropriate 2·9msec/30°. The f.m. data is demodulated by a PLL and stored in the same pair of 16K RAMs that are used in the record mode. The RAM controller section ensures that the data clocked out of the RAMs is realigned in accordance with the playback CIC. The

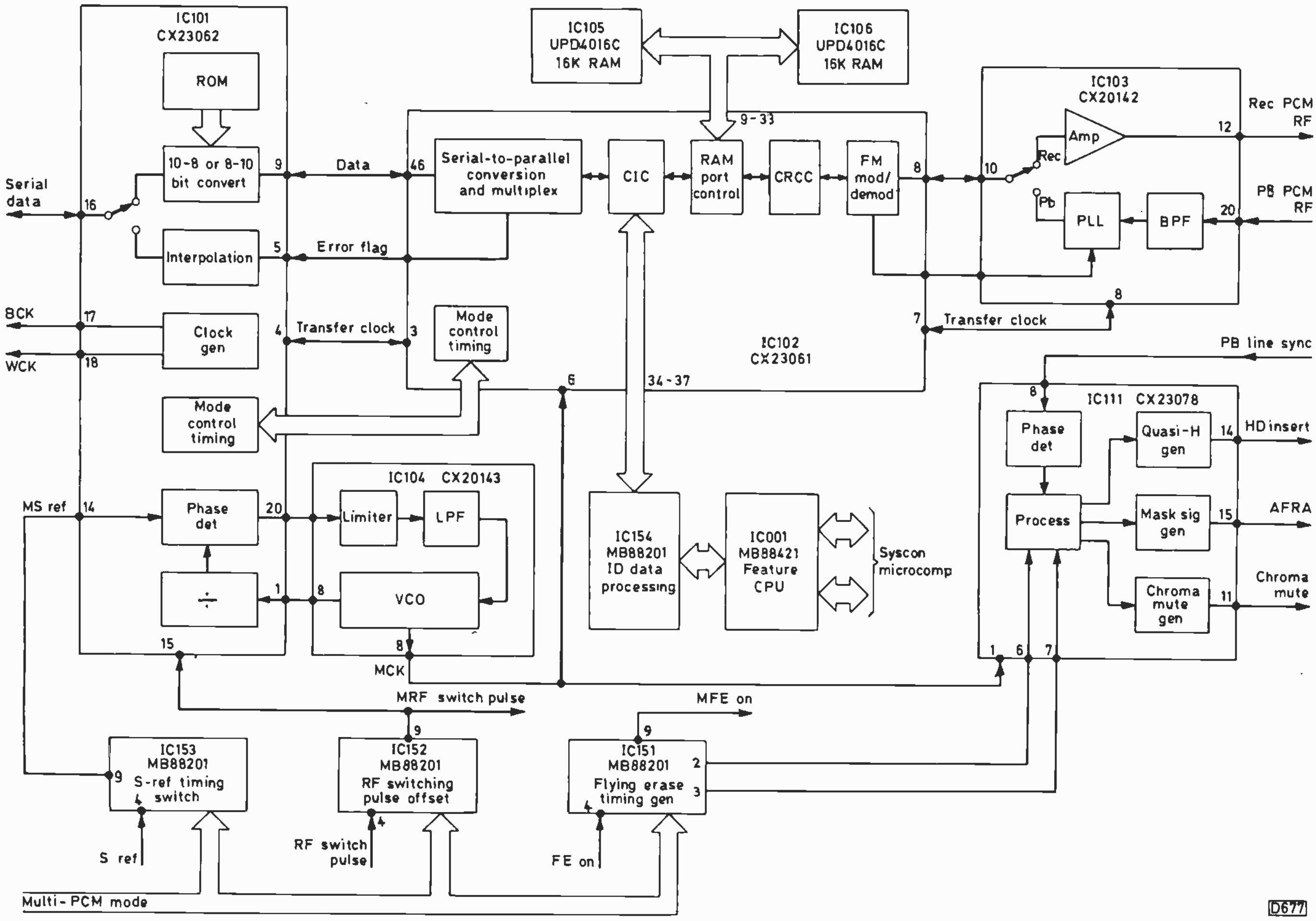



*Fig. 36: PCM processing is carried out by several i.c.s, as shown here with their relationships and interconnections. IC111/152/153 are mainly concerned with multi-PCM operation: IC151 additionally deals with PCM dub processing.*

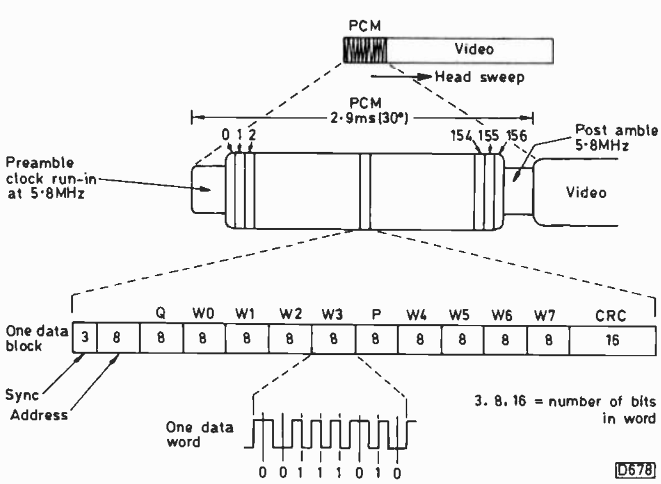



*Fig. 37: Analysis of the PCM segment of a recorded tape track. The characteristics are explained in the text.*

CRCC section indicates the presence of any data errors in each block: these will normally be corrected by the P and Q parity check words. If the error is too great for this correction an error flag appears, invoking the interpolation section.

Most data errors are caused by dropouts and can generally be corrected by the combined effects of the 16-bit CRCC word and the two 8-bit P and Q parity check words. If the dropout is so severe that all these measures fail, interpolation is carried out. With this process a badly corrupted sample is discarded and replaced with a synthesised one derived from preceding and succeeding samples.

The way in which this is done is illustrated in Fig. 38. In (a) one data word, D2, is missing. Primary interpolation takes place: D2 is reconstituted as a word carrying data consisting of the average of the words on both sides, D1 and D3. Secondary interpolation is used where, as in (b), two consecutive words (D2 and D3) are damaged. D2 is simulated by taking an average of the data in words D1 and D4: a new D3 is formed from the average of the new D2 and the existing D4.

What happens if three or more consecutive words are so corrupt that they have to be discarded? It becomes impossible for the electronics to speculate on what they might have been during the short time available, so the chip goes into a "pre-hold" mode, as shown at (c), in which the value of the last good word is held until the reappearance of valid data.

The data leaves the de-interleave and error correction section still in non-linear 8-bit form. It must next be expanded back to 10-bit form. The process is similar to

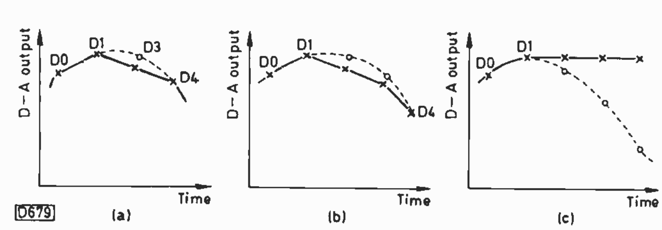



*Fig. 38: Interpolation processes: (a) primary operation in the absence of one sample; (b) secondary operation where two samples are missing; (c) "pre-holding" where three or more samples have been lost.*

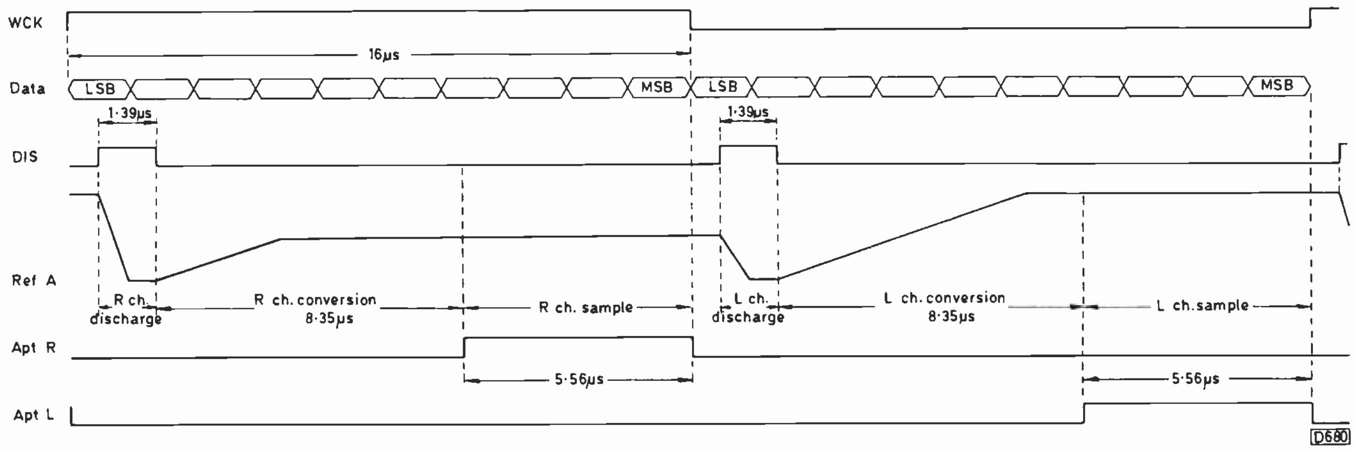



*Fig. 39: D-A conversion during PCM replay. In this example the R-channel output is much lower than the L-channel output.*

that used for 10- to 8-bit conversion during record, again using a look-up table in ROM. The error concealment process just described in fact takes place at the linear 10-bit stage.

D-A conversion makes use of the same integrator stage and storage capacitor as before. Fig. 39 shows a timing chart for the D-A conversion process. The capacitor is first rapidly discharged (during the DIS pulse) to a fixed (2·5V) reference voltage, REF A. At the end of the DIS-pulse period the capacitor is charged by a constant current for a period depending on the contents of the data word being converted. The maximum charging period (corresponding to peak sound) will not exceed 8·35$\mu$sec and the final charge level (at constant current, remember) is proportional to the charging period. This level is sampled (APT pulse period) during the final 5·56$\mu$sec of the conversion process: a succession of these samples is integrated to form the analogue output signal. As shown in Fig. 39, left- and right-channel signals are dealt with alternately, in a 32$\mu$sec cycle. Again there's a timing delay – the L-channel sampling/integration takes place as the succeeding R-channel data is being clocked into the conversion registers.

The analogue signal thus reconstituted is still in amplitude-compressed form of course, and next undergoes expansion in the compander circuit previously described in connection with the audio f.m. section. It's then ready to be passed out of the machine. It's amazing, when listening to the crystal-clear and noise-free audio reproduction from a PCM tape, to think of all the aliases, disguises and transformations the signal undergoes during its passage through the entire system.

# Teletopics

## AT THE SHOWS

There were several interesting innovations and hints of things to come at this year's brown goods' trade shows. Large screen CTV sets for a start. Both Grundig and Mitsubishi showed sets using a 36in. FS tube – the same tube in fact, made by Mitsubishi. Grundig's "Super Large Screen" set retails at just under £3,500 and is intended primarily for commercial use. Fidelity have developed a digital TV chassis using ITT chips: it will be used in a range of models with different screen sizes, from 14in. upwards. Hinari's Sunrise Model TVA1, a 14in. colour set, is designed specifically for use in the bedroom: it incorporates a digital clock timer to wake you up to morning TV and a fall-asleep function which automatically puts the set into the standby mode until the morning if you drop off at night. With full function remote control it comes at a suggested price of £199·95. Colour LCD TV sets are likely to be available from several manufacturers before long, including Philips who have just announced a £45m investment in a new plant at Heerlen specifically for the manufacture of LCD panels and TV sets. Philips expect to introduce a 3in. model later this year, featuring an "active LCD" which is claimed to give higher resolution and better colour than passive types.

Digital was the buzzword in the VCR field, with several new models incorporating digital video processing circuitry to provide features such as picture-in-picture and freeze frame. Sharp, in a special "take a look at the future" show, revealed work on a 3D VCR using standard VHS cassettes. Sansui showed a digital video processor, Model VX99, to provide various special effects in conjunction with a camera that can be genlocked. Effects include eight background colours, oil-painting effects, wipes/mixing/fading and picture-in-picture – all for an anticipated price of around £400. Entryvision CCTV systems are being introduced by various companies including Sharp and Toshiba (see also note last month on the Sony Watchcam). The Toshiba system has a camera the size of a fountain pen and a colour LCD monitor. Sharp's system uses an interphone line to provide multiplexed transmission of sound, video and phone signals plus power.

## NEW JOINT VIDEO VENTURE

Hinari Consumer Electronics has formed a 50:50 joint venture company with Japanese manufacturer Shintom to establish a new VCR plant at Cumbernauld near Glasgow. An investment of over £4m is envisaged and the plant is expected to be in operation within a few months. There will be four models initially and about half the output will be exported to other EEC countries.

## TOUGH EEC ACTION

The European Community has adopted a tough stance in efforts to counteract the EC trade imbalance with Japan and avoid possible diversion of Japanese goods to Europe following the recent imposition of tariffs by the USA. The proposed EC measures are aimed particularly at consumer electronics goods, including components for use in VCR manufacture. "Punitive" tariffs could be imposed on colour TV sets in the event of evidence of trade diversion from the US market.

### THE VCR RABBIT

A new system, called the VCR Rabbit, which enables a VCR to drive up to five TV sets around the house, with remote control from another room, has been introduced by EGH (UK) Ltd., Cross Green Industrial Estate, Leeds LS9 0SG. It involves the use of two types of module. The transmitter module is connected to the VCR's output and to the main TV receiver via a standard coaxial cable. A second wire only 0·7mm thick links the transmitter module to a remote Rabbit receiver module up to 50m distant. This thin wire carries the VCR's video signal to the receiver module which converts it to r.f. for feeding into a second set – up to three more sets can be linked to the system via receiver modules. The link wire also carries remote control signals back to the transmitter. Each receiver module is able to receive infra-red remote control commands, while the transmitter module can provide an infra-red output to control the VCR. Thus a handset used with any of the receivers will control the VCR. A simple pack consisting of a transmitter and a receiver unit with link wire costs £99. Extra receivers cost £49 each (with wiring).

### BRANDS AND THE SPARES GUIDE

Teleton Electro (UK) Co. Ltd.'s parent company The General Corporation has adopted the new corporate name Fujitsu General Limited. Fujitsu General will replace the General brand name. Both Fujitsu General and Teleton branded goods will be sold in the UK.

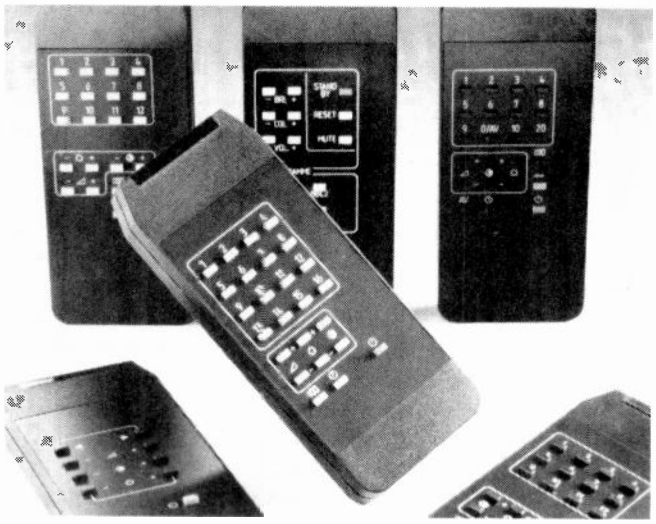
Our TV/VCR Spares Guide, published with the April issue, should have given Technical and Optical Equipment (London) Ltd. as the source of spares for Rigonda sets, not Zenith International. The address and telephone number given were correct.

Information and spares for the Lincoln 35C, about which several readers have asked, are available from Nikkai Imports Ltd., Regents Park House, 45 Byron Street, Leeds LS2 7Q5 (0532 441 640). Spares for Harwood TV sets, which were distributed by Harman Isherwood of Leeds, are available from Jackson Products Ltd., 18th Floor, Station House, Harrow Road, Stonebridge Park, Wembley, Middx HA9 6DE (01-900 0433). This firm can supply only to bona fide trade customers. Spares for Cihan (pronounced GeeHan) and Aro sets are available from Key Electronic Services, 10 Hey Streeet, Bradford, W. Yorks BD7 1HS (0274 370 348). The Cihan brand was used by Greens and the Aro brand by Makro.

We have been asked by Willow Vale Electronics to point out that they are the sole UK distributors appointed by Sharp (UK) Ltd. Wizard Distributors should not have been listed as an official Sharp spares distributor.

### AMPMACE REMOTE CONTROL UNITS

Ampmace (Beechwood House, Falkland Close, Coventry CV4 8HQ) have introduced a range of remote control units which can be used for replacement purposes with TV sets and VCRs from various manufacturers. Ampmace point out that the demand for remote control units is increasing as more and more remote control TV sets appear in the second-hand market and as original



*Some of the range of Ampmace remote control units.*

handsets are damaged or lost. Units currently in stock are suitable for use with Decca, Ferguson, JVC, Philips and Grundig TV sets. The range is to be expanded to cover ITT and Sony sets, Ferguson VCRs and various continental models. Trade prices are £14 plus VAT for ultrasonic units and £14·50 plus VAT for infra-red units.

### NEW MASTHEAD AMPLIFIER

The UP3302 is the latest addition to the Antiference range of masthead amplifiers. It provides high gain at u.h.f. with a v.h.f. bypass that doesn't require termination if not used. The two-stage amplifier provides a gain of 27dB at u.h.f., ± 2dB, with a noise figure of 2·5dB and "exceptionally good" VSWR characteristics. Remote power can be taken from a base power unit or a distribution amplifier with 12V line output, e.g. the Antiference XS6/32. Provision is incorporated to line power a masthead v.h.f. amplifier via the U3302. The retail price is £18·50 plus VAT.

### SONY MIC FOR VIDEO-8 USE

Sony has introduced an electret condenser microphone for use with its complete range of Video-8 camcorders. The ECM-K120 has variable directivity – the response can be supercardioid, unidirectional or omnidirectional – and is powered either by battery or from the camcorder. A special suspension for the pickup cupsules and receptacle damper reduce the effect of contact noise or vibration from the camcorder. The plugs are gold-plated to provide quality connections.

### IN BRIEF

Amstrad has withdrawn from participation in British Satellite Broadcasting, the UK DBS venture. BSB has been awarded a separate fifteen-year franchise to provide advanced teletext on three DBS channels . . . Mullard is investing some £15m at its Durham TV tube plant to extend production to include high-resolution data graphic display tubes. Production will initially concentrate on 90° 14in. DGD tubes and is expected to reach an annual level of a quarter of a million tubes by the end of 1988 . . . Kodak has announced the availability in the UK of its Megaplus camera. This is an advanced solid-state monochrome camera with the high resolution of 1·4 million pixels. It's intended for industrial and scientific applications.

# TV Fault Finding

*Reports from J.K. Potts, Guy W.E. Mundy, T. Eng., Hugh MacMullen, Mick Dutton, Steve Leatherbarrow, Lawrence Ingram and G.C. De Fraine.*

## Decca 110 Series Chassis

These sets have proved to be quite reliable apart from occasional failure of the e.h.t. tray which can be replaced with a standard type. This is usually all that's required. Recently however one came in with the usual faulty tray but damage to the chopper power supply had occurred. On inspection we found that the d.c. fuse F601 has blown, the fusible resistor R627 in the start-up circuit was open, and both the chopper transistor Tr605 and transistor Tr604 in the driver stage were short-circuit. Tr604 is type BSR59 and it turned out to be very difficult to get a replacement. It's a special device with a fast-switching junction and seems to have been discontinued. We eventually had to go to Tatung who supplied a Ferranti FST164K5. On fitting this the set was back to normal, but a lot of delay and telephone enquiries had been involved.
**J.K.P.**

## Grundig 6632GB

We've had several of these older remote control models with the same symptoms: set on permanent standby, won't switch on but the channel numbers change. In each case the problem has been due to Tr1341 (BC548B) on the self-seeking module being leaky. **G.W.E.M.**

## Fidelity ZX3000 Chassis

The problem with this set was predominantly green/pink pictures with occasional surges of green saturation. A scope check on the colour bars at the base of the green output transistor revealed "squashed" green chroma. R224 (100kΩ) which biases the base of the green driver transistor TR14 had risen in value to 203kΩ. **G.W.E.M.**

## Zanussi 22Z616

This modern stereo TV set would start to display a white hum bar and a slightly reduced picture size, with the power supply "chirping", after about four hours' use. It would then switch to standby and would subsequently restart and run again. Obviously the fault was a thermal one. Use of the hairdryer/freezer technique established that the TDA4600 switch-mode power supply control chip IC301 was faulty. **G.W.E.M.**

## Sony KV1810UB

This set suffered from severe field cramp when the back was on. It was a difficult fault to find. The culprit eventually turned out to be the coupling electrolytic C522 (22μF, 16V) which became leaky at a certain critical temperature. **H.MacM.**

## Rank-Toshiba T24 Chassis

This has proved to be an extremely reliable chassis. One problem is the lack of a field shift control. If there's slight field cramp and the picture is a bit low, increasing the value of C317 in the feedback circuit from 2·2μF to 4·7μF will put matters right.

No chroma is usually caused by R229 (3·6kΩ) going open-circuit.

An occasionally snowy picture can be caused by plug 501 from the tuner to the i.f. strip being dirty – you can't see this, it looks so clean from the outside. **H.MacM.**

## Sharp 12P41

Lack of height with cramping at the top and bottom can be caused by a dry-joint on the deflection coils subpanel where there's a centre-tap connection. **H.MacM.**

## Philips G11 Chassis

This set had no chroma – whenever I left the customer's house. I eventually discovered that connection 17 on chroma/luminance module U6200 had never been soldered. **H.MacM.**

## Ferguson TX90 Chassis

The height on this portable was a trifle enthusiastic – we estimated about 18ft. On one shot we were trying to work out what the silvery object that covered a third of the screen was – it turned out to be a man's belt buckle! A BZV85 68V zener diode in the field output stage read normal in the forward direction and 18kΩ in reverse. Replacing it cured the fault. Before finding this one I had tried changing the field output transistors – note that the zener diode is not present in earlier production models.

Another of these sets went into shutdown periodically, needing to cool for ten minutes or so before it would work again. Due to the nature of the fault it was some time before we discovered that the regulator was the culprit. Freezer and heat had little effect. **S.L.**

## Philips KT3 Chassis

A variety of highly intermittent and unpredictable faults on these sets with the tuner preset draws have been encountered – all sorts of colour variation and tuning change etc. on one or more channels. None of the usual methods of fault provocation seem to work and the only cure is to plod through all the plug pins and sockets on the selector and tuner panels, soldering and adjusting every one of them. **L.I.**

## Grundig CUC220 Chassis

The complaint with this set was white lines at the top when hot – it would show up only in a warm room with the back cover on. A puff of freezer on the TDA2655B field timebase chip revealed the culprit. **L.I.**

## Blaupunkt FM120

A common fault with this model is sound and h.t. present but no e.h.t. You will probably find the 18Ω wire-wound resistor in the feed to the BU208D line output transistor open-circuit. Check the line output transistor before replacing the resistor, and remember the c-e reading due to the diode in the BU208D.

In one of these sets the 18Ω resistor was open-circuit and the BU208D was leaky. After a check on the line drive we switched on. Enormous sparks came from the focus tag on the line output transformer and the internal resistors were found to be very low in value. A new transformer had to be fitted. **L.I.**

### Philips KT3 Chassis

There was no h.t. and no output from the TDA2581 chopper control chip. The U470 chopper module was removed and the 12V supply to the chip was checked – it comes from the junction of R300, C300 and zener diode D300 on the U450 mains rectifier panel. The zener diode (12V) was found to be open-circuit and further investigation showed that the print from R298 runs between the tags of C300. A minute amount of carbon was found here. The print was cut out and bridged and D300 and C300 were replaced. The chip failed almost immediately after switching on so this also had to be replaced. **L.I.**

### Sony KV1320 Mk. 1

I get quite a number of sets that are brought down from London by owners of weekend cottages etc., also a number of Sonys which have been turned away elsewhere. This set fell into both categories. It had not been used for some while and was partly dismantled. Someone had broken the e.h.t. rectifier – a 3AT2 valve in the Mk.I version – and had given up. With this replaced and the set reassembled it seemed to work very well. After a long test it went back to London – to reappear a few weeks later. "Gradually goes dark" was the complaint this time, and after three days it did indeed go dark. Touching board P restored the brightness and it took ages to go wrong again. Careful probing then led us to the tube's screen voltage control VR602. To be on the safe side a new one was fitted. **R.B.**

### Plustron Palladium C14ENS

Twice the e.h.t. stick arced over to the screening can, killing the TA7146P intercarrier sound chip. I removed the can and cut up an old Pye hybrid chassis focus control to enclose the stick fully and stop any further fireworks. **R.B.**

### Fidelity ZX3000 Chassis

The problem with this colour portable was that if it was left for more than a day or two it would start up with screams of protest from the line output stage, eventually settling down and working normally from then on. A raster with a foldover could sometimes be seen. After trying a new line output transformer we found that replacing the BU508A line output transistor cured the problem. I must say that I've not come across this sort of behaviour due to a line output device before. Incidentally the set was very badly affected by nicotine: when I washed the back half of the cabinet shell in soapy water I found that it was silver, not a jaundiced yellowy-grey.

The ZX3000 is also used as the basis of some computer monitors (Prism for one). The owner of one of these had been fiddling with the first anode control and had split the slot with an unsuitable screwdriver. I just managed to reset it correctly with a pair of pliers. **R.B.**

### Philips K40 Chassis

The problem with this set was a predominance of blue. Faint blue flyback lines were also visible. Checks on the tube base panel showed that the fault lay in the blue output stage, since the output transistor's collector voltage was low at 100V instead of 160V. The base voltage was correct and the emitter voltage was slightly out. We checked the values of the resistors in the blue channel in comparison to the other two channels but could find no differences. After disconnecting everything in turn we discovered that the h.f. compensation capacitor C2216 was leaky (about 400Ω). This didn't show up in circuit because there's a series resistor. Replacing C2216 provided a cure. **M.Du.**

### Panasonic TC2201

The complaint was no picture with a funny noise on the sound. When we switched the set on there was indeed no picture and the funny noise was loud motorboating. Use of a can of freezer proved very helpful: when the AN331 a.g.c./sync chip IC301 was squirted the picture and sound returned to normal. A replacement chip put matters right. **M.Du.**

### Thorn 1590 Chassis

The complaint with this set was that the picture shrank from the bottom when it warmed up. We tried just about everything in the field driver and output stages without success. The cause turned out to be the field oscillator isolating diode W3. It measured perfect out of circuit but a replacement cured the fault. **M.Du.**

### Toshiba C2290B (Rank T24 Chassis)

This set suffered from very grainy pictures. We at first suspected the tuner as we've had many similar repairs due to lightning damage. In this case however the tuner was blameless: the cause of the fault was a dry-joint on the tuner coupling coil 1L31. **M.Du.**

### NordMende T4231/Ferguson 3787

The complaint with this set was that it died after about fifteen minutes. This was indeed the case and we found that regulation thyristor DU11 (type 17058) was the culprit. It was going open-circuit when warm. **M.Du.**

### Panasonic TC2203 (U1 Chassis)

There was no output from the power supply. The chopper transistor Q801 was found to have 325V at its collector but nothing at its emitter. There was no voltage at its base either as R832 (150Ω) had gone open-circuit. **M.Du.**

### Ferguson TX90 Chassis

The set came in with the complaint of intermittent loss of picture and sound. It ran for two days before the fault put in an appearance, then the slightest touch on the board restored normal operation. No tapping or movement would make the set go off again. When the next failure occurred the tube's heaters went out, there was no focus voltage and the readings at the collectors of the RGB output transistors were low at 95V. Eventually the set failed completely – just as well or I'd still be looking! It turned out that the winding between pins 9 and 6 of the line output transformer was open-circuit, but to add to the confusion pin 9 was internally shorting to pins 5, 7 etc. Hence a 95V h.t. rail. What had happened inside that transformer I shall never know. **G.C.DeF.**

# Getting Started with Satellite TV

**John Hopkins**

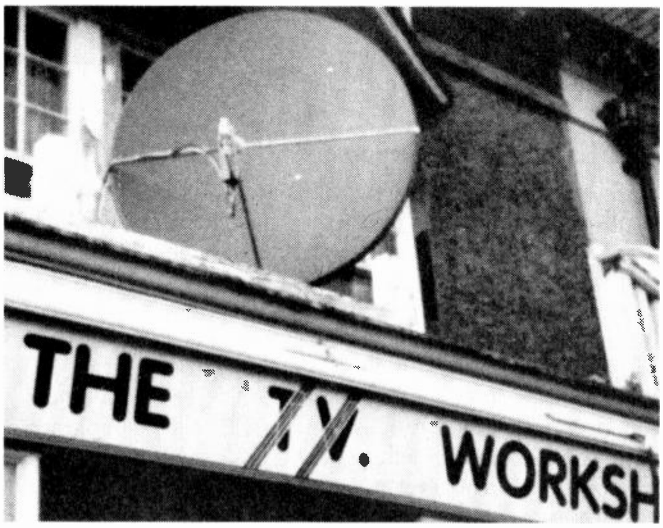
Having made the decision to become the first stockist of satellite TV receiving equipment in Felixstowe I sent off an order, with cheque, to a supplier. That was on November 7th. Exactly twenty days later a small white delivery van drew up outside to deliver the goods for my latest venture.

We unloaded the four parcels and carried them into the shop in the fond hope that we might find everything labelled with full instructions enclosed. But alas we should have realised: Murphy's Law still governs all new ventures!

### Aerial Assembly

The aerial assembly comes in three parts, the dish itself which we instantly recognised, the stand assembly which had clear instructions, and the polar mount which is where the supplier started to lose interest. We followed the instructions up to the point where we had a perfect stand assembly. The next step was to attach the dish to the polar mount by means of four long bolts. This was where Murphy's Law started to apply. Unfortunately the top two bolts have to be longer than the bottom two because the top rib is longer and has a bracing strut to fit on to it. This item is referred to as part reference E, with no further explanation. Also supplied is part reference F, which is shown as a short length of flat strip steel rounded off at one end, with two holes at the square end and one hole at the round end. This turned out to have two holes, both of which were square, at each end.

We decided to assemble the dish in the shop for two reasons. First to see how it went together. Secondly customers might come into the shop to see what we were up to – and might actually buy something. After a quick trip to the local builders' merchants for the correct length bolts we followed all the instructions and found that we had a bit left over. It was a long bar of black steel, 22·5 × 1in., with a large hole at one end and a small hole at the other. It acts as a bracing strut between parts E and F, but we first had to make a further trip to the builders' merchants for a bolt to secure the small hole to part E.




*Success – the dish assembly on the balcony above the shop.*

Now we had only to secure the feedhorn to the dish, using the three steel rods provided. So we unpacked the final parcel and there it was – gone! We had ordered an inclinometer so that we would have everything ready for installation by the date we had advertised but this and the feedhorn had not been delivered. They came two days later, via the postman. The feedhorn had three wires hanging from it, coloured red, white and black. These obviously went to the earth, pulse and +5V connections on the receiver, but which way round? A phone call to the supplier gave us a hint. "If you look at the back of the receiver you'll see that there are three connections, red, white and blue." "But mine are red, white and black." "Yes but we remember it easier as red, white and blue." So I asked him which colour went to +5V and he said he didn't know but they connected as red, white and blue in that order. Nice to find that we all know what we're talking about even if we haven't the faintest idea what we're doing.

### Switch on

The dish was reassembled in the back yard and everything was connected up. So I decided to take the plunge. Using a long stick I poked at the on-off switch. Well not quite, but I did feel that I might be about to destroy something I was not sure about. Just to be on the safe side I had left the feedhorn wires off when I switched on. Then I switched off, connected the wires, and switched on again. Sure enough the signal strength indicator light dimmed. I quickly switched off and connected the wires as follows: red to +5V, white to pulse, black to ground. The light came up to full brightness again and I prayed to forgotten gods that I hadn't destroyed anything.

### Finding a Satellite

Now we come to the bit that counts. As I write this I've finished my first installation and can afford to say it's not too bad, or you just do this and then that. Don't you believe it! Imagine a piece of paper about four inches square with a pin hole somewhere in it and that you have to find the hole using a pin while blindfolded. If you start tracking at the top left-hand corner and more to the right then back again you'll eventually find it, but if your satellite is the hole and the dish is the pin you also have to have your receiver correctly tuned to the satellite TV signal and correct polarity alignment. Get either of these wrong and you can go right past the satellite without noticing it.

We set the stand on level ground and checked that it was not only level but that the centre pole was straight on all sides, using a spirit level, then mounted the dish and pointed it due south. Right at the building next door! I decided to give up for the day and went in for my tea.

### Next Day

Next day I set the receiver to number five and by using a small, short-range walky-talky managed to get a very poor patch of light in the centre of the screen. At this point a small warning: don't fit an aerial to the u.h.f. input of the satellite receiver or you may find you're trying to tune in the BBC or ITV. We tried tuning in the satellite receiver and at about three we got RAI. This is an Italian station on the lines of ITV and comes through quite sharply, though the sound is a bit paper-and-combish. By slight adjustments to everything on the dish we were able to get the best we were going to unless we pulled down our neighbour's shop, so we decided to move the dish.

