

DECEMBER 1987

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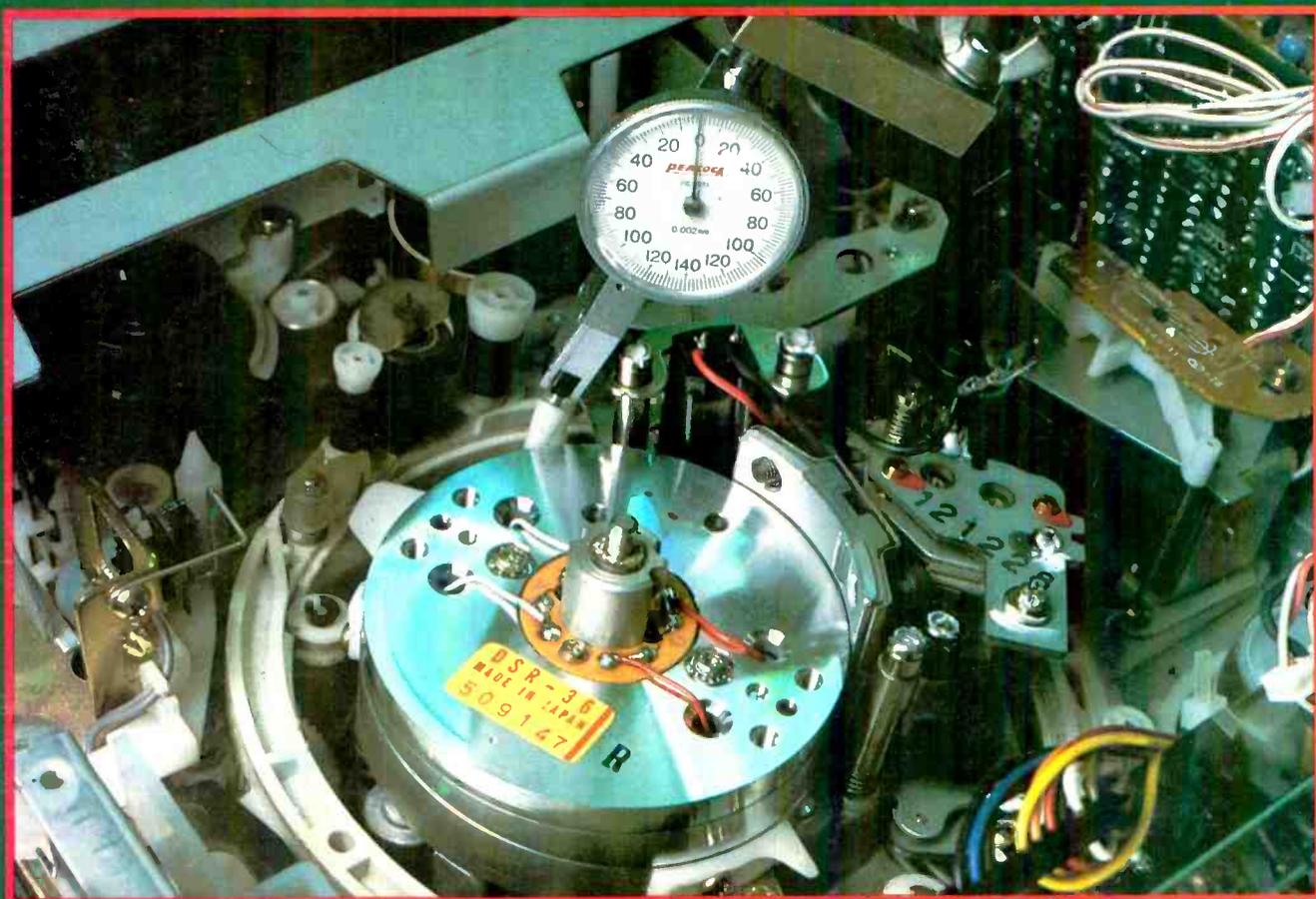
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TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

**Extra inside – The HRS Commodore
Computer Spares Catalogue**

*Available to readers in
the UK and Ireland only*

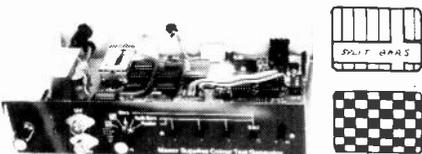


**Servicing the Sony SLC6 VCR
Practical Computer Programming
Second-hand VCR Guide • DX-TV
Series and Parallel Networks
TV Fault Finding • VCR Clinic**

MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR
FOR DOMESTIC TV & VCR.

TEST
DEMONSTRATIONS
AT 172
WEST END LANE



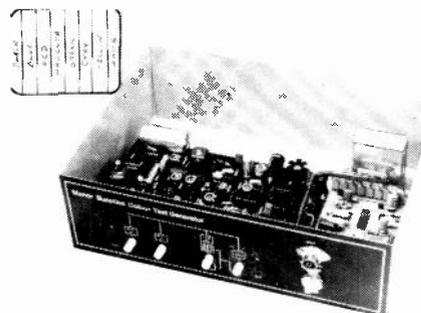
- ★ 40 different patterns and variations.
- ★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- ★ 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
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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 (CII 1 to 4) FOR OVERSEAS £5.75.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

ADD
VAT
15%

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Mullard VM6101 **£30.00**, Philips KT3, K30 **£30.00**, Texas XMII
(TIFAX) **£28.00** p.p. **£1.80**

THORN TX9 MK2/3, TX10, teletext
Mullard Decoder 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**

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PHILIPS G11 PANELS ex rental (untested).
Scan **£10.00**, Frame, Decoder **£5.00** p.p. **£2.00**.
PHILIPS G11 IF PANEL (New) Less Tuner **£2.50** p.p. **£1.30**
SPECIAL OFFER Mullard/Philips quality UHF modulator (audio & video
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PHILIPS G11 6 position touch tune channel selector units **£16.00** p.p. **£1.80**
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KT3 Non text (RC4001) **£21.50**, KT3, K30 etc. Text **£25.00**.
PHILIPS HANDSETS Ex rental, text, Untested. KT Text/Video Type. **£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 (Non-Text)
£18.00; TX9, TX10 Infra red Teletext **£21.50**, p.p. **£1.20**. Others available.
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, TX10 Saw Filter IF Panel. **£5.00** p.p. 80p.
TX9, TX10 Remote & tuning control panel (1515) **£10.50** p.p. **£1.80**.
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Sound & Vision. **£28.50** p.p. **£1.20**.

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PAL ENCODER KIT (RGB to Video) **£18.50** p.p. **£1.30**.

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TIONAL GREY SCALE Kit **£2.90** p.p. 45p.

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ITT CVC30 SERIES, Convergence & Purity Control Panels, **£2.50**
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ITT CVC30 SERIES PANELS SURPLUS (untested) **£2.50** each. CMP31,
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THORN TX9 Panels salvaged ex factory for spares incl. Electrolytic & Mains
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THORN 9000 SERIES IF/Decoder **£10.00** p.p. **£2.30**. Line T.B., Power
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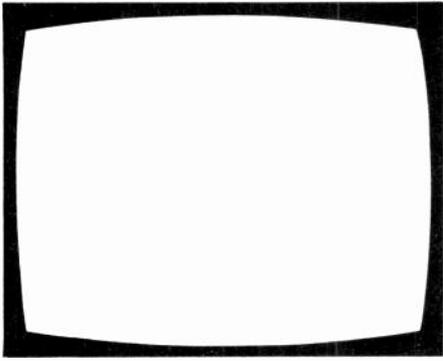
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TELEVISION

December
1987

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On sale November 18th

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QUERIES

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

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TV sets seem to be getting ever more reluctant to be serviced. Some recent examples that have caused trouble.
- 99 Second-hand VCR Guide** *Derek Snelling*
A comparison of some of the more readily available VCRs on the second-hand market, with guidance on price, performance and reliability.
- 100 Teletopics**
News, comment and developments.
- 102 Servicing the Sony SLC6UB VCR** *David Botto*
Large quantities of these front-loading Betamax machines were sold in the early 80s. They are capable of good performance if well maintained. Notes on the power supply, common faults and servicing.
- 107 Coincidence Detection** *Chris Avis*
Not a dissertation on obscure circuitry: simply a note about the odd coincidences that occur in day-to-day servicing.
- 108 TV Services in Ireland** *Christopher Holland*
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- 110 TV Fault Finding**
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| 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 |

SEMICONDUCTORS

| | |
|-------------|-------|
| 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 | 2.10 |
| UPC1230H | 4.39 |
| UPC1238 | 2.50 |
| UPC1245V | 1.35 |
| UPC1277 | 4.81 |
| UPC1350C | 4.15 |
| UPC1353C | 6.78 |
| UPC1365C | 4.37 |
| UPC1366C2 | 2.00 |
| UPC1367 | 2.08 |
| UPC1358H | 1.88 |
| UPC1360C | 2.16 |
| UPC1363C | 2.15 |
| UPC1370C2 | 2.58 |
| UPC1382C | 3.08 |
| UPC1384 | 3.78 |
| UPC1394C | 3.07 |
| UPC1447H | 58 |
| UPC41C | 2.80 |
| UPC577H | 2.46 |
| UPC585C | 1.28 |
| UPC1167C2 | 2.70 |
| UPD553C164 | 20.76 |
| UPD7519G | 17.13 |
| UPD7538C020 | 11.06 |
| UPD546C107 | 22.26 |
| UPD547C049 | 11.18 |
| U05G | 1.27 |
| V11N | 1.27 |
| 10E2 | 43 |
| 10V705 | 8.74 |

COMMODORE ICs

| | |
|----------|-------|
| 74LS260 | 55 |
| 2732 | 3.30 |
| 2764 | 3.20 |
| 27128 | 4.95 |
| 27256 | 5.90 |
| 4116 | 1.10 |
| 4164 | 1.60 |
| 6264 | 2.75 |
| 6522 | 4.00 |
| Z80A CPU | 1.70 |
| 8271 | 60.00 |
| ZTX213 | 17 |
| ZTX313 | 27 |
| ZTX650/1 | 35 |
| LM1889 | 2.00 |

VALVES

| | |
|-----------------|-------|
| 30FL2 | 1.70 |
| DY802 | 98 |
| DY867 | 66 |
| ECC81 | 1.08 |
| ECC82 | 98 |
| ECC83 | 1.07 |
| ECC84 | 80 |
| ECC85 | 98 |
| ECC88 | 1.35 |
| ECC89 | 1.30 |
| ECC82 | 88 |
| ECH81 | 1.68 |
| ECH84 | 1.66 |
| ECL80 | 84 |
| ECL82 | 1.90 |
| EF80 | 95 |
| EF86 | 2.20 |
| EF183 | 99 |
| EF184 | 1.09 |
| EL90 | 1.75 |
| EL34 | 3.50 |
| EL84 | 1.05 |
| EY867 | 68 |
| EY500A | 2.25 |
| EZ80/81 | 56 |
| GY501 | 1.60 |
| GZ34 | 3.50 |
| K766 | 9.75 |
| K777 | 8.50 |
| K798 (alt type) | 12.00 |
| PC97 | 1.65 |
| PC85 | 1.85 |
| PC805 | 1.00 |
| PCF80 | 1.40 |
| PCF200 | 1.35 |
| PCF800 | 1.38 |
| PCF801 | 1.13 |
| PCF802 | 1.12 |
| PCF805 | 1.80 |
| PCF808 | 1.63 |
| PCH200 | 1.20 |
| PCL82 | 1.20 |
| PCL84 | 1.20 |
| PCL805 | 1.09 |
| PCL86 | 1.92 |
| 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 | 2.80 |
| PY500A | 8.31 |
| PY800/1 | 69 |
| UCH81 | 2.25 |
| UCL83 | 1.82 |
| UY85 | 1.35 |
| PL8027 | 4.00 |
| 40KD6 | 5.30 |
| 21LU8 | 3.00 |
| 12DW4A | 4.50 |
| 3AT2B | 5.00 |
| 12BH7A | 3.75 |