For the rest of the day we moved the dish all over the yard and the shop next door moved with us. Fortunately we have a small balcony over the top at the front of the shop, and a quick trip with the compass confirmed that we would have a clear view to the south if we pulled down part of the balcony rail.

Another day dawned on this Herculean task and saw us repeating the whole exercise on the balcony. This had the advantage of shorter cables, and we were really beginning to feel confident. It seemed that we had RAI in no time at all, and this time it was better than the local station.

### Polarity

Then we hit the next snag! We had RAI, Europa (it was still on then) and TV5, also a very poor (scrambled) Sky. But where were all the other stations? There's a polarity button on the front of the receiver, but pushing this didn't seem to do anything. Time for another call to our suppliers. The chap there told me that when I'd connected my red, white etc. leads I'd jammed the polarotor motor. He told me to take it apart and, using a pair of needle pliers, turn the motor manually to free it. I didn't like the idea of doing this but tried it anyway and was rewarded by a motor noise when the polarity switch was pressed. Lo and behold we'd a lot more stations to look at, including Music Box – a 24-hour pop music program in English.

### In Conclusion

I won't bother you with the number of days that passed by. We had snow, rain, Christmas and the New Year. Somewhere along the line we found another satellite, about 40° to the right. This gave us Premier with movies, the Children's Channel, CNN news, Screen Sport and Lifestyle. One final note: the bracing strut between E and F has to be drilled in several places, and there's a certain amount of play in all the joints – this has to be allowed for in the final adjustments. All in all it turned out to be a very worthwhile project, and having done it once I now know that I can save time by tuning in the customer's TV set and receiver to the dish in a matter of minutes and that the dish will be easier to align because I know where to point it.

Hopefully this account of my comedy of errors will encourage others to have a try at this product, because it really is here to stay.

# Test Pattern Program for the Vic 20

**Bill Brown**

Various computer test pattern programs have appeared in *Television* in the past, but I've yet to spot one for the Commodore Vic 20 – until now!

Like the Commodore 64, the Vic 20 has a screen border which can't be used for display. This can be overcome by using double-height, user-defined graphics and altering the number of rows and columns, then recentring the display. A total of ten screen displays is instantly available after running the following program. This is made possible by redefining the characters used rather than by redefining the entire screen. In lines 90-120 press keys f1, f3, f5 and f7 as indicated between the quotes: do not type f1 etc. Further improvements could be incorporated, e.g. sound, colour bars, etc., but a grey scale is not available with the Vic 20.

The patterns are called up as follows:

| *Key pressed* | *Effect* |
|---|---|
| 1 | Changes display to black characters on white screen |
| 2 | Changes display to white characters on black screen |
| f1 | Displays horizontal lines |
| f3 | Displays vertical lines |
| f5 | Displays crosshatch |
| f7 | Displays dot matrix |
| Any other | Displays combined crosshatch with dot matrix |

I've found this program to be very useful when setting up the convergence in the absence of an off-air test pattern display and hope that others will also find it a useful servicing aid. I would expect that the idea could be adapted to suit other computers, but if so the locations would have to be changed.

### Program

```
10 POKE 36879,25:POKE 36869,255:POKE 52,28:POKE
   56,28: CLR
20 X=7680:Y=8185:Z=30720:H=36864:V=H+1:C=V+1:
   R=C+1:MS=7168:ME=7183
30 FOR A=X TO Y:B=A+Z
40 POKE A,0:POKE B,0: NEXT
50 GOTO 240
60 GET I$:IFI$=""THEN 60
70 IF I$="1" THEN POKE 36879,25: GOTO 60
80 IF I$="2" THEN POKE 36879,17: GOTO 60
90 IF I$="f1" THEN 200
100 IF I$="f3" THEN 210
110 IF I$="f5" THEN 220
120 IF I$="f7" THEN 230
130 GOTO 240
200 FOR L=MS TO ME: POKE L,0: NEXT: POKE 7175,255:
    POKE ME,255: GOTO 60
210 FOR L=MS TO ME: POKE L,16: NEXT: GOTO 60
220 FOR L=MS TO ME: POKE L,1: NEXT: POKE 7175,255:
    POKE ME,255: GOTO 60
230 FOR L=MS TO ME: POKE L,0: NEXT: POKE 7171,16:
    POKE 7179,16: GOTO 60
240 RESTORE
250 FOR J=0 TO 15: READ E: POKE MS+J,E: NEXT
260 POKE V,13: POKE H,7: POKE R,37: POKE C,156:
    GOTO 60
1000 DATA 1,1,1,17,1,1,1,255
1010 DATA 1,1,1,17,1,1,1,255
```

# ECONOMIC DEVICES & QUICK SAVE T.V. SPARES

| | |
|---|---|
| 15/80H | 3.71 |
| 15/85R | 3.30 |
| 16039 | 0.79 |
| 16181 | 1.04 |
| 16182 | 1.04 |
| 16334 | 0.98 |
| 16335 | 0.94 |
| 16446 | 0.98 |
| 16600 | 1.38 |
| 16802 | 1.27 |
| 17052 | 5.61 |
| 17053 | 5.61 |
| 17074 | 9.30 |
| 17089 | 3.45 |
| 17127 | 3.51 |
| 17376 | 1.58 |
| 17523 | 1.95 |
| 17524 | 1.32 |
| 1N4001 | 0.06 |
| 1N4002 | 0.06 |
| 1N4003 | 0.06 |
| 1N4004 | 0.08 |
| 1N4005 | 0.08 |
| 1N4006 | 0.08 |
| 1N4007 | 0.07 |
| 1N4148 | 0.03 |
| 1N4448 | 0.05 |
| 1N5401 | 0.14 |
| 1N5402 | 0.15 |
| 1N5403 | 0.16 |
| 1N5404 | 0.15 |
| 1N5408 | 0.35 |
| 1N914 | 0.04 |
| IR3403 | 5.00 |
| 1S1555 | 0.31 |
| 1S44 | 0.10 |
| 1S5012A | 0.81 |
| 1S921 | 0.10 |
| 2N1303 | 0.38 |
| 2N2219A | 0.33 |
| 2N2222 | 0.38 |
| 2N2646 | 0.80 |
| 2N2904 | 0.36 |
| 2N2905 | 0.43 |
| 2N2906 | 0.38 |
| 2N2926 | 0.15 |
| 2N3053 | 0.27 |
| 2N3054 | 0.99 |
| 2N3055 | 0.61 |
| 2N3442 | 1.56 |
| 2N3702 | 0.14 |
| 2N3703 | 0.18 |
| 2N3705 | 0.16 |
| 2N3706 | 0.14 |
| 2N3707 | 0.16 |
| 2N3711 | 0.11 |
| 2N3771 | 0.70 |
| 2N3772 | 1.71 |
| 2N3773 | 2.29 |
| 2N3819 | 0.42 |
| 2N3823 | 1.17 |
| 2N3904 | 0.62 |
| 2N3908 | 0.62 |
| 2N4101 | 1.73 |
| 2N4240 | 3.30 |
| 2N4444 | 1.73 |
| 2N5293 | 0.50 |
| 2N5294 | 0.50 |
| 2N5296 | 0.49 |
| 2N5297 | 0.50 |
| 2N5298 | 0.61 |
| 2N5771 | 1.18 |
| 2N6109 | 1.58 |
| 2N6130 | 0.72 |
| 2N6133 | 1.25 |
| 2N6180 | 0.95 |
| 2N6292 | 1.65 |
| 2N696 | 0.43 |
| 2N698 | 0.43 |
| 2SA1006 | 1.50 |
| 2SA1011 | 1.65 |
| 2SA1015 | 0.49 |
| 2SA1012 | 1.25 |
| 2SA1020Y | 0.89 |
| 2SA1027R | 0.45 |
| 2SA473 | 0.75 |
| 2SA766S | 4.95 |
| 2SC1173Y | 1.25 |
| 2SC1474 | 1.25 |
| 2SC1509 | 1.35 |
| 2SD1391RL | 3.95 |
| 2SA1095 | 3.74 |
| 2SA1103 | 6.55 |
| 2SA329 | 0.40 |
| 2SA489 | 1.17 |
| 2SA490 | 2.25 |
| 2SA493 | 2.25 |
| 2SA562 | 0.57 |
| 2SA564 | 0.75 |
| 2SA614 | 4.88 |
| 2SA628 | 1.14 |
| 2SA639S | 1.75 |
| 2SA659 | 0.49 |
| 2SA673 | 1.50 |
| 2SA684 | 1.61 |
| 2SA697 | 0.82 |
| 2SA699 | 1.75 |
| 2SA715 | 0.95 |
| 2SA747 | 10.74 |
| 2SA748 | 1.36 |
| 2SA817 | 0.65 |
| 2SA818 | 1.82 |
| 2SA835 | 2.50 |
| 2SA836 | 0.89 |
| 2SA844 | 0.65 |
| 2SA872 | 0.70 |
| 2SA884 | 2.15 |
| 2SA937R | 0.97 |

| | |
|---|---|
| 2SA940 | 0.59 |
| 2SA940-2 | 2.14 |
| 2SA950 | 0.72 |
| 2SA951 | 1.26 |
| 2SA966-Y | 1.16 |
| 2SA999 | 1.36 |
| 2SB774 | 1.15 |
| 2SB185 | 1.13 |
| 2SB375 | 3.87 |
| 2SB400 | 0.40 |
| 2SB405 | 1.03 |
| 2SB449B | 6.98 |
| 2SB511 | 2.50 |
| 2SB54 | 1.39 |
| 2SB546 | 3.75 |
| 2SB56 | 2.80 |
| 2SB618A | 2.22 |
| 2SB631 | 3.25 |
| 2SB643 | 0.61 |
| 2SB669 | 3.67 |
| 2SB681 | 3.96 |
| 2SB695 | 1.98 |
| 2SB75 | 1.04 |
| 2SB774 | 0.61 |
| 2SB819 | 0.89 |
| 2SC1034 | 6.75 |
| 2SC1050 | 5.06 |
| 2SC1096 | 1.16 |
| 2SC1104 | 3.98 |
| 2SC1106 | 4.54 |
| 2SC1114 | 3.25 |
| 2SC1116 | 4.95 |
| 2SC1124 | 1.28 |
| 2SC1129 | 0.34 |
| 2SC1131 | 0.64 |
| 2SC1158 | 3.33 |
| 2SC1162 | 1.05 |
| 2SC1172 | 2.22 |
| 2SC1195 | 5.80 |
| 2SC1212A | 1.97 |
| 2SC1213 | 0.89 |
| 2SC1226 | 1.46 |
| 2SC1293 | 0.90 |
| 2SC1306 | 1.98 |
| 2SC1316 | 10.25 |
| 2SC1317 | 0.87 |
| 2SC1364 | 0.49 |
| 2SC1383 | 1.20 |
| 2SC1391 | 2.45 |
| 2SC1398 | 0.94 |
| 2SC1413A | 3.05 |
| 2SC1446 | 1.25 |
| 2SC1447 | 2.07 |
| 2SC1475 | 0.37 |
| 2SC1505 | 1.00 |
| 2SC1514 | 1.69 |
| 2SC1573Q | 1.25 |
| 2SC1578 | 8.74 |
| 2SC1583 | 1.17 |
| 2SC1617 | 3.89 |
| 2SC675 | 1.41 |
| 2SC1678 | 1.98 |
| 2SC1741 | 1.25 |
| 2SC1810 | 1.70 |
| 2SC1815 | 0.66 |
| 2SC1826 | 0.65 |
| 2SC1829 | 3.34 |
| 2SC1875 | 5.85 |
| 2SC1881K | 2.98 |
| 2SC1893 | 3.02 |
| 2SC1906 | 0.98 |
| 2SC1921 | 1.37 |
| 2SC1923 | 1.07 |
| 2SC1929 | 2.25 |
| 2SC1942 | 4.20 |
| 2SC1945 | 7.99 |
| 2SC1959 | 0.45 |
| 2SC1957 | 1.09 |
| 2SC1953 | 1.93 |
| 2SC1962 | 1.93 |
| 2SC1969 | 3.10 |
| 2SC1983 | 8.35 |
| 2SC1985 | 1.55 |
| 2SC2009 | 0.34 |
| 2SC2029 | 2.33 |
| 2SC2028 | 2.11 |
| 2SC2063 | 0.99 |
| 2SC2078 | 3.11 |
| 2SC2073 | 2.25 |
| 2SC2085-Q | 1.40 |
| 2SC2091 | 1.30 |
| 2SC2141 | 1.86 |
| 2SC2166 | 1.98 |
| 2SC2216 | 0.69 |
| 2SC2233 | 2.20 |
| 2SC2236 | 1.65 |
| 2SC2278 | 1.69 |
| 2SC2314 | 2.17 |
| 2SC2335-KI | 10.41 |
| 2SC2551 | 1.26 |
| 2SC2565 | 3.92 |
| 2SC2570 | 2.88 |
| 2SC2577 | 3.58 |
| 2SC2578 | 6.75 |
| 2SC2671 | 1.99 |
| 2SC2826 | 2.07 |
| 2SC288A | 1.85 |
| 2SC3153 | 5.26 |
| 2SC372 | 1.40 |
| 2SC373 | 1.16 |
| 2SC383 | 1.33 |
| 2SC388 | 0.50 |
| 2SC394V | 0.81 |
| 2SC403C | 0.60 |
| 2SC41 | 2.19 |
| 2SC458 | 0.39 |
| 2SC495 | 0.92 |
| 2SC515A | 2.85 |

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|---|---|
| 2SC535 | 0.79 |
| 2SC536 | 0.33 |
| 2SC537 | 0.54 |
| 2SC605L | 1.16 |
| 2SC620 | 1.46 |
| 2SC643A | 1.54 |
| 2SC668 | 0.67 |
| 2SC681 | 4.40 |
| 2SC682 | 1.88 |
| 2SC684 | 1.65 |
| 2SC693 | 0.63 |
| 2SC710 | 0.69 |
| 2SC711A | 0.50 |
| 2SC717 | 1.28 |
| 2SC734 | 1.43 |
| 2SC761-Y | 0.95 |
| 2SC783 | 3.98 |
| 2SC790Y | 1.73 |
| 2SC828 | 0.28 |
| 2SC867A | 3.84 |
| 2SC876 | 0.96 |
| 2SC930 | 0.54 |
| 2SC935 | 4.13 |
| 2SC936 | 8.66 |
| 2SC940 | 4.68 |
| 2SD1128 | 2.90 |
| 2SD1138 | 0.84 |
| 2SD1273 | 1.36 |
| 2SD1453 | 5.39 |
| 2SD152K | 2.64 |
| 2SD198 | 3.87 |
| 2SD234 | 0.49 |
| 2SD235 | 0.60 |
| 2SD24 | 2.29 |
| 2SD257 | 2.94 |
| 2SD292 | 2.59 |
| 2SD313 | 2.59 |
| 2SD325D | 2.26 |
| 2SD348 | 16.13 |
| 2SD350 | 5.20 |
| 2SD350A | 2.80 |
| 2SD353 | 8.38 |
| 2SD389 | 2.41 |
| 2SD401 | 1.55 |
| 2SD414 | 1.98 |
| 2SD471 | 2.13 |
| 2SD560 | 2.95 |
| 2SD588A | 2.36 |
| 2SD600 | 3.25 |
| 2SD601R | 0.65 |
| 2SD613 | 1.03 |
| 2SD621 | 12.85 |
| 2SD636 | 0.55 |
| 2SD639-R | 0.77 |
| 2SD655 | 0.98 |
| 2SD657 | 3.50 |
| 2SD661A | 0.80 |
| 2SD731 | 2.45 |
| 2SD773 | 0.33 |
| 2SD811 | 7.65 |
| 2SD823 | 1.98 |
| 2SD837 | 1.56 |
| 2SD841 | 3.65 |
| 2SD856 | 1.45 |
| 2SD857Q | 1.84 |
| 2SD882 | 1.50 |
| 2SD894 | 1.63 |
| 2SD898 | 3.45 |
| 2SK105H | 2.15 |
| 2SK152 | 2.95 |
| 2SK34 | 0.76 |
| 2SK41 | 1.07 |
| 2SK79 | 2.98 |
| 40408 | 0.50 |
| 40594 | 1.53 |
| 40636 | 1.43 |
| 4EX581 | 0.80 |
| 741 | 0.30 |
| 7805-T022 | 0.63 |
| 7806 | 0.73 |
| 7808 | 0.85 |
| 7812-T022 | 1.16 |
| 7815 | 0.64 |
| 7818 | 0.92 |
| 7824 | 0.64 |
| 7905 | 0.80 |
| 9368 | 10.70 |
| AA133 | 0.12 |
| AC133 | 0.12 |
| AC123K | 0.43 |
| AC127 | 0.27 |
| AC128 | 0.34 |
| AC138 | 0.24 |
| AC141 | 0.29 |
| AC142K | 0.44 |
| AC151 | 0.28 |
| AC176 | 0.30 |
| AC179 | 0.28 |
| AC183 | 0.72 |
| AC187 | 0.39 |
| AC187K | 0.43 |
| AC188 | 0.47 |
| AC188-01 | 0.49 |
| AC188K | 0.43 |
| AC193K | 0.65 |
| AC194K | 0.65 |
| AD140 | 1.06 |
| AD143 | 1.93 |
| AD145 | 1.60 |
| AD161 | 0.56 |
| AD162 | 0.45 |
| AD262 | 1.25 |
| AF114 | 2.47 |
| AF115 | 1.24 |
| AF118 | 1.20 |
| AF127 | 0.50 |
| AF139 | 0.53 |
| AF178 | 1.45 |
| AF179 | 0.55 |

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|---|---|
| AF180 | 0.55 |
| AF181 | 0.53 |
| AF186 | 0.53 |
| AF239 | 0.43 |
| AF279 | 0.88 |
| AL113 | 1.36 |
| AN115 | 3.98 |
| AN155 | 1.89 |
| AN206 | 2.58 |
| AN208 | 3.55 |
| AN210 | 2.28 |
| AN211 | 3.25 |
| AN214Q | 2.75 |
| AN234 | 5.92 |
| AN236 | 3.78 |
| AN239 | 6.95 |
| AN240P | 1.52 |
| AN241 | 1.71 |
| AN245 | 4.49 |
| AN253 | 2.97 |
| AN260 | 3.85 |
| AN262 | 1.98 |
| AN272 | 7.92 |
| AN281 | 6.65 |
| AN295 | 5.52 |
| AN301 | 3.60 |
| AN302 | 3.99 |
| AN303 | 4.39 |
| AN305 | 8.95 |
| AN315 | 2.46 |
| AN316 | 5.53 |
| AN318 | 5.44 |
| AN320 | 5.47 |
| AN321 | 2.25 |
| AN322 | 5.85 |
| AN331 | 4.59 |
| AN337 | 3.81 |
| AN340P | 1.17 |
| AN355 | 5.98 |
| AN362 | 1.75 |
| AN370 | 3.95 |
| AN5010 | 5.70 |
| AN5111 | 2.92 |
| AN5120N | 4.50 |
| AN5132 | 4.39 |
| AN5250 | 3.98 |
| AN5435 | 3.08 |
| AN5610 | 2.85 |
| AN5612 | 4.68 |
| AN5613 | 4.63 |
| AN5630 | 3.95 |
| AN5701N | 1.66 |
| AN6250 | 2.95 |
| AN6300 | 4.40 |
| AN6310 | 8.74 |
| AN6320N | 4.28 |
| AN6340 | 11.00 |
| AN6341 | 5.98 |
| AN6342 | 1.61 |
| AN6363 | 16.00 |
| AN6371 | 9.24 |
| AN6387 | 10.65 |
| AN6531 | 1.95 |
| AN6551 | 1.35 |
| AN6552 | 0.68 |
| AN6610 | 2.40 |
| AN6677 | 8.95 |
| AN7111 | 1.45 |
| AN7114E | 8.54 |
| AN7115 | 3.38 |
| AN7120 | 4.65 |
| AN7145 | 2.80 |
| AN7146 | 4.35 |
| AN7151 | 2.26 |
| AN7156 | 2.85 |
| AN7158 | 6.75 |
| AN7218 | 1.64 |
| AN7223 | 4.25 |
| AU107 | 3.50 |
| AU110 | 2.25 |
| AU113 | 5.25 |
| AY105K | 2.08 |
| AY106 | 1.09 |
| BA524 | 8.21 |
| B250 | 2.65 |
| B40 | 1.55 |
| BA130 | 0.14 |
| BA1310 | 1.98 |
| BA1320 | 1.38 |
| BA1322 | 3.95 |
| BA1330 | 2.75 |
| BA145 | 0.19 |
| BA148 | 0.25 |
| BA154 | 0.40 |
| BA155 | 0.12 |
| BA156 | 0.05 |
| BA159 | 0.15 |
| BA182 | 0.24 |
| BA222 | 1.66 |
| BA302 | 1.24 |
| BA311 | 1.32 |
| BA312 | 1.05 |
| BA313 | 0.76 |
| BA317 | 0.08 |
| BA318 | 0.02 |
| BA328 | 4.77 |
| BA333 | 1.37 |
| BA335 | 6.27 |
| BA5102A | 2.86 |
| BA511 | 2.92 |
| BA514 | 2.20 |
| BA521 | 2.52 |
| BA524 | 8.94 |
| BA526 | 7.98 |
| BA527 | 2.98 |
| BA532 | 1.56 |
| BA536 | 2.95 |
| BA6209 | 5.52 |

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| BA656 | 5.46 |
| BA7100 | 11.35 |
| BA841A | 28.98 |
| BA843 | 3.96 |
| BA854 | 5.76 |
| BAV18 | 0.21 |
| BAV19 | 0.11 |
| BAV20 | 0.31 |
| BAV21 | 0.34 |
| BAW62 | 0.19 |
| BAX12 | 0.44 |
| BAX13 | 0.11 |
| BAX16 | 0.11 |
| BC107 | 0.13 |
| BC107A | 0.11 |
| BC107B | 0.18 |
| BC108 | 0.15 |
| BC108B | 0.15 |
| BC109 | 0.12 |
| BC109B | 0.15 |
| BC109C | 0.12 |
| BC113 | 0.14 |
| BC119 | 0.36 |
| BC126 | 0.23 |
| BC132 | 0.14 |
| BC135 | 0.14 |
| BC137 | 0.18 |
| BC138 | 0.34 |
| BC139 | 0.28 |
| BC140 | 0.45 |
| BC141 | 0.34 |
| BC142 | 0.34 |
| BC143 | 0.19 |
| BC147 | 0.08 |
| BC148A | 0.10 |
| BC148B | 0.13 |
| BC148C | 0.11 |
| BC149 | 0.11 |
| BC149B | 0.13 |
| BC153 | 0.14 |
| BC154 | 0.14 |
| BC159 | 0.36 |
| BC160 | 0.40 |
| BC161 | 0.28 |
| BC168 | 0.36 |
| BC169C | 0.16 |
| BC170 | 0.16 |
| BC171 | 0.11 |
| BC172 | 0.13 |
| BC172B | 0.27 |
| BC173 | 0.17 |
| BC174B | 0.27 |
| BC177 | 0.35 |
| BC178 | 0.26 |
| BC179 | 0.26 |
| BC182 | 0.08 |
| BC182L | 0.10 |
| BC182LB | 0.14 |
| BC183L | 0.11 |
| BC183LB | 0.26 |
| BC184 | 0.13 |
| BC184L | 0.14 |
| BC184LB | 0.26 |
| BC186 | 0.27 |
| BC187 | 0.28 |
| BC204 | 0.16 |
| BC207 | 0.14 |
| BC212 | 0.11 |
| BC212B | 0.26 |
| BC213L | 0.10 |
| BC213LB | 0.15 |
| BC214 | 0.10 |
| BC214LB | 0.26 |
| BC225 | 0.40 |
| BC237 | 0.10 |
| BC237BJ | 0.12 |
| BC238 | 0.10 |
| BC238A | 0.13 |
| BC238B | 0.13 |
| BC239 | 0.12 |
| BC239B | 0.25 |
| BC251A | 0.31 |
| BC294 | 0.50 |
| BC300 | 0.35 |
| BC301 | 0.45 |
| BC302 | 0.53 |
| BC303 | 1.04 |
| BC307 | 0.18 |
| BC307A | 0.14 |
| BC308 | 0.18 |
| BC308A | 0.11 |
| BC309 | 0.17 |
| BC317A | 0.13 |
| BC327 | 0.15 |
| BC328 | 0.11 |
| BC337 | 0.09 |
| BC338 | 0.34 |
| BC368 | 0.24 |
| BC440 | 1.09 |
| BC441 | 0.44 |
| BC454 | 0.36 |
| BC460 | 0.42 |
| BC461 | 0.47 |
| BC462 | 1.15 |
| BC463 | 0.64 |
| BC477 | 0.37 |
| BC478 | 0.32 |
| BC479 | 0.41 |
| BC532 | 0.28 |
| BC546 | 0.17 |
| BC547 | 0.10 |
| BC548 | 0.10 |
| BC549 | 0.10 |
| BC550 | 0.10 |
| BC556 | 0.16 |
| BC557 | 0.10 |
| BC558 | 0.10 |
| BC559 | 0.10 |
| BC559B | 0.11 |

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|---|---|
| BC560C | 0.14 |
| BC635 | 0.36 |
| BC636 | 0.42 |
| BC637 | 0.24 |
| BC639 | 0.20 |
| BC640 | 0.24 |
| BC879 | 0.39 |
| BC880 | 0.31 |
| BCX34 | 0.40 |
| BCY70 | 0.30 |
| BCY71 | 0.21 |
| BCY72 | 0.20 |
| BD115 | 0.46 |
| BD116 | 0.70 |
| BD124 | 1.31 |
| BD124P+KIT | 0.69 |
| BD131 | 0.57 |
| BD132 | 0.42 |
| BD133 | 0.53 |
| BD135 | 0.36 |
| BD136 | 0.26 |
| BD137 | 0.36 |
| BD138 | 0.46 |
| BD139 | 0.34 |
| BD140 | 0.29 |
| BD144 | 1.70 |
| BD150 | 1.25 |
| BD157 | 0.67 |
| BD160 | 1.60 |
| BD163 | 0.71 |
| BD165 | 0.62 |
| BD166 | 0.42 |
| BD168 | 0.73 |
| BD175 | 0.60 |
| BD179 | 0.49 |
| BD181 | 0.99 |
| BD182 | 0.99 |
| BD183 | 0.99 |
| BD184 | 1.21 |
| BD187 | 0.53 |
| BD189 | 0.69 |
| BD190 | 0.69 |
| BD201 | 0.98 |
| BD202 | 0.60 |
| BD203 | 0.50 |
| BD204 | 0.61 |
| BD207 | 1.79 |
| BD208 | 0.34 |
| BD222 | 0.49 |
| BD225 | 0.49 |
| BD228 | 0.63 |
| BD229 | 1.05 |
| BD232 | 0.50 |
| BD234 | 0.42 |
| BD237 | 0.47 |
| BD238 | 0.39 |
| BD239 | 0.45 |
| BD240 | 0.37 |
| BD241 | 0.39 |
| BD242 | 0.39 |
| BD243A | 0.33 |
| BD243C | 0.29 |
| BD244 | 0.51 |
| BD244C | 0.79 |
| BD245C | 0.99 |
| BD246C | 1.25 |
| BD253 | 1.05 |
| BD278A | 0.80 |
| BD317 | 2.60 |
| BD318 | 2.85 |
| BD375 | 0.42 |
| BD380 | 0.76 |
| BD410 | 0.52 |
| BD433 | 0.47 |
| BD434 | 0.49 |
| BD435 | 0.49 |
| BD436 | 0.60 |
| BD437 | 0.49 |
| BD438 | 0.40 |
| BD441 | 1.42 |
| BD442 | 1.41 |
| BD509 | 1.65 |
| BD510 | 1.07 |
| BD519 | 1.50 |
| BD529 | 1.32 |
| BD530 | 1.18 |
| BD533 | 0.67 |
| BD534 | 0.53 |
| BD535 | 0.79 |
| BD536 | 0.61 |
| BD537 | 0.74 |
| BD538 | 1.45 |
| BD544B | 0.83 |
| BD598 | 1.25 |
| BD677 | 0.56 |
| BD679 | 0.57 |
| BD680 | 0.76 |
| BD681 | 1.48 |
| BD696 | 2.47 |
| BD699 | 3.49 |
| BD700 | 3.70 |
| BD707 | 1.06 |
| BD709 | 1.12 |
| BD710 | 0.80 |
| BD809 | 0.85 |
| BD810 | 0.69 |
| BD879 | 0.74 |
| BD880 | 0.79 |
| BD895 | 2.31 |
| BD899 | 2.48 |
| BD901 | 0.79 |
| BD902 | 0.84 |
| BDW83C | 1.56 |
| BDW84C | 1.56 |
| BDX32 | 1.75 |
| BDX53A | 4.93 |
| BDX53B | 1.85 |
| BDX54B | 2.16 |
| BDX62A | 2.15 |

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|---|---|
| BDX63A | 1.96 |
| BDY20 | 1.21 |
| BDY81 | 1.18 |
| BF115 | 0.40 |
| BF117 | 0.66 |
| BF118 | 0.67 |
| BF121 | 0.25 |
| BF123 | 0.21 |
| BF127 | 0.13 |
| BF137 | 0.29 |
| BF153 | 0.58 |
| BF154 | 0.26 |
| BF157 | 0.33 |
| BF158 | 0.18 |
| BF159 | 0.18 |
| BF160 | 0.31 |
| BF167 | 0.38 |
| BF173 | 0.34 |
| BF177 | 0.35 |
| BF178 | 0.40 |
| BF179 | 0.36 |
| BF180 | 0.36 |
| BF181 | 0.32 |
| BF182 | 0.34 |
| BF183 | 0.39 |
| BF184 | 0.43 |
| BF185 | 0.39 |
| BF194 | 0.14 |
| BF195 | 0.14 |
| BF196 | 0.17 |
| BF197 | 0.18 |
| BF198 | 0.17 |
| BF199 | 0.17 |
| BF200 | 0.37 |
| BF218 | 0.36 |
| BF224 | 0.17 |
| BF237 | 0.65 |
| BF240 | 0.17 |
| BF241 | 0.17 |
| BF245 | 0.50 |
| BF245A | 0.52 |
| BF245B | 0.49 |
| BF246A | 2.52 |
| BF255 | 0.20 |
| BF256 | 0.38 |
| BF256LB | 0.42 |
| BF256LC | 0.42 |
| BF257 | 0.34 |
| BF258 | 0.36 |
| BF259 | 0.34 |
| BF262 | 0.57 |
| BF263 | 0.57 |
| BF271 | 0.34 |
| BF273 | 0.20 |
| BF274 | 0.20 |
| BF324 | 0.35 |
| BF336 | 0.33 |
| BF337 | 0.40 |
| BF338 | 0.33 |
| BF355 | 0.29 |
| BF362 | 0.66 |
| BF363 | 0.60 |
| BF371 | 0.50 |
| BF391 | 0.25 |
| BF417 | 0.84 |
| BF418 | 1.87 |
| BF422 | 0.29 |
| BF423 | 0.52 |
| BF450 | 0.35 |
| BF451 | 0.29 |
| BF457 | 0.41 |
| BF458 | 0.39 |
| BF459 | 0.52 |
| BF460 | 0.60 |
| BF469 | 0.31 |
| BF470 | 0.55 |
| BF471 | 0.33 |
| BF472 | 0.33 |
| BF479 | 0.61 |
| BF480 | 1.38 |
| BF491 | 1.99 |
| BF495 | 0.64 |
| BF506 | 0.43 |
| BF509 | 0.41 |
| BF523 | 0.24 |
| BF532 | 0.45 |
| BF596 | 0.18 |
| BF597 | 0.27 |
| BF694 | 0.22 |
| BF757 | 0.59 |
| BF759 | 0.47 |
| BF761 | 1.05 |
| BF762 | 0.75 |
| BF869 | 0.47 |
| BF870 | 0.30 |
| BF959 | 0.42 |
| BF960 | 0.49 |
| BF970 | 0.69 |
| BFR39 | 0.44 |
| BFR61 | 0.50 |
| BFR62 | 0.50 |
| BFR79 | 0.29 |
| BFR81 | 1.65 |
| BFR86 | 1.08 |
| BFR89 | 1.63 |
| BFR90A | 0.70 |
| BFT42 | 0.43 |
| BFT43 | 0.43 |
| BFT84 | 0.40 |
| BFW10 | 0.60 |
| BFX29 | 0.34 |
| BFX84 | 0.37 |
| BFX85 | 0.41 |
| BFX86 | 0.36 |
| BFX87 | 0.55 |
| BFX88 | 0.34 |
| BFX89 | 0.44 |
| BFY50 | 0.32 |
| BFY51 | 0.50 |

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|---|---|
| BFY52 | 0.27 |
| BFY79 | 0.49 |
| BFY90 | 0.61 |
| BLY49 | 2.20 |
| BR100 | 0.22 |
| BR101 | 0.65 |
| BR103 | 0.75 |
| BR303 | 1.23 |
| BRC116 | 0.67 |
| BRC300 | 2.01 |
| BRC5296 | 0.77 |
| BRC6109 | 0.83 |
| BRC82 | 1.08 |
| BRC83 | 2.19 |
| BRC84 | 2.08 |
| BRX44 | 0.60 |
| BRX49 | 0.67 |
| BRY39 | 0.69 |
| BSS38 | 0.87 |
| BSTBD140G | 5.25 |
| BSTC0246 | 6.99 |
| BSTC0233 | 7.25 |
| BSTCC0143 | 3.07 |
| BSTD1043 | 2.85 |
| BSV57B | 3.49 |
| BSW68 | 0.60 |
| BSX19 | 1.29 |
| BSX20 | 0.34 |
| BSY52 | 0.50 |
| BSY79 | 0.51 |
| BT100A | 1.61 |
| BT106 | 1.55 |
| BT108 | 1.45 |
| BT119 | 1.76 |
| BT120 | 2.17 |
| BT121 | 2.48 |
| BT123 | 1.98 |
| TBA970 | 3.06 |
| BT151-800R | 0.89 |
| BTT6018 | 2.42 |
| BTT8124 | 4.89 |
| BU106 | 2.48 |
| BU108 | 1.50 |
| BU109 | 2.65 |
| BU110 | 5.69 |
| BU111Y | 4.16 |
| BU125 | 2.48 |
| BU126 | 1.25 |
| BU137 | 6.53 |
| BU205 | 1.08 |
| BU206 | 1.27 |
| BU207 | 1.65 |
| BU208 | 1.46 |
| BU208/02 | 1.97 |
| BU208A | 1.12 |
| BU208D | 1.95 |
| BU209 | 1.93 |
| BU226 | 2.95 |
| BU326 | 2.00 |
| BU326A | 2.20 |
| BU326S | 2.20 |
| BU406 | 1.49 |
| BU406D | 1.79 |
| BU407 | 0.82 |
| BU407D | 1.09 |
| BU412 | 9.15 |
| BU426A | 1.13 |
| BU500 | 1.95 |
| BU508A | 1.75 |
| BU536 | 5.80 |
| BU608 | 2.65 |
| BU705 | 2.25 |
| BU806 | 1.79 |
| BU807 | 0.80 |
| BU826A | 2.15 |
| BUW84 | 1.39 |
| BUX84 | 1.00 |
| BUX85 | 1.10 |
| BUY69A | 2.04 |
| BY126 | 0.13 |
| BY127 | 0.08 |
| BY133 | 0.13 |
| BY164 | 0.47 |
| BY176 | 0.52 |
| BY179 | 1.08 |
| BY182 | 0.95 |
| BY184 | 0.47 |
| BY187 | 0.77 |
| BY189 | 1.79 |
| BY198 | 1.62 |
| BY201/2 | 1.50 |
| BY203/20 | 0.59 |
| BY207 | 0.22 |
| BY208 | 0.46 |
| BY210-400 | 0.19 |
| BY210-600 | 0.27 |
| BY210-800 | 0.34 |
| BY218 | 1.64 |
| BY223 | 1.23 |
| BY224-600 | 1.88 |
| BY225-100 | 1.13 |
| BY226 | 0.25 |
| BY227 | 0.49 |
| BY228 | 0.60 |
| BY229-1000 | 1.12 |
| BY229-600 | 0.92 |
| BY255 | 0.69 |
| BY295-600 | 1.03 |
| BY298 | 0.36 |
| BY299 | 0.45 |
| BY407 | 0.90 |
| BY409 | 1.49 |
| BY448 | 1.35 |
| BY713 | 1.10 |
| BYW19/1000 | 0.69 |
| BYW56 | 0.34 |
| BYX10 | 0.29 |
| BYX55-600 | 0.19 |
| BYX71-600 | 0.90 |

| | |
|---|---|
| BYX71-350 | 1.40 |
| BYX94 | 0.16 |
| BYY56 | 1.20 |
| BZY93C30 | 1.86 |
| BZY88 RANGE | 0.10 |
| BZX61 RANGE | 0.18 |
| BZX79 RANGE | 0.10 |
| C106D | 0.46 |
| C106M | 0.76 |
| C1129 | 0.58 |
| CA3046 | 2.55 |
| CA3089 | 0.83 |
| CA3090AQ | 3.25 |
| CA3094 | 2.20 |
| CA3131EM | 3.12 |
| CBF16848N-071 | 1.56 |
| CD4001 | 0.34 |
| CD4002 | 0.27 |
| CD4008 | 1.35 |
| CD4011 | 0.29 |
| CD4012 | 0.24 |
| CD4013 | 0.33 |
| CD4016 | 0.46 |
| CD4017 | 0.82 |
| CD4020 | 1.23 |
| CD4021 | 0.39 |
| CD4023 | 0.28 |
| CD4025 | 0.64 |
| CD4028 | 0.84 |
| CD4040B | 0.85 |
| CD4047 | 1.06 |
| CD4049 | 0.46 |
| CD4052 | 0.75 |
| CD4066 | 0.30 |
| CD4069 | 0.29 |
| CD4070 | 0.66 |
| CD4081 | 0.35 |
| CD4093 | 0.72 |
| CD4511 | 1.10 |
| CD4528 | 2.04 |
| CD4556 | 1.47 |
| CR02AM-8 | 1.55 |
| CV12E | 4.09 |
| CX095D | 3.14 |
| CX104 | 9.64 |
| CX108 | 10.50 |
| CX109 | 7.86 |
| CX130 | 8.76 |
| CX134 | 12.32 |
| CX136 | 11.49 |
| CX139 | 11.83 |
| CX157 | 4.84 |
| CX158 | 5.52 |
| CX177 | 6.46 |
| CX187 | 6.84 |
| CX755 | 12.95 |
| CX885A | 6.85 |
| DEC1 | 2.20 |
| DEC2 | 2.20 |
| DS3486N | 4.33 |
| DS3487N | 4.33 |
| E1222 | 0.40 |
| E5024 | 0.28 |
| E5386 | 0.25 |
| E9003 | 0.46 |
| E9005 | 0.50 |
| ESM310BP | 4.15 |
| FND500 | 5.78 |
| GC374 | 1.65 |
| GD243 | 4.95 |
| GF758 | 0.84 |
| GH3F | 1.82 |
| HA11215 | 4.50 |
| HA11211 | 2.53 |
| HA11225 | 4.29 |
| HA11226 | 10.44 |
| HA11229 | 0.85 |
| HA11235 | 2.48 |
| HA11124 | 5.25 |
| HA11244 | 2.82 |
| HA11251 | 4.47 |
| HA11125 | 4.29 |
| HA1137W | 2.87 |
| HA1138 | 5.03 |
| HA11414 | 5.65 |
| HA1144 | 7.87 |
| HA1156 | 1.16 |
| HA1160 | 4.78 |
| HA1166 | 1.96 |
| HA1166X | 5.36 |
| HA1167 | 5.36 |
| HA11706 | 9.50 |
| HA11705 | 8.00 |
| HA11703 | 4.95 |
| HA11701 | 4.56 |
| HA11710 | 9.50 |
| HA11713 | 9.75 |
| HA11711 | 20.16 |
| HA11715 | 3.25 |
| HA11714 | 9.75 |
| HA11716 | 13.10 |
| HA11725 | 18.26 |
| HA11725MP | 16.00 |
| HA117555P | 6.23 |
| HA11781 | 8.90 |
| HA1180 | 5.15 |
| HA1196 | 7.43 |
| HA13001 | 2.25 |
| HA1306 | 2.26 |
| HA1338 | 7.50 |
| HA1339 | 2.33 |
| HA13402 | 7.87 |
| HA13342 | 2.65 |
| HA13365 | 4.02 |
| HA1366WR | 1.86 |
| HA1367 | 4.32 |
| HA1368R | 2.45 |
| HA1368 | 2.07 |
| HA1370 | 3.71 |

IF YOU DON'T SEE IT LISTED ASK FOR QUOTE. GIVE MAKE MODEL LOCATION. REMEMBER TO ADD 0.60p POST & HANDLING. ADD 15% VAT TO TOTAL

# PO BOX 228, TELFORD TF2 8QP ☎ TEL 0902 712083

| | |
|---|---|
| HA1374 | 4.80 |
| HA1377 | 4.98 |
| HA1389R | 2.05 |
| HA1389 | 2.39 |
| HA1392 | 1.65 |
| HA1394 | 3.95 |
| HA1397 | 3.76 |
| HA1398 | 3.98 |
| HA1406 | 2.47 |
| HA1452 | 0.85 |
| HBF4030AF | 2.48 |
| HD14538 | 2.07 |
| HD38702-A2 | 8.95 |
| HD38750A53 | 8.95 |
| HD38750A-7 | 7.25 |
| HD38800A50 | 14.09 |
| HD44801A05 | 18.25 |
| HEF4001BP | 0.67 |
| HISH1010 | 8.59 |
| HISH1004 | 6.00 |
| HISH1002 | 9.50 |
| HM6231 | 9.81 |
| HM6232 | 10.65 |
| HM6251 | 6.25 |
| HM7103 | 4.85 |
| HM9032 | 3.22 |
| HM9012 | 3.22 |
| HM9015 | 3.24 |
| HT4207 | 17.16 |
| HT4208 | 18.25 |
| IN5401 | 0.11 |
| IR2403 | 4.25 |
| IR2C05 | 4.25 |
| IR3P06 | 2.25 |
| IR3P08 | 4.95 |
| IR94558 | 6.25 |
| IS751 | 2.85 |
| ITT425 | 0.18 |
| IZ0003GE | 5.37 |
| IZ0020GE | 5.93 |
| K174YP | 3.46 |
| KA2101 | 2.92 |
| KC581C | 6.32 |
| KC582C | 3.97 |
| KC583C | 6.63 |
| L200CV | 1.69 |
| LA1201 | 1.02 |
| LA1210 | 1.56 |
| LA1230 | 2.87 |
| LA1320 | 2.87 |
| LA1352 | 1.75 |
| LA1357N | 11.07 |
| LA1363 | 1.05 |
| LA1364 | 3.02 |
| LA1365J | 3.44 |
| LA1385 | 1.94 |
| LA1387 | 8.10 |
| LA3155 | 1.25 |
| LA3301 | 1.65 |
| LA3350 | 1.43 |
| LA3361 | 3.89 |
| LA3365 | 3.98 |
| LA3390 | 4.25 |
| LA4030P | 4.20 |
| LA4031P | 3.20 |
| LA4032P | 2.35 |
| LA4100 | 1.25 |
| LA4101 | 1.30 |
| LA4102 | 2.81 |
| LA4112 | 0.56 |
| LA4125 | 2.25 |
| LA4138 | 3.45 |
| LA4140 | 1.15 |
| LA4192 | 4.29 |
| LA4220 | 1.62 |
| LA4250 | 6.75 |
| LA4400 | 3.92 |
| LA4420 | 1.72 |
| LA4422 | 1.72 |
| LA4430 | 1.56 |
| LA4440 | 2.95 |
| LA4445 | 3.95 |
| LA4460 | 2.32 |
| LA4461 | 2.95 |
| LA4505 | 7.25 |
| LA5112N | 2.98 |
| LA7020 | 13.86 |
| LA7025 | 11.97 |
| LA7027 | 10.92 |
| LA7040 | 9.20 |
| LA7042 | 3.58 |
| LA7800 | 2.65 |
| LA7801 | 1.92 |
| LB1274 | 3.08 |
| LC7800 | 9.20 |
| LD3120 | 1.13 |
| LD3150 | 2.25 |
| LM1017N | 4.29 |
| LM1877 | 10.92 |
| LM224 | 1.75 |
| LM2808 | 6.25 |
| LM2877 | 5.25 |
| LM317CKC | 1.38 |
| LM324N | 0.54 |
| LM339N | 0.80 |
| LM340K | 11.85 |
| LM342P | 1.62 |
| LM342P | 1.62 |
| LM342P | 1.62 |
| LM348N | 2.15 |
| LM380N | 2.80 |
| LM384N01 | 3.25 |
| LM567CN | 1.71 |
| LM6402/011 | 10.23 |
| LM6402A093 | 10.15 |
| LM748 | 1.82 |
| LM8360 | 3.87 |
| LM8361 | 3.57 |
| LR2612 | 11.95 |
| LR3419 | 9.37 |
| LR3471 | 9.37 |
| LU1141 | 7.27 |
| LU52012 | 5.95 |
| LU52011 | 14.95 |
| LU03112 | 12.37 |
| M193 | 12.75 |
| M21C | 1.13 |
| M23C | 2.83 |
| M293 | 6.95 |
| M51102L | 6.35 |
| M5115P | 5.24 |
| M51203L | 3.15 |
| M51231P | 0.95 |
| M5134-9341 | 4.13 |
| M51353P | 5.25 |
| M51381P | 5.09 |
| M51393AP | 9.35 |
| M51394P | 11.97 |
| M5142P | 6.85 |
| M5144P | 4.25 |
| M51513L | 2.55 |
| M51515BL | 3.23 |
| M51517L | 3.71 |
| M5192 | 2.20 |
| M5194AP | 5.74 |
| M5231L | 1.95 |
| M53274P | 1.33 |
| M54532P | 2.15 |
| M54544L | 4.75 |
| M58478P | 8.77 |
| M58485P | 13.65 |
| MA06 | 1.07 |
| MA8001 | 0.82 |
| MA8003 | 1.16 |
| MB3705 | 1.98 |
| MB3712 | 1.85 |
| MB3713 | 1.69 |
| MB3730 | 2.94 |
| MC13002 | 3.69 |
| MC1310P | 2.25 |
| MC1327P | 1.33 |
| MC1330P | 2.88 |
| MC1350P | 1.61 |
| MC1351P | 3.96 |
| MC1352P | 2.50 |
| MC1357P | 2.15 |
| MC1358P | 1.55 |
| MC14001 | 2.40 |
| MC14013 | 0.41 |
| MC14493P | 11.95 |
| MC14494P | 2.15 |
| MC14497 | 3.16 |
| MC14510BAL | 3.75 |
| MC14511BCP | 1.10 |
| MC14528BCP | 2.70 |
| MC1712 | 3.88 |
| MC5192 | 19.50 |
| MC7724CP | 3.49 |
| MC7818C | 2.18 |
| MCR100/7 | 1.65 |
| MCR106-5/6 | 0.95 |
| MCR220/7 | 2.28 |
| ME0402 | 0.17 |
| ME0404/2 | 0.47 |
| ME0411 | 0.28 |
| ME6002 | 0.26 |
| ME6102 | 0.28 |
| ME8001 | 0.34 |
| ME0411 | 0.75 |
| MJ2501 | 3.30 |
| MJ3001 | 1.76 |
| MJ481 | 1.53 |
| MJ802 | 4.90 |
| MJE2955 | 1.89 |
| MJE3055 | 1.05 |
| MJE340 | 0.49 |
| MJE520 | 0.49 |
| ML231 | 3.33 |
| ML232B | 3.65 |
| ML237B | 2.51 |
| ML238 | 5.77 |
| ML923 | 3.35 |
| ML926 | 3.98 |
| MM5314N | 4.02 |
| MM5316N | 9.16 |
| MM5318N | 3.11 |
| MM5369N | 2.01 |
| MM5387AA/N | 6.20 |
| MM5841N | 6.64 |
| MN1400VL | 13.65 |
| MN1405 | 12.95 |
| MN1435VX | 11.48 |
| MN6016A | 20.56 |
| MP1192 | 5.07 |
| MP2794 | 4.00 |
| MP2812 | 5.07 |
| MP8512 | 1.57 |
| MPC596 | 2.13 |
| MPF256C | 0.60 |
| MPS6570 | 0.48 |
| MPSA42 | 0.65 |
| MPSA56 | 0.27 |
| MPSA92 | 0.49 |
| MPSU05 | 0.86 |
| MPSU10 | 1.56 |
| MPSU56 | 0.78 |
| MPSU60 | 1.98 |
| MR818 | 0.33 |
| MR854 | 0.72 |
| MR914 | 1.20 |
| MSM5816RS | 17.35 |
| MSM5840H | 9.70 |
| MVS460-02 | 0.61 |
| NE542 | 2.50 |
| NE545B | 4.86 |
| NE555 | 0.30 |
| NE556 | 0.95 |
| NE565N | 1.33 |
| NE645BN | 3.35 |
| NP1106 | 8.60 |
| DA202 | 0.11 |
| OA47 | 0.16 |
| OA91 | 0.09 |
| OA95 | 0.12 |
| OC28 | 2.95 |
| OC29 | 2.15 |
| OC36 | 1.28 |
| OC44 | 0.35 |
| OC45 | 0.18 |
| OC72 | 0.44 |
| OC75 | 0.44 |
| ON236 | 1.06 |
| ON782 | 1.98 |
| OT121 | 1.45 |
| PT6042 | 2.45 |
| PT8504 | 4.98 |
| R1038 | 2.19 |
| R1039 | 2.19 |
| R2008B | 1.33 |
| R2009 | 1.98 |
| R2010B | 1.33 |
| R2029 | 1.33 |
| R2030 | 1.33 |
| R2257 | 3.71 |
| R2265 | 1.49 |
| R2305 | 1.18 |
| R2322 | 0.59 |
| R2323 | 0.76 |
| R2354A | 2.01 |
| R2354B | 2.01 |
| R2443 | 0.88 |
| R2461 | 1.50 |
| R2540 | 1.95 |
| R2540X | 3.30 |
| R2615 | 0.67 |
| RCA16029 | 2.01 |
| RCA16600 | 1.38 |
| RCA16802 | 1.08 |
| RCA17074 | 6.60 |
| RCA17376 | 1.58 |
| RCA17524 | 0.83 |
| RCA17523 | 0.83 |
| RCA2060 | 2.00 |
| RGP01-15 | 1.65 |
| RGP10 | 0.30 |
| RGP30M | 0.40 |
| RT402 | 1.58 |
| RT905A | 2.38 |
| S1299 | 7.98 |
| S175 | 31.48 |
| S2062D | 2.07 |
| S2800D | 5.54 |
| S2802 | 3.47 |
| S2818 | 4.05 |
| S3702S | 6.15 |
| S40W | 16.68 |
| S6080B | 8.80 |
| SA8063 | 5.17 |
| SAA1006 | 1.75 |
| SAA1020 | 4.76 |
| SAA1025 | 4.40 |
| SAA1024 | 2.81 |
| SAA1075 | 6.25 |
| SAA1121 | 7.44 |
| SAA1124 | 3.25 |
| SAA1130 | 4.99 |
| SAA1174 | 7.77 |
| SAA1250 | 4.15 |
| SAA1251 | 5.85 |
| SAA11351 | 4.95 |
| SAA3027P | 10.65 |
| SAA5000 | 2.95 |
| SAA5010 | 5.39 |
| SAA5012 | 5.20 |
| SAA5020 | 5.78 |
| SAA5030 | 8.25 |
| SAA5050 | 7.74 |
| SAB1009B | 5.98 |
| SAB3011 | 7.34 |
| SAB3013 | 5.61 |
| SAB3021 | 7.90 |
| SAB3024 | 6.36 |
| SAB3209 | 5.82 |
| SAB3210 | 3.49 |
| SAF1032P | 5.50 |
| SAF1039 | 3.35 |
| SAS5010 | 8.39 |
| SAS560S | 2.26 |
| SAS560T | 5.42 |
| SAS570T | 5.42 |
| SAS570S | 2.61 |
| SAS580 | 2.85 |
| SAS6600 | 1.33 |
| SAS660 | 2.97 |
| SAS6700 | 1.33 |
| SAS670 | 3.96 |
| SAS6710 | 1.93 |
| SBA750 | 1.61 |
| SC84203 | 19.35 |
| SC9504P | 1.95 |
| SDA2006 | 18.95 |
| SDA2112/2 | 12.85 |
| SG264A | 6.45 |
| SG613 | 8.87 |
| SG629 | 8.27 |
| SG6533 | 11.96 |
| SI-1020H | 10.89 |
| SI-1125HD | 17.63 |
| SI1125H | 7.50 |
| SI1225HD | 19.27 |
| SI1630HD | 21.98 |
| SI6900 | 12.00 |
| SKE1/02 | 1.85 |
| SKE2F1/04 | 1.39 |
| SKE2G3/04 | 1.05 |
| SKE4F1/06 | 0.35 |
| SKE4F2/08 | 1.24 |
| SKE4F2/06 | 0.85 |
| SKE4F2/10 | 1.24 |
| SKE4G2/02 | 0.96 |
| SKE5F3/10 | 1.60 |
| SKS1/10 | 2.15 |
| SL1310 | 3.14 |
| SL1430T | 2.32 |
| SL414 | 3.69 |
| SL432A | 3.44 |
| SL439 | 2.48 |
| SL471 | 4.78 |
| SL480 | 3.98 |
| SL490 | 2.44 |
| SL901B | 6.95 |
| SL918A | 6.98 |
| SN16861AN0 | 4.95 |
| SN16862AN | 2.98 |
| SN16966N | 10.25 |
| SN29717N | 7.19 |
| SN29716N | 3.66 |
| SN29715N | 6.04 |
| SN29722 | 11.95 |
| SN29723AN | 7.65 |
| SN29764AN | 1.38 |
| SN29767 | 4.98 |
| SN29770BN | 3.84 |
| SN29772BN | 4.91 |
| SN29771BN | 1.48 |
| SN29791 | 2.98 |
| SN29798N | 5.56 |
| SN2709 | 0.44 |
| SN7400N | 0.34 |
| SN7401N | 0.36 |
| SN7402N | 0.65 |
| SN7404N | 0.24 |
| SN7408N | 0.27 |
| SN7410N | 0.27 |
| SN74121 | 1.60 |
| SN7413N | 0.37 |
| SN74141N | 2.65 |
| SN74151AN | 1.51 |
| SN74154N | 1.27 |
| SN74190 | 1.35 |
| SN7420N | 0.34 |
| SN7430 | 0.49 |
| SN7440N | 0.27 |
| SN7472 | 1.54 |
| SN7474N | 0.44 |
| SN7490AN | 0.93 |
| SN74LS26N | 0.53 |
| SN76001N | 1.65 |
| SN76013ND | 7.50 |
| SN76023N | 5.15 |
| SN76023ND | 3.96 |
| SN76033N | 3.65 |
| SN76110N | 0.90 |
| SN76115AN | 1.61 |
| SN76131 | 1.92 |
| SN76227N | 1.33 |
| SN76226DN | 1.98 |
| SN76228N | 3.27 |
| SN76242 | 8.95 |
| SN76243 | 8.50 |
| SN76396 | 2.90 |
| SN76533N | 2.47 |
| SN76532N | 2.95 |
| SN76545 | 3.87 |
| SN76546N | 3.47 |
| SN76549 | 2.59 |
| SN76570 | 3.08 |
| SN76611 | 2.59 |
| SN76620 | 2.59 |
| SN76660N | 2.48 |
| SN76666N | 1.41 |
| SN76708 | 4.86 |
| SN76709N | 25.54 |
| SN76707N | 5.11 |
| SN76705N | 1.34 |
| SN76730 | 6.00 |
| SN76810N | 0.60 |
| SN76832N | 3.25 |
| SN94041 | 5.54 |
| SN94042 | 5.54 |
| SP8385 | 0.55 |
| SPS5384 | 1.98 |
| ST1702L | 0.99 |
| STA401 | 6.76 |
| STA441C | 3.00 |
| STA471C | 7.56 |
| STK0029 | 5.54 |
| STK0039 | 5.11 |
| STK0040 | 12.78 |
| STK0050 | 7.72 |
| STK0080 | 9.16 |
| STK011 | 5.08 |
| STK013 | 9.25 |
| STK014 | 9.80 |
| STK015 | 7.75 |
| STK016 | 8.45 |
| STK022 | 5.25 |
| STK025 | 12.50 |
| STK031 | 12.95 |
| STK040 | 9.40 |
| STK043 | 13.44 |
| STK054 | 7.13 |
| STK058 | 18.25 |
| STK077 | 7.67 |
| STK078 | 8.91 |
| STK080 | 16.50 |
| STK082 | 11.86 |
| STK086 | 13.59 |
| STK1039 | 5.75 |
| STK2110 | 7.33 |
| STK2145 | 16.25 |
| STK2230 | 7.70 |
| STK2240 | 14.40 |
| STK2250 | 18.95 |
| STK3042 | 10.25 |
| STK3044 | 5.75 |
| STK4019 | 4.50 |
| STK430 | 11.75 |
| STK433 | 6.25 |
| STK4332 | 8.25 |
| STK435 | 5.94 |
| STK4352 | 12.25 |
| STK436 | 4.70 |
| STK437 | 9.65 |
| STK4372 | 3.85 |
| STK439 | 7.25 |
| STK441 | 10.25 |
| STK443 | 10.29 |
| STK457 | 13.45 |
| STK460 | 6.95 |
| STK461 | 9.68 |
| STK463 | 11.53 |
| STK466 | 11.77 |
| STK4833 | 16.95 |
| STK501 | 6.32 |
| STK502 | 5.74 |
| STK5314 | 12.32 |
| STK5730 | 3.95 |
| STK7216 | 14.50 |
| STK772 | 6.95 |
| STR1096 | 5.45 |
| STR4090 | 11.98 |
| STR440 | 7.85 |
| STR441 | 6.95 |
| STR451 | 5.54 |
| STR453 | 8.16 |
| STR454 | 7.50 |
| STR6020 | 8.31 |
| T6029V | 5.75 |
| T6035V | 0.73 |
| T6036 | 0.67 |
| T6037 | 2.11 |
| T6044V | 0.97 |
| T6045 | 1.20 |
| T6049 | 1.45 |
| T6052V | 0.87 |
| T6058 | 3.08 |
| T6059 | 2.77 |
| T9003V | 1.25 |
| T9005V | 2.38 |
| T9011V | 0.49 |
| T9013V | 7.96 |
| T9014V | 2.60 |
| T9016 | 1.02 |
| T9019W | 1.98 |
| T9034V | 1.45 |
| T9035V | 2.33 |
| T9051 | 7.30 |
| T9054V | 3.95 |
| T9057V | 0.70 |
| T9062V | 0.49 |
| T9064 | 1.03 |
| TA6002 | 4.35 |
| TA7027 | 4.80 |
| TA7050 | 1.74 |
| TA7051 | 1.74 |
| TA7054 | 2.55 |
| TA7060AP | 0.71 |
| TA7061AP | 1.27 |
| TA7069 | 3.13 |
| TA7070P | 1.83 |
| TA7072P | 2.57 |
| TA7073P | 5.86 |
| TA7074P | 1.98 |
| TA7076P | 7.80 |
| TA7089P | 3.10 |
| TA7092P | 8.65 |
| TA7093P | 3.99 |
| TA7102P | 5.88 |
| TA7108P | 1.61 |
| TA7109 | 3.71 |
| TA7122B/P | 0.92 |
| TA7124P | 2.34 |
| TA7129P | 1.50 |
| TA7130P | 1.27 |
| TA7136AP | 1.27 |
| TA7137P | 0.98 |
| TA7141AP | 3.87 |
| TA7146 | 2.50 |
| TA7146P | 4.23 |
| TA7148P | 1.67 |
| TA7149P | 3.26 |
| TA7152P | 2.09 |
| TA7161P | 5.45 |
| TA7162P | 3.25 |
| TA7169 | 7.95 |
| TA7172P | 1.41 |
| TA7176P | 2.48 |
| TA7193AP | 14.05 |
| TA7193P | 7.25 |
| TA7201P | 2.71 |
| TA7203P | 2.18 |
| TA7204P | 2.16 |
| TA7205P | 1.38 |
| TA7206P | 6.35 |
| TA7207P | 3.34 |
| TA7208P | 2.15 |
| TA7210P | 3.58 |
| TA7214P | 3.63 |
| TA7215P | 2.58 |
| TA7217AP | 1.45 |
| TA7222 | 1.95 |
| TA7226 | 3.57 |
| TA7227P | 2.81 |
| TA7229P | 4.45 |
| TA7230P | 4.98 |
| TA7232P | 6.60 |
| TA7233P | 3.15 |
| TA7240AP | 7.83 |
| TA7245P | 5.92 |
| TA7270 | 7.50 |
| TA7310P | 2.15 |
| TA7312P | 2.45 |
| TA7313AP | 1.36 |
| TA7314 | 5.94 |
| TA7323P | 3.15 |
| TA7325P | 1.15 |
| TA7339P | 1.75 |
| TA7340P | 5.06 |
| TA7607AP | 3.10 |
| TA7609 | 3.28 |
| TA7611AP | 4.80 |
| TA7616P | 5.25 |
| TA7622AP | 8.94 |
| TA7628P | 5.06 |
| TA7629P | 7.50 |
| TA7630P | 2.98 |
| TA7640AP | 2.29 |
| TA7672P | 2.40 |
| TA7676P | 2.81 |
| TA7726P | 10.25 |
| TAA320A | 1.27 |
| TAA350A | 6.45 |
| TAA570 | 1.74 |
| TAA621AX1 | 4.85 |
| TAA621A12 | 2.14 |
| TAA661B | 2.62 |
| TAA691 | 8.58 |
| TAA700 | 3.75 |
| TAA930 | 4.87 |
| TAA970 | 2.83 |
| TAA110 | 2.52 |
| TAG232-600 | 0.79 |
| TAG626-600 | 1.20 |
| TBA120AS | 1.24 |
| TBA120SB | 1.05 |
| TBA120T | 0.95 |
| TBA120U | 2.50 |
| TBA120A | 1.05 |
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| TBA1440G | 5.20 |
| TBA1441 | 2.80 |
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| TBA395Q | 1.10 |
| TBA396 | 2.90 |
| TBA400 | 2.39 |
| TBA440P | 1.55 |
| TBA480Q | 1.30 |
| TBA500P | 6.58 |
| TBA510 | 2.11 |
| TBA520 | 1.84 |
| TBA520Q | 1.66 |
| TBA530 | 1.30 |
| TBA530 | 1.30 |
| TBA540 | 1.15 |
| TBA540Q | 1.15 |
| TBA560C | 1.40 |
| TBA560CQ | 1.60 |
| TBA570Q | 1.60 |
| TBA570A | 1.71 |
| TBA641A12 | 4.13 |
| TBA641B72 | 3.03 |
| TBA651 | 0.87 |
| TBA673 | 2.60 |
| TBA700 | 1.85 |
| TBA720 | 2.65 |
| TBA730 | 3.55 |
| TBA750Q | 2.90 |
| TBA760 | 1.71 |
| TBA800 | 0.85 |
| TBA810S | 1.61 |
| TBA810T | 1.50 |
| TBA810AS | 1.00 |
| TBA820 | 1.52 |
| TBA820M | 1.10 |
| TBA890 | 2.50 |
| TBA920 | 1.89 |
| TBA920Q | 2.31 |
| TBA940 | 1.87 |
| TBA950 | 1.84 |
| TBA970 | 3.56 |
| TBA990 | 1.82 |
| TBA990Q | 1.68 |
| TC4001BP | 3.25 |
| TC4011BP | 3.50 |
| TC4013BP | 3.75 |
| TC4016BP | 3.15 |
| TC4053BP | 4.34 |
| TC4069 | 2.25 |
| TC4071BP | 2.76 |
| TC4081BP | 3.25 |
| TC40H000 | 1.98 |
| TC4514BP | 5.44 |
| TC9002BP | 11.34 |
| TCA270Q | 1.71 |
| TCA270S | 1.27 |
| TCA270SQ | 1.65 |
| TCA290A | 2.39 |
| TCA420A | 2.16 |
| TCA440 | 2.25 |
| TCA530 | 2.24 |
| TCA640 | 7.36 |
| TCA650 | 2.04 |
| TCA660B | 3.30 |
| TCA730 | 3.81 |
| TCA750 | 2.25 |
| TCA800Q | 6.95 |
| TCA830S | 2.38 |
| TCA890 | 5.44 |
| TCA900 | 2.04 |
| TCA910 | 2.04 |
| TCA940 | 2.47 |
| TCA940E | 2.93 |
| TCE330 | 3.89 |
| TCEP100Q | 10.25 |
| TCEP100 | 9.61 |
| TD3406AP | 3.98 |
| TD3F800R | 4.16 |
| TD3F900H | 4.16 |
| TD62105P | 2.50 |
| TD62104P | 2.50 |
| TD62706P | 4.50 |
| TDA1001B | 2.31 |
| TDA1003A | 2.25 |
| TDA1005A | 2.22 |
| TDA1006A | 2.11 |
| TDA1010AF | 4.25 |
| TDA1011 | 2.98 |
| TDA1010 | 1.25 |
| TDA1011A | 3.25 |
| TDA1028 | 2.45 |
| TDA1034B | 2.42 |
| TDA1035S | 2.95 |
| TDA1035T | 1.85 |
| TDA1037 | 1.78 |
| TDA1037D | 2.05 |
| TDA1044 | 2.62 |
| TDA1047 | 4.10 |
| TDA1059B | 0.98 |
| TDA1054M | 1.35 |
| TDA1060 | 2.60 |
| TDA1082 | 3.25 |
| TDA1151 | 1.22 |
| TDA1170S | 2.25 |
| TDA1190 | 2.11 |
| TDA1190Z | 3.96 |
| TDA1200 | 1.50 |
| TDA1235 | 3.88 |
| TDA1236 | 4.30 |
| TDA1270 | 3.55 |
| TDA1327A | 1.33 |
| TDA1412 | 1.05 |
| TDA1420 | 2.55 |
| TDA1440 | 3.45 |
| TDA1470 | 2.25 |
| TDA1470P | 4.25 |
| TDA1506 | 7.85 |
| TDA1510 | 6.28 |
| TDA1512 | 3.69 |
| TDA1515 | 6.97 |
| TDA1559 | 3.15 |
| TDA1670 | 4.48 |
| TDA1770 | 3.85 |
| TDA1905 | 1.76 |
| TDA1908 | 1.95 |
| TDA1940 | 1.95 |
| TDA1950 | 2.95 |
| TDA2005 | 3.95 |
| TDA2006 | 1.55 |
| TDA2004 | 2.27 |
| TDA2002 | 0.90 |
| TDA2003 | 1.75 |
| TDA2010 | 1.68 |
| TDA2020 | 2.35 |
| TDA2030 | 1.99 |
| TDA2140 | 1.68 |
| TDA2150 | 6.20 |
| TDA2151 | 2.07 |
| TDA2160 | 4.01 |
| TDA2161 | 1.85 |
| TDA2170 | 3.45 |
| TDA2270 | 4.65 |
| TDA2510 | 7.85 |
| TDA2520 | 2.37 |
| TDA2522 | 3.46 |
| TDA2524 | 4.50 |
| TDA2521 | 3.71 |
| TDA2525 | 3.80 |
| TDA2532 | 2.50 |
| TDA2530 | 2.70 |
| TDA2541 | 2.48 |
| TDA2540 | 2.15 |
| TDA2545Q | 5.94 |
| TDA2560 | 2.17 |
| TDA2575A | 0.50 |
| TDA2576A | 2.85 |
| TDA2571A | 3.66 |
| TDA2578A | 2.57 |
| TDA2576A+K | 12.35 |
| TDA2581 | 1.98 |
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| TDA2593 | 2.47 |
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| TDA2595 | 3.65 |
| TDA2600 | 6.50 |
| TDA2611AQ | 2.98 |
| TDA2612Q | 4.68 |
| TDA2611A | 1.25 |
| TDA2610 | 2.79 |
| TDA2620 | 2.15 |
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| TDA2631 | 2.73 |
| TDA2640 | 2.95 |
| TDA2652 | 13.45 |
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| TDA2680 | 3.20 |
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| TDA2780AQ | 5.14 |
| TDA2795 | 2.78 |
| TDA2791 | 2.5 |
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| TDA4290 | 4.47 |
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| TDA4500 | 4.55 |
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| TDA4620 | 4.78 |
| TDA5500 | 6.03 |
| TDA5700 | 2.75 |
| TDA7270S | 2.25 |
| TDA8190 | 2.47 |
| TDA9403 | 2.35 |
| TDA9503 | 2.92 |
| TDA9513 | 5.44 |
| TDB1033 | 2.68 |
| TDE1081 | 7.05 |
| TE626 | 1.49 |
| TEA1002 | 2.55 |
| TEA1009 | 1.86 |
| TEA1014 | 3.30 |
| TEA1020SP | 8.21 |
| TIC106C | 0.61 |
| TIC106M | 0.57 |
| TIC116Y100 | 2.07 |
| TIC44 | 0.72 |
| TIC45 | 0.77 |
| TIC47 | 0.35 |
| TIP120 | 1.06 |
| TIP110 | 0.45 |
| TIP112E | 0.85 |
| TIP112 | 0.88 |
| TIP117 | 0.95 |
| TIP121 | 0.87 |
| TIP126 | 0.73 |
| TIP132 | 1.40 |
| TIP137 | 1.50 |
| TIP29 | 0.84 |
| TIP2955 | 0.95 |
| TIP29A | 0.46 |
| TIP29B | 0.63 |
| TIP29C | 0.40 |
| TIP29D | 0.75 |
| TIP3055 | 0.75 |
| TIP30A | 0.41 |
| TIP30C | 0.16 |
| TIP31A | 0.34 |
| TIP31B | 0.38 |
| TIP31C | 0.50 |
| TIP32A | 0.53 |
| TIP32B | 0.69 |
| TIP32C | 0.40 |
| TIP33 | 0.85 |
| TIP33A | 1.05 |
| TIP33C | 0.80 |
| TIP34 | 3.54 |
| TIP41A | 0.49 |
| TIP41B | 0.65 |
| TIP41C | 0.49 |
| TIP42A | 0.49 |
| TIP42B | 0.53 |
| TIP42C | 0.33 |
| TIP47 | 0.65 |
| TIP48 | 0.92 |
| TIP49 | 3.61 |
| TIP55A | 3.65 |
| TIS43 | 1.43 |
| TIS90 | 0.28 |
| TL011CP | 0.95 |
| TL072 | 1.85 |
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| TL072CP | 2.55 |
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| TMS3894NL | 19.25 |
| MS5102NLL | 6.25 |
| TUA2000 | 8.98 |
| TV106 | 1.86 |
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| UPC1188 | 7.40 |
| UPC1212C | 1.72 |
| UPC1225H | 3.25 |
| UPC1230 | 5.24 |
| UPC1238 | 4.09 |
| UPC1263 | 4.09 |
| UPC1277H | 5.85 |
| UPC1278H | 5.80 |
| UPC1351C | 1.81 |
| UPC1350C | 1.40 |
| UPC1353 | 7.85 |
| UPC1355C | 2.13 |
| UPC1363 | 4.20 |
| UPC1362 | 2.98 |
| UPC1365C | 6.98 |
| UPC1366 | 8.38 |
| UPC1360C | 4.51 |
| UPC1378H | 4.25 |
| UPC141C | 3.75 |
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| UPC151C | 2.95 |
| UPC2002 | 1.48 |
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| UPC324C | 4.17 |
| UPC32C | 5.25 |
| UPC339C | 4.90 |
| UPC41C | 4.10 |
| UPC4558C | 2.15 |
| UPC474 | 5.11 |
| UPC554C | 1.85 |
| UPC566H | 2.95 |
| UPC574 | 3.25 |
| UPC575C2 | 2.40 |
| UPC576H | 2.58 |
| UPC577H | 1.25 |
| UPC578C | 8.70 |
| UPC580C | 4.13 |
| UPC587C2 | 1.34 |
| UPC592H | 2.15 |
| UPC595 | 2.95 |
| UPC596 | 1.98 |
| UPD1514C | 8.95 |
| UPD2819C | 4.98 |
| UPD4013B | 4.00 |
| UPD4066B | 4.95 |
| UPD553-164 | 19.25 |
| UPD8049C-1 | 11.50 |
| X0007TA | 4.68 |
| X0022CE | 5.75 |
| X0029CE | 7.09 |
| X0031CE | 4.95 |
| X0035TA | 5.98 |
| X0040TA | 4.50 |
| X0042CE | 4.35 |
| X0043CE | 2.75 |
| X0056CE | 6.25 |
| X0057GE | 6.00 |
| X0062CE | 6.52 |
| X0065CE | 4.25 |
| X0074GE | 10.00 |
| X0077GE | 15.96 |
| X0079CE | 4.95 |
| X0092CE | 4.95 |
| X0096CE | 5.98 |
| X0109CE | 11.25 |
| X0113CE | 2.07 |
| X0195CE | 7.50 |
| X0204CE | 8.74 |
| X0261CE | 8.75 |
| X1222KF | 3.63 |
| IX0111CE | 2.95 |
| Y969 | 0.82 |
| TDA3310 | 2.15 |
| ZPY120 | 3.25 |
| ZTK33 | 0.43 |