THYRISTORS

| | |
|--|------|
| DEC1 | 2.20 |
| DEC2 | 2.20 |
| THY15/80 | 2.40 |
| THY15/85 | 2.40 |
| Transistor mounting kit TO66, TO3, TO220AB | 30 |

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

| | |
|---------------|------|
| BF273 | 24 |
| BF274 | 24 |
| BF336 | 19 |
| BF337 | 39 |
| BF338 | 33 |
| BF355 | 30 |
| BF362 | 68 |
| BF363 | 72 |
| BF371 | 13 |
| BF392 | 35 |
| BF422 | 46 |
| BF457 | 50 |
| BF458 | 49 |
| BF459 | 58 |
| BF460 = BF462 | 38 |
| BF469 | 66 |
| BF470 | 38 |
| BF597 | 166 |
| BF575 | 54 |
| BF578 | 54 |
| RCA16335 | 90 |
| RCA16039 | 1.18 |
| RCA16092 | 1.18 |
| RCA16040 | 96 |
| RCA16041 | 84 |
| RCA16334 | 90 |
| =ON447 | |
| RCA16335 | 90 |
| =ON448 | |
| RCA16957 | 2.88 |
| TIC46 | 1.18 |
| TIC46 | 60 |
| TIC47 | 72 |
| TIL32 | 65 |
| TIL78 | 48 |
| TIP29C | 48 |
| 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 |
| T9024V | |

EXPORT ORDERS WELCOME

REMOTE HAND SETS

**SAME DAY DESPATCH
FAST - FAIR - EFFICIENT SERVICE**

AMSTRAD

| | | |
|---------|----------|-------|
| 1422292 | CTV2210 | 15.00 |
| 1422187 | CTV2200 | 15.00 |
| 151910 | TV/VIDEO | 15.00 |
| 1409221 | CTV1409 | 15.00 |
| 151175 | VCR5200 | 17.00 |
| 150583 | VCR7000 | 10.00 |
| 150878 | VCR9000 | 10.00 |

DECCA

| | | | |
|--------|---------|--------|-------|
| 80/100 | NON TXT | VS | 16.50 |
| 80/10 | NON TXT | VS8511 | 19.50 |
| 101 | NON TXT | VS8513 | 23.50 |

SONY

| | | |
|----|--------|-------|
| C5 | RH75T | 29.04 |
| C6 | RH72 | 22.62 |
| C7 | RHT200 | 45.00 |
| C9 | RHT213 | 45.00 |

ITT

| | | |
|------------|--------|-------|
| CVC45 RG5 | VS8262 | 25.00 |
| CVC32 RG15 | VS8573 | 25.00 |

PLEASE NOTE THAT SOME HANDSETS ARE MANUFACTURERS ORIGINALS BUT SOME MAY BE AN ALTERNATIVE TYPE.

FIDELITY

| | | | |
|--------------|--------|----------|-------|
| FD09193 | Txt. | 32 butt. | 15.90 |
| FD09820 | IS500 | 12 butt | 13.81 |
| FD09156 | F14R | 12 butt | 13.81 |
| FD09111 | AVS | 14 butt | 13.75 |
| FD09141 | CTV14S | 4 butt. | 13.75 |
| 20R/22R/140R | | | |

THORN/FERGUSON

| | | | |
|------|------------|---------------|-------|
| T723 | TX9/10 | NON TXT IR | 16.50 |
| T725 | TX9 | NON TXT IR | 16.50 |
| T731 | TX9/10/100 | TXT/STEREO IR | 16.50 |
| T732 | TX10 | TXT IR | 16.50 |
| T736 | TX9/10/100 | TXT IR | 16.50 |
| T739 | TX100 | | 16.50 |

JVC

| | | |
|-------|--------|-------|
| TP843 | TXT IR | 13.50 |
|-------|--------|-------|

GEC

| | | |
|------------|----------------|-------|
| GC56520831 | 9300/V4001 | 9.93 |
| GCA512220 | C1404H-C1656H | 30.00 |
| GCA512230 | C1653 | 22.00 |
| GCA510710 | C2086H, C2087H | 28.50 |
| GCA514620 | C2067H | 28.50 |
| GCA510870 | C2089H, C2090H | 21.00 |
| | C2889H, C2290H | |
| | C2069, C2269H | 27.50 |

GRUNDIG

| | | | |
|--------------|---------------|----|-------|
| RTP20/VRC112 | TP16-21-21VHR | IR | 13.50 |
| RTP05/VRC138 | TP8-120-120E | IR | 13.50 |
| RTP06/IR107N | TP160-160E | IR | 13.50 |
| RTP07/IR380N | TP200-300-390 | IR | 13.50 |
| RTP400/IR401 | TP400VT-500VT | IR | 13.50 |
| VRC204 | TP12 | VS | 13.50 |

PHILIPS

| | | | |
|----------------|------------------|--------------|-------|
| G11 | IR170/843 | TXT IR | 13.50 |
| G11 (KONIG) | TXT IR8435 | | 22.20 |
| G11 (KONIG) | TXT 2 FUNCTION | VS8518 | 18.75 |
| G11 (KONIG) | NON TXT | VS8263 | 21.50 |
| G11 31 | BUTTON 691-17181 | (PHILIPS) US | 27.00 |
| KT3/30 (KONIG) | NON TXT | IR8331 | 15.85 |
| KT3/30 (KONIG) | TEXT | IR8420 | 17.90 |
| KT3/30/35/40 | RC5 | | 25.00 |

REPAIR KITS - FOIL/BUTTONS/INST.

| | | |
|---------|--------------|------|
| KT3/K30 | WITHOUT TEXT | 8.95 |
| KT3/K30 | WITH TEXT | 8.95 |

| | |
|-----------------------|-------|
| REMOTE CONTROL TESTER | 29.94 |
|-----------------------|-------|

ORDERS FROM GOVERNMENT ESTABLISHMENTS, SCHOOLS, ETC. WELCOME ON REQUISITION.

VIDEO BELT KITS

| | | | |
|---------|-----------|------------------|------|
| VKIT 1 | AKAI | 9300/9500/9800 | 3.50 |
| | JVC | HR3300/3320/3360 | |
| | TCE | 8903/3V00/16/22 | |
| VKIT 2 | PANASONIC | NV7000/7200 | 3.00 |
| VKIT 3 | SONY | SLC5/7 | 3.75 |
| VKIT 4 | SONY | SL8000/8500/8600 | 4.50 |
| VKIT 5 | SONY | SL3000UB | 4.00 |
| VKIT 6 | PANASONIC | NV3000B | 3.00 |
| VKIT 7 | SANYO | 9300P | 4.25 |
| VKIT 8 | PANASONIC | NV2000B | 3.75 |
| VKIT 9 | PANASONIC | NV8600/8610/V011 | 4.42 |
| VKIT 10 | TOSHIBA | V8600 | 3.00 |
| VKIT 11 | SHARP | VC7300 | 3.50 |
| VKIT 12 | SHARP | VCE300/6600 | 4.00 |
| VKIT 13 | SANYO | VTC5000 | 1.95 |
| VKIT 14 | SANYO | VTC5300 | 2.50 |
| VKIT 15 | JVC | HR7650-3V31 | 2.50 |
| VKIT 16 | HITACHI | 5000 | 2.25 |
| VKIT 17 | SHARP | 8300 | 1.76 |
| VKIT 18 | SHARP | 9300 | 1.47 |
| VKIT 19 | HITACHI | VT8000 | 1.12 |
| VKIT 20 | HITACHI | VT11/33 | 2.15 |
| VKIT 21 | HITACHI | 9500 | 1.12 |
| VKIT 22 | SONY | SLC6 | 3.75 |
| VKIT 23 | SANYO | 5500 | 1.95 |
| VKIT 24 | PANASONIC | NV300/333 | 1.75 |
| VKIT 25 | TOSHIBA | V7540 | 1.90 |
| VKIT 26 | JVC | HR7000 | 96p |
| VKIT 27 | THORN | 3V29/HR7200 | 1.95 |
| VKIT 28 | AMSTRAD | 7000 | 2.25 |
| VKIT 29 | PANASONIC | NV777 | 1.80 |
| VKIT 30 | SONY | T9 | 2.20 |
| VKIT 31 | TOSHIBA | 9600 | 1.20 |

VIDEO SPARES

VIDEO TAPE

★ "DOWN IN PRICE" ★

SKC

| | |
|--------|--------|
| E60 | 2.00 |
| E120 | 2.30 |
| → E180 | 2.45 ← |
| E240 | 3.45 |
| → L750 | 2.70 ← |

SCOTCH

| | |
|--------|--------|
| E30 | 2.90 |
| E60 | 3.05 |
| E120 | 2.89 |
| → E180 | 3.50 ← |
| → L750 | 3.65 ← |
| VCC360 | 6.59 |
| VCC480 | 7.50 |

SUNDRIES

| | |
|-----------------------------|-------|
| VHS DRUM MOTOR | 25.50 |
| VHS CAPSTAN MOTOR | 25.50 |
| SANYO REEL MOTOR (5000) | 12.95 |
| SHARP REEL MOTOR | 19.50 |
| VHS (Gen. Purp.) THORN/JVC | 5.95 |
| TAKE UP CLUTCH ASSY. | |
| SHARP TAKE UP IDLER | |
| 0005/GEZZ | 2.97 |
| 0006/GEZZ | |
| SANYO REEL DRIVE PULLEY | 6.95 |
| HITACHI F/F IDLER VT11E/33E | 3.91 |

WE HAVE A LARGER RANGE LISTED UNDER SPECIFIC MANUFACTURERS IN CATALOGUE FOR THORN, SONY, HITACHI, FIDELITY, NATIONAL PANASONIC, PHILIPS.