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# Series and Shunt Networks

**S.W. Amos, B.Sc., C.Eng., M.I.E.E.**

The star and delta networks shown in Fig. 1 are familiar to power engineers. They can be equivalent: in other words, provided the component values for one network are related to those of the other in a particular way the two networks have identical electrical characteristics. Thus for equivalent networks it's impossible to determine, from measurements made at the terminals, whether the components are star- or delta-connected.

These networks are also well known to electronic engineers of course, but usually appear differently in circuit diagrams. The star network is generally shown as in Fig. 2(a) and is known as a T network: the delta network is drawn in the form shown in Fig. 2(b), the pi network. Again the T and pi networks can be equivalent so that, given the component values used in one network, it's possible to calculate the component values needed in the other network to give identical characteristics. One of the two alternatives may be more suitable than the other for a particular application however. In this article we'll give some examples and show how to calculate the component values required.

Our first example consists of a two-stage amplifier with the transistors connected in cascade, see Fig. 3(a) – the circuit is shown in simplified form. The idea here is to apply negative feedback to improve the linearity but more particularly to make the amplifier's performance less dependent on the characteristics of the particular transistors used.

One way of applying negative feedback is to use a series-connected resistor, R3, between the collectors of the two transistors as shown. It's immediately apparent that R1, R2 and R3 form a pi network. An alternative approach is to use the shunt-connected resistor R4 to feed the two collector load resistors, as shown in Fig. 3(b). The three resistors now form a T network. In both circuits the feedback affects Tr2 only – Tr1 is outside the feedback loop and serves only to introduce the input signal to Tr2.

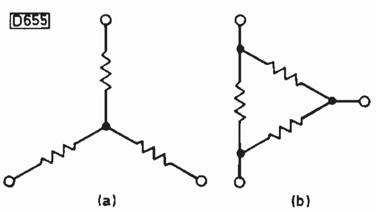
In examining the behaviour of the two circuits shown in Fig. 3 we must remember that bipolar transistors are current-operated devices, even though they are often used as voltage amplifiers – an example of such an amplifier will be given later. We will consider the circuit therefore in terms of Tr2's input and output currents. We can calculate the effect of the feedback applied in circuit (a) in the following way. Tr2's effective collector load consists of R2 and R3 in parallel, but if the value of R3 is large compared to that of R2 its shunting effect can be neglected. Thus Tr2's collector current (*I*out) sets up a voltage *I*outR2 across R2: this voltage drives a current (*I*outR2)/R3 through R3. This is the feedback current *I*fb that's applied to Tr2's base. Thus we have *I*fb = (*I*outR2)/R3, giving *I*out/*I*fb = R3/R2.

We'll assume that R3 applies a considerable amount of feedback. Thus the feedback current *I*fb is many times the base current, and Tr2's input current *I*in (which must be equal to the sum of the feedback and base currents) is very nearly equal to *I*fb. We can thus say with little error that Tr2's current gain is:

*I*out/*I*in = R3/R2 = feedback resistance/load resistance. (1)

The gain is therefore independent of Tr2's characteristics and is determined by the component values used in the negative feedback circuit.

Now consider the alternative circuit shown in Fig. 3(b). Tr2's output current *I*out flows through R4, generating a voltage *I*outR4 which in turn drives a current *I*fb of (*I*outR4)/R1 into Tr2. On the same basis as before we can



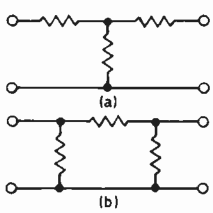




*Fig. 1 (left): Star (a) and delta (b) networks.*

*Fig. 2 (right): The star network is better known to electronic engineers as the T network (a) while the delta network is better known as the pi network (b).*

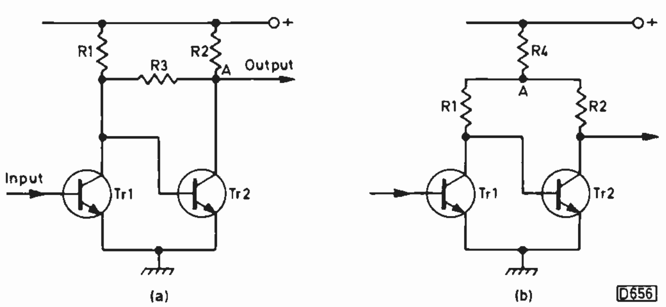



*Fig. 3: Two ways of applying negative feedback to a two-stage amplifier, (a) by means of a pi network and (b) by means of a T network.*

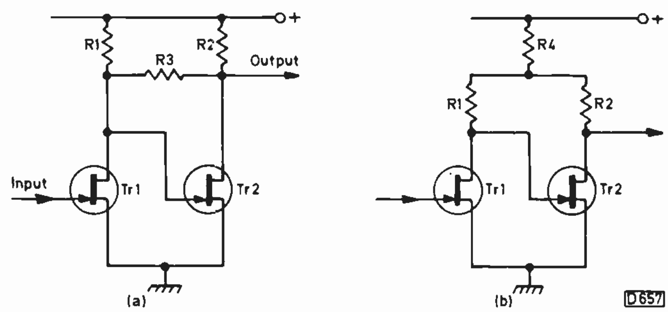



*Fig. 4: Feedback arrangements as in Fig. 3 but this time with field effect transistors.*

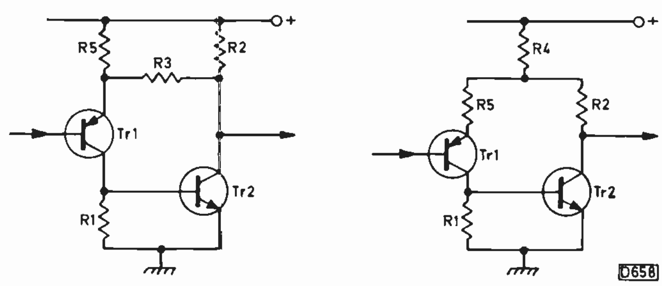



*Fig. 5 (left): The arrangement shown in Fig. 4(a), but this time with complementary transistors.*

*Fig. 6 (right): Complementary bipolar transistor circuit with T network negative feedback.*

say that Tr2's current gain is given by:

$I$out/$I$in = R1/R4 = load resistance/feedback resistance. (2)

The current gain is once more independent of transistor characteristics provided the feedback is considerable.

Notice that in both circuits the current gain is equal to the ratio in which Tr2's output current is split at point A. This is a useful feature of this type of circuit, enabling the current gain to be deduced by simply checking the component values used in the current divider.

If the two amplifier circuits shown in Fig. 3 are to provide the same current gain we get, equating expressions (1) and (2), R3/R2 = R1/R4, i.e. R3R4 = R1R2. Thus the product of the feedback resistors is equal to the product of the collector load resistors.

The values of R1 and R2 are normally chosen to suit the required operating conditions for the transistors and the supply voltage. Thus for a given amplifier circuit their product is fixed and there's a reciprocal relationship between the equivalent values of R3 and R4 – the higher R3 is made, the smaller must be R4 to provide the same degree of feedback.

As an example, suppose R1 is 4·7kΩ and R2 3·3kΩ. The product is $15{\cdot}5 \times 10^6$. We can now choose a value for R3 (or R4) to give the required gain. Let's choose to have a current gain of 5. Thus from expression (1) we would give R3 a value of 5 × 3·3kΩ = approximately 16kΩ. If instead we chose the T network feedback circuit R4 would be $(15{\cdot}5 \times 10^6)$/16kΩ = approximately 1kΩ, a result which can be obtained just as easily from expression (2).

What happens if Tr1 and Tr2 are field-effect transistors or valves, i.e. voltage-operated devices? We can't in this case analyse the circuit behaviour in terms of currents because these devices respond only to the voltage applied to the gate or grid. Fig. 4 is a repeat of Fig. 3 with junction-gate field-effect transistors replacing the bipolar transistors.

In Fig. 4(a) R1 and R3 comprise a voltage divider across Tr2's load resistor R2, applying a fraction – R1/(R1 + R3) – of the output voltage $V$out to Tr2's gate. If the value of R3 is large compared to that of R2, as is usual, the division ratio becomes approximately R1/R3 and the feedback voltage is ($V$outR1)/R2. Provided the feedback employed is considerable, this is almost equal to the input voltage $V$in provided by Tr1. Thus $V$in = ($V$outR1)/R3, so that Tr2's voltage gain is given by:

$V$out/$V$in = R3/R1 = feedback resistance/load resistance. (3)

In Fig. 4(b) the voltage divider across Tr2's output is formed by R2 and R4. The feedback voltage generated across R4 is applied to Tr2's gate via R1. Thus Tr2's voltage gain is given by:

$V$out/$V$in = R2/R4 = load resistance/feedback resistance. (4)

In both circuits the voltage gain is given by the ratio of the two resistors that form the negative feedback voltage divider across the amplifier's output. Thus once more the feedback amplifier's voltage gain can be deduced from the values of these two resistors.

For equal voltage gain with the two circuits shown in Fig. 4 we have from expressions (3) and (4) R3/R1 = R2/R4, giving R3R4 = R1R2, which is precisely the same result we had with the bipolar transistor circuits. This general result is therefore applicable to all forms of active device.

As an example, consider the circuit previously suggested, with R1 4·7kΩ and R2 3·3kΩ, giving a product of $15{\cdot}5 \times 10^6$. This time we want the feedback to give us a voltage gain of 5 from Tr2. If we use a pi feedback circuit then from expression (3) R3 must be 5 × 4·7kΩ = 23·5kΩ. If we use a T network instead, R4 should be $(15{\cdot}5 \times 10^6)$/23·5kΩ = 660Ω, a result which can also be obtained from expression (4). These values for R3 and R4 are not the same as those that were required to give a current gain of 5 – in fact use of expressions (1) and (2) would show that these particular values for R3 and R4 would give a current gain of 7·1. Thus for a particular circuit the voltage gain is not equivalent to the current gain. The disparity can in fact be enormous, as shown later.

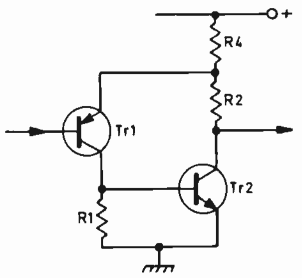
### *Choice of Circuit*

Thus we have two possible ways of applying negative feedback in an amplifier circuit – by means of a pi-section or a T-section network – and by suitable choice of value for R3 or R4 both can be arranged to provide the same gain. Does one network have an advantage over the other?

If, in addition to establishing the gain and improving the linearity, the negative feedback is used to shape the frequency response, there may be a good reason for choosing one type of circuit rather than the other. For example, R3 in Fig. 3 and Fig. 4 could be shunted by a capacitor to increase the h.f. negative feedback, providing a response that falls as the frequency rises. To achieve the same result with a T-section network it would be necessary to add an inductor in series with R4. Connecting a capacitor in series with R3 would reduce the feedback as the frequency falls, giving a response that rises with decreased frequency. To obtain the same response with a T-section network an inductor would be required in parallel with R4. If a capacitor is connected in parallel with R4 the response rises as the frequency is increased. To obtain this result with a pi-section network an inductor would be required in series with R3. Since no one likes to use an inductor where a capacitor can be used to achieve the same effect, pi or T networks can be used depending on the shape of the required frequency response. It's significant that in each of these three examples a capacitor included in one network requires an inductor in the other to give the same frequency response shape.

### *Two-stage Feedback*

So far we've treated Tr1 as a source of signal for Tr2. It would clearly improve the linearity of the whole amplifier if Tr1 was included within the feedback loop. Doing this is simplified if Tr1 is of complementary type to Tr2, permitting direct connection between the collector of Tr1 and the base of Tr2. One possible arrangement is shown in Fig. 5. Tr1's collector load resistor R1 is now connected to the negative side of the supply. Its position in the pi-section feedback circuit is taken by R5, Tr1's emitter resistor. One might think that the analysis previously given for the circuit shown in Fig. 3(a) doesn't apply to this arrangement, but in fact it does. So long as the analysis is confined to the signal currents the inclusion of Tr1 within the feedback loop makes no difference. The feedback current flowing through R3 is applied to the emitter of Tr1. It thus passes through Tr1, emerging virtually unchanged in amplitude or phase at Tr1's collec-



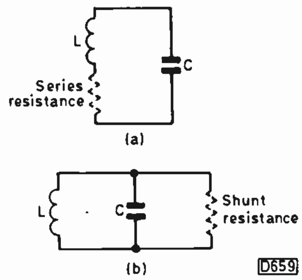




*Fig. 7 (left): The arrangement shown in Fig. 6, but with R5 omitted.*

*Fig. 8 (right): The losses in an LC circuit can be represented as a series (a) or a shunt (b) resistance.*


*Fig. 9: Two methods of capacitive coupling to an LC tuned circuit, (a) by means of a series capacitor and (b) by means of a shunt capacitor.*

tor. As before, it's then applied to Tr2's base. It's assumed that R5 is large compared with Tr1's emitter a.c. resistance and that R1 is large compared with Tr2's base input impedance – both reasonable assumptions in a practical circuit. So the feedback current enters Tr2's base as in Fig. 3(a) and Tr2's current gain is given by R3/R2. Tr1 acts as a common-base amplifier for the feedback current – such an amplifier has unity current gain of course. Tr1 is still a common-emitter amplifier of the current fed to its base, with considerable current gain which is unaffected by the feedback current.

How does this circuit react to voltage signals? This is a quite different story, because R3 and R5 now act as a voltage divider across Tr2's output and the feedback voltage generated across R5 behaves as an input voltage for Tr1, a voltage which is amplified by Tr1 to appear of increased amplitude but non-inverted at its collector and thus at Tr2's base. So Tr1 is now well and truly within the feedback loop and its gain is reduced, along with that of Tr2, to give an overall voltage gain of R3/R5. Thus in this circuit there's a great disparity between the voltage and the current gain.

Applying the series/shunt transformation to Fig. 5 gives us the circuit shown in Fig. 6. Here the ratio of R2 to R4 determines the overall voltage gain and R5, which in Fig. 5 determines the degree of feedback, no longer serves any useful purpose. In fact it attenuates the feedback voltage applied to Tr1's emitter and can be eliminated, giving the circuit shown in Fig. 7. This is often used as a linear voltage amplifier – see for example Tr1/2 in Fig. 4 on page 113 of the December 1986 issue of *Television.*

## LC Circuits

In discussing feedback networks we have seen that the product of the equivalent series and shunt resistors is equal to a product characteristic of the amplifier – in fact the product is that of the two resistors. This reciprocal relationship between equivalent values of series and shunt components crops up in a number of different areas in electronics. It occurs for example in *LC* circuits, where the series resistance in the circuit is related to the shunt resistance according to the expression:

series x shunt resistance = ($L$ or $C$ reactance)$^2$.

In an *LC* circuit however the series resistance is unlikely to be that of a component deliberately included in the circuit. It's more likely to be resistance that's inherent in the inductor, representing the losses due to ohmic resistance, skin effect and proximity effect. This resistance is not often directly encountered in electronics: it's more likely to be known indirectly because it determines the inductor's $Q$ value according to the relationship:

$$Q = \text{reactance/series resistance.} \qquad (5)$$

For example, the coil in a TV i.f. tuned circuit might have an inductance of $1\mu$H, which represents a reactance of approximately 230Ω at an i.f. of 36·5MHz. The undamped $Q$ value might be 100, and expression (5) tells us that the series resistance is 2·3Ω.

The loss in an i.f. winding can alternatively be represented as a resistance in parallel with the *LC* circuit, as shown in Fig. 8(b). This is often known as the parallel resistance, or dynamic resistance, of the tuned circuit. It's related to the $Q$ value and the reactance as follows:

$$Q = \text{shunt resistance/reactance.} \qquad (6)$$

Using the same figures as above, this is equal to 23kΩ.

Such a shunt resistance is not a physical component but a fictitious one effectively connected across the *LC* circuit: it's nevertheless real in its damping effect on the circuit, and limits the $Q$ value to 100.

The $Q$ value determines the bandwidth of the tuned circuit (being equal to bandwidth/centre frequency). We would probably decide that a value of 100 is too high for a TV i.f. amplifier, giving a bandwidth of only 365kHz at a centre frequency of 36·5MHz. To obtain a 6MHz bandwidth, as required for a 625-line TV signal, a $Q$ value of about 6 is more suitable. From expression (6) this corresponds to a shunt resistance of 1,400Ω. To obtain this result we could connect a resistor of say 1·5kΩ across the *LC* circuit or, more practically, we could arrange for the input resistance of the following transistor to provide the required damping.

We have so far confined our attention to series and shunt resistors, but star/delta transformations are possible with other components. Suppose for example that we wish to inject a signal into a tuned circuit. Mutual inductance is frequently used of course to provide the coupling between the signal source and a tuned circuit – very convenient because this doesn't require any additional components. Sometimes however mutual inductance isn't convenient (an example is given later) and a capacitor is used instead. The coupling capacitor can be used as a series component, as in Fig. 9(a), or as a shunt component, as in Fig. 9(b). The magnitude of the signal injected into the *LC* circuit is determined by the coupling coefficient which, for series and shunt capacitors respectively, is given by the following relationships:

$$\text{coupling coefficient} = \text{series } C/\text{tuning } C \qquad (7)$$
$$\text{coupling coefficient} = \text{tuning } C/\text{shunt } C \qquad (8)$$

Combining these expressions, we can see that the values of the series and shunt capacitances required to give the same degree of coupling are related by the expression:

series $C$ x shunt $C$ = tuning $C^2$.

Let's take a practical example. A 465kHz i.f. transformer commonly employs two similar tuned circuits which are loosely coupled to provide a bandpass effect.

The coupling coefficient needs to be about 0·015 to give a bandwidth of 7·5kHz, suitable for use in an a.m. radio receiver. A common tuning capacitor value for such an i.f. transformer is 250pF. If series-capacitance coupling is used, expression (7) shows that the coupling coefficient calls for a series capacitor of 3·75pF. If, on the other hand, shunt-capacitance coupling is used, expression (8) shows that the value of the coupling capacitor should be 0·017$\mu$F.

Shunt-capacitance coupling is useful when the two tuned circuits forming a bandpass pair are physically separated – as for example in a TV receiver where one section of a bandpass tuned circuit is mounted in the tuner and the other at the input to the i.f. strip. Nowadays the tuner is mounted on the same PCB as the i.f. strip, but in earlier designs it was common to couple the two circuits together via a length of coaxial cable whose capacitance formed part of the coupling capacitance.

# *Micro Clinic*

***Reports from Roger Burchett and Nick Beer***

## Sinclair Spectrum

It's been said before that the first check with these machines should be on Tr4 and the −5V line. The machine can initalise and appear to be o.k. (until the keyboard is used) with the −5V line missing, so to save time and heartache remember to make voltage checks first.

Colour problems with later Spectrums and Spectrum Pluses are generally due to the SN94459N chip – replace it with an LM1889. **R.B.**

## Acorn Electron

My colleague found the d.c. power socket dry-jointed and the output lead broken at the power pack end. Too late though: on this machine the ULA (type 12C021) appears to succumb first. It's expensive at over £20. The moral of course is always to look after your power supplies. **R.B.**

## Printers

We've started to take on printer repairs – more by default than design. A Micro Peripherals MP165 (an NEC clone) is owned by a local printer who kept on using it with a very dodgy head. On fitting a new one we found that the descenders and the underlining were missing. One of the pins was not firing, due to the relevant driver transistor (type 2SD1308) being short-circuit collector-to-emitter.

Next came an Epson FX80 which would work with an Amstrad but not with a BBC computer. On setting up a test we found that the BBC computer knew the printer was connected and kept on trying to fill the printer's buffers without success. While checking around the parallel interface we found that pin 29 was permanently low. This is a return for the "busy" line. The pull-up resistor (3·3k$\Omega$) is part of a multiple thick-film package which appeared to have a bad connection on one leg. To be sure we changed it. Why the printer worked with an Amstrad computer is not too clear. Perhaps someone with knowledge of IBM and compatibles can explain this? **R.B.**

## Sinclair Spectrum Plus

We sold a batch of "new" Spectrum Pluses to a local school and congratulated ourselves on beating Dixons etc. for the order. That was a mistake! We've had a few back with odd problems which we've had to repair ourselves under guarantee. The common link is that they've all received attention before.

One machine had had reset problems since we'd supplied it. The reset had been slow and not always completed. Also the logo had occasionally been accompanied by the flashing cursor. On investigation the machine turned out to be a Spectrum issue 3B that had been converted to a Spectrum Plus. The reset arrangement was novel – instead of taking the CPU reset pin to chassis it took the 5V line to chassis! No apparent damage had been caused by this brutal treatment and the machine now works normally.

Following this we've had a number of other Spectrum Pluses with old boards inside. One was a real heartache. It came in with Tr4 short-circuit and a number of chips damaged. We did a memory check before boxing it up and found that it worked only as a 16K machine. To shorten a long story, it would appear that Sinclair sold a number of 48K machines that were working only with 16K – labelling them as 16K of course. The extra 32K of RAM was soldered in (no holders), ready to spring any poor unsuspecting soul about to upgrade them a surprise. This particular board had been recycled in a Spectrum Plus case and had been sold again (in a large Liverpool store), still only as a 16K machine. No one appears to have checked it at any stage during this procedure. Just to add a little spice to the fun, the membrane was very intermittent on extend mode, delete and symbol shift. As we're a long way from Liverpool we repaired all this and levied a nominal charge, hoping to get the loss covered by future business.

Way back in BC (before computers) we made it our policy always to check TV sets before delivering them. We continued this policy AD (after digital?) and it has paid dividends over and over again. We refuse to sell an item still boxed unless the customer is adamant. Even so we recently missed an Amstrad printer whose ribbon was twisted. **R.B.**

## Atari 1010 Cassette Decks

We've had a number of these with the plastic function selector buttons broken. Replacement requires quite a bit of dismantling but is fairly straightforward. **N.B.**

## Commodore 64

This machine wouldn't stop at the end when loading a program from a cassette or wouldn't load after acknowledging finding the program. The cause was a faulty 6510 chip. **N.B.**

## Sinclair Spectrum

In this Spectrum both Tr4 and the 5·1V zener diode had gone short-circuit, thus preventing operation of the power supply. **N.B.**

# A Vintage TV Restoration

**Steve Rowley**

Following the start of regular TV broadcasting in November 1936, and the subsequent decision in February 1937 to adopt the Marconi-EMI 405-line system and drop alternate transmissions using the Baird 240-line system, it has to be said that the sale of TV receivers was, to put it mildly, disappointing. Television was surrounded by an air of mystique. Indeed one of the rumours that abounded at the time was that "they" could see into your home in the same way that the viewer could watch an outside broadcast. It was almost certainly not for this reason however, but simply because of the cost, that so few sets were sold.

Jobs were scarce in the depressed thirties, and money to spend on luxuries was scarcer still. To add to the problem many families would have recently bought a wireless set and would probably not be able to buy a new TV set whilst still paying for the wireless. At sixty to a hundred pounds or more TV didn't come cheap. The radio and TV manufacturers responded by bringing out smaller sets with five, seven and nine inch screens. The smallest of these, the five inch HMV 904/Marconiphone 706, cost 29 guineas – the seven inch versions sold at 39 guineas. These sets were bought in reasonable numbers, but the price was still beyond the reach of most people.

By 1939 a number of manufacturers, notably Ekco, Pye and GEC, had brought out "television adaptors". These were vision only receivers that produced pictures in the normal manner on their small screens: the accompanying sound was obtained by connecting the "adaptor" to one's wireless set. By omitting the loudspeaker and audio output stage the size of the cabinet could be reduced and the price could be kept down to a level within reach of a wider section of the public. The Ekco Model TA201 was one such set: it sold for 22 guineas.

### The Ekco TA201

By the standards of the day the TA201 was a small set. It measured 19½ × 17 × 16in. yet weighed a hefty 70lbs. The 7in. tube produced a 6½ × 5½in. picture – note that the pre-war aspect ratio was 5:4. The cabinet was of polished, fine-grained walnut, and a matching stand was available for an extra two guineas. Also available was a sister model, the TS701, which was similar in appearance but had sound and cost 26 guineas.

Judging by the amount of promotional material produced, Ekco obviously expected great things of the TA201. Original leaflets and brochures for pre-war sets are nowadays very scarce, so it's perhaps an indication of how much material was produced that I've three different brochures on this model.

### Condition

As a collector and restorer of vintage TV sets I acquired a TA201 from a fellow collector some six years ago. It was in a sad state, with a rusty chassis and a control knob and the fibre back missing. Worst of all the tube was broken. Despite several advertisements and much searching I couldn't find a replacement tube, either new or used. Everything comes to those who wait however, and during the next couple of years two more TA201s plus a spare tube came into my possession. One of these sets I've passed on: the other, though minus its cabinet, provided all the missing parts, including the tube and fibre back cover.

### Restoration

The methods and techniques used in restoring vintage sets couldn't be farther removed from those employed in the modern repair shop. The thought of switching on then, if the set survives, finding upwards of 25-30 faults would be unthinkable for a commercial servicing organisation.

My own approach is first to remove the chassis from its cabinet and then, using a stiffish paint brush together with a fine-nozzled vacuum cleaner, to clean the chassis thoroughly, sucking away all the accumulated dust and rubbish. The next step is to clean around the tube's e.h.t. connection, also the connecting cable.

The chassis of the TA201 is well laid out from a maintenance point of view. There are three units, one mounted horizontally at the bottom and one at each side, with the valves facing inwards. This layout gives easy access to the undersides of two of the three units. The bottom unit is the power supply which doesn't need much attention to its underside whilst the set is running.

With the set in a clean condition my next task was to replace all the waxed paper and electrolytic capacitors – the majority of the latter are underneath the power supply chassis, for h.t. smoothing. Without exception all the waxed paper capacitors were leaky, so around ten faults were probably removed in one go. The leads of the new capacitors were coiled to form small "tubes" which could be soldered in place over the severed leads of the original components. This gives a neat appearance, and the joints and layout remain in the original condition. Once the capacitors were sorted out I gave the resistors a quick look over for signs of over heating and where necessary checked the value with an ohmmeter. None of the resistors appeared to be seriously adrift, so it was time to switch on.

### The Big Moment!

The big moment had arrived! Would the Ekco work after forty-five years out of service? Perhaps predictably, the results were somewhat less than exciting. For my efforts so far I was rewarded with nothing more than a ghostly white blob which didn't appear to respond to any amount of knob twiddling. Clearly the timebases weren't working.