VIDEO HEADS

★ NEW HEADS - SOME PRICES DOWN ★

| | |
|---|-------|
| 3H55V AKAI/FERGUSON/JVC | 21.95 |
| 3H55N (4H55) NATIONAL PANASONIC/ORION | 21.95 |
| PS3BS SONY C5/6/7 | 23.95 |
| PS3B2S SONY C20/24/30 SL8000 | 25.00 |
| PS3B3S SONY DSR 21/38/59R | 34.95 |
| SONY (GENUINE) 8000VB | 49.39 |
| SONY (GENUINE) SLC9 | 49.39 |
| SONY (GENUINE) SLC5,6,7 | 49.39 |
| 5HSS (SP) SHARP 9300-9700 | 26.95 |
| SHARP (GENUINE) 3300/9700 (While stocks last) | 56.00 |
| P53BT TOSHIBA 9600 | 30.00 |
| TOSHIBA 9600 UPPER ASSY. ONLY | 14.50 |
| 3H55H HITACHI 4000/5000/5500 | 25.50 |
| 3H55HA HITACHI 9300/4001 | 25.50 |
| HITACHI H1V1/VT800E/9300/9500 | 35.62 |
| HITACHI VT33E/GEC4004 | 35.62 |
| HITACHI VT11/GEC4100 | 35.62 |
| SANYO 9300/9455/9500 | 53.00 |
| SANYO 5000/5300/5400 | 58.00 |
| PHILIPS V2000 and V2023 | 64.00 |
| PHILIPS 1700 | 71.00 |

REFURBISHED HEADS (Exchange)

| | |
|-------------------------------------|-------|
| THORN NEW LIFE (Most VHS types) | 22.95 |
| THORN NEW LIFE (National Panasonic) | 24.95 |

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 | 29 | 3.9 | 52p |
| AKAI | 26 | 20 | 3.9 | 50p |
| JVC | 39.3 | 32.8 | 3.9 | 56p |
| JVC | 33 | 23.9 | 4 | 56p |
| NATPAN | 31.2 | 25 | 3.1 | 56p |

VIDEO PINCH ROLLERS

| PANASONIC | NV7000 | 4.35 |
|-----------|---------------------------------|------|
| SANYO | VTC900/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 | TCE GEN | 4.35 |

MERRY CHRISTMAS



Video Care

| | |
|-------------------------|-------|
| Universal Copy Kit | 7.50 |
| Head Cleaner | 90 |
| Beta Eccentricity Gauge | 55.00 |
| Chamois Sticks | 25 |

Video Lamps

| | |
|---------------------|------|
| Nat. Pan. Bulb VHS | 1.30 |
| General Purpose VHS | 1.41 |
| 3V23 with plug VHS | 1.95 |

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|---|---------------------------------|-------|
| GG1 | CHALLENGER PANEL BKII | 27.95 |
| A75 | SHORROCK ACORN 75 PANEL | 32.50 |
| B1 | EUROBELL (No. S.A.B.)* | 21.00 |
| B2 | EUROBELL (with S.A.B.)* | 26.95 |
| BV | 6V BATTERY FOR EUROBELL | 3.75 |
| *Price includes Multi Adaptor to use with "C" type bell boxes | | |
| T1 | 12V BELL (Tan) | 12.95 |
| B5 | 'C' TYPE Polyprop. Boxes (comp) | 4.55 |
| B6 | 'C' TYPE Polycarb. Boxes (comp) | 7.80 |
| B12 | 'C' TYPE DUMMY COVER (no back) | 3.25 |
| B13 | 'C' TYPE Translucent | 7.80 |

INFRA RED/SECURITY LIGHTS

| | | | |
|-------|---|--------|-------|
| 817S | SHORROCK | P.I.R. | 22.50 |
| 815S | SHORROCK | P.I.R. | 41.50 |
| 817SH | SHORROCK | P.I.R. | 24.15 |
| 815SH | SHORROCK | P.I.R. | 43.57 |
| 01 | ORION | P.I.R. | 24.00 |
| 04 | ORION EXTERNAL | P.I.R. | 48.00 |
| 05 | ORION EXTERNAL with built in Floodlight | | 60.00 |
| SL5 | HALOGEN FLOOD with Lamp | | 17.74 |
| SL5R | SPARE LAMPS SL5 | | 4.50 |
| SL8 | INFIRASCAN EXTERNAL | P.I.R. | 62.94 |
| ST | TASLEY AUTO LANTERN | | 27.00 |

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| | | |
|-----|------|-------|
| 12V | 1.2A | 7.23 |
| 12V | 2.6A | 7.87 |
| 12V | 6A | 10.73 |
| 12V | 1.9A | 7.77 |

S.A.B. MODULES

| | |
|------------------|-------|
| SHORROCK S.A.B. | 8.76 |
| SHORROCK DE LUXE | 11.49 |

PANIC BUTTONS

| | |
|-------|------|
| STND. | 2.88 |
| BRASS | 3.24 |

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- Includes:*
- 2 Zone Panel with connection diagram ★
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 - Outside Bell Box with Bell ★
 - Inside Multitone Sounder ★
 - Roll 6 core cable ★
 - 2x Infra Red Detectors ★
 - 5 Pairs Window Contacts ★
 - Panic Button ★
 - Buzzer ★
 - Tamper Switch ★

JUST ASK!!

SOUNDERS/SIRENS

| | | | |
|------|--------------------------|---------|-------|
| S2 | 712 EXTERNAL SIREN | (116db) | 5.75 |
| S4 | 1010/2010 EXTERNAL SIREN | (116db) | 5.96 |
| S4 | 1010/2010 EXTERNAL SIREN | (116db) | 5.96 |
| S22 | DYNABLAST | (127db) | 18.14 |
| S13 | SOUND BOMB 1 | (104db) | 3.37 |
| S14 | SOUND BOMB 2 | (111db) | 5.17 |
| S15 | SOUND BOMB 3 MULTITONE | | 4.50 |
| S16 | P228 | (105db) | 4.61 |
| S17 | MIKRO | (110db) | 5.28 |
| S18 | 362 PIEZO | (110db) | 7.80 |
| | 12V MUSICAL BUZZER | | 1.56 |
| M801 | 722 BUZZER | | 0.60 |
| 802 | PMB27 BUZZER | | 0.70 |

SUNDRIES

| | | | |
|-----------------------------|-----------------------------------|------|-------|
| XENON FLASHERS | | | |
| XE1 | 12 PCL 128 Red/Amber/Blue | | 6.75 |
| XE3 | LOW PROFILE 121PCL Red/Amber/Blue | | 6.90 |
| TAMPER SWITCHES 2.5" | | | |
| | | | 0.60 |
| SELF CONTAINED ALARM | | | |
| | | | 25.00 |
| CONTACTS | | | |
| C10 | 5 TERM FLUSH | | 0.56 |
| C11 | 4 WIRE FLUSH | | 0.62 |
| C12 | 5 TERM SURFACE | | 0.59 |
| C13 | 4 WIRE SURFACE SLIMFIT | | 0.62 |
| C6 | ROLLER SHUTTER CONTACTS | | 6.10 |
| C9 | ROLLER SHUTTER CONTACTS PLASTIC | | 2.28 |
| PRESSURE MATS | | | |
| PM1 | STAIR MAT | 1.20 | |
| PM2 | STANDARD MAT | 1.34 | |

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 ANTEX
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| Phone Ext. Kit | 7.50 |
| Cable Ext. Kit | 5.95 |
| Ext. Socket Surface | 1.68 |
| Ext. Socket Flush | 1.75 |
| Cable Tidy | 0.99 |
| 5m Ext. Lead | 2.95 |
| 3m Ext. Lead | 2.23 |
| Dual Adaptor | 2.50 |

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| AA140 9p | BD453 31p | BR122 14p | TIP125 65p | | PCF219 62p | CA-3031 250p | LA-4547 230p | STK-459 740p | TDA-2028 170p | 2SC-945 40p | ULN-2008 69p |
| AA141 9p | BD454 31p | BR123 14p | TIP126 65p | | PCF220 62p | CA-3032 250p | LA-4548 230p | STK-460 740p | TDA-2029 170p | 2SC-945 40p | ULN-2009 69p |
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| AA143 9p | BD456 31p | BR125 14p | TIP128 65p | | PCF222 62p | CA-3034 250p | LA-4550 230p | STK-462 740p | TDA-2031 170p | 2SC-945 40p | ULN-2011 69p |
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| AA160 9p | BD473 31p | BR142 14p | TIP145 65p | | PCF239 62p | CA-3051 250p | LA-4567 230p | STK-479 740p | TDA-2048 170p | 2SC-945 40p | ULN-2028 69p |
| AA161 9p | BD474 31p | BR143 14p | TIP146 65p | | PCF240 62p | CA-3052 250p | LA-4568 230p | STK-480 740p | TDA-2049 170p | 2SC-945 40p | ULN-2029 69p |
| AA162 9p | BD475 31p | BR144 14p | TIP147 65p | | PCF241 62p | CA-3053 250p | LA-4569 230p | STK-481 740p | TDA-2050 170p | 2SC-945 40p | ULN-2030 69p |
| AA163 9p | BD476 31p | BR145 14p | TIP148 65p | | PCF242 62p | CA-3054 250p | LA-4570 230p | STK-482 740p | TDA-2051 170p | 2SC-945 40p | ULN-2031 69p |
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| AA169 9p | BD482 31p | BR151 14p | TIP154 65p | | PCF248 62p | CA-3060 250p | LA-4576 230p | STK-488 740p | TDA-2057 170p | 2SC-945 40p | ULN-2037 69p |
| AA170 9p | BD483 31p | BR152 14p | TIP155 65p | | PCF249 62p | CA-3061 250p | LA-4577 230p | STK-489 740p | TDA-2058 170p | 2SC-945 40p | ULN-2038 69p |
| AA171 9p | BD484 31p | BR153 14p | TIP156 65p | | PCF250 62p | CA-3062 250p | LA-4578 230p | STK-490 740p | TDA-2059 170p | 2SC-945 40p | ULN-2039 69p |
| AA172 9p | BD485 31p | BR154 14p | TIP157 65p | | PCF251 62p | CA-3063 250p | LA-4579 230p | STK-491 740p | TDA-2060 170p | 2SC-945 40p | ULN-2040 69p |
| AA173 9p | BD486 31p | BR155 14p | TIP158 65p | | PCF252 62p | CA-3064 250p | LA-4580 230p | STK-492 740p | TDA-2061 170p | 2SC-945 40p | ULN-2041 69p |
| AA174 9p | BD487 31p | BR156 14p | TIP159 65p | | PCF253 62p | CA-3065 250p | LA-4581 230p | STK-493 740p | TDA-2062 170p | 2SC-945 40p | ULN-2042 69p |
| AA175 9p | BD488 31p | BR157 14p | TIP160 65p | | PCF254 62p | CA-3066 250p | LA-4582 230p | STK-494 740p | TDA-2063 170p | 2SC-945 40p | ULN-2043 69p |
| AA176 9p | BD489 31p | BR158 14p | TIP161 65p | | PCF255 62p | CA-3067 250p | LA-4583 230p | STK-495 740p | TDA-2064 170p | 2SC-945 40p | ULN-2044 69p |
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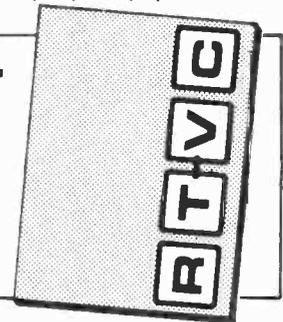
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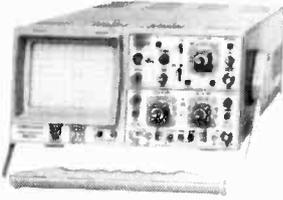
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 - Trigger DC-40MHz AC, DC, HF, LF, (TV Frame)
 - Active TV Sinc. Sep.
 - Invert both channels
 - Variable hold-off 10:1
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 - Plus many more features

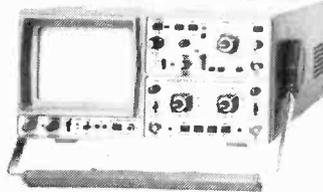
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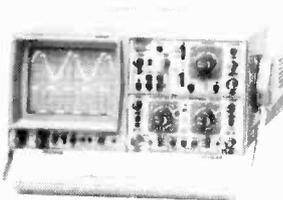