Both timebases have T41 thyratrons as the generators. The line output stage uses an AC6 while the field output stage uses a Pen45. All four valves were changed, but there was no improvement in the results obtained. Unfortunately E.K. Cole didn't permit publication of the circuit diagram, so my fault finding was seriously hampered. The service information at my disposal consisted of three pages from the July 1939 issue of the *"Radio Marketing" Service Man's Manual*. This included just about everything other than the vital circuit diagram.

Not to be outdone, I worked my way around the circuit and eventually found a very leaky capacitor hidden away behind a potentiometer mounting panel on top of the chassis. This capacitor is part of the line form circuit, and on replacing it I soon heard the familiar 10kHz whistle telling me that the line timebase was now working. Replacement of the two $0{\cdot}1\mu F$ Visconol 4kV e.h.t. reservoir/smoothing capacitors cured the massive hum bar that moved slowly down the screen, and I now had a blank raster that could be controlled in height, width and focus.

My success was unfortunately short-lived. The screen slowly turned dark and smoke began to issue from the power unit. A check with the ohmmeter confirmed the worst – the e.h.t. transformer had developed shorted turns. Anyone who restores vintage TV sets lives in fear of this happening – finding a replacement is virtually impossible, and rewinding the original is costly, always assuming that you can find someone prepared to do it.

In the present case I'd the spare chassis, so the e.h.t. transformer was quickly removed from this. Not surprisingly, the "new" transformer was itself a replacement type, so it would appear that the original transformer was prone to failure. Fortunately the replacement worked, so I was back with my blank raster.

### 405-line Material

There's one major stumbling block when restoring 405-line sets – there are no longer any transmissions! But we have our ways. If, like myself, you're not lucky enough to possess a standards converter, there are basically two choices. The first is to use a simple 405-line pattern generator. This is adequate for restoration purposes, but provides little of entertainment value for subsequent viewing! A much better solution is to use video recordings of 405-line material. Normal 625-line recordings cannot be used unless processed through a standards converter. Connect the VCR's video and audio output sockets to a v.h.f. modulator operating at the correct frequency for the TV set – the construction of a suitable modulator was described in the October 1984 issue of *Television*. I'm fortunate in possessing both pre- and post-war v.h.f. material, including "Television Comes to London", a short film about the construction of the Alexandra Palace studios and transmitter.

### Getting the Picture

The v.h.f. modulator's output was connected via a length of standard coaxial cable to the TA201's aerial input socket. Being a born optimist, I drew the curtains and switched off the lights in readiness for some viewing. As anyone in the trade will confirm, such rashness always invokes a variety of faults – and this was no exception. Sod's Law again prevailing, there remained a blank raster and no amount of contrast increase (gain) or focusing adjustment would resolve a picture.

The SP41 vision r.f. amplifier valves were replaced, as were the SP42 sync separator and the SP41 video amplifier valves. All to no effect. The fault was eventually traced to the vision demodulator valve which wasn't lighting up. This was difficult to find as the valve, a D1 subminiature type, was concealed in what looked like another r.f. tuning coil can. The D1 is a strange little valve, with three pins in a row at one end and a further pin at the other end. Replacing it had the desired effect, and after carrying out adjustments to the hold controls and the contrast and focus controls the familiar figure of Mickey Mouse came into view. This cartoon was the very last programme to appear on TV prior to the wartime close down. It was perhaps ironic that it should appear on the screen after I'd devoted so many hours to the restoration.

### Results

The sound output socket (complete with its original plugs) was connected to the gramophone sockets of a contemporary Cossor wireless set, Model 375. This time I was lucky, and after a couple of minutes of warming-up time "The Lambeth Walk" was echoing round the room. Both the picture and sound were of good quality, the latter being considerably better than the sound obtained from many modern-day sets. The geometry and contrast were good but the brightness was such that viewing was best either in an unlit room or with the light source behind the set. Advancing the setting of the brightness control too far produced flaring, which was only to be expected with a set of this age. Judicious adjustment of the r.f. cores produced a further improvement, as did adjustment of the sound rejector capacitor, which improved the line hold.

The set is now used on a fairly regular basis, mainly for the entertainment of those who are either too young to remember or who simply couldn't afford pre-war television. Watching the Ekco TA201 is not at all like watching a modern TV set. For me it invokes a feeling of excitement, as though I was one of the pioneers who produced the first television pictures. Last year saw the fiftieth anniversary of the start of high-definition TV broadcasting in the UK. I wonder whether the little Ekco will be producing pictures in another fifty years' time?

# VCR Clinic

*Reports from Steve Beeching, T. Eng., Eugene Trundle, Philip Blundell, Eng. Tech. and Patrick Rafferty*

## Saisho VR9055

There was no cassette tray operation, no eject and a tape was stuck in the machine. As the motor was without power the main drive i.c., type RA6209, was suspected. After replacing this the operation was sluggish and hesitant, with intermittent eject. The motor had been checked with an external power supply (yes, the RS one E.T. reviewed in the May issue – he got his after seeing mine!), so we were back to the chip. As luck would have it however I checked the wiring to the motor. This is wrapped around the cassette compartment metal chassis, was tight and had cut through, shorting the motor's output to chassis. **S.B.**

## Sharp VC8381

There were no playback pictures and the E-E pictures showed signs of white clipping. The supply lines were correct. Rather than getting bogged down with the clipped whites attention was turned to the absence of playback pictures. IC402 had no sync pulses at pin 1 and no video signal at pin 20, though there was a video signal at pin 18. In the E-E mode there were signals at both pins 18 and 20, but the signal at pin 20 was clipped. After changing the i.c., for no good reason whatsoever, the voltages were checked. Pin 18 read 5·1V instead of 4·3V. C439 was found to be leaky. **S.B.**

## JVC HRD725

There was a background sizzle on the sound from the right-hand stereo hi-fi channel. The left-hand channel was fine. Various checks were made, including increasing the level of the right-hand 1·8MHz carrier. All to no avail. Only replacing the video heads (ouch!) provided a cure. Although the left and right audio channels are recorded by the audio heads as a mixed carrier, head wear seems to affect the right-hand channel first – presumably because of the higher frequency.

Another problem that can occur with these machines is failure of the power supply regulator transistor Q2. This can create unforeseen problems – the symptoms range from full to no display, with the capstan motor running. If Q2 has failed, change both Q1 and Q2 and check D2. As the rail voltage can increase to 20V or so a regulator circuit on the tuner panel is likely to be destroyed, so replace the following as a precaution: Q3, D13, D17, D18, D19, D20, C13, C14, L1 and IC1. **S.B.**

## Grundig VS380

Intermittent sound erasure is generally due to cracks in the solder joints on the coils around the erase oscillator. These are mounted horizontally and are subject to machanical shock.

Low audio from the left-hand channel with an AV input was traced to failure of the input select i.c. Customers should be told not to connect plugs and sockets while the machine is powered. **S.B.**

## Grundig VS300 Series

You may sometimes find that the head drum goes around backwards. The drum motor is bidirectional and is told which way to rotate by the microcomputer chip, via a series/parallel shift register and a four-way buffer driver. If the micro gets incorrect data from any source it tends to rotate the drum the wrong way. In one case the cause of the trouble was found to be the input data interface while in another the cause was a seized capstan motor. Drum motor winding failure will create the same problem. So remember: backwards drum rotation is only a symptom and the cause could well be something apparently not related to the drum. You must check the power rails, resets, FGs, CTL and optocoupler input to the syscon before ripping out expensive i.c.s. Ask Grundig Pete! **S.B.**

## Grundig VS380

Intermittent operation of the f.m. audio record level display was traced to a poor joint on T2049. This removed the 22V supply. **S.B.**

## Ferguson 3V44/JVC HRD140

There were no functions and no "operate" power up. After checking all the circuit protectors attention was turned to the syscon microcomputer chip which was replaced. Note that the M50730-607SP has been replaced by the M50730-610SP – I don't know why. **S.B.**

## JVC HRD180

One of these machines lost time. Replacing the clock crystal X101 and resetting C102 as per the manual cured the trouble.

With another one there were no functions and circuit protector CP4 was open-circuit. This was bridged with a piece of wire as a check but there was no 12V at pin 9 of the 12V regulator. With a new regulator fitted there were still no functions and CP4 was again open-circuit. The cause of the fault was traced to the motor drive chip IC602 which was short-circuit – a 12V, 3A power supply helped sort this out.

There was inconsistent channel selection with another of these machines – when changing channels the u.h.f. numbers would alter and the machine would be off tune. For example, if programme 9 was tuned to ch. 58, selecting 9 would result in ch. 21 or 57 appearing, though reselecting would produce ch. 58. Changing the tuning memory chip, the tuning PLL chip, then the timer/display microcomputer chip had no effect. The resets, power rails and clocks were all checked – even the timer was changed. The cause? C7 on the power panel had a dry-joint at one end. This put a ripple on the 30V line, confusing the memory chip. **S.B.**

## Panasonic Oil Clutch Motors

Heard about the new Panasonic oil clutch motors? What will we tell customers – it leaked? **S.B.**

## JVC GRC1

One of these camcorders wouldn't record. The cause was a faulty record inhibit switch.

Intermittent audio recording and no playback tracking was traced to a wire to the erase head shorting to the servo panel – the sharp component pins penetrate the screened cable. This is a problem with portable equipment which is subject to mechanical shock.

On another of these machines intermittent audio recording was traced to a dry-joint in the oscillator circuit: all suspect joints were touched up. **S.B.**

## NEC PVC744E

There's a good chance that the reel motor is faulty if any of the reel drive transistors have failed (Tr11 and Tr12 usually go).

When refitting the cassette housing make sure that it doesn't catch on the back-tension band – or you'll find that the machine won't thread up. **P.B.**

## Sony SLC6 Mk. 2

The metal cassette flap had come off and was loose inside the machine. When it was refitted the machine would thread up but the loading ring wasn't being held in position. A quick read through the manual was needed to discover that the brake/select solenoid wasn't being pulsed. Q613 was short-circuit. **P.B.**

## Sharp VC387

The problem with this machine was tracking noise on playback – the noise was stationary and the tracking control had no effect. As the drum lock (TP701) and capstan lock (TP708) voltages were normal attention was turned to the tracking control which was found to be open-circuit.

For no power on but the clock working check that IC801 on the mechacon board has 9V at pin 64. If not, follow the track back and you'll probably find an open-circuit semiconductor fuse (this isn't shown on the circuit diagram!). **P.B.**

## ITT VR3916

We've had two more cases of no clock display. In one case R423 on the timer board was open-circuit, in the other R2 in the power supply was responsible. **P.B.**

## JVC GXN70

The reported problem was no colour, though a scope check showed that the CVBS output had chroma information. Investigation on the SSG/deflection panel showed that the subcarrier frequency was incorrect at about 4·42716MHz. The problem was solved by replacing crystal X701, which enabled the subcarrier frequency to be correctly set with the trimmer.

In this camera the screening cans that surround the crystal and SSG chip are extremely tricky to remove: there's a great risk of damage to the board and nearby components. **E.T.**

## Toshiba V8600

The accusation againt this old battleship of a VCR was that it lost five minutes in each hour. Set to run in the workshop it kept better time than my wristwatch for two days on the trot. It was then returned to the customer's home, where it continued to keep exemplary time. The likelihood is that a spike or transient on the mains supply had triggered the microcomputer chip into 60Hz operation of the clock counter. In future we'll advise customers with this sort of problem to unplug from the mains, count to ten and try again before bringing the machine to the workshop. **E.T.**

## Sony SLC6

The customer had no sooner taken this machine home after a workshop overhaul than he was on the phone to complain that it wouldn't thread up. This sort of problem has cropped up in the workshop too, on various makes and models. The solution lies in getting a correct microcomputer reset. The customer had switched on at the mains with the VCR operate switch already on: it's sometimes essential to apply mains power before you switch on at the front panel. **E.T.**

## JVC HRD180

This machine, one of the latest, came back to the workshop with a no vision recording fault. It was intermittent, like all the best ones. The effect was complete loss of picture to a screenful of snow while the sound continued. The problem lay at CN2/7 (/REC) on the video board, where a stiff ribbon cable enters from J2 on the mechacon board. The solder connection had probably broken when the 03 video board was hinged down during assembly. **E.T.**

## JVC GZS3/S5

The picture produced by this camera was very dark, with a pink and purple chroma overlay. Turning the colour fully down at the monitor gave us a very dark picture with only the brightest highlights (workshop lamps and windows) emerging from the blackness. The luminance signal was o.k. up to Q2 on the 01 video processing board: it then virtually disappeard. The trouble was in the black-level clamp circuit, where the /CP2 pulse ties the luminance signal to a fixed 1·7V potential during the line blanking period. This clamp reference voltage is held by a 10$\mu$F tantalum capacitor, C5, which was open-circuit. **E.T.**

## Grundig VS180

On most occasions a known good tape would play back perfectly but now and again the picture would begin to jump for a few seconds at intervals of 40-45secs. When playback returned to normal the fault wouldn't occur until the machine had been stopped and restarted. The time interval between the jumping sessions suggested that the problem was due to the rotation of the spools in the cassette rather than electronic trouble.

We found that when the fault occurred the back-tension tape control arm was firmly locked to the optosensor instead of being free to swing back and forth to level out tape pay-out irregularities. When the fault was not present the arm was free to trigger the sensor as it should. There's a small plastic sleeve on the control arm's stop peg. It's retained by a "hooked" end on the peg, presumably a buffer. This sleeve must have flattened a little, since now and again the hooked end would latch over the back plate of the optosensor at start up. As the owner came from afar and wanted to leave at once I slipped a small length of RS red plastic sleeving tightly over the peg-and-sleeve so that the red sleeving stopped the hook engaging. Results were first class. Note that the diagram on page 74 of the manual doesn't show either the plastic sleeve or the hooked end to the stop peg. **P.R.**

# Long-distance Television

Roger Bunney

As hoped, April proved to be a rewarding month for Sporadic E reception. This is always a pointer to a good season starting in mid-May. There were several periods of SpE activity, including an excellent opening on Easter Monday afternoon – it's most unusual for an opening to occur during a public holiday! The settled weather conditions proved helpful for tropospheric propagation, and as an additional bonus the April Lyrids meteor shower (April 19-25th) produced substantial signal pings at frequencies rising as high as Band III. The SpE log, collated from various UK reports, is as follows:

| | |
|---|---|
| 5/4/87 | NRK (Norway) ch. E2; SR (Sweden) E2; DR (Denmark) E3. |
| 14/4/87 | DFF (E. Germany) E4; NRK E4; CST (Czechoslovakia) R1. |
| 16/4/87 | TVE-1 (Spain) E2-4; TVE-2 E2; RTP (Portugal) E2; ARD (W. Germany) E2. |
| 19/4/87 | RAI (Italy) IA, B; ORF (Austria) E2a; TVE-1 E2-4; TVE-2 E2. |
| 20/4/87 | TVE-1 E2-4; TVE-2 E2; RTP E2, 3. |
| 26/4/87 | TVE-2 E2; RTP E3. |

The 21st provided CB SpE at 27MHz, with various southern European stations being heard at high levels. Band I was not affected.

Tropospheric propagation improved from the 12th. Band I, III and u.h.f. signals from RTE (Ireland) were received in central/western UK by the 15th. W. German Band III/u.h.f. signals were also improving, with reception in central/southern UK. But the most active period was from the 23rd to the 29th. Throughout this period W. German/Benelux/French Band III/u.h.f. signals were received at good strengths as far west as Wales. Perhaps the most active day was the 28th, with Swedish v.h.f./u.h.f. and Danish Band III signals being added. Interesting that on the 29th Iain Menzies (Aberdeen) received very strong E. German u.h.f. signals during the morning – conditions died down later that day.

The new Dutch third programme (NOS-3) transmitter at Smilde (ch. E44, 1,000kW e.r.p.) was on test during April – so keep a careful watch on this channel.

During the April Lyrids meteor shower Mark Baldwin (Rugby) logged ORF (Austria) ch. E5 and CST (Czechoslovakia) ch. R6. This reception occurred on the peak day – the 22nd. MS propagation was fairly active during the period, with medium/short pings in Band I. Band III MS is not usual but, as Mark as shown, can occur.

## News Items

**Spain:** A new TVE-1 transmitter is in operation on ch. E2 at Casares, a small mountain town some 22 miles NNE of Gibraltar. The output power is at present unknown but is expected to be low.

**UK:** John Butcher, under secretary of state at the DTI, has indicated that the department is giving sympathetic consideration to the use of the 50MHz band (50-52MHz) by class B amateur radio operators – the band is at present used only by class A operators. Power level limitations could be eased.

The DTI has also indicated that the UK Citizens' Band is to be increased to 80 channels, using the new European standard (CEPT). Use of the original 40 channels will be reviewed in 1990.

**W. Germany:** A network is being commissioned to transmit the SAT-1 satellite TV service to main areas. Most of the transmitters operate at under 1kW e.r.p. The main ones of interest are as follows:
Augsburg ch. E38/40, 6kW. Bremen ch. E45, 1kW. Kaiserslautern ch. E50, 1kW. Munchen ch. E29, 1kW. Saarbrucken ch. E56, 1kW. Bamberg ch. E45, 1kW.

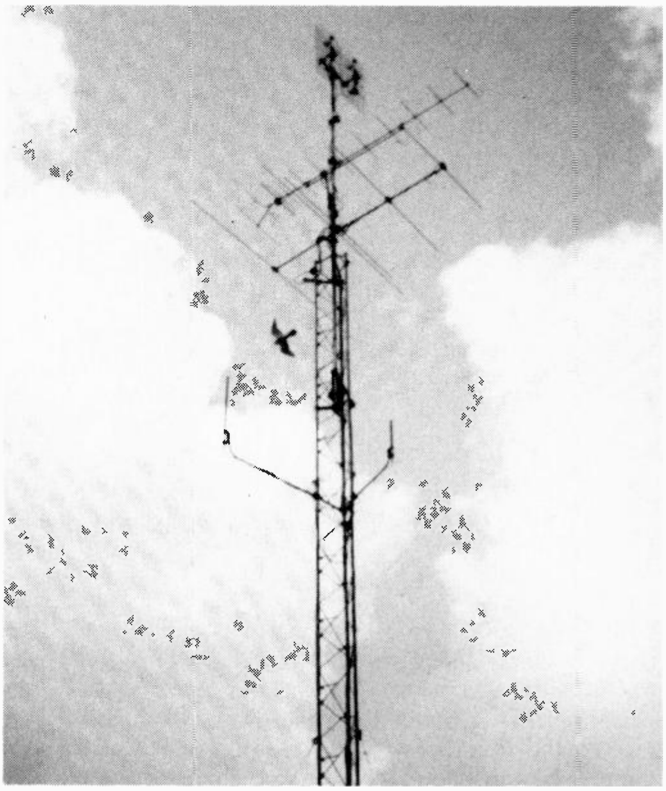
**Denmark:** Rumours suggest that from 1990 onwards all v.h.f. transmitters will gradually be closed, starting with the ch. E3/4 outlets which are soon to have u.h.f. counterparts. The new transmitter tower in West Copenhagen, due to open on April 1st 1988, will transmit DR-1 on ch. 31 and TV-2 on ch. E53 – the old ch. E4 outlet will continue in use for some years.

**W. Germany:** The following private/local TV transmitters will operate in Schleswig-Holstein: Kiel ch. E24 400W e.r.p. TV-1; Flensburg ch. E24 100W e.r.p. TV-1; Flensburg ch. E28 200W e.r.p. TV-2.

New identifications have been announced for the Bremen ZDF and Radio Bremen 3 test patterns – "2. Programm K34" and "3. Programm K42" respectively, with "Bremen" above in both cases.

Channels E61 and E69 are to be released for TV broadcasting. The BDXC report that for NDR/RB/SFB programme linking there's a high-power tropospheric link between Gartow/Hohbeck in W. Germany and W Berlin. The link uses ch. S13 (245·25MHz vision) and operates at 500kW e.r.p.

**USSR:** The Moscow first programme now starts an hour earlier, at 0400 GMT. The first news programme, Vremja, is at 0430-0500.



*Roger's DX aerial mast complete with Les Wallen 27 and 49MHz aerials and full-size plastic decoy falcon to the rear of the Band I array.*

**France:** Two new TV6 (now called M-6/Metropole 6) transmitters are in operation – Lille/Lambersart ch. E53 and Dunkerque-Ville ch. E62. The power is 1kW e.r.p. in both cases.

**USA:** Of interest though not exactly DX-TV news – US military officials have activated a communications satellite that had been "in storage" for at least seven and a half years. The Ford satellite was the third in a series of four and was held stored due to the excellent performance and life of the second satellite in the series, NATO-IIIB.

### *Spectrum Deregulation and Pricing*

The DTI has just published a substantial document entitled "Deregulation of the Radio Spectrum in the UK". This considers potential changes in the spectrum to accommodate new services, new frequency planning, and "the possible benefits from introducing market forces and the price mechanism into spectrum management". It requires closer study than we have so far been able to give it, but several points are clear.

There is to be no development of ground radar in the TV band 582-606MHz and existing installations are to be phased out in the interests of reducing TVI. These installations currently operate at 60kW peak power. The subdivision of Band III has been reviewed – details were given in an earlier column. It's suggested that Band I could be split into two allotments approximately 8MHz wide, though the possibility of interference from foreign broadcasters and "some computer and other electronic equipment" is recognised. Some of the suggested users are cordless PABX (operators may need a bandwidth of 8MHz to allow high packing density), diversity paging (using several frequencies at specified time intervals), and that old favourite PMR. The document recommends early release of the Band I spectrum to allow rapid, cost-effective development of the equipment that would be required. Implementation would be helped by increased revenue from licence fees. An indication of the future!

### *DX-TV Tuner Unit*

HS Publications of 7 Epping Close, Mackworth Estate, Derby DE3 4HR have announced a new converter unit, the Special D100, that covers Band I, II (TV), III and u.h.f. It costs a little more than the Standard D100 which omits Band II. It's based on the NSF 47807 tuner and includes switched selectivity. For further information send an s.a.e. to HS Publications.

### *Far East Report*

Our correspondent in South Korea, Jean-Louis Dubler, has been on his travels again. He reports that there are four TV networks in Thailand, though their coverage is limited. Bangkok has four TV channels, three of which have affiliated Band II f.m. transmitters for relaying dual-language sound. Two of the networks are operated by the army, the others being private. Singapore has three channels, one with 100 per cent English language transmissions and the other with various Malay dialects. There's a single TV channel in Bali – but Malaya ch. E3 is available via transequatorial tropospheric propagation at a distance of some 700 miles, reception varying from fair to poor!

### *Aerials and Other Things*

As mentioned last month, I've been looking into the possibilities of using small active and passive aerials for

DX-TVing. The Les Wallen 49MHz UK paging service aerial has now been mounted on my mast at the 40ft level: the equivalent 27MHz base aerial is mounted on an adjacent stub mast (see accompanying photo). The 27MHz base aerial is 40in. overall and again has an integral SO329 socket (for use with PL259 plug). Both aerials consist of a helical element within a waterproof PVC tube, with an efficient built in vertical mast clamping bracket arrangement. Initial tests suggest that at 49·83MHz the gain of the 27MHz aerial is some 8-10dB up on that of the 49MHz aerial – it will be interesting to check on the results obtained when the SpE season starts. I'm told that Revco now have an in-line "tube-like" preamplifier that covers the whole radio spectrum to 1GHz with a gain of around 13dB, a noise figure of 3-5dB and excellent linearity/overload performance – a sample is awaited. Initial assessment of the 27MHz aerial showed that it worked well from 6MHz upwards through to the 450MHz u.h.f. band, with a scanner.

If you look at the photograph you'll see that there appears to be a bird flying close to the lattice mast. As DXers and radio amateurs will know, various birds love to perch on aerial elements. This leads to the build up of excrement on the alloy tubing, which then tends to corrode. This is in addition to the droppings to ground from such birds. I noted the suggestion in a recent magazine of using a decoy bird of prey to frighten other birds off and eventually found at a local garden centre a replica plastic hawk modelled in flight. This was suspended from the rear of the Band I array using fishing line nylon. Initial results suggest that starlings are wary, though a local pigeon is quite happy to sit nearby.

One of the nylon supports snapped after just one day, so stainless steel fishing line was then fitted. Three days later the hawk crashed to earth due to excessive spin on the two stainless steel support wires used. Shorter wires have now been fitted to prevent this spin. The plastic bird of prey certainly looks realistic, seeming to hover in a gentle breeze. One concerned neighbour reported a large bird caught up in the mast – could I climb up and release it! So if you are suffering from aerial damage caused by birds, a plastic hovering bird of prey could be the answer.

Details of a "small-dimension TV aerial for the v.h.f. band" have been received from a contact in Poland. Unfortunately the text is largely in Russian, making it extremely difficult to establish the theory of the aerial and the claimed performance. Constructional details are shown in Figs 1-4 and Table 1. It should be possible to make up this aerial, using helical elements within plastic tubing (rainwater/drain piping). The original articles include gain figures which indicate wideband performance, ranging from 9dB at 50MHz to around 10·25dB peak – these figures are based on an array with five directors, a single dipole and a sheet reflector.

The main feature of the aerial is the helical director and dipole elements which have eight turns in each half element, with ten close-spaced turns at the centre (directors – the dipole has a matching arrangement), using 1mm diameter enamelled wire located in a slot. Metal cones are fixed at each end of the elements and are connected to the far ends of the spiral element wire. There's no boom connection at the centre of the elements – the plastic boom is some 90cm long with a diameter of 30mm. Each element varies in turn detail (see Table 1).

Hopefully the information given will be sufficient to enable an aerial of this type to be tried. If the aerial does indeed provide the performance claimed it could well be the answer to the problem of minimising the visual impact of a v.h.f. DX-TV aerial in a modern housing estate. The detailed metal cone diagrams suggest that the profile is important in obtaining the claimed performance. I wonder whether a tube of copper (water pipe) would suffice, the coil being wound on a given plastic/PVC pipe complete with end copper tube and the assembly then slid inside a slightly larger PVC tube to provide weatherproofing.

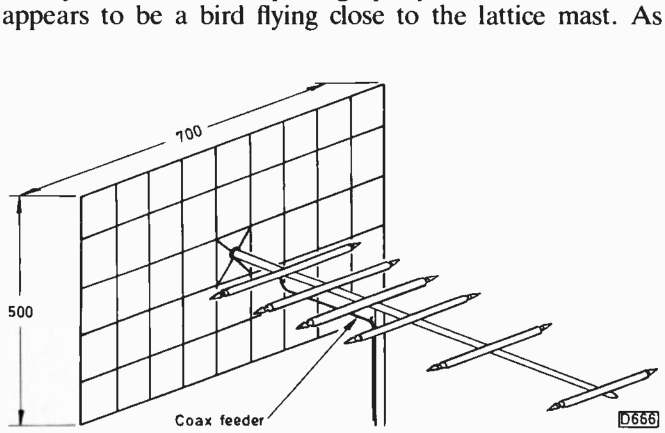


*Fig. 1: Overall view of the Russian wideband v.h.f. array.*

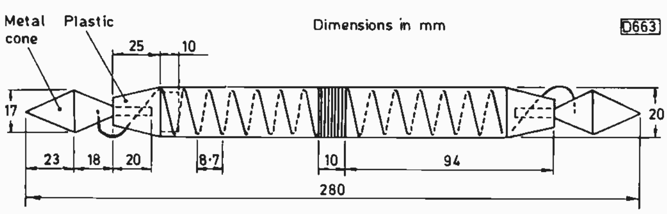


*Fig. 2: Constructional details of the first director.*

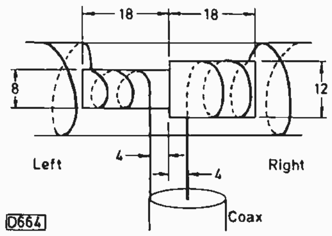


*Fig. 3: Feeder/dipole matching arrangement.*

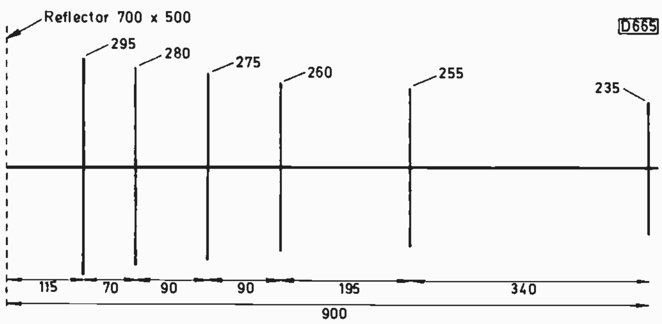


*Fig. 4: Element dimensions and spacing.*

**Table 1: Element coil details.**

| *Element* | *Spacing between turns (mm)* | *Overall length of coils in each half element (mm)* | *Overall length of 1mm enamelled wire per half element (mm)* |
|---|---|---|---|
| Dipole | 8·8 | 90 | 720 |
| Director-1 | 8·7 | 84 | 672 |
| Director-2 | 8·6 | 78 | 624 |
| Director-3 | 6·8 | 70 | 560 |
| Director-4 | 6·4 | 64 | 504 |
| Director-5 | 6·3 | 62·8 | 502·4 |

# Service Bureau

***Requests for advice in dealing with servicing problems must be accompanied by a £1·50 cheque or postal order (made out to IPC Magazines Ltd.), the query coupon and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.***

### *GRUNDIG CUC70 CHASSIS*

**The problem with this set is colour patterning during monochrome reception. It works perfectly with colour programmes. The patterning is intermittent and can occur with the set at any temperature from cold to fully warmed up. Tapping the decoder board makes no difference and there don't seem to be any dry-joints. The only way in which the interference can be cleared is to turn the colour right down.**

The problem is not with the set but with the broadcasting authorities who nowadays seldom seem to switch off the burst signal during monochrome transmissions. As a result the Grundig set's colour-killer doesn't switch off, leading to colour confetti if the signal is anything less than impeccable. The only solution, it seems, is to turn down the colour control during the rare periods of monochrome pictures.

### *SANYO VTC5000*

**The problem with this four year old machine is continual mains fuse blowing. The 315mA fuse may blow after a day or it may last a month. The machine works perfectly once the fuse has been replaced. About six fuses have been fitted so far, and adding a transient suppressor in the mains plug has not improved matters. The fuse always blows when the machine is in the standby mode.**

The fault is quite common on these machines. It should clear after replacing the mains filter capacitor C5201 with an 0·0047$\mu$F, 350V a.c. type. RS Components stock a suitable capacitor.

### *FERGUSON TX90 CHASSIS*

**The bottom two inches of the field scan are very unstable when the set is first switched on, and a white line is present about two inches from the bottom. A very light tap on the cabinet will cure the fault temporarily. The field scan occasionally collapses for a second or so. After half an hour the field scan is usually normal.**

This problem is quite common and is almost always caused by dry-joints on the legs of the field output transistors TR104 and TR105. Resolder these carefully, along with any other suspect looking joints in the same area of the board.

### *SONY SL8000UB*

**This machine will run for only five-fifteen minutes in the record or play modes. After this the keys return to the stop position – as if end-of-tape is activated. Subsequent attempts at restarting produce no results as the keys spring back up: only the rewind function is available. If the machine is left for a considerable time you can get another five-fifteen minutes of record or playback. The heads and threading ring have been cleaned and a new belt has been fitted.**

The machine plainly thinks it has reached tape end, due to cessation of oscillation in the left-hand side end-sensor coil. While a faulty coil or intermittent plug/socket connections can be responsible, the fault is more often due to failure of the forward sensor preset RV701. Replace it, along with RV702, then set up both of them as specified in the manual.

### *ITT CVC32/3 CHASSIS*

**The programme suddenly changed to channel 1 while we were watching channel 3. Now this is the only programme that can be obtained whichever button is pressed. The SAA1024 chip in the remote control transmitter has been changed but this had no effect.**

The most likely cause of the problem is the SAA1025 remote control decoder chip IC1 in the CMC60 remote control assembly in the set. Before condemning it check for 18V at pin 16 of IC4 and 8·2V at pin 8 of IC2. If either of these supply lines is incorrect, suspect zener diodes D2 and D4.

### *PANASONIC NV333*

**The problem with this machine is that the lid won't stay down. It seems to be permanently in the eject mode. If the loading mechanism is wound manually the lid shuts, but as soon as power is reapplied the loading motor comes on and lifts the lid up again.**

We suggest that you check the operation of the cassette-down and loading-end switches before suspecting trouble in the syscon department. Make sure that the eject button is not stuck, leaky or corroded. If all these things are in order and the contacts on the remote control jack socket are making properly the most likely culprit is the mode select switch.

### *FERGUSON TX10 CHASSIS*

**There's quite severe darkening of the picture when white captions are displayed and, depending on the white content of the picture, there's a constant variation of the background brightness level – particularly on video playback. The VCR is not at fault since it works correctly with another set. The picture seems rather flat generally despite the fact that a new tube has been fitted recently.**

It seems very much as though something is amiss in the beam current limiter circuit. Prove it by disconnecting R622, when normal contrast should be restored. If not, the TDA3560 decoder chip IC601 is suspect. If normal contrast does return, check C609 (10$\mu$F) then the components between R622 and the tube's outer conductive coating.

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**TELEVISION JULY 1987**

## *ITT CVC1200 SERIES CHASSIS*

**The problem with this set is that the BU508A chopper transistor goes short-circuit at switch-on. Trying to check on the cause is getting rather expensive!**

A very common cause of this symptom is that R716 (150kΩ) is faulty. Replace it anyway. If the old one checks o.k., test the following items before restoring power: line output transistor T501, EW modulator diode D501 and the rectifier diodes D732 and D733. If the problem lies with any of these four, leakage or a short-circuit will be indicated.