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- Bandwidth DC-20MHz
 - Sens. Ch1, Ch2: 1mV/cm
 - Delay Line
 - Time Base 1.25s/cm - 10ns/cm
 - Delayed Sweep 100ns - 0.1s
 - Trigger DC-50MHz AC, DC, HF, LF, (TV Frame)
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 - Calibrator
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 - Sens. Ch1, Ch2: 2mV/cm
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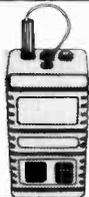
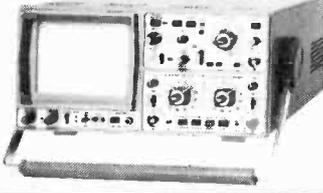
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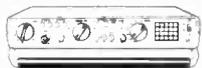
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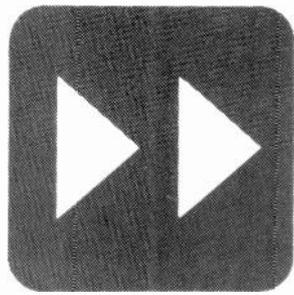


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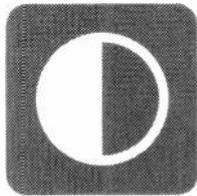
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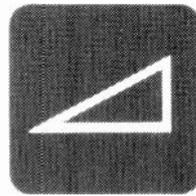
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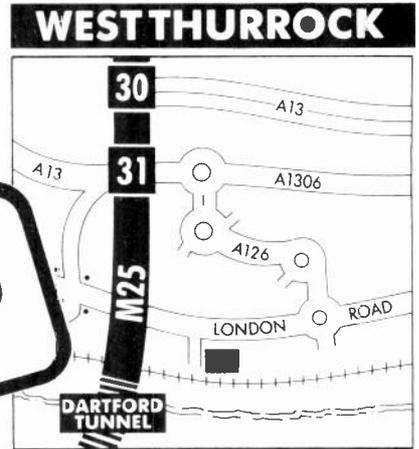
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| 3HSS(4N)..... | £46.50 |
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| 3HSS(4NB)..... | £54.60 |
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| 3HSS(V)..... | £27.95 |
| Fits model numbers: 3V00, 3V16, 3V22, 3V29, 3V30, 3V31, 3V35, 3V36, 3V38, 3V39, HR3300, HR3330, HR3360, HR7200, HR7300, HRD120. | |
| Sharp | |
| 3HSS(SP)..... | £39.90 |
| Fits model numbers: VC9100, VC9300, VC9500, VC9700, VC381, VC8381, VC383, VC386, VC388, VC482. | |
| Toshiba | |
| PS3B(T)..... | £37.95 |
| Fits model numbers: V9600, V31B, V33B. | |
| Hitachi | |
| 3HSS(H)..... | £28.50 |
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| Sony | |
| PS3B(S)..... | £29.90 |
| Fits model numbers: SLC5, SLC6, SLC7, SL3000 also various NEC models. | |
| PS4B(2S)..... | £34.50 |
| Fits model numbers: SLC20, SLC30, SLC40, SLC1. | |
| PS5B(3S)..... | £44.25 |
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| Amstrad/Saisho | |
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| NV366..... | £84.50 |
| NV688, NV777, NV788..... | £54.50 |
| NV730..... | £57.50 |
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| Ferguson | |
| 3V00, 3V16, 3V22..... | £49.50 |
| 3V29, 3V30..... | £49.50 |
| 3V32..... | £54.60 |
| 3V35, 3V36, 3V38, 3V39..... | £49.50 |
| Sharp | |
| VC7300, VC7700, VC7750..... | £86.40 |
| VC8300..... | £86.40 |
| VC9300, VC9500, VC9700..... | £61.10 |
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| VT6500, VT8000, VT8300..... | £34.50 |
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| VT9300, VT9500, VT9700..... | £34.50 |
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| VT17E, VT19E..... | £54.60 |
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| NV7000, NV7200..... | £6.50 |
| NV333, NV366..... | £6.50 |
| NV370, NV830, NV850..... | £2.80 |
| NV688..... | £6.50 |
| NV777, NV788..... | £4.70 |
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| NV730..... | £1.90 |
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| NV870, NV810..... | £2.80 |
| Ferguson | |
| 3V00, 3V16, 3V22..... | £6.50 |
| 3V23..... | £3.90 |
| 3V29, 3V30..... | £4.90 |
| 3V35, 3V36, 3V38, 3V39..... | £2.90 |
| Sanyo | |
| VTC5000, VTC5150..... | £1.99 |
| VTC5300, VTC5400..... | £4.50 |
| VTC9300..... | £6.50 |
| Sony | |
| SLC5, SLC7..... | £6.50 |
| SLC6..... | £7.50 |
| SL8000, SL8080..... | £6.50 |
| Sharp | |
| VC7300, VC7700, VC7750..... | £6.50 |
| VC8300..... | £6.50 |
| VC9100, VC9300, VC9500..... | £6.50 |
| VC381, VC383, VC386..... | £6.50 |
| Hitachi | |
| VT5000, VT5500..... | £6.50 |
| VT8000, VT8300, VT8500..... | £2.90 |
| VT9300, VT9500, VT9700..... | £3.30 |
| VT11E, VT14E, VT17E, VT19..... | £6.50 |
| VT33E..... | £6.50 |
| Akai | |
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| VS2, VS3, VS4, VS5..... | £4.90 |
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| NV333, NV366..... | £3.00 |
| NV8600, NV8610..... | £3.95 |
| Ferguson | |
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| 3V23..... | £2.90 |
| 3V29, 3V30..... | £3.50 |
| 3V35, 3V36, 3V38, 3V39..... | £2.90 |
| Sanyo | |
| VTC5000, VTC5150..... | £1.00 |
| VTC5300, VTC5400..... | £2.50 |
| VTC9300..... | £4.25 |
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| VC381, VC383, VC386..... | £2.50 |
| Hitachi | |
| VT5000, VT5500..... | £4.50 |
| VT8000, VT8300, VT8500..... | £1.50 |
| VT9300, VT9500, VT9700..... | £1.50 |
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| Amstrad/Saisho etc..... | £18.20 |
| Panasonic NV333, NV366..... | £16.80 |
| Sanyo VTC5000, 5300, 5400..... | £9.90 |
| Panasonic NV7000..... | £19.80 |

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| Sharp VC7300, VC7700..... | £26.40 |
| Sharp VC8300..... | £26.40 |
| Hitachi VT5000..... | £24.75 |

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| Sharp VC7300, VC7700..... | £29.30 |
| Ferguson/JVC 3V00, 3V16, 3V22..... | £29.90 |
| Ferguson/JVC 3V29, 3V30..... | £29.60 |
| Ferguson/JVC 3V35, 3V36, etc..... | £25.77 |
| Hitachi VT5000..... | £24.75 |
| Hitachi VT8000, 8500, etc..... | £34.50 |
| Hitachi VT9300, 9500, etc..... | £34.50 |
| Hitachi VT11, VT14, VT17..... | £24.50 |
| Sony C5, C7..... | £29.90 |

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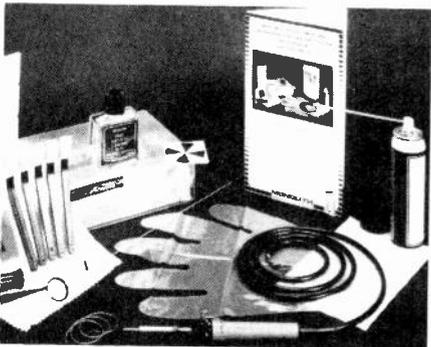
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| VTC5000, VTC5150, VTC5300, VTC5400..... | £4.95 |
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| Hitachi | |
| VT5000, VT5500..... | £5.95 |
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| VT33E..... | £5.95 |
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9. 5- octal bases for relays or valves
10. 12- glass reed switches
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39. 2- mains operated relays 3 x 8 amp changeovers
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45. 4- 200 ohm earpiece
46. 1- Mullard Thyristor trigger module
47. 10- assorted knobs 1/4" spindles
48. 5- different thermostats, mainly bi-metal
49. 1- Magnetic brake - stops rotation instantly
50. 1- low pressure 3 level switch can be mouth operated
51. 2- 25 watt pots 8 ohm
52. 2- 25 watt pots 1000 ohm
53. 4- wire wound pots - 18, 33, 50 and 100 ohm your choice
54. 4- 3 watt wire wound pots 50 ohm
55. 1- time reminder adjustable 1-60 mins clockwork
56. 7- 5.5 amp stud rectifiers 400v
57. 1- mains shaped pole motor 3/4" stack - 1/4 shaft
58. 2- 5" all fan blades fit 1/4" shaft
59. 2- 3" plastic fan blades fit 1/4" shaft
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62. 2- mains motors with gear box 16 rpm
63. 4- 11 pin moulded bases for relays
64. 5- B7G valve bases
65. 4- skirted B9A valve bases
66. 1- thermostat for fridge
67. 1- motorised stud switch (s.h.)
68. 1- 2 1/2 hours delay switch
69. 1- 6v mains power supply unit
70. 1- 4 1/2 mains power supply unit
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74. 10- slider type volume controls
75. 1- heating pad 200 watts mains
76. 1- 1W amplifier Mullard 1172
77. 1- wall mounting thermostat 24V
78. 1- leak effect extension 5" speaker cabinet
79. 2- p.c. boards with 2 amp full wave and 17 other recs
80. 12- mtrs twin screened flex white p.v.c. outer
81. 2- plastic boxes with windows, ideal for interrupted beam switch
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83. 241. 1- car door speaker (very flat) 6 1/2" 15 ohm made for Radiomobile
84. 2- speakers 6" x 4" 16 ohm 5 watt made for Radiomobile
85. 2- mains transformers 9V 1/2A secondary split primary so ok also for 115V
86. 267. 1- mains transformers 15V 1A secondary p.c.b. mounting
87. 330. 2- 6v 0.6v mains transformer 3A p.c.b. mounting
88. 350. 40- double pole leaf switches
89. 365. 1- 7uf 660v 50Hz metal cased condenser
90. 453. 2- 2 1/4in. 60ohm loudspeakers
91. 454. 2- 2 1/4in. 80ohm loudspeakers
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93. 464. 2- packets resin filler/scaler with cures
94. 465. 3- 5A round 3 pin plugs will fit item 193
95. 466. 4- 7 segment l.e.d. displays
96. 470. 4- pc boards for stripping, lots of valuable parts
97. 473. 1- 5" 4ohm speaker with built in tweeter Radio mobil
98. 1- 3A double pole magnetic trip, saves repairing fuses
99. 480. 4- 1000uf 25V axial electrolytic capacitors

TELEPHONE BITS

- Master socket (has surge arrester - ringing condenser etc) and takes B.T plug £3.95
- Extension socket £2.95
- Dual adaptors (2 from one socket) £3.95
- Cord terminating with B.T. plug 3 metres £1
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COMPACT FLOPPY DISC DRIVE EME-101

The EME-101 drives a 3" disc of the new standard which despite its small size provides a capacity of 500k per disc, which is equivalent to the 5 1/4" disc. We supply the Operators Manual and other information showing how to use this with popular computers: BBC, Spectrum, Amstrad etc. All a special spin price of £27.50 including post and VAT. Data available separately £2, refundable if you purchase the drive.