# TEST CASE

## 295

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

VCR repairs are eagerly undertaken by those of our technicians who are following the practical VCR servicing course of the City and Guilds Institute at the local college. They represent good practice for this summer's "hands-on" examination.

Useful experience was promised by a Ferguson 3V42 in the awaiting repair queue. Its problem was noted down as no colour, and the man who picked it up was anxious to deal with it "by the book", as he would have to on the day. Having connected it up and tuned the monitoring TV set to its output channel, he replayed a good test tape of colour bars. Despite the fact that the VCR's rear-mounted switch was set to colour the monitor displayed a crisp black-and-white step wedge.

His next move was to make a recording of the colourful bars reproduced in the E-E mode from a pattern generator and to replay the tape via a working machine. This proved that the fault was also present in the record mode – playback of the tape was in monochrome, with occasional breakthrough of vertical bars of incorrect colour. So it was back in with the colour-bar test tape and settle down to trace the fault with the 3V42 in the playback mode and the scope as the main diagnostic tool.

This machine's video circuit board is mounted print side up in an ideal position for access and diagnosis – above the deck. All the components and test points are clearly marked and the service manual is a helpful one. In short, the working conditions were ideal. Our technician's first check was for an off-tape 625kHz colour-bar signal at TP404, the input to the main up-converter on the board. It was present and at the correct 300mV peak-to-peak level. An output from the converter was present at pin 23 of IC401 and the signal was also present at TP401, proving that the 4·43MHz bandpass filter BPF402 was intact and also that the converter was receiving an input from the sub-converter stage via BPF401.

Continuing along the helpful green dotted line on the circuit diagram, our technician traced a 4·43MHz signal which looked like good colour bars through the crosstalk cancelling circuit then back into IC401 at pin 1. Within the chip, the signal passes from pin 1 to pin 21 via the playback colour-killer, which plainly took some objection to the signal it was seeing: for most of the time the chroma at TP405 was muted. At odd moments the colour-bar signal would appear at TP405, but the monitor's display remained firmly in monochrome! It was correctly deduced that this was due to the action of the auto colour-killer in the TV set – further evidence that the chroma signal was in some way sub-standard, though it looked quite acceptable on the oscilloscope's screen.

The VCR's chroma signal channel was clearly intact, so our technician decided to check the frequency of the voltage-controlled 4·43MHz crystal oscillator. The counter showed that it was correct to within 20Hz: its amplitude at TP403 was also correct. The a.f.c. setting (for 625kHz at TP422) was also found to be correct. Enquiry amongst colleagues on the subject of strange no-colour faults produced horror stories about incorrectly wired video heads, but the drum and the wiring to it had not been disturbed. What next? D.C. voltage checks at the i.c. pins perhaps. These were not very fruitful, and in terms of the practical examination period time was ebbing away. Which essential test had been omitted? See next month's test case page.

## *ANSWER TO TEST CASE 294*
## *— page 560 last month —*

Our patient last month was a Decca TV set fitted with the 100 series chassis. It appeared to have an evil and obscure a.g.c. fault that put a heavy horizontal shading bar across the picture and thoroughly upset the line and field sync. We had proved that the cause of the trouble was on the i.f. panel – by fitting a known good one. After refitting the set's own panel we'd then encountered some rather puzzling conditions in the a.g.c. department.

The root of the trouble lay at pin 6 of the TCA270S vision demodulator/a.g.c./a.f.c. chip. One generally finds a single capacitor connected between this pin and chassis, the 47nF a.g.c. reservoir capacitor – in this case C126. The Decca designers however had decided to add an extra network consisting of D103 (1N4148) followed by the parallel combination of C125 (4·7$\mu$F) and R110 (120kΩ) connected to the 12V line, which of course is grounded signalwise. D103 had gone short-circuit, effectively placing C125 in parallel with C126. This hundred-fold increase in the value of the reservoir capacitor was clearly not to the chip's liking.

The network D103/C125/R110 does not normally take any part in the a.g.c. circuit's action – it's there as a clipper to prevent noise spikes and similar disturbances producing spurious a.g.c. effects.

Not a nice fault, though we should perhaps not have taken so long to find a dead short in the only standard diode (as opposed to the various zeners) on the entire i.f. panel.

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| **G8** Line Panel | £12.00 |
| **G8** 6 Push Button | £9.00 |
| **KT4-KT3-K30** Handset Replacement | £12.00 |
| **HT520 METER 20,000** Fuse Diode Protector Logic Test Facility | £15.90 |
| **9000 SERIES** Decoder 01 929 014 080 Thorn | £5.00 |
| **LATEST VIDEO** For Latest Philips, GEC, Pye and Hitachi Front panel with memory chip and push button and pots and LED's. | £6.00 NEW |
| 20AX GEC LOPT Panel with Split Diode | £4.00 |
| LOPT Split Diode 2432871 | £7.00 |
| **RANK** T20 Fouces Pot | 75p |
| **RANK** 718 Foucs Pot | £1.00 |
| 26" LOPT Split Diode 2432301 | £8.00 |
| 16" LOPT Split Diode 2433481 | £6.00 |
| Ex Panel Split Diodes 2432871/2432981 | £5 |
| Split Diode 2433752 | £6 |
| **HITACHI** Mains Switch | 50p |
| **HITACHI** AE Socket | 30p |
| ·1 **CONDENSER** Axail Leads 450 A/C 1200 D/C | 15p |
| **MAINS TRANSFORMER** 240v in/20v/8v | £1.00 |
| **GREEN FLAT**, NEC, LED's | 3p each 100 for £2 |
| 15V015V 1 Amp Print Type | £1 |
| 12+12V 2.8VA Print 1"×1" | 75p |
| 8+8V 1 Amp Print | 75p |
| **HITACHI** 6 x 4 – 8Ω Speaker | 50p |
| **ET596** UHF V/CAP Tuner, small | £2.50 |
| **FIDELITY** Panels with I.C | £1.00 |
| **FIDELITY** LOPT Split Diode AT2076/80 | £3.00 |
| AT 2076/80 | £5.00 |
| **ITT CVC20 to 45 PANELS** Send for list | £5.00 each |
| **PHILIPS KT3-KT35 PANELS** Send for list | £5.00 each |

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|---|---|
| **HI-FI MICROPHONE** N8501 Philip | £8.00 |
| **G8 TUNER** V/CAP on Panel | £3.50 |
| **G8 SPEAKER** | 75p |
| **9,000 SPEAKER** | £1.00 |
| **THORN 9000** Sound OP Panel | £30p |
| **ONE I.C** K35 Decoder | £7.00 |
| **THICK FILM**, Hitachi RB-32 4A | £2.00 |
| **K30 IF/K35 IF** | £2.00 |
| **THICK FILM**, Hitachi Frame | £5.00 |
| **THORN** Lopt 8500-8800 | £4.00 |
| **TX9 THORN** Tuner Panel with ICS Pots | £3.00 |
| **N.E.C.** Light Emitting Diodes | 20p |
| **BY223** Replacement | 30p |
| **THORN CHASSIS** 1600-1700 Series Mono | £10.00 |
| **THORN 1600** Rec- & Anode Cap | 50p |
| **KT3-K30** Slider Pots 4.7k | £1.00 for 10 |
| **ET-614** UHF V/CAP Tuner | £2.00 |
| **K35** 20 Turn Pots | 6p each |
| **HITACHI & GEC** 20k Pots | 20 for £1.00 |
| **KT3 K30** Speaker | 30p |
| **K35** Sound O/P Panel Plug in | £3.00 |
| **K35** 12 way Push Button Unit | £1.50 |
| **K35** L.O.P.T. Split Diode | £6.00 |
| **RANK T20** Front Panel | £6.00 |
| **G8** 6 Button Unit, New Type | £9.00 |
| **6 off LED DISPLAYS**, Mixed | £1.00 |
| **HAND SET TESTER**, Infra Red | £8.00 |
| **PHILIPS SBC 471** 2 Way Stereo Headphone with Volume Controls | £17.00 |
| **AERIAL SPLITTER** with filter | £1.00 |
| **DYNAMIC STEREO HEADPHONE** EM 6146 | £10.00 |
| **PHILIPS UNI DIRECTIONAL** Dynamic Microphone | £10.00 |
| **20 TURN POTS** with Band Switch | 10p |
| **PUSH BUTTON** Mains Switch with Screw Holes Fixing | 4 for £1 |
| **PYE 713** Line Trans | £4.50 |
| **PYE 731** Line Trans | £3.50 |
| **800v DIODES** at 3 amps. Glass Beads | 6p each, 20 for £1.00 |
| **G11** 6 Touch Unit with Cable Forms (Drawer Unit) Replacement | £12.00 |
| **KT3** Line Output Transformer | £5.00 |
| **9000 THORN** Front Panel with POTs & Push Buttons | £4.00 |
| **THORN 8500** Time Base | £3.00 |
| **7 SEG DISPLAYS** 4 Bank Displays Z-6042T | 50p |
| **SPLIT DIODE** FBS1245AR | £5.00 |
| **PHILIPS KT3** 4R7 W.W. Resistor | 15 for £1.00 |
| **BU508D** | @ £1.00 each |

2432211
2432301
2432461
2432491
2432871
2432981
2433212
2433581
2433751

**£5 EACH**

**HITACHI L.O.P.T.**

33651
36072
36362
36383
36482
36761
36831
36832
36833

**L.O.P.T. SPLIT DIODE PHILIPS**

**£5 EACH**

AT2036/00
AT2048/11
AT205.
AT2076/35
AT2076/38
AT2076/51
AT2076/55
AT2076/71T
AT2080/15
RCO ST CT3325
OT2041

**£10 EACH**

# SENDZ COMPONENTS

## 63 BISHOPSTEIGNTON, SHOEBURYNESS, ESSEX SS3 8AF.

**SAME DAY SERVICE**

**All items subject to availability. No Accounts: No Credit Cards. Postal Order/Cheque with order.**
**Add 15% VAT, then £1 Postage. Add Postage for Overseas.**
**Callers: To shop at**

## 212 LONDON ROAD, SOUTHEND. Tel. 0702-332992

***Open 9-1/2.30-6. GVMT + school orders accepted on official headings.***
***Add 10% handling charge.***

# T. POWELL

**16 PADDINGTON GREEN, LONDON W2 1LG**
**Tel: 01-723 9246 (Answerphone)**

| | |
|---|---|
| AN127Q | £2.20 |
| AN203 | £2.20 |
| AN210 | £1.75 |
| AN211A | £2.30 |
| AN214Q | £1.80 |
| AN217B | £2.20 |
| AN228W | £2.90 |
| AN234 | £5.95 |
| AN236 | £2.50 |
| AN239Q | £4.20 |
| AN240P | £1.50 |
| AN241P | £1.50 |
| AN247P | £2.50 |
| AN259 | £2.75 |
| AN260P | £2.20 |
| AN262 | £1.60 |
| AN271A | £2.50 |
| AN274 | £2.75 |
| AN295 | £3.60 |
| AN301 | £3.50 |
| AN302 | £3.30 |
| AN303 | £2.75 |
| AN305 | £3.50 |
| AN313U | £2.95 |
| AN315 | £2.30 |
| AN316 | £3.75 |
| AN318 | £4.95 |
| AN331 | £2.95 |
| AN340P | £1.50 |
| AN360 | £1.30 |
| AN362L | £1.60 |
| AN366P | £1.70 |
| AN374P | £2.20 |
| AN377 | £2.00 |
| AN610P | £1.80 |
| AN612 | £1.80 |
| AN5033 | £5.25 |
| AN5265 | £3.20 |
| AN5510 | £2.75 |
| AN5620X | £3.50 |
| AN5701 | £1.80 |
| AN5722 | £1.60 |
| AN5730 | £1.85 |
| AN5732 | £1.85 |
| AN5753 | £1.95 |
| AN6250 | £2.30 |
| AN6310 | £6.25 |
| AN6341N | £4.00 |
| AN6344 | £4.75 |
| AN6350 | £7.50 |
| AN6356N | £3.85 |
| AN6360 | £4.50 |
| AN6362 | £5.50 |
| AN6363 | £7.50 |
| AN6387 | £5.95 |
| AN6610 | £1.80 |
| AN6677 | £6.30 |
| AN6811 | £1.60 |
| AN6873 | £4.50 |
| AN6884 | £2.75 |
| AN7105 | £2.30 |
| AN7110 | £1.50 |
| AN7111 | £1.50 |
| AN7114E | £1.75 |
| AN7115E | £1.60 |
| AN7116 | £1.50 |
| AN7120 | £1.50 |
| AN7130 | £1.30 |
| AN7145M | £1.95 |

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|---|---|
| AN7146M | £2.20 |
| AN7154 | £1.90 |
| AN7156N | £2.50 |
| AN7158N | £3.25 |
| AN7160 | £3.75 |
| AN7161 | £3.75 |
| AN7168 | £2.75 |
| AN7178 | £2.95 |
| AN7213 | £2.20 |
| AN7223 | £3.95 |
| AN7273 | £3.95 |
| AN7310 | £1.20 |
| AN7311 | £1.20 |
| BA301 | £0.80 |
| BA311 | £0.95 |
| BA313 | £0.80 |
| BA318 | £1.50 |
| BA401 | £0.80 |
| BA402 | £0.80 |
| BA403 | £1.95 |
| BA511A | £1.80 |
| BA514 | £1.90 |
| BA521 | £1.80 |
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| BA527 | £1.60 |
| BA532 | £1.60 |
| BA536 | £2.40 |
| BA547 | £2.50 |
| BA612 | £1.80 |
| BA631 | £5.75 |
| BA656 | £4.50 |
| BA843 | £4.50 |
| BA847 | £3.75 |
| BA853 | £7.50 |
| BA1310F | £1.75 |
| BA1320 | £1.25 |
| BA1330 | £1.75 |
| BA1360 | £1.80 |
| BA5102A | £2.75 |
| BA5406 | £3.20 |
| BA6137 | £2.75 |
| BA6209 | £3.75 |
| BA6304 | £2.20 |
| CX0642 | £8.50 |
| CX065B | £2.95 |
| CX075B | £2.75 |
| CX095C | £2.85 |
| CX100D | £6.75 |
| CX101G | £7.75 |
| CX130 | £4.75 |
| CX136A | £7.50 |
| CX143A | £7.50 |
| CX157 | £4.25 |
| CX158 | £3.75 |
| CX160 | £3.50 |
| CX161A | £3.50 |
| CX162 | £3.95 |
| CX170 | £6.75 |
| CX181 | £8.75 |
| HA1124A | £2.75 |
| HA1137W | £1.75 |
| HA1144 | £4.25 |
| HA1151 | £2.50 |
| HA1156W | £1.20 |
| HA1167 | £3.75 |
| HA1196 | £1.75 |

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|---|---|
| HA1199 | £1.85 |
| HA1306W | £1.80 |
| HA1319 | £2.50 |
| HA1339A | £1.85 |
| HA1366W | £1.80 |
| HA1366WR | £1.85 |
| HA1367 | £3.25 |
| HA1368 | £1.90 |
| HA1368R | £1.95 |
| HA1372 | £3.50 |
| HA1374 | £2.50 |
| HA1377 | £2.20 |
| HA1388 | £3.50 |
| HA1389 | £2.20 |
| HA1389R | £2.20 |
| HA1392 | £2.50 |
| HA1394 | £2.95 |
| HA1397 | £2.75 |
| HA1398 | £2.75 |
| HA1457W | £1.75 |
| HA11112W | £3.75 |
| HA11211 | £2.30 |
| HA11215A | £4.35 |
| HA11219 | £3.25 |
| HA11221 | £2.75 |
| HA11223W | £3.80 |
| HA11225 | £1.95 |
| HA11226 | £4.50 |
| HA11227 | £2.20 |
| HA11235 | £2.30 |
| HA11244 | £4.60 |
| HA11401 | £2.80 |
| HA11423 | £4.75 |
| HA11440A | £3.95 |
| HA11701 | £3.50 |
| HA11703 | £4.50 |
| HA11704 | £5.20 |
| HA11705 | £6.95 |
| HA11706 | £4.75 |
| HA11710 | £3.75 |
| HA11711 | £9.50 |
| HA11713 | £6.50 |
| HA11714 | £5.95 |
| HA11715 | £6.25 |
| HA11716 | £4.75 |
| HA11717 | £5.75 |
| HA11718 | £4.75 |
| HA11727 | £9.50 |
| HA11745 | £9.00 |
| HA11747 | £9.50 |
| HA11747ANT | £9.50 |
| HA11749 | £4.75 |
| HA11750 | £5.00 |
| HA11751NT | £8.50 |
| HA11753NT | £8.50 |
| HA11758NT | £8.50 |
| HA11768 | £4.50 |
| HA11788 | £4.50 |
| HA11816NT | £6.50 |
| HA11828NT | £9.50 |
| HA12001W | £6.50 |
| HA12002 | £2.95 |
| HA12017 | £2.75 |
| HA12035 | £9.50 |
| HA12038 | £6.75 |
| HA12413 | £2.75 |
| HA13001 | £2.95 |
| HA13402 | £4.95 |
| HA13403 | £7.50 |
| HA13430A | £4.50 |

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|---|---|
| LA1111P | £0.95 |
| LA1140 | £2.20 |
| LA1201 | £0.85 |
| LA1222 | £1.00 |
| LA1230 | £1.50 |
| LA1231 | £2.35 |
| LA1240 | £1.50 |
| LA1365 | £1.50 |
| LA1368 | £1.50 |
| LA1387 | £3.60 |
| LA1460 | £2.50 |
| LA2100 | £2.95 |
| LA3160 | £1.80 |
| LA3161 | £2.50 |
| LA3201 | £0.95 |
| LA3210 | £0.75 |
| LA3300 | £1.65 |
| LA3301 | £1.30 |
| LA3350 | £1.30 |
| LA3361 | £1.20 |
| LA3370 | £2.80 |
| LA4030P | £2.00 |
| LA4031P | £1.95 |
| LA4032P | £1.90 |
| LA4051P | £1.20 |
| LA4100 | £1.20 |
| LA4101 | £1.00 |
| LA4102 | £1.40 |
| LA4110 | £1.75 |
| LA4112 | £1.75 |
| LA4120 | £2.95 |
| LA4125 | £2.20 |
| LA4126 | £2.60 |
| LA4140 | £0.80 |
| LA4160 | £2.40 |
| LA4170 | £3.50 |
| LA4182 | £2.10 |
| LA4192 | £1.95 |
| LA4200 | £1.50 |
| LA4201 | £1.60 |
| LA4220 | £1.50 |
| LA4230 | £2.25 |
| LA4250 | £2.75 |
| LA4420 | £1.60 |
| LA4422 | £1.40 |
| LA4430 | £1.40 |
| LA4440 | £2.50 |
| LA4445 | £2.75 |
| LA4460 | £1.80 |
| LA4461 | £1.80 |
| LA4500 | £2.60 |
| LA4505 | £2.80 |
| LA4507 | £4.25 |
| LA4520 | £2.50 |
| LA5112 | £1.85 |
| LA6458D | £1.20 |
| LA7016 | £2.75 |
| LA7215 | £2.75 |
| LA7751 | £4.75 |
| LA7755 | £3.20 |
| LA7800 | £1.95 |
| LA7801 | £2.95 |
| LA7806 | £2.75 |
| LA7808 | £2.95 |
| LB1287 | £2.75 |
| LB1405 | £2.20 |
| LC4066B | £2.95 |
| LC7120 | £3.50 |
| LC7130 | £3.50 |
| LC7131 | £3.75 |
| LC7136 | £2.75 |
| LC7137 | £2.75 |

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|---|---|
| M5106P | £2.75 |
| M5134P | £3.25 |
| M5155P | £1.85 |
| M51102L | £3.95 |
| M51513L | £1.80 |
| M51514AL | £1.95 |
| M51515BL | £2.70 |
| M51516L | £2.80 |
| M51517L | £2.80 |
| M51518L | £2.20 |
| M51521AL | £1.90 |
| MB3705 | £1.80 |
| MB3712 | £1.50 |
| MB3713 | £1.60 |
| MB3722 | £3.50 |
| MB3730 | £2.50 |
| MB3731 | £3.50 |
| MB3756 | £2.60 |
| MB8719 | £3.85 |
| S 40W | £10.50 |
| SI-1125H | £7.50 |
| STK011 | £3.95 |
| STK013 | £7.25 |
| STK014 | £7.25 |
| STK015 | £5.20 |
| STK020 | £5.75 |
| STK022 | £5.30 |
| STK025 | £7.50 |
| STK040 | £8.70 |
| STK043 | £10.50 |
| STK077 | £6.50 |
| STK078 | £6.75 |
| STK080 | £7.50 |
| STK082G | £7.75 |
| STK086 | £9.50 |
| STK430 | £5.50 |
| STK431 | £5.95 |
| STK433 | £5.25 |
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| STK441 | £7.95 |
| STK443 | £7.95 |
| STK457 | £6.50 |
| STK459 | £6.75 |
| STK461 | £7.50 |
| STK463 | £8.40 |
| STK465 | £8.50 |
| STK501 | £6.25 |
| STK0025 | £4.95 |
| STK0029 | £4.75 |
| STK0039 | £4.75 |
| STK0040 | £6.25 |
| STK0049 | £6.50 |
| STK0059 | £7.00 |
| STK0080 | £7.75 |
| STK2028 | £7.50 |
| STK2029 | £5.75 |
| STK2129 | £6.75 |
| STK2230 | £6.50 |
| STK3042 | £6.50 |
| STK4060 | £6.50 |
| STK4141II | £7.50 |
| STK4191II | £8.95 |
| STK4332 | £5.75 |
| STK4392 | £7.50 |
| STK5211 | £6.75 |
| STK5421 | £6.50 |
| STK5422 | £6.75 |

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|---|---|
| STK5451 | £6.75 |
| STK5720 | £6.80 |
| STK5730 | £4.25 |
| STK7308 | £5.95 |
| STK8250II | £10.75 |
| STR440 | £5.80 |
| STR441 | £5.80 |
| STR2012 | £7.20 |
| STR4211 | £7.20 |
| STR6020 | £7.20 |
| TA7050P | £1.80 |
| TA7051P | £1.80 |
| TA7054P | £2.20 |
| TA7066P | £1.50 |
| TA7070P | £1.75 |
| TA7074P | £1.95 |
| TA7104P | £2.50 |
| TA7108P | £1.50 |
| TA7109AP | £2.50 |
| TA7120P | £0.75 |
| TA7122AP | £0.90 |
| TA7130P | £1.00 |
| TA7136P | £1.00 |
| TA7137P | £1.00 |
| TA7139P | £2.50 |
| TA7140P | £1.75 |
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| TA7193P | £4.00 |
| TA7202P | £4.50 |
| TA7203P | £1.90 |
| TA7204P | £1.75 |
| TA7205AP | £1.00 |
| TA7207P | £1.75 |
| TA7208P | £1.75 |
| TA7210P | £2.50 |
| TA7214P | £2.60 |
| TA7215P | £2.30 |
| TA7217AP | £1.60 |
| TA7220P | £2.50 |
| TA7222AP | £1.30 |
| TA7223P | £2.30 |
| TA7225P | £3.25 |
| TA7226P | £3.20 |
| TA7227P | £2.20 |
| TA7229P | £3.25 |
| TA7230P | £1.95 |
| TA7232P | £2.95 |
| TA7240AP | £2.95 |
| TA7241AP | £2.95 |
| TA7270P | £2.75 |
| TA7310P | £1.85 |
| TA7312P | £1.50 |
| TA7313AP | £1.50 |
| TA7314P | £2.50 |
| TA7315AP | £2.35 |
| TA7317P | £2.75 |
| TA7324P | £2.50 |
| TA7325P | £1.00 |
| TA7328AP | £2.20 |
| TA7331P | £2.20 |
| TA7343P | £2.95 |
| TA7607AP | £2.95 |
| TA7608CP | £3.95 |
| TA7609P | £2.70 |
| TA7611AP | £3.20 |
| TA7614AP | £2.75 |
| TA7617AP | £2.50 |

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|---|---|
| TA7628P | £2.95 |
| TA7640AP | £1.75 |
| TA7641BP | £1.95 |
| TA7658P | £1.75 |
| TA7668BP | £1.98 |
| TA7688P | £2.95 |
| UPC16C | £1.95 |
| UPC20C | £2.50 |
| UPC30C | £2.20 |
| UPC41C | £2.30 |
| UPC561C | £2.50 |
| UPC566H | £0.75 |
| UPC573C | £2.50 |
| UPC574J | £0.65 |
| UPC575C | £1.00 |
| UPC576H | £2.20 |
| UPC587C | £1.30 |
| UPC592H | £0.95 |
| UPC595C | £2.20 |
| UPC1001H | £2.20 |
| UPC1009C | £2.20 |
| UPC1018C | £1.95 |
| UPC1025H | £2.20 |
| UPC1026C | £1.00 |
| UPC1028H | £0.90 |
| UPC1031H | £1.95 |
| UPC1032H | £0.60 |
| UPC1035C | £1.95 |
| UPC1037H | £1.25 |
| UPC1156H | £2.95 |
| UPC1158H | £0.95 |
| UPC1165C | £1.30 |
| UPC1168C | £1.30 |
| UPC1170H | £1.60 |
| UPC1171C | £1.50 |
| UPC1176C | £1.75 |
| UPC1177H | £1.50 |
| UPC1181H | £1.10 |
| UPC1182H | £1.10 |
| UPC1183H | £2.20 |
| UPC1185H | £2.50 |
| UPC1186H | £0.90 |
| UPC1187V | £1.75 |
| UPC1215V | £1.35 |
| UPC1223C | £2.20 |
| UPC1225H | £2.00 |
| UPC1230H | £2.50 |
| UPC1263C | £2.50 |
| UPC1277H | £2.75 |
| UPC1278H | £2.75 |
| UPC1350C | £1.20 |
| UPC1353C | £1.95 |
| UPC1356C | £2.00 |
| UPC1363C | £2.20 |
| UPC1378H | £2.40 |
| UPC1382C | £1.10 |
| UPC1384C | £2.85 |
| UPC1387C | £2.50 |
| UPC1391H | £1.50 |
| UPC1403CA | £5.75 |
| UPC1420CA | £6.50 |
| UPC1458C | £0.95 |
| UPC1533HA | £2.75 |
| UPC4557C | £1.50 |
| UPC4558C | £0.90 |
| UPD1514C | £5.75 |
| UPD4514BC | £3.50 |
| X0042CE | £2.20 |
| X0077GE | £9.95 |
| X0092CE | £5.60 |

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|---|---|
| 2SA101 | £0.50 |
| 2SA103 | £0.60 |
| 2SA329 | £0.40 |
| 2SA350 | £0.60 |
| 2SA495 | £0.40 |
| 2SA539 | £0.40 |
| 2SA562 | £0.40 |
| 2SA643 | £0.70 |
| 2SA733 | £0.35 |
| 2SA768 | £0.95 |
| 2SA899 | £0.75 |
| 2SA952 | £0.40 |
| 2SA1015 | £0.35 |
| 2SA1102 | £2.20 |
| 2SA1103 | £2.20 |
| 2SA1104 | £2.50 |
| 2SA1105 | £2.75 |
| 2SA1106 | £2.75 |
| 2SB54 | £0.70 |
| 2SB75 | £0.60 |
| 2SB341V | £2.75 |
| 2SB405 | £0.80 |
| 2SB426 | £2.95 |
| 2SB471 | £3.50 |
| 2SB492 | £0.75 |
| 2SB509D | £1.95 |
| 2SB536 | £0.95 |
| 2SB546 | £1.50 |
| 2SB561 | £0.35 |
| 2SB698 | £0.40 |
| 2SB755 | £3.50 |
| 2SC372 | £0.35 |
| 2SC380 | £0.35 |
| 2SC458 | £0.30 |
| 2SC460 | £0.35 |
| 2SC461 | £0.35 |
| 2SC503Y | £0.70 |
| 2SC536 | £0.35 |
| 2SC537 | £0.35 |
| 2SC710 | £0.35 |
| 2SC732 | £0.35 |
| 2SC733 | £0.35 |
| 2SC828 | £0.30 |
| 2SC840 | £1.50 |
| 2SC900 | £0.35 |
| 2SC929D | £0.35 |
| 2SC930D | £0.35 |
| 2SC1034 | £4.75 |
| 2SC1061 | £1.20 |
| 2SC1096 | £0.70 |
| 2SC1364 | £0.35 |
| 2SC1815Y | £0.45 |
| 2SC1875 | £2.95 |
| 2SC1942 | £3.25 |
| 2SC1957 | £0.80 |
| 2SC1969 | £1.75 |
| 2SC2078 | £0.95 |
| 2SC2166 | £0.95 |
| 2SC2335 | £1.50 |
| 2SC2577 | £1.95 |
| 2SC2578 | £2.75 |
| 2SC2579 | £2.75 |
| 2SC2580 | £2.75 |
| TDA1515 | £4.50 |
| TDA2002 | £0.80 |
| TDA2003 | £0.90 |
| TDA2004 | £2.20 |
| TDA2005 | £2.75 |
| TDA2006 | £1.50 |
| TDA2020 | £1.40 |
| TDA2030 | £1.40 |
| TDA3562A | £5.50 |

## VIDEO BELT KITS

| | |
|---|---|
| AKAI VS-2EG/5EG (5) | £2.00 |
| AKAI VS 9700EG (6) | £2.25 |
| FISHER VBS 7000 (6) | £2.70 |
| FISHER VBS 9000 (3) | £1.50 |
| HITACHI VT5000 (7) | £2.20 |
| JVC HR3300/3600 (9) | £2.50 |
| JVC HR3360/3660 (7) | £2.50 |
| JVC HR7700 (3) | £1.70 |
| PANASONIC NV333 (5) | £1.90 |
| PANASONIC NV2000 (5) | £1.90 |
| PANASONIC NV7000 (5) | £1.75 |
| PANASONIC NV8600 (7) | £2.25 |
| SANYO VTC5500 (3) | £1.50 |
| SANYO VTC9300 (4) | £2.75 |
| SHARP VC6300 (5) | £2.25 |
| SHARP VC7300/7700 (5) | £1.80 |
| SHARP VC8300 (5) | £2.00 |
| SHARP VC9300 | £1.80 |
| SONY SLT7ME/T7 (6) | £2.00 |
| SONY SLC7/J7 (6) | £2.00 |
| SONY SL800/8080 (6) | £2.50 |
| TOSHIBA V5475 (6) | £2.20 |
| TOSHIBA V7540 (5) | £2.25 |
| TOSHIBA V8600 (6) | £1.80 |

## LATE EXTRA

| | |
|---|---|
| AN5430 | £2.95 |
| AN7140 | £2.20 |
| UPC1365C | £3.60 |
| UPC1394C | £1.95 |
| SAA1059 | £1.95 |
| SAA1250 | £3.25 |
| SAA1251 | £4.95 |
| SAA1272C | £3.25 |
| SAA5000 | £1.50 |
| SAA5010 | £4.50 |
| SAA5020 | £5.75 |
| SAA5030 | £6.50 |
| SAA5040A | £8.50 |
| SAA5040B | £10.50 |
| SAA5042 | £8.00 |
| SAA5050 | £7.50 |
| TDA1908 | £1.75 |
| TDA2653A | £5.20 |
| TDA3505 | £4.75 |
| TDA3560 | £4.50 |
| TDA3651 | £2.95 |
| TDA4431 | £2.25 |
| TDA4600 | £2.95 |

## VIDEO HEADS

| | |
|---|---|
| JVC 3HSS | £28.75 |
| PANASONIC 4HSS | £28.75 |
| PANASONIC NV730 | £52.60 |
| SONY DSR36R | £32.00 |
| HITACHI VT5000/8000/9000 | £33.50 |
| HITACHI VT11/14/33 | £33.50 |
| HITACHI VT17/19 | £44.00 |
| SANYO VTC5000 | £44.00 |
| JVC IDLER PU47752 | £4.95 |
| HITACHI IDLER VT11-14-17 | £3.75 |

**CASSETTE MOTORS**

| | |
|---|---|
| 6-9-12-13 2 Volts | £2.95 |

**CASSETTE HEADS**

| | |
|---|---|
| Mono | £1.50 |
| Stereo | £2.50 |
| Auto Reverse | £2.75 |
| Mini/Stereo | £2.75 |

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**3 LEAD TYPE**

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|---|---|
| SFE 4.5MB | £0.35 |
| SFE 5.5MB | £0.35 |
| SFE 6.0MB | £0.35 |
| SFE 6.5MB | £0.35 |
| CDA 6.0MC | £0.40 |
| CDA 6.5MC | £0.40 |

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## SEMICONDUCTORS

### DIODES

| | | |
|---|---|---|
| 10E2 | Gen. | 0.42 |
| GH 3F | KV Gen. | 1.80 |
| IS 1555 | | 0.42 |
| VIIN | KV 1810UB | 1.24 |
| CV 12E | GEN.=CSM-2A 4A 101 | 2.98 |
| U05G | KV 1810UB | 1.24 |
| BR 303 | KV 2704=SHOR 3042 | 1.80 |