TANGENTIAL HEATERS

We again have very good stocks of these quiet running instant heat units. They require only a simple case, or could easily be fitted into the bottom of a kitchen unit or book case etc. At present we have stocks of 1.2kw, 2kw, 2.5kw and 3kw. Prices are £5 each for the first 3, and £6.95 for the 3k. Add post £1.50 per heater if not collecting.

CONTROL SWITCH enabling full heat, half heat or cold blow, with connection diagram. 50p for 2kw, 75p for 3kw.

AXIAL FANS mains operated, famous West German FAPST company, all metal construction for reliability even running hot. Size approx 4 1/2 x 4 1/2 x 1 1/2 especially recommended for sun beds, but they are quiet running so suitable for office, kitchen, bathroom etc. Brand new offered at about half price proper ramley £8. Our ref 8P8 Good stocks, discount for quantities over 12.

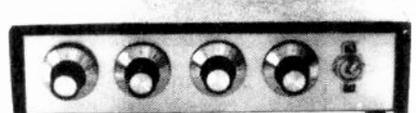
SPEAKER EXTENSION CABLE Twin 7mm conductors so you can have long runs with min sound loss and for telephone extensions or burglar alarms, bells, intercoms etc. 250m coil only £3 - £1 post. Ref 3P28

TORROIDAL ISOLATION TRANSFORMER 400 watts 230 volts in £30 volts out. Supplementary 10 volt winding allows voltage adjustments. Toroidal construction makes it most compact. Regular price about £40 Our price only £18 + £3 post.

VENNER TIME SWITCH Mains operated with 20 amp switch. One on and one off per 24 hrs, repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95 without case, metal case - £2.95, adaptor kit to convert this into a normal 24hr. time switch but with the added advantage of up to 12 on/off per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

12 volt MOTOR BY SMITHS Made for use in cars, etc. these are very powerful and easily reversible. Size 3 1/2" long by 3" dia. They have a good length of 1/4" spindle - 1 1/10 hp £3.45 1 1/8 hp £5.75, 1 1/6 hp £7.50

SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by 1/4" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

THIS MONTHS SNIP 5" VDU OR MONITOR ideal to work with computer or video camera uses Philips black and white tube ref M24/305W. VDU is brand new and has a time bases and EHT circuitry. Requires only a 16v dc supply to set it going. Its made up in a lagged metal frame work but has open sides so should be cased. The VDU comes complete with circuit diagram and has our six months guarantee. Offered at a lot less than some firms are asking for the tube alone, only £16 plus £5 post.

LOW VOLTAGE RELAY OMRON 3.5v coil, plug in di sockets. 5a c/o contacts Brand new offered at a silly price 2 for £1 ref B0548.

POLARISED RELAY depending upon its direction dc current as low 4 Ma makes this open circuit, so it could be used to protect delicate instruments or as an earth leakage, or reverse voltage trip etc 2 for £1 ref B0549.

24Hr TIME SWITCH. Beautifully made with West German precision. Just under 4" square with 15 amp c/o contacts can be set anywhere around 24 hr dial to the nearest 15 mins also with an override switch. Price £8 each. Ref 8P6 but hurry we have only 300.

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POCKET MULTITESTER 4K ohms per volt - 11 ranges AC/DC volts to 1000 - DC current and ohms - nicely packaged - offered 33 1/3 discount only £7. Our ref 7P2.

TELEPHONE LEAD 3 mtrs long terminating one end with new BT, flat plug and the other end with 4 correctly coloured coded wires to fit to phone or appliance. Replaces the lead on old phone making it suitable for new BT socket. Price £1 ref B0552 or 3 for £2 ref 2P164.

POWERFUL IONISER KIT Generates approx. 10 times more IONS than the ETI and similar c. units. Will refresh your home, office, shop, work room, etc. Makes you feel better and work harder. A complete mains operated kit, case included. £11.50 + £2.00 P&P.

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DEPT. TV, 250 PORTLAND ROAD, HOVE, BRIGHTON, SUSSEX BN3 5QT

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NEW ITEMS

Some of the many described in our current list which you will receive with your parcel.

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- 2P120 - 1 combined clockwork switch and thermostat for boiler control.
- 2P122 - 1 30a rotary switch, surface mounting with pointer knob.
- 2P123 - 1 25a rotary switch, surface mounting, cover engraved, high, medium, low and off.
- 2P124 - 1 28kv .001mfd block condenser.
- 2P127 - 1 30a bridge rectifier assembly on heat sinks.
- 2P129 - 1 10rpm motor 115v so supplied with adaptor for 230v.
- 2P131 - 1 Crouzet motor 230v fits the Crouzet gearbox.
- 2P132 - 1 cooling heat-sink for fire warning or protection.
- 2P133 - 1 Crouzet motor 230v, Crouzet ref C50.
- 2P134 - 1 9v 500mA psu, plugs into 13a socket.
- 2P135 - 10m 10 conductor intercom cable.
- 2P136 - 1 2 1/2kw element made for tangential blowers.
- 2P137 - 1 Thermo couple, stainless steel tipped for measuring internal heat.
- 2P138 - 1 Nicad transformer 20v-0-20v 14 upright mounting.
- 2P141 - 1 rechargeable battery D size (4 AH) solder lead ended.
- 2P142 - 10m 4 par intercom cable white PVC outer.
- 2P144 - 1 mains operated relay with 4 x 8a c/o contacts.
- 2P145 - 1 10,000 uf 70v dc smoothing capacitor.
- 2P146 - 1 7,800 uf 150v dc smoothing capacitor.
- 2P147 - 1 10w 100 ohm line matching transformer.
- 2P148 - 1 Technical information on 3" FDD refundable if you buy fdd.
- 2P149 - 5 diff battery operated model motors.
- 2P150 - 1 PSU chassis with all components for 24v 2A dc unwired.
- 2P151 - 1 Metal box 1 1/2 x 1 1/4 x 4 with lid add £2.00 post.
- 2P152 - 1 Motor start capacitor 80uf 250v.
- 2P153 - 1 Two station intercom unused but line reject.
- 2P154a - 1 Nicad charger - plug into 13a socket 5.2v, 7UA output
- 2P154b - 1 Nicad charger - plug into 13a socket 6v, 9VA output
- 2P155 - 1 Mains transformer giving 16, 17, 18 & 20V 60W
- 2P158 - 1 Oven thermostat with lamp, calibrated knob.
- 2P159 - 1 9v 500ma cased with mains lead and output lead.
- 2P160 - 1 13a plug adaptor fused takes 3 x 13a plugs.
- 2P161 - 1 16" diagonal slide cutters.
- 2P162 - 1 Stereo Matrix PCB mounting de-emphasis K35
- 2P163 - 1 AC Working capacitor 12uf 660V AC or 1500v dc.
- 2P163a - 1 AC Working capacitor 14uf 350v AC or 800v dc.
- 2P164 - 3 Phone leads 3 mtrs long tags one end BT plug other end.

£3 POUNDERS

- 3P7 - 1 DC voltage, doubler or halver for 12v to 24v, 12 to 6v, 24 to 12v.
- 3P8 - 1 24hr time switch Sangamo, new condition, guaranteed 1 year.
- 3P9 - 1 12v 500mA psu plugs in 13a socket.
- 3P10 - 1 Mains transformer 50v 2A with 6.3 pilot light winding, upright mounting, fully shrouded.
- 3P13 - 1 Noise filter to fit in mains lead of appliance up to 25a
- 3P15 - 1 waterproof case will take 200 watt transformer.
- 3P16 - 1 signal box, 3 lamps on face plate of metal box size 5 1/2 x 3 1/2
- 3P17 - 1 choke and starter to work 8" fluorescent tube at 125w.
- 3P18 - 1 22v 3a mains transformer with bridge rect fitted on top panel.
- 3P20 - 1 0.5a ammeter 3 1/2 ac/dc ex equipment.
- 3P21 - 1 power factor correction condenser 35uf 350ac.
- 3P22 - 1 200va - auto transformer 230 to 115v toroidal encapsulated £1.50 post.
- 3P23 - 1 36v-0-36v tapped 20v-0-20v 100va.
- 3P24 - 1 3" floppy disc for Amstrad etc.
- 3P25 - 1 7" Electricians pliers.

£4 POUNDERS

- 4P1 - 1 Car Radio aerial.
- 4P12 - 50m low loss co-ax 75 ohm + £1 post.
- 4P13 - 3 Hertsman line and set switches 15 amp.
- 4P14 - 1 150w mains transformer "C" core 43v 3.5A secondary.
- 4P15 - 1 powerful motor 2" stack fitted with gearbox final speed 60 rpm, mains operated, could operate door opener etc.
- 4P17 - 1 Uniselector 3 pole 25w, 50v coil standard size.
- 4P18 - 1 Volt meter with digital display (DIGIVISOR).
- 4P19 - 1 12v car motor will fit to gearbox 4P20.
- 4P20 - 1 Gear train giving speed reduction.

£5 POUNDERS

- 5P86 - 1 Transformer upright mounting 230/240v primary 2 x 100 1A secondary.
- 5P88 - 1 transformer in waterproof metal box 24v 5a, add £2 post.
- 5P89 - 1 4 bank heating element each 2kw ideal convector heater.
- 5P90 - 1 18" long tangential blower with motor at one end.
- 5P91 - 1 14" blower, motor in middle.
- 5P92 - 10m Audio co-ax double screened 75ohm super low loss for TV.
- 5P93 - 1 6" alarm bell 24v dc or ac.
- 5P94 - 1 Current transformer 14v out with 1a dc input.
- 5P95 - 1 Vintage photo cell.
- 5P97 - 1 Impedance matching transformer 0.4-5-8-160 ohm 100 add £1.50 post.
- 5P98a - 1 0-30a ammeter for mounting outside control panel.
- 5P98b - 1 0-100a ammeter for mounting outside control panel.
- 5P99 - 1 Mains operated blower centrifugal output size app 5" x 1 1/2".
- 5P100 - 1 Mains splitter 45a switch 3 x 15a fused circuits.
- 5P101 - 1 Model motor 1 rpm from 6v reversible.

£7 POUNDERS

- 7P1 - 1 Instant heat solder gun - mains with renewable tip and job light.

£8 POUNDERS

- 8P1 - 1 Charger transformer 10a upright mounting 230/240 primary 16v 10a secondary.
- 8P2 - 1 6" underframe alarmbell suitable for a fire alarm or burglar alarm mains operated.
- 8P3 - 1 heat sink big powerful so ideal for power transmitter.
- 8P5 - 1 1/2 hp motor 900 rpm capacitor run.
- 8P6 - 1 24hr time switch - 2 on off 16a c/o contacts 3" x 3" x 1 1/2".
- 8P7 - 1 Silent siren/invisible ray kit.
- 8P8 - 1 Pagot fan 3 1/2 x 3 1/2 x 1 1/2 230v metal bodied.

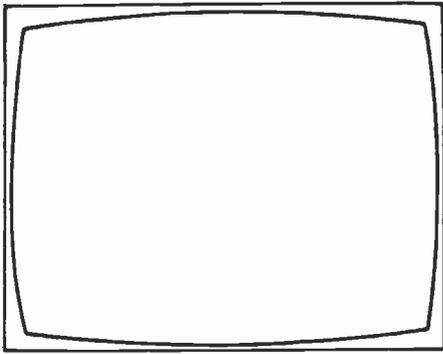
£10 POUNDERS

- 10P13 - 1 reversible motor with gearbox 104rpm Parvalux.
- 10P14 - 1 100a time switch 1 on/off per 24hr extra triggers £1 pair.
- 10P15 - 1 Max demand meter 230 AC mains.
- 10P16 - 1 powerful air mover 2 small type blowers with motor in middle.
- 10P18 - 1 mains operated klaxon.
- 10P19 - 1 12v alarm bell really loud, mains operated, in iron case + £5 post.
- 10P22 - 1 sensitive volt meter relay.
- 10P23 - 1 fruit machine heart 3 fruit wheels each stepper motor operated.
- 10P24 - 1 big panel meter face size 4 3/4 x 2 1/2 200ua movement scaled 1-10.
- 10P26 - 1 "Secretary" phone auto-dialler complete untested sold as such.
- 10P29 - 1 12v engine cooling fan.
- 10P30 - 1 instrument psu on pcb has 4 outputs. 12v/.5v 6a/12v .5v/5v .5a.
- 10P31 - 1 7 day time switch 16a c/o contacts sep switches for each day.
- 10P32 - 1 68 rpm 1/8th hp motor reversible.

£15 POUNDERS

- 15P1 - 1 kit for 115v hi fi amp.
- 15P2 - 1 kit for psu to supply one or two 15P1 amps.
- 15P3 - 1 time switch battery or mains operated - 16a c/o contacts, 7 day programmable has 36hr reserve.

LIGHT CHASER KIT Motor driven switch bank with connection diagram, used in connection with 4 sets of X-neas lights makes a very eye catching display for home, shop or disco, only £5 ref 5P56.



TELEVISION

Servicing set-ups

Steve Beeching's letter on a later page addresses a problem that's been touched on here before, that of making hi-tech servicing financially viable. The servicing trade has been called upon to handle an increasingly wide variety of ever more sophisticated domestic electronic products – in addition to the basic “no-frills” items – in recent years. Indeed the degree of sophistication of some of this equipment is such that the traditional dividing line between consumer and professional products is becoming very blurred. We now have digital TV sets in which all manner of digital extras, such as picture-in-picture displays, can be incorporated. Colour decoder circuitry is tending to become more complex as, to ease the problems of the production lines (it's expensive to stop a modern assembly line to vary a model's specification), multi-standard capability and the ability to generate signals within the set and provide switching for external sources are often built in. That's just one decoder: at least three others will be found in the sets on sale within a couple of years or so – to handle teletext, multiplexed digital dual-standard sound signals, and MAC satellite TV transmissions. There is going to be an increasing disparity between cheapo and top-of-the-range products, though the latter will be available at prices that would have been unthinkable just a few years back, thanks to the vast amount of processing that can be done within a single complex chip of the VLSI variety. The move to market and promote models that would have been considered specialist or professional until recently is all part of another subject that's been discussed in this column before, the tendency for countries with an old-established TV industry to turn to greater value-added products in order to be able to compete with the ability of manufacturers in newly developing economies around the Pacific basin to turn out basic sets at rock-bottom prices. And basic sets at rock-bottom prices doesn't mean rubbish: much the same production technology has to be used wherever a set is produced, so quality and reliability standards remain high.

So the TV screen and cabinet that confront you on the workbench could have behind it anything from a simple tuning/colour signal processing/timebase/power supply arrangement to a digital version with a wide range of extras. Whilst the majority of faults will inevitably continue to relate to the mains, e.h.t. and power-handling sections of a set irrespective of its complexity, we are nevertheless likely to have to face an increasing demand for obscure faults to be traced and put right. You can go only so far with chip changing and logic probing. It could well mean the need to have available an increasing range of specialised and hence expensive test gear.

There's a strange irony in all this. While sets cost the customer remarkably little for the features offered, what can the customer expect when something goes wrong? If it's a simple fault with a simple remedy the customer can expect a relatively modest basic charge. But suppose the fault takes several hours of highly skilled technician's time and calls for the use of expensive, specialist equipment? It could increasingly be the case that whilst a basic set can be serviced for what the public considers an acceptable charge a top-of-the-range set with a weirdo fault will bring forth an astronomic bill that calls into question the viability of bothering with it.

We've talked mainly about TV sets so far. The same problems apply with video equipment of course, only even more so since the product range is much wider – VCRs of varying degrees of sophistication, camcorders and cameras likewise. When it comes to a product that's not and probably never will be a mass-market item, such as a video camera, the potential servicing problems become even greater.

Traditionally the trade has tended to deal with the cost problem by a process of evening out charges. Charge a bit more for the simple faults to cover the cost of having to deal with the occasional “uneconomic” ones. You can't apply this system however when you are dealing with a very wide range of products – DAT machines and compact disc players plus microcomputers and microwave ovens say, in addition to the usual TV/video products – and when, in a large organisation where costs have to be carefully monitored, it's necessary to keep accurate records of the time spent, spares used, etc. (use of computerised control may already be making this essential). Is there an alternative solution?

The one that Steve Beeching has put forward and is actively pursuing is the “specialist cell”. If you need a lot of expensive test gear to handle hi-tech products it's sensible to deal only with such products and leave run-of-the-mill servicing to others. This will quite quickly tend to pay dividends in another way. If you concentrate on servicing a small range, say of specialised cameras, you will soon get to know them pretty well. This means that the time spent per unit and the charges can be kept low. It's certainly a logical way for things to go.

So will the future lie with an increasing number of small, highly specialised service centres to take on the more difficult work? Unless a service department is very large indeed it will be difficult for it to handle economically all the types of work that will be needed in future years. In fact even large service departments, including those of the manufacturers, may find it uneconomic to handle special items that turn up only rarely. It does seem therefore that the trade will have to evolve along the lines of subcontracting out the more specialised work. The traditional service departments will still be required to carry out the more routine operations such as deck cleaning, transistor and fuse replacement and so on. And many of the problems they have to deal with are by no means simple nowadays.

EDITOR

John A. Reddihough

Please note that the telephone numbers below are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 81.

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COVER PHOTO

This month's cover photograph shows video head disc alignment in a Sony SLC6UB VCR (see servicing article on page 102). The dial gauge, whose fixing jig is visible at the top centre, is being used to check the newly fitted disc for eccentricity.

CORRECTIONS

(1) First a correction to a correction – we seem to be unlucky with the part numbers for those Sony fault-finding guides. Having corrected one part no. last month we now find we got two of them mixed up: S-79600001 is the TV and Home Computers book, S-7951001 is the Audio book.

(2) A correction is required to the acknowledgement on page 45 last month (MMDS rebroadcast system article). Bill Evans is the Broadband Services Manager of the Manitoba Telephone System.

Practical Computer Programming

Part 1

Mike Phelan

In this new series we aim to explore the microcomputer's usefulness to the wide range of people engaged in servicing domestic electronic equipment as a hobby or professionally. In other words, the readers of this magazine. In a recent series of articles Chas E. Miller introduced us to word processing and database management packages as an aid to efficiency in running a small servicing business. I myself wrote a series on the micro's workings. This spawned a few more very useful articles on the subject. So much so that the microcomputer has indeed now become very much a part of *Television* magazine's coverage. This present series will approach the subject from what I hope is a new angle, but rather than trying to describe what the intention is let's get on with it!

What are computers for?

What computers are for must be the archetypal 64 million dollar question, to which there is not really any sensible answer. It's a little like asking "what's a piece of paper for?" – a rather silly question.

There are many applications for a microcomputer in a small business, from stock control to doing the accounts, invoicing jobs, keeping fault notes and many other similar tasks. There's a great deal of commercial software available for these jobs, but before going too deeply into this side of things we ought perhaps to go back to square one for the benefit of those readers who've had only limited contact with the microcomputer.

What a computer is

It's difficult to say when the first computer came into being or what distinguished it from other means of mechanical number manipulation, including the humble abacus. It's generally agreed that a computer is a machine that has a means of storing data and also of storing instructions to manipulate the data. If this is so, the first computer must have been Babbage's "difference machine". We needn't concern ourselves with history however – there are plenty of books that cover the period from Blaise Pascal's calculator to the present day.

We now have i.c.s with immense calculating power, and the borderline between the pocket calculator and the computer is ill defined. There are programmable calculators which can carry out a series of operations according to a program (note that the spelling "program" has unfortunately crept into the language in the context of computers: we will reluctantly go along with this). A computer however can be programmed to make decisions and interact with the user via a screen and keyboard: these are some of the differences that set the computer apart from the calculator.

The average microcomputer consists of a "system unit", a keyboard and a monitor. With a small home computer the electronics may be contained in the keyboard unit and a domestic TV set may serve as the monitor. With a "business" machine the system unit will contain the bulk of the electronics, together with any disc drives. The system unit contains a microprocessor i.c. that does most of the work, and some sort of memory in which to store

things (until you switch off). Also required is a more permanent means of storage, usually a magnetic medium such as a cassette tape or a disc. Fig. 1 shows a simple microcomputer block diagram.

What does the thing do?

To answer the question of what the thing does, we start with the microprocessor. Readers who wish to know only about program design and writing can skip this section. No knowledge of binary arithmetic or the workings of the processor is needed to program a computer.

First, a few common misconceptions. Computers are not intelligent and cannot "think". They can carry out only what we've programmed them to do. A computer doesn't manipulate conventional numbers. What it deals with are voltage levels – just two. A digital computer, the type we are discussing, represents numbers by high and low voltage, or logic, levels. These levels are approximately those of the two sides of the supply. Unfortunately, you can represent only two digits with two voltage levels, so numbers must be represented by a numbering system that uses only two digits, zero and one, i.e. a binary form of arithmetic. The decimal system of numbers that we use seems the obvious system to employ, but was an arbitrary choice initially – way back in the mists of time. The binary system seems strange to us, but is the only choice open to a machine that deals with only highs and lows, i.e. ones and zeros. It's convenient to think of a computer as something that manipulates numbers, but what it really deals with is voltage levels used to represent numbers.

The microprocessor

There are about a dozen or so "popular" microprocessor chips, among them the Z80, 6502, 8088, 8086, 80286 and 80386. Home microcomputers tend to use either the Z80 or the 6502/6502A. The processor chip is a rather complicated device that can carry out a number of instructions and is connected to the rest of the computer system by a data bus, an address bus and a few other links. It incorporates a clock (a crystal oscillator) to control the timing of its operation. Fig. 2 shows a basic microprocessor block diagram.

One element of data is termed a byte, which can be any number from zero to 255. In binary form zero is 0000 0000

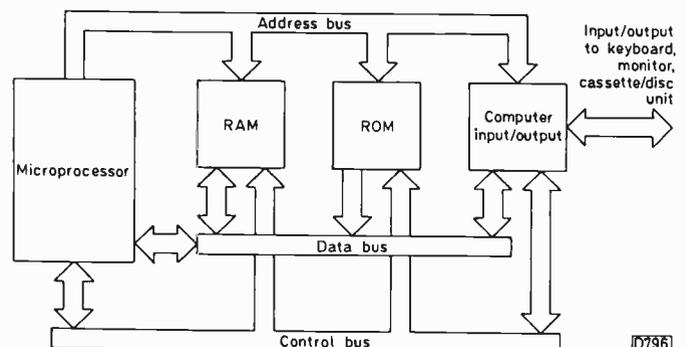


Fig. 1: Simple microcomputer block diagram.