### THYRISTORS

| | | |
|---|---|---|
| SG-264A | KV Gen. | 4.98 |
| SG-629 | KV 1810UB | 7.85 |
| SG-6533 | KV Gen.=SG613 | 10.86 |

### IC's

| | | |
|---|---|---|
| BX-342 | SLC7UB | 4.98 |
| CX-104A | KV 1810UB | 6.40 |
| CX-108 | | 10.86 |
| CX-109 | | 4.98 |
| CX-136A | VTR Gen. | 10.86 |
| CX-143A | SLC5/7UB | 8.98 |
| CX-177 | | 6.40 |
| CX-186 | SLC5UB | 6.40 |
| CX761A | | 10.86 |
| M51231P | KV 2200UB | 2.98 |
| SI1225 | | 16.80 |
| STK 2129 | | 16.80 |
| STK 4026 | | 10.86 |
| STK 5314 | | 8.98 |
| TBA 120U | | 4.10 |
| TCP 4621 AF6 | | 10.86 |
| TDA 2578A | KV 2752UB | 2.98 |
| TDA 3652 | KV 2752UB | 4.98 |
| TDA 4600-2 | KV 2052/6UB | 6.40 |
| UPC 1365C | KV Gen. | 10.86 |
| UPC 1394C | KV 2060/62UB | 2.98 |
| UPD 546C107 | SLC7UB | 21.64 |
| UPD 547C049 | SLC7UB | 10.86 |

### TRANSISTORS

| | | |
|---|---|---|
| P.S.U. TRANS. KIT 2SC 2335 SLC7 | | 10.86 |
| TRANS. ASSY. TAF 40 | | 7.85 |
| 2SA 771 | TAF 5A=2SA 1206 | 2.98 |
| 2SA 835 | Gen. | 1.80 |
| 2SA 1027R | ICF-C820L=2SA 1115P | 1.24 |
| 2SA 1175 | SLC7UB | 0.42 |
| 2SB 733 | KV 2204UB | 1.24 |
| 2SB 740C | TCK 88B | 1.24 |
| 2SB 856 | Gen. | 1.80 |
| 2SC 403C | | 0.42 |
| 2SC 867A | Gen. | 2.98 |

## TRANSISTORS CONTINUED

| | | |
|---|---|---|
| 2SC 945=2SC | 634 SP=2SC 1364 | 0.42 |
| 2SC 1034 | | 6.40 |
| 2SC 1061 | Gen. | 2.98 |
| 2SC 1114 | Gen. | 6.40 |
| 2SC 1124 | | 1.24 |
| 2SC 1316 | Gen. Trs. Assy. | 7.85 |
| 2SC 1362-7 | Gen.=2SC 634 SP-47 | 0.42 |
| 2SC 1413A | KV Gen. | 7.80 |
| 2SC 1454-6 | | 4.98 |
| 2SC 1475 | KV 1810UB=2SA 1174 | 1.24 |
| 2SC 1962 | Gen. | 1.80 |
| 2SC 2009 | Gen. | 0.42 |
| 2SC 2278 | Gen. | 1.24 |
| 2SC 2369 | SLC5/7UB | 4.10 |
| 2SC 2551 | KV Gen. | 1.24 |
| 2SC 2785 | AG-7UB | 0.42 |
| 2SC 2958 | | 1.24 |
| 2SC 3153 | KV 2060UB | 4.98 |
| 2SD 257 | ST 5150 | 2.98 |
| 2SD 725 | KV 2204/2704 | 10.86 |
| 2SD 773 | Gen. | 0.42 |
| 2SD 774 | SL/HMK | 1.24 |
| 2SD 870 | KV 2704 | 7.85 |
| 2SD 1164 | SLC6UB | 1.24 |
| 2SD 1497-02 | KV 2252/2752 | 4.98 |
| 2SD 1497-06 | KV 2252/2752 | 4.98 |

**PLEASE ASK FOR ANY PARTS NOT LISTED.**
**NON-STOCK ITEMS AVAILABLE ON REQUEST.**

## VIDEO HEADS & ACE ASSY.

| | | |
|---|---|---|
| SL8000/8080 | DSR-43R | 56.75 |
| SLC5/6/7 | DSR-36R | 48.60 |
| SLC9 | DSR-21R | 48.60 |
| SLC20/30/40 | DSR-35A | 48.60 |
| SL-F1 | DSR-35A | 48.60 |
| SLC6 | ACE | 35.94 |
| SLC7 | ACE | 34.40 |

## PILOT LAMPS

| | | |
|---|---|---|
| STR6060F | 1-518-070-00 | 1.24 |
| Gen. | 1-518-115-XX | 1.24 |
| 360mA 11V Gen. | 1-518-116-00 | 1.24 |
| 40mA 4.5V Gen. | 1-518-169-XX | 1.24 |
| 130mA 23V | 1-518-263-00 | 1.55 |
| 13V HMK11 | 1-518-323-00 | 1.24 |
| 40mA 8V TAF-45 | 1-518-409-21 | 1.24 |

## MANUALS (0 VAT RATED)

| | |
|---|---|
| ALL SONY VIDEO SERVICE MANUALS | 10.86 |
| ALL SONY TV SERVICE MANUALS | 6.30 |

## VIDEO SPARES

| SLC5/7 | SONY PART NUMBER | |
|---|---|---|
| BOOSTER ANTENNA | 1-463-296-00 | 37.50 |
| MODULATOR | 1-464-116-00 | 61.51 |
| TAPE UP SENSOR (C7) | 1-543-145-00 | 1.80 |
| CONTROL KNOB (C7) | 3-659-547-00 | 1.24 |
| LID TIMER (C7) | 3-703-075-00 | 1.24 |
| CAP 2 SHAFT (C7) | 3-703-075-00 | 0.42 |
| CAPSTAN MOTOR | 8-838-008-10 | 42.01 |
| IDLER KIT | A-670-634-8B | 5.40 |
| LIMITER ASSEMBLY | X-365-331-00 | 2.98 |
| IDLER ASSEMBLY | X-365-932-40 | 1.24 |
| BRAKE ASSEMBLY | X-365-932-82 | 1.80 |
| PINCH ROLLER | X-365-933-70 | 1.24 |
| **SLC6** | | |
| SOLENOID | 1-454-293-11 | 11.86 |
| MODULATOR | 1-464-188-00 | 70.91 |
| THREADING GEAR | 3-671-128-00 | 1.24 |
| DC MOTOR | 8-835-070-11 | 17.20 |
| IDLER KIT | A-670-639-1B | 4.10 |
| REEL MOTOR (MK1) | A-673-710-1[illegible] | 17.20 |
| REEL MOTOR (MK2) | A-673-710-6A | 27.[illegible]5 |
| FORWARD ASSEMBLY | A-674-007-1A | 4.10 |
| MOTOR FRONT LOAD | A-675-113-1A | 4.15 |
| PULLEY ASSY. LOAD | X-3[illegible]-101-50 | 1.24 |
| **SL-F1/C9** | | |
| DC DC CONVERTOR | 1-464-217-00 | 22.53 |
| CARRIAGE MOD KIT (C9) | A-675-121-2B | 18.86 |
| CASS. LOAD MECH. (C9) | A-675-123-6A | 70.91 |
| GUIDE PIN KIT | A-675-910-7[illegible] | 6.65 |
| UPPER CYLINDER | A-676-013-[illegible] | 27.85 |
| 5 RING ASSEMBLY (C9) | X-366-943-10 | 18.85 |
| PINCH ROLLER (SLC20) | X-366-930-76 | 7.85 |

## BELTS

**INDIVIDUAL BELTS AVAILABLE IF REQUIRED**

| | | |
|---|---|---|
| SL8000 KIT 5 PIECES | | 8.82 |
| SLC5/7 KIT 6 PIECES | | 5.40 |
| SLC6 KIT 6 PIECES | | 8.26 |
| TC Gen. | 3-434-110-00 | 1.24 |
| TAKE UP BELT TC Gen. | 3-472-332-00 | 1.24 |
| BELT DRIVE TC Gen. | 3-498-114-00 | 1.24 |
| BELT MIDWAY TC 161SO | 3-531-646-00 | 1.24 |
| BELT CAPSTAN TC 92 | 3-536-447-01 | 1.24 |
| CAPSTAN TC 135/136SD | 3-542-458-00 | 1.24 |
| BELT FLAT TC 186SD | 3-543-978-00 | 1.24 |
| BELT CAPSTAN TC Gen. | 3-558-706-00 | 1.24 |
| BELT CAPS. HST-300 | 3-564-319-00 | 1.24 |
| T/UP BELT HMK-3000 | 3-573-122-00 | 1.24 |
| BELT HMK3000 | 3-573-153-01 | 1.24 |
| HMK 70 & UNIV. T/TABLE | 4-827-489-XX | 3.10 |

## SWITCHES & RELAYS

| | | |
|---|---|---|
| RELAY SLC7 | 1-515-416-00 | 4.98 |
| RELAY | 1-515-418-00 | 4.98 |
| RELAY TC-K55 | 1-515-547-11 | 4.98 |
| CHANNEL KV1340/1820 | 1-516-847-00 | 16.80 |
| TIMER SW SLC5/7 | 1-552-438-00 | 1.80 |
| SLIDE SW REC SL8000 | 1-552-834-00 | 1.24 |
| SLIDE SW R/P SL8000 | 1-552-836-00 | 1.80 |
| SWITCH POWER KV GEN | | 4.98 |

## REMOTE CONTROLS

| | | |
|---|---|---|
| RM 604B | KV 1612 | 43.76 |
| RM 606 | KV 2704 | 52.38 |
| RM 603B | KV 2206 | 61.51 |
| RM 609 | KV 1612 (MK2) | 43.76 |
| RM 615 | KV 2212 | 52.38 |
| RM 602 | KV 2200 | 37.50 |
| RM 632 | KV 2252 | 37.50 |
| RMT 200 | SLC7 | 52.38 |
| RM 75T | SLC5/T7 | 29.30 |
| RM 616 | | 52.38 |
| RM 72 | SLC6 | 22.53 |
| RMT 213 | SLC9 | 43.76 |

## GENERAL COMPONENTS

| | | |
|---|---|---|
| UNIV. TEXT BOARD | DPK203B | 70.91 |
| ACFI CHARGER UNIT | | 42.01 |
| CAP 33mF 160v KV | 1-123-024-11 | 1.24 |
| CAP 22mF 400v KV | 1-123-032-11 | 1.24 |
| CAP 0.018mF 1.5v KV | 1.129-952-11 | 1.80 |
| TRAP 6MHz | 1-409-333-00 | 1.24 |
| TELE. AERIAL KV1400 | 1-501-178-00 | 7.85 |
| FILTER 6Mhz | 1-527-262-11 | 1.24 |
| TERMINAL ANTENNA | 1-536-683-11 | 10.86 |
| STYLUS ND 143G | 1-549-114-00 | 11.31 |
| R/P HEAD 181-3602D | 8-829-373-40 | 5.10 |
| MOTOR DNF-1001B | 8-835-006-00 | 22.53 |
| MOTOR DNE-4100A | 8-835-049-01 | 17.20 |
| VID. TEST TAPE KR52H | 8-969-995-52 | 36.55 |
| CARTRIDGE XL 150 | A-450-506-9A | 22.53 |
| STYLUS ND 150G | A-458-706-2A | 10.86 |
| PINCH ROLLER TC Gen. | X-348-930-60 | 1.24 |
| P. ROLLER TC 204SD | X-354-241-30 | 1.80 |
| MOTOR KIT MT-Gen. | X-354-931-41 | 17.20 |
| PINCH ROLLER | X-355-862-00 | 1.24 |
| PINCH ROLLER TCK 55 | X-356-400-60 | 1.24 |
| CAS. HOLD. ASSY. TCK44 | X-357-350-91 | 1.80 |
| BEARING ASSY. HMP70 | X-482-740-81 | 4.10 |

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## VIDEO HEADS

| | |
|---|---|
| ***Panasonic*** | |
| NV2000, 2010, 7000, 7200, 8600, 8610, 333, 370 genuine | £44.00 |
| NV366,688,777,788 genuine | £64.50 |
| Panasonic 4HSS Equivalent heads (Not NV366) | £31.95 |
| ***Ferguson*** | |
| 3292, 3V00, 3V16, 3V22, 3V23, 3V24, 3V29, 3V30, 3V35, 3V36, 3V38 genuine | £49.50 |
| Ferguson 3HSS Equivalent heads | £31.95 |
| ***Sharp*** | |
| VC9300, 9500, 9700, 381, 386, 387, 388, 482, 581 genuine | £67.20 |
| Sharp VC7300, 7700, 8300 genuine | £73.00 |
| Sharp VC9300 etc Equivalent | £39.90 |
| ***Sony*** | |
| C5, C6, C7 genuine | £49.50 |
| Sony SL8000, 8080 genuine | £54.50 |
| Sony C9, C20, C30 genuine | £54.50 |
| Sony C9 | £46.50 |
| Sony C5, C6, C7 Equivalent | £31.95 |
| Sony C20, C30 Equivalent | £36.50 |
| ***Sanyo*** | |
| VTC9300, 5000, 5150, 5300, 5400 genuine | £49.90 |
| ***Toshiba*** | |
| V9600, V31, V33 Equivalent | £42.50 |
| Toshiba V9600, V31, V33 genuine | £54.60 |
| Toshiba V8600 genuine | £67.50 |
| ***Hitachi*** | |
| VT5000, 8000, 8300, 9300, 9500, 9700, VT11, VT14E genuine | £39.95 |
| Amstrad 7000 Equivalent | £39.90 |
| ***Fisher*** | |
| 615/620 Equivalent | £46.00 |

## PINCH ROLLERS

| | |
|---|---|
| ***Panasonic*** | |
| NV2000, 7000, 7200 | £5.95 |
| NV333, 366, 688, 370 | £7.95 |
| NV430, 730 | £7.95 |
| ***Sharp*** | |
| VC6300 | £7.90 |
| VC7300, 7700, 8300 | £8.70 |
| VC9300, 381, 386 etc | £5.40 |
| ***Hitachi*** | |
| VT5000, 8000, 9000 | £6.95 |
| VT11E, 14E, 17E, 19E | £6.95 |
| ***Sony*** | |
| C5, C6, C7 | £5.95 |
| SL-C20, C30, C40 | £5.95 |
| SL8000, 8080 | £5.95 |
| ***Ferguson/JVC*** | |
| 3V00, 3V16, 3V22 | £5.95 |
| 3V23, 3V24, 3V29/30 | £7.95 |
| 3V35, 36, 38, 39 | £8.90 |
| ***Sanyo*** | |
| VTC9300, 5000, 5300 | £7.95 |
| VTC5400, 5150, 6500 | £7.95 |

## SENSOR LAMPS

| | |
|---|---|
| All Panasonic | £1.80 |
| All Ferg/JVC | £1.80 |
| Sharp VC9300 etc | £2.90 |
| Sharp VC7300 etc | £2.90 |
| All Hitachi | £1.80 |

## SENSOR L.E.D's

| | |
|---|---|
| All Panasonic | £2.90 |
| All Ferg/JVC | £2.90 |
| All Hitachi | £5.75 |

**HUNDREDS OF SPARES FOR PANASONIC, HITACHI, SANYO, SONY, FERGUSON, ETC. AVAILABLE**

## IDLERS (GENUINE)

| | |
|---|---|
| ***Panasonic*** | |
| NV2000, 7000, 7200 | £3.45 |
| NV333, 366, 688, 788 | £3.45 |
| NV777, 370, 430 | £4.50 |
| NV730 | £6.50 |
| ***Sharp*** | |
| VC9300, 9500, 9700 | £3.90 |
| 381, 386, 387, 388 | £3.90 |
| 482, 483, 486, 581 etc | £3.90 |
| ***Amstrad*** | |
| 7000 | £3.90 |
| ***Sony*** | |
| C5/C7 Idler kit | £4.95 |
| C6 Idler kit | £4.95 |
| C5/6/7 Idler only | £1.65 |
| ***Sanyo*** | |
| Reel drive pulley | £8.88 |
| VTC5000, 5150, 6500 | £8.88 |
| ***Hitachi*** | |
| VT8000, 8300, 8500 | £4.72 |
| VT9300, 9500, 9700 | £4.75 |
| VT11E, 14E, 17E, 19E | £6.50 |
| ***Ferguson*** | |
| Clutch assy large | £6.95 |
| 3292, 3V00, 3V16, 3V22 | £6.95 |
| Clutch assy small | £6.95 |
| Idler assy 3V29, 30 | £3.45 |
| 3V35, 3V36, 3V38, 3V39 | £4.50 |
| ***Fisher*** | |
| FVHP615 etc. | £6.90 |

MOST OTHERS AVAILABLE

## BELT KITS (GENUINE)

| | |
|---|---|
| ***Panasonic*** | |
| NV2000, 2010 | £6.50 |
| NV7000, 7200 | £6.50 |
| NV333, 366 | £6.50 |
| NV688, 788 | £4.70 |
| NV8600, 8610 | £6.50 |
| ***Sharp*** | |
| VC6300 | £6.50 |
| VC7300, 7700 | £6.50 |
| VC8300 | £6.50 |
| VC9300, 381 etc | £6.50 |
| ***Sanyo*** | |
| VTC9300 | £6.50 |
| VTC5000 | £1.99 |
| VTC5300, 5400 | £6.50 |
| ***Sony*** | |
| SLC5, C7 | £6.50 |
| SLC6 | £7.50 |
| SL8000, 8080 | £6.50 |
| ***Hitachi*** | |
| VT5000 | £6.50 |
| VT8000, 8500 | £2.90 |
| VT9300, 9300 | £3.30 |
| VT11E, 14E, 17E | £6.50 |
| ***Ferguson/JVC*** | |
| 3V00, 3V16, 3V22 | £6.50 |
| 3V23 | £4.50 |
| 3V29, 3V30 | £6.50 |
| 3V35, 36, 38, 39 | £3.90 |
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| V9600 | £6.50 |
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| Amstrad 7000 | £18.20 |
| Sanyo 5000 etc | £14.20 |
| Panasonic NV333 | £16.80 |
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| Ferg/JVC, 3V22 etc | £29.90 |
| Sharp 9300 etc | £29.30 |
| Hitachi VT5000 | £24.75 |
| Sharp VC7300, VC8300 | £26.40 |
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| VC8300 | £39.90 |
| VC7300, 7700, 7750 | £29.30 |
| Ferg/JVC, 3V22 etc | £29.90 |
| 3V29, 3V30 | £29.60 |
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| Hitachi VT5000 | £24.75 |
| VT8000, 8300, 8500 | £37.70 |
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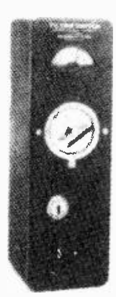

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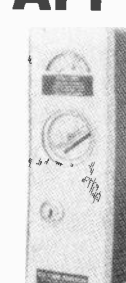

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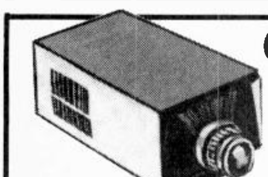

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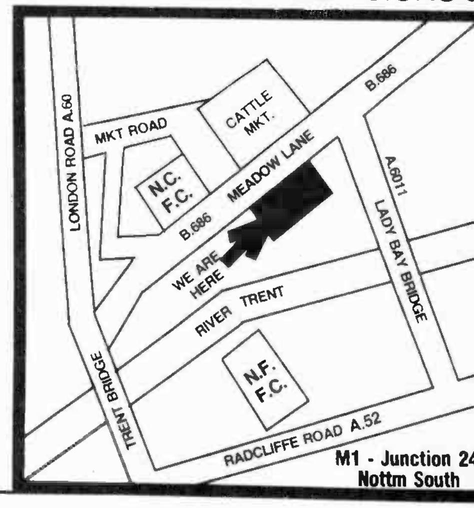


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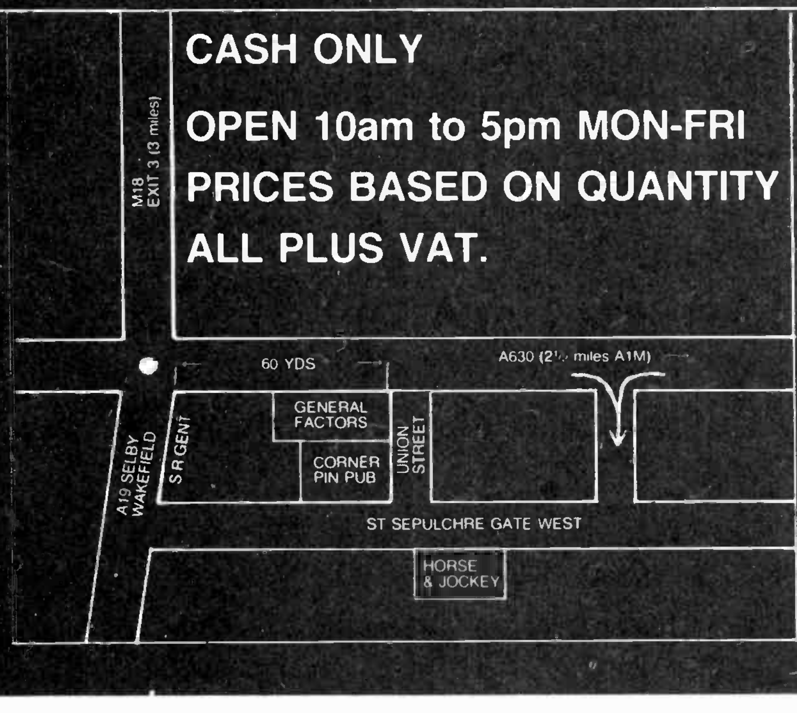


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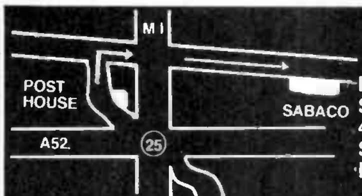


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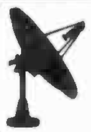

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**The Service Engineers** Guide to Teletex £2

4 Types Fedility front panels with i.c. & pats £2 each

| | |
|---|---|
| BB 103 | 10p |
| BB 105A×12 | £1 |
| BB 105B×12 | £1 |
| BB 105G×12 | £1 |
| BB 121a | 10p |
| 47 | 10p each |

1A/1600V 10p

DG3P EQV-BY228 10 for £1

2 amp bridge rec. wire end 15p

| | |
|---|---|
| CV 8617 | 10p |
| Y 716 | 10p |
| Y 729 | 30p |
| Y 730 | 10p |
| Y 827: 6A/1KV | 20p |
| Y 860 | 30p |
| Y 933 | 5p |
| Y 969 | 50p |
| Y 997 | 30p |
| Min 12 volt Relays | 75p |
| R 1038 | 40p |
| R 1039 | 40p |
| R 2009 | 80p |
| R 2010b | £1 |
| R 2029 | 50p |
| R 2210 | 60p |
| R 2257 | 60p |
| R 2265 | 50p |
| R 2305 | 50p |
| R 2306 | 30p |
| R 2322/2323 | pair 80p |
| R 2323 | 15p |
| R 2396 | 50p |
| R 2461 | 80p |
| R 2030 | 50p |
| R 2443=BD124 | 30p |
| R 2540 | £2 |
| R 2737 | 40p |
| R 2738=TIP41 | 30p |
| R 2775=TIP41c | 40p |
| R 3129=TIP47 | 40p |
| R 4050 | £1.00 |
| S 2008b | 80p |
| 2SD898B | £1 |
| 2SC1942 | £1 |
| **Hitachi sets etc.** | |
| STR441 | £2.50 |
| STR454 | £2 |
| S 2000AF line o.p | £1 |
| 2SC940 | £1 |
| BU 105/04 | 80p |
| BU 108 | £1 |
| BU 124 | 50p |
| BU 126 | 80p |
| BU 180a | 65p |
| BU 204 | 70p |
| BU 205 | £1 |
| BU 206 | £1 |
| BU 207 | £1 |
| BU 208 | 80p |
| BU 208A | £1.10 |
| BU 208D | 90p |
| BU 222 | £1 |
| BU 326 | £1 |
| BU 407 | 60p |
| BU 426V | 60p |
| BU 500 | £1.10 |
| BU 500D | £1 |
| BU 508A | £1.20 |
| BU 526 | 75p |
| BU 807 | £1 |
| BU 824 | 50p |
| BUW 11 | £1.00 |
| BUW 84 | 60p |
| BYW 20-08-9 | £1 |
| BYW 95 | 10p |
| TIC 106a | 30p |
| TIC 116m | 40p |
| TIC 116n/Y 1003 | 35p |
| TIC 126N | 40p |
| TIC 206m | 30p |
| TIC 225S | 40p |
| TIC 226E | 40p |
| TIC 226m | 30p |
| TIC 236m | 30p |
| TAG 226/600 | 50p |
| TICV 106D (T092 case 2A/400V) | 10p |
| TIP 29 | 20p |
| TIP 30 | 35p |
| TIP 30A | 35p |
| TIP 30B | 40p |
| TIP 30C | 45p |
| TIP 31 | 30p |
| TIP 32 | 25p |
| TIP 33B | 50p |
| TIP 33C | 70p |
| TIP 34A | 50p |
| TIP 34B | 60p |
| TIP 34C | 70p |
| TIP 35B | 50p |
| TIP 35C | 70p |
| TIP 35D | 80p |
| TIP 36 | 50p |
| TIP 36C | 70p |
| TIP 41B | 40p |
| TIP 41D | 70p |
| TIP 42/BRC 6109 | 30p |
| TIP 48 | 40p |
| TIP 49 | 30p |
| TIP 57 | 30p |
| TIP 100 | 30p |
| TIP 102 | 30p |
| TIP 115 | 50p |
| TIP 117 | 50p |
| TIP 125 | 35p |
| TIP 126 | 40p |
| TIP 127 | 40p |
| TIP 130 | 30p |
| TIP 131 | 25p |
| TIP 136 | 30p |
| TIP 140 | 50p |
| TIP 640 | 50p |
| TIP 2955 | 35p |
| TIP L761A-1000V/4Amp | 75p |
| T 6032 | 30p |
| T 6036 | 40p |
| T 6040 | 40p |
| T 6047 | 40p |
| T 6049 | 40p |
| T 6051 | 40p |
| T 6052 | 40p |
| T 9004 | 40p |
| T 9005 | 40p |
| ZTX 107 | 10p |
| ZTX 108c | 10p |
| ZTX 109k | 5p |
| ZTX 213 | 5p |
| ZTX 341 | 10p |
| ZTX 342 | 10p |
| ZTX 384 | 10p |
| ZTX 451 | 10p |
| ZTX 550 | 10p |

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|---|---|
| MJ 2253 | 60p |
| MJE 3040 | 60p |
| MJE 2209 | 10p |
| SP 8385 | 50p |
| SAB 3205 | £1.00 |
| SAB 4209 | £1.00 |
| 300M + 700 320V | £1.80 |
| 200 + 100 + 100 + 50 300V | 50p |
| 150 + 200 + 250M 300V | 50p |

Computer Transformer 20v/2.25A; 20v/1.5A; 17/.5A; 19/.5A; 28/.05A £3
Mains ViewData 240V/240/6V/4 amp/6v 500m/a
in / out - - - - - - -

Mains trans 240/12v-0-12v 2 amp £3.50

| **Voltage Regulators** | |
|---|---|
| +5V/UA78PO5SC | 30p |
| −5V/LM79MO5CP | 25p |
| −8V/79M08c | 30p |
| +6V/78M06c | 30p |
| +10v/78LA10 | 20p |
| LM 337 | 30p |
| LM 342/18 | 30p |
| LM 340T 5.0 | 50p |
| +12V/LM 340T12 | 50p |
| +15V/78M15 | 15p |
| +18V/MC78M18 | 20p |
| +24V/78M24 | 30p |
| MC 7724cp | 40p |
| MC 7824 | 40p |

| | |
|---|---|
| TIS 90 | 10p |
| TIS 92 | 20p |
| TIS 93 | 20p |
| U 19885 | 40p |
| U 3832 | 15p |
| U 3845 | 15p |
| MR 508 | 10p |
| MR 501 | 10p |
| MR 502 | 10p |
| BCW 71R | 30p |
| BYF 1202 | 10p |
| BYF 1204 | 10p |
| BYF 3126 | 40p |
| BYF 3214 | 40p |
| BYX 10 | 10p |
| BYX 36/600 | 35p |
| BYX 38/300 | 25p |
| BYX49/600R | 75p |
| BYX 55/350 | 10p |
| BYX 55/600 (Bead) | 10p |
| BYX 71/350 | 20p |
| BYX 71/600 | 50p |
| BYX 72/300 | 20p |
| BYX 36/600 | 50p |
| BYV 95B | 10p |
| BVY 95C | 12p |
| BYV 96D | 10p |
| BYZ 106 | 10p |
| BPW 41 | 15p |
| BYW 56 2A/1000v G11 | 8p |
| BZU 15/24 | 54p |
| BZY 93c75 | 50p |
| BZV 15/18 | 30p |
| BZV 15/30 | 30p |
| BZW 70c6v2 | 10p |
| BZX 79.3v | 10p |

Bush thyristor RCA 76122 £1
Transformer 240v/20v-500Ma 75p
Chassis type Transformer 240v/12 Volts 500m/a 75p
CVC 20 tube base £2
Tube Base Rank & G11 £1.20
6v-9v-13v tape motor 75p

Infra red led LD57CA 15p
AT 4041/41 transductor £1
15K-20 turn pots 20p
Thorn panel 6×100 pot + changeover switch (Irish) 50p
Battery converter TA 75 for colour TV. 12/24v Thorn 3787 £6
Thorn 3500 2A cut out 50p

Stereo GEC amp 20 watt + pre-amp with 4 pots + mains power unit with circuit £6

**SPECIAL OFFER**
**Decca-TTT etc.**
FEO4/1/250AC/4 Mains filters (grey type) × 4 **50p**

| **BRIDGES** | |
|---|---|
| KBL 005 | 30p |
| KBL 02 | 30p |
| KBP 04 | 30p |
| W02 | 15p |
| W004 | 15p |
| W005 | 20p |

Thorn Chassis U916D Complete £10

Thorn TX9 Remote Panels with I.C.s £2.50

Thorn 9000 4 Slider Front Panel with Mains Switch and LRAD £4

24V 4Amp (100VA) Trans £4.00

Mains 240V (100VA) to 240V out fully shrouded £5.00

ITT CVC45 8 way resistor unit for v/cap £3

CVC40 8 button unit with mains lead & slider pots with sockets £10.00

| | |
|---|---|
| 8000/30v | 50p |
| 470/40v × 10 | £1 |
| 22/100v × 10 | £1 |
| 100/350v | 70p |
| 400/350v | 70p |
| .47/500v | 25p |
| 1/600v | 25p |
| .022/1kv | 10p |

NI.CD Charger MW398 6A.A £8
NI.CD 5 Hours Battery Charger £8

Nickel Cadmium Battery Charger AA-C-D-PP9 £6

12 Volt Aerial Changer over Relays 144 Mc/s 45 watts 50p

6 Push Button Unit for GEC 2100 Series Replacement for Touch Button Unit £8

8 SEG LED Display with driver I.C. LM1017 **50p**

CVC8-9 Push Button Unit **£10**

Electronic Buzzer **60p**

15V, 015V, 1A Print Type Trans £1

Philip's Headphones Compact Disc Stereo Type £13

ITT Display Tube 58705 50p

8 Seg Display FND500 20p

Model 3000 Pocket Personal D.M.M. Volts range AC, DC 200M/V to 400V. Res. 2000Km £24

Export PYE731 6 Push Button unit with (UHF-VHF) band switch £4

ITT Micro Phone M5 50p with switch

1½ Volt Sub Min Relays 25p

Philips Solar Scientific SBC1730 Calculator £12

15v-0-15v 1 Amp Transformers £1

| | |
|---|---|
| RGP30K | 10p |
| RGP30G | 8p |
| RGP10B | 5p |
| RGP15G | 6p |
| T6024WG1 | 10p |

**SEND FOR DATA DIGITAL METERS**

| | |
|---|---|
| HD1000 | £20 |
| HD3000 | £25 |
| HD5000 | £24 |
| HD6000 | £32 |
| HD8000 | £35 |

| **Multi Core** | £4.50 |
|---|---|
| 60-40 Soldar 500G 20 SWG | £5.00 |
| 15 Watt Stereo Amp Sanyo Module with Data | 50p |
| 25pcs Precision Screwdriver & Tool Set | £6.00 |
| 25 Watt Solder Iron | £4.00 |

**Various Tools and Accessories**

| | |
|---|---|
| T/V V/Aerial 300Ω or 75Ω | £1.50 |
| L.C.D. clock display with alarm | 75p |
| * D/P push mains switch | 20p each |
| Mains lead & two pin socket for radio cassette | 35p |
| T/V loop aerial | 75p |
| Radio Telescopic Aerial | £1.00 |
| Philips Neon Lamps for TV sets | 5p |
| Freeze Philips | £1.20 |
| Foam Cleaner Philips | £1.20 |
| Contact Cleaner Philips | £1.20 |
| Cans of Anti Static, Degrease Cleaner and Anti Corona | All at £1.40 |
| Lorlin Full Remote Relay Switch fit most T/V sets, mains 4 tag, 2 tag 12 volt | £1.00 |
| Mains timer. 13 amp — up to 2 hours: easy to use, plugs into socket | £3.00 |
| Screen locking agent, large can | £1.50 |
| Red E.H.T. LAED and Anode Cap | £1.00 |
| Weller solder iron 15 watt/25 watt | £5.00 |
| Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V | 60p |
| 100 Coax Plugs | £12.00 |
| De-solder pump + 2 nozzels Philips | £4.00 |
| Flat Red LED and Green | 5p |
| 500gm 60/40 solder reel | £6 |
| Solder 1 kilo reel | £5.50 |
| Dual v/u meter -20 – +10db | £1 |
| K30 thermistor 232266298009 | 75p |
| De-solder Pump | £2.50 |
| Portasol Flameless Gas Soldering Iron | £16.00 |

**Panel Meters VM/A**

| | |
|---|---|
| G.P.O. 3 Meter LRAD New Plan Extension Lead | 50p |
| Gray front and .0-300V AC/DC 2¾ × 2¼ | £2.00 each |

SONY 1400KV Chroma Panel £6
SONY 1400KV Touch button unit £3.50

GEC Decoder Panel PC772A3 PC446A5 £6

Tube Base 20AX GEC PC852B3 £1

Thorn Aerial Socket TX10 £1

12 Volt Mains Trans 500M/A £1.00

**Quantity Reductions**

| | |
|---|---|
| BY204/4 | 25 for £1.00 |
| BY206 | 25 for £1.00 |
| W005 bridge | 20 for £2 |
| KT3 touch button black | 6 for £1 |
| G11 touch button red | 6 for £1 |
| K30 full remote Dawer Ass with 3 I.C. | £7.00 |
| K30 VHF. UHF Dawer Ass | £6.00 |
| BY298 3 amp/fast/R | 20 for £1.50 |
| BU126 | 10 for £6.00 |
| BU205 | 10 for £8.00 |
| BU105 | 10 for £6.00 |
| BF458 | 10 for £1.00 |
| BF224 | 20 for £1.40 |
| OA90 | 40 for £1.00 |
| 50 Ceramic Condensers | £1.50 |
| Mixed Mounting Kit for Power Transistors | 50p |
| 300 Condensers | £1.50 |
| 300 Resistors | £1.50 |
| 150 Electrolytics | £2.00 |
| 15 Bulbs Philips | 40p |
| Antistatic Discloth | 5 for £1 |

**SENDZ COMPONENTS**
**TO ORDER SEE BACK PAGE**

| | |
|---|---|
| Plastic Boxes 4¾ × 4 × 1 × ¾ | 50p |
| 100 Fuses | £2.00 |
| 100 W/W Res. | £1.50 |
| BF 199 | 20 for £1 |
| 10 × 20 Turn 100k pots. Rank | £2 |
| BF 470 | 20 for £2 |
| 20 Slider Knobs | 70p |

6 Mixed UHF Aerial Isolating Sockets, some with long leads. Fit ITT, GEC, Philips, Pye £1.00

**Mixed Packs**

| | |
|---|---|
| TO66 12 Power Trans RCA 16182 NPN Replacement for BD124 and Mounting Kits | £1.00 |
| 50 Mixed AC series Transistor | £4.50 |
| 25 Panel Mount Bulbs & Neons | £1.50 |
| 10A | £1.50 |
| 25 LED red/yellow/green | £1.50 |
| 20I/C Holders | £1.20 |
| 20 Large LED Red | £1.00 |
| 20 Small LED Red | £1.00 |
| 10×20 Turn 100K Pots | £1.00 |
| 100 Transistor | £2.50 |
| 20 Convergence Pots | 80p |
| 10 Thermistors | 50p |
| 20 Slider Pots | £1.00 |
| 30 Presets | 50p |
| 40 glass reed switch | £1 |
| 10 press to make switch | 70p |
| 40 Pots | £1.50 |
| 5 Tube Bases | £1.00 |
| 1,000 Diodes, Condensers, Resistors on Bandolier | £2.00 |
| 20 Knobs | £1.00 |
| 20mm Fuse Holders Chassis Mount | 20 for £1 |
| IN4001/6 100 mixed | £2.50 |
| EHT Diodes, small | 20 for £1 |
| 200 Mixed Diodes | £1 |
| 100 500M/A Fuse | £1 |
| 100 1.225 Amp Fuse | £1 |
| Mixed V/Cap Pots ITT-GEC-Hitachi-Philips etc, | 20 for £1 |
| ITT Mains Switch with Remont CMC113 | £1 |

# SENDZ COMPONENTS

**63 Bishopsteignton,**
**Shoeburyness, ESSEX SS3 8AF**
**SAME DAY SERVICE**
**All items subject to availability.**
**No Accounts : No Credit Cards**
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**Add 15% VAT, then £1 Postage**
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**Callers: To shop at 212 London Rd., Southend. Tel. 0702-332992**
*Open 9-1/2.30-6. GVMT + school orders accepted on official headings add 10% handling charge.*

### Tuner Units

| | |
|---|---|
| VHF-UHF with Data Tuner MEC1-F51 | £3 |
| Thorn TX10 Export V/Cap UHF-VHF | £6 |
| G8 Tuner V/Cap. New | £2 |
| G8 6 Button Unit | £9 |
| V/Cap Rank UHF Z776 F/Unit | £6 |
| V/Cap Rank VHF Z773 F/Unit | £5 |
| NEW G8 Tuner V/Cap | £3.50 |
| T20 6 Push Button Unit | £7 |
| ELC2000 on Panel | £2.50 |
| GEC 6 Push Button Unit | £6 |
| ITT 6 Push Button Unit | £6 |
| DECCA 6 Push Button Unit | £6 |
| GEC or Hitachi 6 push button unit 2110 Conversion | £8 |
| GEC 2110 V/Cap | £5 |
| ELC1043 (Ex Panel) | £3.75 |
| ELC1042 NEW | £5.50 |
| ELC2000 NEW | £4.00 |
| ELC2004 NEW | £8.00 |
| ELC2006 NEW | £4.00 |
| GEC Tuner V/Cap Hitachi Alter 1979 E1548, E1547, E1541B | £8.00 |
| ASTEC UM1183 | £10.00 |
| V314 (VHF) | £5.00 |
| V317 (VHF) | £7.00 |
| V334 (VHF) | £5.00 |
| U321 | £6.00 |
| U341 UHF | £7.00 |
| U342 (UHF) | £5.00 |
| U411 UHF | £7.00 |
| U.V. 411 Tuner | £10.00 |
| U V 415 | £7.00 |
| U V 417 | £7.00 |
| Fidelity and Amstrad 2000 V/Cap Tuner | £5.00 |
| Small V/Cap Mitsumi UHF | £4.00 |
| VHF | £3.00 |
| Portable & rotary Tuners Sanyo & Mitsumi UHF | £5.00 |
| NSF-UHF/VHF Varicap (old type) | £8.00 |
| Mosfit UHF/VHF (new type) | £8.00 |
| UF2-B31 Fidelity V/Cap T/Unit | £6 |
| UHF-VHF V/Caps on panel | £3.00 |
| HITACHI 20 Turn Pot | 40p |
| U321 on panel | £6.00 |
| Tuner unit VHS Sylvania GTR Videon MTS 900 | £2.50 |
| Toshiba VHF-UHF EG5221 | £5.00 |
| Mullard Video Modulator Application, video tape recorders, TV cameras, video games, closed circuit T.V., C.C.T.R. system Data supplied | £10.00 |
| UHF Tuner GTR Sylvania E4714A | £2 |
| VHF Tuner GTR Sylvania E3720B | £2 |

| | |
|---|---|
| Sylvania UHF E4720B | £6.00 |
| Sylvania VHF 900 | £6.00 |
| Small Tuner DX 175 220MHz | |
| Auto Changeover | £5.00 |
| 900 Thorn Tuner on Panel | £7.00 |
| THORN 1400 4P B Mech Tuner | |
| THORN 1500 4P B Mech Tuner | |
| THORN 1590 4P B Mech Tuner | |
| THORN 3500 4P B Mech Tuner | |
| All new & boxed | £4.00 each |
| TDK 19000A | 50p |
| Delay Lines | |
| DL20A 80p DL600 | £1.00 |
| G8 (Old Type) | £1 |
| DL600 | £1.00 |
| DL700 | £1.00 |
| KT3 Luminence | 75p |
| Luminance Delay Line (CVC 45) | |
| Co Ax Joint | 15p |
| Co Ax Belling Lee Plug | 12p |
| Co Ax Splitter | £1.00 |
| UHF Modulator CCIR | £3.00 |
| Infra Red Emitting Diode | 20p |
| NE2861I Small Neon Lamps GEC & Philips | 5p |
| Mullard 5 Watt Amps. LP1162 New | 75p |

### T.V. Tubes

| | |
|---|---|
| 12" 110 31 510 with coils Post £2.50 | £5 |
| 12 A31 300 Hitachi | £10 |

| S.W. Filters | | S.W. Filters | |
|---|---|---|---|
| TW2013 | 50p | SW185 | £1 |
| SW153 | 50p | SW153 | 50p |
| SW150 | £1 | SW154 | 50p |

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|---|---|
| BF694 | 10p |
| BF758 | 30p |
| BF760 | 30p |
| BFT34 | 15p |
| BFT43 | 10p |
| BFT84 | 8p |
| BFW11 | 20p |
| BFX29 | 30p |
| BFX84 | 25p |
| BFY50 | 15p |
| BFY52 | 20p |
| BFY90 | 25p |
| BLY49 | 25p |
| BPW41 | 25p |
| BRC116 | 25p |
| BRX43 | 15p |
| BRX48X | 10p |
| BRY56 | 30p |
| BSS68 | 10p |
| BSY79 | 10p |
| BSY95a | 10p |
| BTY80 | 20p |
| BSX19 | 17p |
| BSX20 | 17p |
| FT3055 | 30p |
| TCT82 | 30p |
| TCT520 | 30p |
| 2N930 | 5p |
| 2N2221 | 8p |
| 2N2222 | 8p |
| 2N2906 | 10p |
| 2N3055 | 40p |
| 2N3566 | 10p |
| 2N3702 | 10p |
| 2N3711 | 10p |
| 2N3583 | 50p |
| 2N3904 | 15p |
| 2N4355 | 10p |
| 2N4442 | £1.00 |
| 2N4444 | £1.00 |
| 2N5296 | 40p |
| 2N5983 | 30p |
| 2N6099 | 40p |
| 2N6109 | 40p |
| 2N6130 | 50p |
| 2N6133 | 20p |
| 2N6348 | 20p |
| 2N6399 | 10p |
| 2X 2N6099 on heat sink | 50p |
| 2SA437 | 20p |
| 2SC643A | £1.00 |
| 2SA992 | 10p |
| 2SB407 Sanyo TO3 | 10p |
| 2SB474 | 30p |
| 2SB566 | 10p |
| 2SB686 | |
| 2SC772 | 20p |
| 2SC381 | 10p |
| 2SC458 | 50p |
| 2SC732 | 10p |
| 2SC733 | 10p |
| 2SC940 | £1.00 |
| 2SC1030 | £1.00 |
| 2SC1162 C/18 | 30p |
| 2SC1520 | 25p |
| 2SC1546 | 20p |
| 2SC1617 | £1.00 |
| 2SC1725 | 20p |
| 2SC1740 | 20p |
| 2SC1942 | £1.00 |
| 2SC2068 | 20p |
| 2SC2073 | 8p |
| 2SC2122A | £1.00 |
| 2SC2229 | 15p |
| 2SC2688 | 20p |

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|---|---|
| 2SC3795 | 30p |
| 2SC7350 | 15p |
| 2SD180 TO3 80V/6A | 15p |
| 2SD200 | £2.00 |
| 2SD716 | £1.00 |
| 2SD787 | 30p |
| 2SD811 | £2.00 |
| 2SD820 | £1.00 |
| 2SD868 | 75p |
| 2SD870 | £1.00 |
| 2SD880 | 30p |
| 2SD1266 | £1.00 |
| 2SD1432 | £1.00 |
| 2SD1576 | £1.00 |
| 2SK30A | 10p |
| BC107 | 10p |
| BC108 | 10p |
| BC109 | 5p |
| BC113 | 10p |
| BC114 | 10p |
| BC115 | 10p |
| BC116 | 10p |
| BC117 | 20p |
| BC119 | 20p |
| BC125 | 10p |
| BC126 | 10p |
| BC139 | 10p |
| BC140 | 30p |
| BC141 | 25p |
| BC143 | 25p |
| BC147 | 10p |
| BC148 | 10p |
| BC149 | 10p |
| BC153 | 10p |
| BC154 | 10p |
| BC157a | 10p |
| BC158 | 10p |
| BC159 | 10p |
| BC160/16 | 25p |
| BC171 | 10p |
| BC172 | 10p |
| BC173 | 10p |
| BC174 | 10p |
| BC183 | 10p |
| BC184 | 10p |
| BC204 | 10p |
| BC207 | 10p |
| BC212 | 10p |
| BC213 | 10p |
| BC214 | 10p |
| BC237 | 10p |
| BC238 | 8p |
| BC239 | 10p |
| BC250 | 8p |
| BC251 | 10p |
| BC252 | 10p |
| BC262 | 10p |
| BC263b | 20p |
| BC293 | 10p |
| BC298 | 10p |
| BC300 | 10p |
| BC301 | 30p |
| BC303 | 30p |
| BC307 | 7p |
| BC308 | 7p |
| BC309 | 10p |
| BC327 | 10p |
| BC328 | 10p |
| BC328 338 pair | 15p |
| BC337 | 10p |
| BC338 | 10p |
| BC347 | 10p |
| BC349b | 10p |
| BC350 | 20p |
| BC365 | 10p |
| BC368 | 10p |

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|---|---|
| BC384 | 10p |
| BC394 | 10p |
| BC413 | 10p |
| BC414 | 10p |
| BC416 | 10p |
| BC440 | 30p |
| BC454 | 10p |
| BC455 | 10p |
| BC456 | 10p |
| BC460 | 25p |
| BC462 | 10p |
| BC463 | 10p |
| BC478 | 10p |
| BC527 | 10p |
| BC532 | 10p |
| BC546 | 10p |
| BC547 | 10p |
| BC548 | 10p |
| BC556 | 10p |
| BC557 | 10p |
| BC558 | 10p |
| BC559 | 10p |
| BC635 | 10p |
| [illegible] | 25p |
| [illegible] so Pair | 75p |
| [illegible] | 25p |
| [illegible] | 25p |
| [illegible] | 30p |
| BD124 (metal) | 30p |
| BD130Y | 25p |
| BD131 | 30p |
| BD132 | 30p |
| BD135 | 25p |
| BD136 | 30p |
| BD138 | 30p |
| BD140 | 30p |
| BD176 | 30p |
| BD182 | £1.00 |
| BD183 | 70p |
| BD202 | 60p |
| BD204 | 60p |
| BD207 | 60p |
| BD221 | 20p |
| BD222 | 30p |
| BD228 | 30p |
| BD226 | 20p |
| BD233 | 30p |
| BD238 | 30p |
| BD238 | 30p |
| BD239 | 15p |
| BD240 | 50p |
| BD243 | 30p |
| BD244 | 50p |
| BD250a | 30p |
| BD252 | 20p |
| BD253B | 50p |
| BD331 | 20p |
| BD37[illegible] | 20p |
| BD410 | 25p |
| BD433 | 25p |
| BD437 | 25p |
| BD438 | 30p |
| BD439 | 30p |
| BD544 | 40p |
| BD650 | 50p |
| BD678 | 30p |
| BD681 | 30p |
| BD682 | 30p |
| BD807 | 50p |
| BD809 | 30p |
| BD810 | 30p |
| BD817 | 30p |
| BD819 | 30p |
| BD834 | 30p |
| BD838 | 30p |
| BD441D | 30p |
| BD862 | 30p |

| | |
|---|---|
| BD610 | 40p |
| BD646 | 50p |
| BD676A | 30p |
| BD807 | 20p |
| BD826 | 50p |
| BD948 | 30p |
| BDX75 | 20p |
| BDU64B | 50p |
| BDU65 | 50p |
| BF761 | 30p |
| BF769 | 30p |
| BF788 | 20p |
| BF819A | 30p |
| BF858 | 30p |
| BF871 | 30p |
| BFR39 | 15p |
| BFR52 | 7p |
| BFR79 | 15p |
| BFR81 | 15p |
| BFR87 | 10p |
| BFS60 | 10p |
| BFT42 | 20p |
| BFT57 | 20p |
| BSD215 | 50p |
| MR1366 | 20p |
| BRC M-200 | 40p |
| BRC-M-300 | 50p |
| BRC 1693 | £1.00 |
| BRC 3064 | £1.00 |
| BT1822 | £1.00 |
| BT16016 | £1.20 |
| BT16018/ML237B | £1.50 |
| BT16218 | £1.50 |
| BT18124 | £1.00 |
| BT18224 | £1.00 |
| BUP22A | £1.00 |
| CA270AE | 50p |
| CA270CW | 50p |
| CA270CE | 50p |
| CA920AE | £1.00 |
| CA1310 | 50p |
| CA3046 | 50p |
| CA3065Q | 50p |
| CA3094AE | 50p |
| CA3123 | 40p |
| CA3146 | £1.00 |
| CA3189 | 40p |
| CBE16848 | 50p |
| CD4510 | 30p |
| DM7492 | 50p |
| HA1196 | 40p |
| HA1370 | £2.00 |
| HA11223 | 40p |
| HEF4001 | 10p |
| HBF4011AE | 10p |
| HEF4053B | 30p |
| HEF4066 | 20p |
| HEF4528 | 20p |
| HD38900 | £3.00 |
| K573ID 100I012 | £1.00 |
| LA3220 | 50p |
| LA4102 | £1.00 |
| LM1011N | £1.00 |
| LM1017N | 25p |
| LM8361 | £3.00 |
| M913 | £2.00 |
| M1024–SAA | £2.00 |
| M1025 SAA | £2.00 |
| MC476p | £1.00 |
| MC1307 | 75p |
| MC1312 | |
| MC1349 | 50p |
| MC1352 | £1.00 |
| MC1358 | £1.00 |
| MC1496 | 50p |
| MC14002 | 15p |
| MC14013 | 25p |
| MC14016 | 25p |
| MC14066 | 30p |
| MC14514 | 50p |
| MC1748 | 80p |
| ML M4956 | £1.00 |
| ML231 | £2.50 |
| EF16016 | £2.00 |
| ML232 | £1.00 |
| ML236I | £1.00 |
| ML237B | £1.00 |
| ML238B | £4.00 |
| ML239 | £2.00 |
| ML926 | £1.00 |
| Thorn | |
| MARS400XX | £3.00 |
| MM5387 | £1.00 |
| MM5611 | £1.00 |
| MM5840 | £3.00 |
| K35 Philips Receiver IC | |
| M5840EE84 | £6.00 |
| MM5290N-4 | 75p |
| MM53108N | £4 |
| MR1366 | 20p |
| N64100 | £1.00 |

### Thyristors

| | |
|---|---|
| IR106A | 30p |
| BT151 800R | 80p |
| BT106 Plastic | 40p |
| BT106 Metal | £1.20 |
| [illegible] | £1.00 |
| [illegible] | £1.00 |
| BRC 4443 | 75p |
| G.E. Thyristor | 60p |
| [illegible] | 60p |
| [illegible] | £1.00 |
| MCR 76 | 25p |
| [illegible] | £1.00 |
| [illegible] | £1.00 |
| [illegible] | £2.00 |
| [illegible] | £2.00 |
| [illegible] | £2.00 |
| [illegible] | £2.00 |
| [illegible] | £2.00 |
| [illegible] | 50p |
| MCR 76 | 50p |

### Thermistors

| | |
|---|---|
| GS Degausing | 35p |
| Philips type VA1104 | 70p |
| ITTP 2661 | 15p |
| PTH451 XOR | 15p |
| PTC Thermistor P134 | 20p |
| Degausing Thermistor (fits most sets) | 20p |
| GEC Double Thermistor | 25p |

| | |
|---|---|
| NE555P | 60p |
| NE555 | 60p |
| HD38980C | £3.00 |
| IL-1 | 20p |
| OPT600 | 20p |
| OPT601 | 20p |
| SAA611 | £1.00 |
| SAA661 | £1.75 |
| SAA1020 | £4.00 |
| SAA1021 | £4.00 |
| SAA1024 | £2.50 |
| SAA1025 | £2.50 |
| SAA1073 | £3.00 |
| SAA1074 | £3.00 |
| SAA1075 | £3.00 |
| SAA1124 | £2.00 |
| SAA1130 | £2.50 |
| SAA1174 | £3.00 |
| SAA1176 | £2.00 |
| SAA1250 | £3.00 |
| SAA1251 | £4.00 |
| SAA1272 | £3.00 |
| SAA1274 | £3.00 |
| SAA1276 | £3.00 |
| SAA3027P | £4.00 |
| SAA5000A | £1.50 |
| SAB3013 | £2.00 |
| SAB3210 | £2.00 |
| SAB4209 | £2.00 |
| TBC00124 | £1.00 |
| SAA5000A | £1.50 |
| SAA5010 | £2.20 |
| SAA5012A | £5.00 |
| SAA5020 | £3.50 |
| SAA5030 | £4.50 |
| SAA5040 | £3.50 |
| SAA5040A | £3.00 |
| SAA5043 | £4.00 |
| SAA5050 | £4.50 |
| SAF1032p | £2.50 |
| SAF1039 | £2.00 |
| SAS560 | £2.00 |
| SAS560T | £1.00 |
| SAS570T | 75p |
| SAS660 | £1.00 |
| SAS670 | £1.00 |
| SAS580 | 75p |
| SAS590 | 75p |
| SAS3210 | £2.00 |
| SL437F | £4.00 |
| SL901B | £4.50 |
| SL918 | £4.50 |
| SL1430 | £1.00 |
| TA7122 | £1.15 |
| TAA320A | 50p |
| TAA470 | £1.50 |
| TAA570 | 75p |
| TAA611B | £1.00 |
| TAA621 | £2.00 |
| TAA661 | £1.00 |
| TAA641 | £1.50 |
| TA7108P | £1.00 |
| TA7117 | 50p |
| TA7120P | 50p |
| TA7315AP | 50p |
| TA7137P | 50p |
| TA7607AP | 40p |
| TA7609P | 50p |
| TA7265AP | £3.00 |
| TA7680AP | £3.00 |
| TA7699P | £1.00 |
| TBA120A | 40p |
| TBA120AS | 50p |
| TBA120SA | 40p |
| TBA120B | 40p |
| TBA120SB | 40p |
| TBA120T | 50p |
| TBA120SQ | £1.00 |
| TBA120U | 75p |
| TBA120Q | 30p |
| TBA120C | 40p |
| TBA1441 | £1.00 |
| TBA231 | 75p |
| TBA395Q | 50p |
| TBA396Q | £1.00 |
| TBA396 | 75p |
| TBA440P | £1.00 |
| TBA1440C | £1.00 |
| TBA480Q | £1.00 |
| TBA520 | £2.00 |
| TBA530 | £2.00 |
| TBA540 | £1.00 |
| TBA550Q | £1.75 |
| TBA560CQ | £1.00 |
| TBA570 | £1.50 |
| TBA625 | 50p |
| TBA641 | £2.00 |
| TBA651 | £2.00 |
| TBA673 | £1.00 |
| TBA720A | £1.50 |
| TBA750Q | £1.50 |
| TBA780 | £1.50 |
| TBA800 | 50p |
| TBA810AP | 60p |
| TBA810S | 60p |
| TBA820 | 60p |
| TBA820M | 25p |
| TBA890 | £1.00 |
| TBA920 | £1.50 |
| TBA920Q | £1.50 |
| TBA950 | £1.50 |
| TBA990Q | £1.00 |
| TMS1000NL | £2.00 |
| TMS1943 N2L (clockchip) | £1.00 |
| TMS9980 | £4.00 |
| TMS9901 | £1.00 |
| TMS2708JG45 | 45p |
| TMS2716JL | £1.00 |
| TMS3529 | £1.00 |
| TMS3720ANS | £3.00 |

### TV Crystals

| | |
|---|---|
| 4MHz | |
| 4.433-619 | |
| 6MHz | |
| 8.867238 | |
| 11.059.000 | 30p |
| Large or small | 50p each |
| Antistatic Isolators | |
| Disc Type Black | 10p |
| RCA 1693 | £1.00 |

### Filters

| | |
|---|---|
| 5.5MHz | 15p |
| 6MHz | 30p |
| 6-5MHz | 20p |
| SFD460B | 15p |
| CSB455A | 15p |

**PHILIPS SBC 1730 SOLAR SCIENTIFIC CALCULATOR**
77 Functions
39 Keys
£12.00

| | |
|---|---|
| TMS4014 | 70p |
| TX-012 | £1.00 |
| TMS9902 | £1.20 |
| ULN2216 | 75p |
| UPC566H | £1.00 |
| UPC585C | £1.00 |
| UPC1031H | £2.00 |
| UPC1353C | £1.00 |
| UPC1363C | £2.75 |
| UPC1366C | £1.00 |
| UPC1514C | £3.00 |
| UPC2002 | 35p |
| UPD8049HC | £2 |
| SN29848 | 50p |
| SN29770BN | £1.00 |
| SN29771BN | £1.00 |
| SN29772BN | £1.00 |
| SN7402N | £1 |
| SN7472N | £1 |
| SN74107 | £1.00 |
| SN74167 | 70p |
| SN7472N | 20p |
| SN75108AN | £1.00 |
| SN76001 | £1.00 |
| SN76003 | £1.00 |
| SN76013ND | £2.00 |
| SN76018 | £1.00 |
| SN76008 | £1.00 |
| SN76023N | £1.50 |
| SN76110N | £1 |
| SN76115AN | 50p |
| SN76131 | 50p |
| SN76141N | £1.00 |
| SN76226 | £1.00 |
| SN76227N | £1.00p |
| SN76228N | £1.00 |
| SN76270 | £1.00 |
| SN76532N | £1.00 |
| SN76544N | £2.00 |
| SN76545N | £3.00 |
| SN76546 | £3.00 |
| SN76550 | 30p |
| SN76552 | 30p |
| SN76570 | £1.00 |
| SN76620 | 50p |
| SN76650 | 50p |
| SN76660N | 40p |
| SN76620AN | 50p |
| SN76666 | £1.00 |
| SN76705N | £2 |
| SN76707N | 75p |
| SN76708AN | 75p |
| SN76720 | £1.00 |
| SN76709N | £2.00 |
| UA783P3C | 40p |
| BT100A/02 | 40p |
| BT138/10A | 70p |
| BT146 | 30p |
| TBA540Q | £1.50 |
| TCA270 | £1.00 |
| TCA270Q | £1.00 |
| TCA640 | £1.00 |
| TCA660 | £1.00 |
| TCA270S | £1.00 |
| TCA270SQ | £1.00 |
| TCA740 | £1.00 |
| TCA800 | £5.00 |
| TCA830 | £1.00 |
| TCA940 | £1.00 |
| TCE[illegible] | £1.00 |
| TC[illegible] | £1.00 |
| TCE[illegible] | 30p |
| TDA[illegible] | 50p |
| TDA1003A | £1.00 |
| TDA1010 | £1.00 |
| TDA1012 | £1.00 |
| TDA1060A | £1.50 |
| TDA1035T | £1.00 |
| TDA1035SB | £1.00 |
| TDA1072 | £1 |
| TDA1151 | 30p |
| TDA1170 | £1.00 |
| TDA1190 | £1.00 |
| TDA1200 | 75p |
| TDA1270 | £1.50 |
| TDA1327A | 69p |
| TDA1365 | £3.00 |
| TDA1512 | £2.00 |
| TDA1908A | £1.00 |
| TDA2002 | £1.00 |
| TDA2003 | £1.50 |
| TDA2004 | £2.00 |
| TDA2008 | £2.00 |
| TDA2010 | £1.00 |
| TDA2020 | £1.00 |
| TDA2030 | £2.00 |
| TDA2140 | £3.50 |
| TDA2160 | £1.00 |
| TDA2320 | 50p |
| TDA2525 | £1.00 |
| TDA2545A | £1.00 |
| TDA2600 | £5.20 |
| TDA2640 | £2.00 |
| TDA2522 | £1.00 |
| TDA2530 | £1.50 |
| TDA2532 | £1.00 |
| TDA2540 | 80p |
| TDA2541 | £1.00 |
| TDA2542 | £1.00 |
| TDA2546 | £3.00 |
| TDA2560 | 75p |
| TDA2575A | £1.00 |
| TDA2577 | £2.00 |
| TDA2579 | £2.00 |
| TDA2581 | £2.00 |
| TDA2591 | £1.00 |
| TDA2593 | £3.00 |
| TDA2560 | 50p |
| TDA2600 | £5.75 |
| TDA2611A | £1.00 |
| TDA2611AQ | £1.00 |
| TDA3651A | £1.00 |
| TDA3652 | £2.50 |
| TDA2653 | £4.00 |
| TDA2640 | £2.00 |
| TDA2680 | £1.00 |
| TDA2690 | £1.00 |
| TDA2593 | £1.00 |
| TDA3190 | £1.00 |
| TDA3560 | £4.00 |
| TDA3561 | £3.00 |
| TDA3571A | £2.75 |
| TDA3590 | £3.00 |

| | |
|---|---|
| TDA3591 | £1.00 |
| TDA3650 | £3.50 |
| TDA3651 | £3.00 |
| TDA3651AQ | £3.50 |
| TDA3654Q | £2.00 |
| TDA3710 | £3.50 |
| TDA3800 | £4.00 |
| TDA3180 | £2.00 |
| TDA4420 | £2.00 |
| TDA4600 | £1.00 |
| TDA4600-2 | £3.00 |
| TDA9403 | £3.00 |
| TDD1610S | 50p |
| TEA1039 | £2.00 |
| TEA5114 | £1.00 |
| UPC1365 | £3.00 |
| UPC1363C | £1.50 |
| TDA3300B | £6.00 |
| SN74LS 125AN | 30p |
| SN74LS 248 | 50p |
| SIL4516 | 50p |
| SN16861NG | 50p |
| SN16862AN | £1.00 |
| SN16964AN | 50p |
| SN29764AN | £1.00 |
| UA721 | 40p |
| UA7300 | 40p |
| MPS43A | 25p |
| MJ13005 | 30p |
| MJE51T | 25p |
| MJE340 | 28p |
| MJE660 | 25p |
| MJE661 | 25p |
| MJE3055 | £1.00 |
| MJE2801 | 30p |
| MJE2955 | 50p |
| MJE13005 | 50p |
| Sanikron Diode | 30p |

### Philips Cartridge

| | |
|---|---|
| GP412/11 | £10.00 |

### Transistors

| | |
|---|---|
| A1222 | 25p |
| A1223 | 25p |
| AC106 | 25p |
| AC121 | 25p |
| AC124 | 25p |
| AC128 | 25p |
| AC137 | 25p |
| AC151 | 25p |
| AC131 | 25p |
| AC138 | 25p |
| AC152 | 25p |
| AC153K | 25p |
| AC142K | 25p |
| AC169 | 25p |
| AC176 | 25p |
| AC178K | 25p |
| AC179 | 25p |
| AC186 | 25p |
| AC188 | 25p |
| ACY21 | 25p |
| AD143 | 50p |
| AD149 | 50p |
| AD161/162 | pair 40p |
| AF17A | 25p |
| AF139 | 25p |
| AF181 | £1.00 |
| AF239 | 25p |
| AF367 | 25p |
| AL102 | £1.75 |
| AU110 | £1.50 |
| BLY49 | 50p |
| BF115 | 20p |
| BF121 | 20p |
| BF127 | 20p |
| BF137 | 20p |
| BF157 | 20p |
| BF160 | 20p |
| BF161 | 20p |
| BF164 | 60p |
| BF179 | 30p |
| BF180 | 20p |
| BF181 | 20p |
| BF182 | 20p |
| BF184 | 20p |
| BF194 | 10p |
| BF195 | 10p |
| BF196 | 10p |
| BF197 | 12p |
| BF198 | 10p |
| BF199 | 10p |
| BF200 | 20p |
| BF222 | 10p |
| BF224 | 15p |
| BF238 | 20p |
| BF240 | 16p |
| BF244 | 40p |
| BF245b | 20p |
| BF255 | 20p |
| BF256 | 20p |
| BF257 | 20p |
| BF258 | 25p |
| BF262 | 15p |
| BF263p | 25p |
| BF264 | 15p |
| BF271 | 10p |
| BF273 | 10p |
| BF274 | 10p |
| BF324 | 25p |
| BF337 | 50p |
| BF355 | 30p |
| BF362 | 20p |
| BF363 | 15p |
| BF367 | 15p |
| BF391 | 15p |
| BF394 | 10p |
| BF419 | 30p |
| BF422 | 15p |
| BF423 | 15p |
| BF448 | 30p |
| BF450 | 20p |
| BF458 | 30p |
| BF459 | 30p |
| BF460 | 30p |
| BF468 | 30p |
| BF469 | 30p |
| BF470 | 20p |
| BF480 | 50p |
| BF494 | 30p |
| BF594 | 10p |
| BF597 | 10p |
| BF760 | 30p |
| BF788 | 30p |
| BF819A | 20p |
| BF858 | 30p |
| BF871 | 30p |
| BF869 | 30p |

### I.C. Holders

| DIL – DIL | | DIL – QIL | |
|---|---|---|---|
| 40 Pin × 4 | £1.00 | 16 Pin × 10 | £1.00 |
| 42 Pin × 5 | £1.00 | 18 Pin × 10 | £1.00 |
| 28 Pin × 5 | 80p | 28 Pin × 4 | £1.00 |
| 16 Pin × 10 | 70p | AB Mains Switch | |
| 24 Pin × 5 | 75p | u/v | 30p |
| 14 Pin × 10 | 70p | Philips Electrodynamic | |
| 18 Pin × 10 | 80p | Stereo Headphones N6315 | £10 |