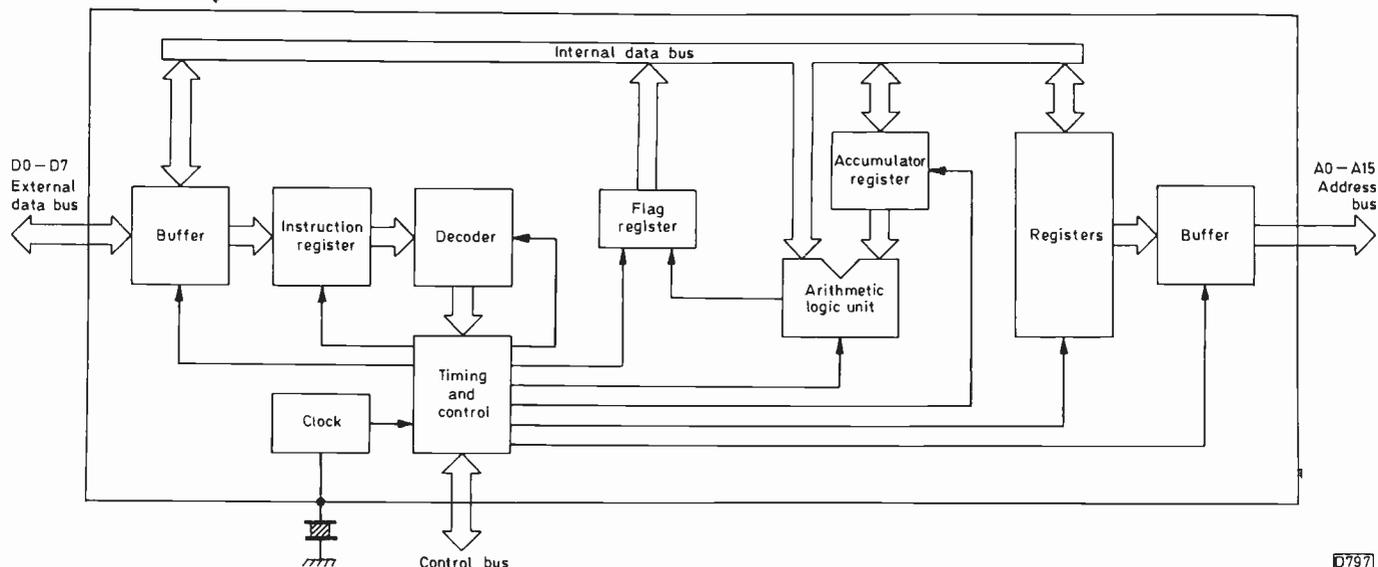


Fig. 2: Basic microprocessor arrangement shown in block diagram form.

and 255 is 1111 1111. Note that we've split the eight bits of the byte into two groups ("nibbles"). This is to make reading easier, although another reason will become apparent shortly. Now to represent eight voltage levels (a collection of zeros and ones) simultaneously we need eight wires or print tracks on a PCB. Thus the data bus has eight connections (D0-D7) to the microprocessor and its associated devices – the memory (RAM) etc. The RAM can be thought of as consisting of lots of spaces each of which can hold a byte of data. Each space has an address – a number that starts at zero and goes up to a number that's less than the maximum that can be represented by the bytes in the address bus.

We call the Z80 and 6502 "8-bit" microprocessors because the data bus has a one byte capacity – eight connections. With these chips the address bus has 16 pins (A0-A15), so the highest figure we can have on the address bus is 1111 1111 1111 1111, which in decimal is 65,536 or 64K for short (1K in computer usage is 1024, not 1000). Why 1024? Because it's a nice round number, 0000 0100 0000 0000 in binary, or to put it another way it's a power of two. The address bus is also connected to the RAM etc.

The microprocessor feeds itself with instructions from the data bus. These instructions are of course binary numbers (machine code) and each type of microprocessor chip has its own unique instruction set. If there are more than 255 instructions, which there usually are, then some must consist of two or more bytes. The instructions are mainly to move bytes between addresses in memory and locations (registers) inside the microprocessor and to carry out limited mathematical and logical operations on them. The computer works on the basis of these seemingly restricted possibilities.

The registers within the microprocessor chip can be thought of as single memory locations. There are usually about ten of them. Some can't be used for general storage as the microprocessor employs them for such things as storing the RAM address of the next instruction to be fetched. In addition, all microprocessor chips have a flag register. The bits of the byte stored in this register are treated separately – they indicate things like whether the result of a calculation was zero or whether it caused an overflow or there was a carry bit left over etc.

When a microprocessor obtains an instruction byte, or

"opcode", it first has to decode this. It then knows whether it will be necessary to fetch any more bytes. For example, if it obtains an opcode that means "load register b with the number from the following address" the microprocessor knows that two more bytes (the address) must be fetched.

Negative numbers

You can also skip the following section if you wish – it's included merely to answer a question which the curious may raise – how is a negative number represented? There are only ones and zeros in binary arithmetic, no minus sign as we are used to having in everyday calculations.

The answer is to employ a system known as "twos complement". We have said that a byte can be used to represent the numbers from zero to 255. There's nothing to prevent us using it to represent any 255 different numbers however – even negative ones. It would be convenient to have as many negative as positive numbers available, so we can choose a range of from -128 to 127. Now any arithmetic required must of course work, which leaves us with only one feasible solution.

Twos complement means that we count from 0 to 127 normally, i.e. in binary terms from 0000 0000 to 0111 1111. 1000 0000 is then used as -128 (instead of 128). The next binary number, 1000 0001, is taken as -127 and so on until 1111 1111 which is -1. A simple check will show that any arithmetic performed on these numbers works. For example:

$$\begin{array}{r} 127 \\ \text{plus } -3 \\ \hline 124 \end{array} \qquad \begin{array}{r} 0111\ 1111 \\ 1111\ 1101 \\ \hline 1\ 0111\ 1100 \end{array}$$

It will be noticed that the result has produced a "carry" bit (the one on the left), but the result is correct without this. The carry bit won't fit into eight bits so we can ignore it (it's actually put into 1 bit of the flag register). To negate a number the bits are complemented (ones changed to zeros and zeros to ones) and 1 is added. It may seem strange but is a very convenient arrangement.

The above example illustrates another point, that subtraction is performed by adding. This is how microprocessors carry out subtraction. Some chips cannot multiply, so successive addition has to be used.

Despite this digression we must stress that a computer can be used and programmed by someone with no knowledge either of its workings or of binary arithmetic.

All the data that comprises a program is stored some-

where in the computer's memory, and must be put there to start with. Somehow the microprocessor must be told where it is and how to start fetching instructions. For this and other exiting revelations, stay tuned!

Fings aint what they used to be

Les Lawry-Johns

I kid you not. Things are getting awkward. Some of the sets that come in now just don't want to be done and were apparently put together with this in mind. "Don't try to mend me" they seem to say, "buy another one". Even old favourites are getting stubborn. Or is it just me? (Chorus: "course it's you".)

Susan's Fidelity CTV14S

Take for example Susan's Fidelity CTV14S – the Mk. II that is, with the ZX3000 chassis.

"It keeps changing channels on its own and will often switch itself off, though the handset is in the other room."

So I ruled out the handset and its battery. I checked here and there on the control panel, changed chips, but still the set would do it. Eventually I phoned Fidelity.

"The amplifier chip IC1 in the screened remote control receiver section could be producing spurious pulses. To check this, cut the track going to pin 2 of the ML923 decoder chip IC2 and wire a 10kΩ resistor from this pin to chassis. If the set no longer changes channels, change the chip in the receiver unit, then restore the link to IC2 and remove the 10kΩ resistor."

So I did the first bit and the set worked fine all day. I phoned Susan and her mother answered. "Is Susan keen on having the remote control handset?" I asked.

"Of course she is" replied her mother.

So I stripped down the receiver unit and replaced the chip, then restored the link between IC1 and IC2 and removed the 10kΩ resistor. The set continued to change channels and switch off without being told to.

Susan came in to find out about her set.

"It's fine without the remote control facility" I told her.

"I never use it anyway" said Susan.

In a flash the track was open-circuit again and the 10kΩ resistor was fitted. She carried the set off and later reported that the picture had never been so good. This made me scratch my head a bit. What had the handset to do with the picture? Never mind.

Another One

Another of these sets has been causing me a real headache of late. It just won't start. When it was brought in the BU426A chopper transistor had gone short-circuit, the 2-2Ω surge limiter resistor R80 had burnt out and the d.c. fuse F2 had gone open-circuit. I fitted a BU508A in place of the BU426A and replaced the other items.

When I switched on all I got was a high d.c. voltage reading at the collector of the chopper transistor and at a couple of other points, but no controlled output from the chopper circuit. So I checked everything in sight and changed the TDA4600 chopper control chip. Still no joy. I now found that there was no start-up voltage at pin 9 of the chip due to an internal short. So I fitted another one. This gave me the start up voltage but nothing much else. I've tried a dozen times and Phil had a go all day on

Saturday, all to no useful end. I'll let you know what it turns out to be – the bloody transformer no doubt. No not the line output transformer. I've got plenty of those in stock and I'd opened the h.t. feed to the line output stage and still got no output from the chopper circuit. I mean the chopper transformer. I don't keep those in stock.

A Thorn 9000 Chassis

Now everyone can repair a set fitted with the Thorn 9000 chassis, can't they? One came in the other day with the report that it failed after a couple of hours. I was a bit busy at the time and jumped at the thick-film over-voltage unit. A new one was fitted in no time. The set then sat there working for four hours. The owner came and collected it. Next day he brought it back again and told H.B. that it had failed after a couple of hours, adding that it came back on immediately.

Now he hadn't told us this the first time, i.e. that the set tripped at erratic intervals. I kept it on with the sound turned up slightly so that I could hear when it tripped. This it duly did. The sound went off and the picture collapsed to the centre for a brief moment before recovering and looking as good as it had done. This time I disconnected the tripler, and when this had been done the sound never faltered. A new tripler was fitted and the set gave no more trouble. Silly me!

A Word of Warning

A couple of months ago I told you about us fitting a new 24in. Pye set in Dr. Dicey's Dynatron cabinet. I mentioned that it fitted well and looked out over his lounge. When I say "us", I mean me and Les who ran me up there. I also said that Les wanted a similar job done on his Dynatron.

So I ordered the same Pye model for Les. Unfortunately his cabinet housed a Pye hybrid colour chassis whereas the good Doctor's had housed a Pye 731 solid-state chassis. The upshot is that Les now keeps the cabinet in another part of the room (to house his booze, I think) while the Pye stands on its stand as it's supposed to do.

Transport

I also mentioned that I was waiting to get my car back. I never did. I had to get another one. It's a gold (the colour!) Renault 18. Honey Bunch loves driving about in it and I suppose I'll get used to it in time. It's just that I don't find it easy nowadays to take to anything new or different. Which is why I find it difficult tackling these modern sets and trying to make sense of the circuit diagrams. I thought it was me but apparently there are a lot of others who find it hard to adapt to these new conditions, especially when they have a cat and two dogs to help them. Oh well, never mind, we've coped so far and I dare say we'll continue to do so.

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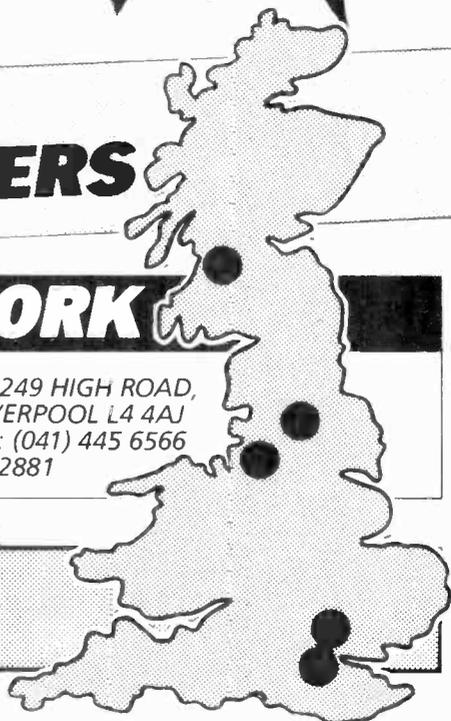
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Second-hand VCR Guide

Derek Snelling

A wide variety of VCRs of different types is now available on the second-hand market. The aim of this short article is to summarise for prospective buyers some of the more important aspects of the machines widely on offer. Before going further, a couple of qualifications should be made. First, some of the comments, on picture quality for example, are subjective. Secondly, it's impossible to quote exact prices. Those given are intended as a guide only – prices are continually dropping as the machines get older. Look on these prices as a relative guide, i.e. they will tend to move up or down together. Now to the machines themselves.

JVC/Ferguson mechanical VCRs

Weaknesses: The bulb, mechanical alignment, belts and clutches.

Head life: Average, about 3-4 years.

Price: £75 or less working, £50 or less faulty.

Comments: These machines are getting long in the tooth now. Not recommended unless you know the machine's history. Be prepared to replace the belts, clutches and probably the head drum. A faulty machine is a cheap way to get to know VHS VCRs.

JVC/Ferguson electronic VCRs

Weaknesses: The bulb and aerial socket. The capstan motor in the 3V35/36/38.

Head life: Average, about 3-4 years.

Price: £125-£150 for the 3V29/30. £150-£175 for the 3V35/36/38.

Comments: Average picture but good reliability. Well worth considering if the machine has a good head.

Mitsubishi VCRs

Weaknesses: Picture quality on earlier models (HS303/320/330). Alignment of guides, audio/control head and oscillators on most models.

Head life: Early models average to good. Later models less than average (three years).

Price: HS306 £175 or less. HS304 £125-£150. HS303/320 around £100.

Comments: Buy one of the earlier models *only* if you have an old TV which will hide the picture quality. The HS306 is well worth considering as it was a very reliable machine after the first twelve months. Remember that spares are harder to obtain and heads are slightly more expensive than with other makes.

Hitachi VCRs

Weaknesses: Poor picture quality with two-speed machines. The capstan motor and the fast forward/rewind idler with the VT11 series.

Head life: Well above average. Five years plus is not unusual.

Price: VT8000 series £100-£125. VT9000 series £125-£150. VT11 series £150-£175.

Comments: Reliable machines with an excellent head life though the picture quality, particularly prior to the VT11 series, can best be described as slightly below average.

Panasonic VCRs

Weaknesses: The belts with the NV2000/NV7000.

Head life: Below average, particularly with the NV366 and NV8600.

Price: NV333/366 £150 or less. NV2000/7000 £125 or less.

Comments: Good picture and very reliable. Recommended but watch for worn heads, especially with the four-head machines such as the NV366, as replacement heads are expensive.

Philips VHS Machines

Weaknesses: Although they haven't been around too long the mechanics seem to be generally weak.

Head life: Unable to say yet.

Price: Probably around £200-£250 but not many of these machines are available to date.

Philips V2000 Series Machines

Comments: This VCR system is now obsolete. Unwise to buy these machines other than for experimental purposes. Prices range from £0 to £20.

Betamax Machines

Weaknesses: The system is losing favour and could become obsolete.

Head life: Lower than average, particularly with models where the tape remains threaded during fast forward and rewind.

Price: £50 working, less than £30 faulty.

Comments: If you want a VCR for time-shift recording only and won't subject it to heavy use a Betamax machine with a good head could be a bargain, otherwise not recommended.

Recommendations

The following machines should, in good condition, be worthwhile purchases: Ferguson Models 3V29/30/35/36/38; Mitsubishi Models HS304/306; Panasonic Models NV333/2000; Hitachi VT9000 and VT11 series.

I would not recommend the Ferguson 3V16/22, the Mitsubishi HS303/320/330, the Panasonic NV366/8600/8610 and non-VHS Philips machines.

Some makes, such as Sharp, have not been included in this survey for the simple reason that I have insufficient knowledge of them.

Before deciding on a particular VCR it's a good idea to check through back issues of *Television* for more detailed information. It's worth shopping around as prices can vary by £50 or more for similar machines. Remember that there are a lot of second-hand VCRs on the market at present, so it's a buyer's market. Always try haggling!

Teletopics

CUT-BACKS AT FERGUSON

The consequences of the sale of Ferguson to Thomson last July are fast becoming clear. For a start, JVC has withdrawn from the joint agreement under which the JVC BX chassis was to be produced at Ferguson's Gosport plant at an initial rate of 200,000 sets a year. Production had already started and will continue until the end of the year. JVC has announced that it will be setting up its own plant to produce sets for sale in the European market, possibly in Scotland – the plant will have a "much higher" capacity than 200,000 sets annually. The BX chassis is at present used in some Ferguson models but this arrangement will come to an end.

Following the close down of the BX lines, much of the TV assembly work previously carried out at Ferguson's Enfield plant will move to Gosport. In terms of employment this means job losses of 900 at Enfield, 270 at Gosport and 20 at Ferguson's plastic moulding plant at High Wycombe – over a quarter of Ferguson's workforce will lose their jobs. Ferguson management hopes that the reorganisation will help restore profitability; at the time of the Thomson take-over Ferguson was losing about £1m a month, and these losses have continued in the fiercely competitive UK CTV market. Ferguson's TV manufacturing capacity is being reduced from a million sets a year to some 700,000. Price cutting has been particularly marked in the small-screen CTV section of the market, but has affected even top-of-the-range models. The J2T VCR assembly venture is not affected by the moves on the TV side.

FIDELITY LOSSES

While Fidelity's parent company Caparo Industries has reported doubled profits for the half year to end June, Fidelity itself sustained increased losses. Fidelity claims to have a major part of the 14in. colour portable market in the UK, but has been unable to make this profitable in the light of fierce competition from imports "on the back of the cheap US dollar". Recent shocks in the markets will have made the situation worse. Caparo hopes to solve the Fidelity problem by entering into a joint-venture deal, but is also prepared to sell the company. The year end has been set as a deadline for a solution. On the trading side it's felt that a move to higher value-added products such as Fidelity's recently introduced digital TV chassis, in conjunction with increased imports from the Far East, could turn Fidelity round.

TV LICENCE FEE TO RISE

The Home Secretary has announced that the colour TV licence fee will be increased from £58 to £62.50 on April 1st. At the same time the monochrome TV licence fee will rise from £18 to £21. The increases are approximately 4.2 per cent and follow the policy announced earlier this year of pegging the fee to the retail price index (the increase is on base figures of £60 and £20 respectively).

In a move aimed at helping the ITV companies, the IBA has agreed to an extra half minute of advertising (to seven and a half minutes) during the peak viewing period of 6-11pm. There will have to be cuts during the rest of the day to maintain the seven minute daily average.

Feasibility studies are to be carried out on the technical and financial prospects of a fifth UK TV channel and of MMDS broadcasting (see last month). The fifth channel study will be undertaken by the Department of Trade and Industry and the Home Office, in collaboration with the BBC, the IBA and interested parties. The DTI and the Home Office have asked consultants to submit proposals for MMDS studies.

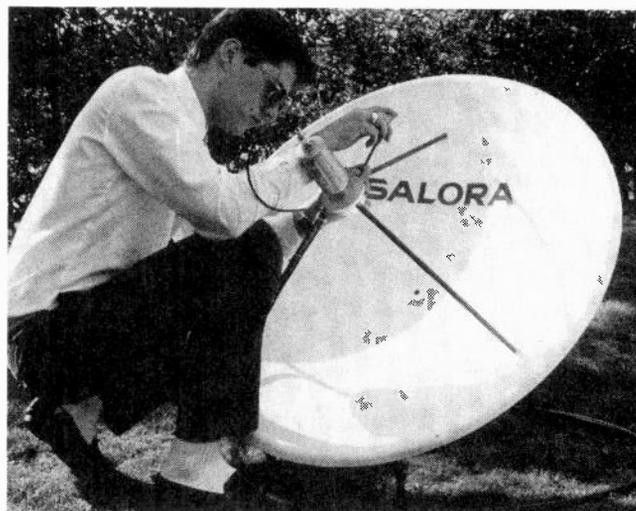
The BBC is to introduce a subscriber-TV system for GPs. A scrambled, one hour programme giving medical news will be transmitted over the BBC-2 transmitters after close down of the normal service, for downloading into VCRs via a decoder unit. The BBC expects the service to provide it with extra revenue of about £1m a year. Other similarly transmitted specialist services could follow.

SATELLITE TV

British Telecom International has won major contracts, which will last for two years initially, to distribute two new satellite TV channels. Film Success International started in November and covers the whole of Western Europe, though the service is aimed principally at Spain. Transmissions are in Spanish and English. SCANSAT-TV3 will start on New Year's Eve. It will be a general entertainment channel aimed at the Scandinavian countries. Both services will be scrambled and transmitted via the Intelsat V satellite at 27.5°W. The new services will bring to fourteen the total number of satellite TV channels handled by BTI.

Salora-Luxor have introduced a new range of satellite TV receiving equipment based on a 90cm dish and a super-low-noise head unit. The systems are intended for single satellite reception. Salora's system uses the SVR1150 receiver and has a suggested retail price of £549 including VAT. Adding a controllable polariser brings the price to £669. Luxor's system uses the Mark 2 receiver and has a suggested retail price of £559 including VAT. Adding the polariser and its control unit brings the price up to £693.

The Premiere satellite TV channel is to be scrambled from January 5th. Subscribers will pay £143 to hire a decoder and an annual charge of £75. The scrambling system has been agreed to by the members of the Cable Programme Providers Group and is expected to be used by other channels not at present scrambled. It modifies



The Salora-Luxor 90cm dish satellite TV receiving systems have been designed for use without need for planning permission and are simple to instal.

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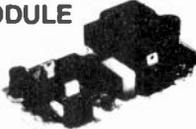


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An attractive steel case designed to house the Control Unit CA 1250 together with the appropriate LED indicators and key switch (available separately). Supplied with the necessary pillars, fixings, and punched front panel, the unit is given a professional appearance by the adhesive silk screened label. Size: 200x180x70mm.

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the sync pulses and adds modulated tones that cause interference on the picture.

TOSHIBA'S 3D CAMCORDER

Toshiba has announced the development in Japan of a 3D camcorder. Its camera section uses twin lenses which produce a stereoscopic pair of video signals. These are recorded on the tape as alternate frames of left and right images. The viewer uses a pair of liquid-crystal spectacles which are switched in synchronism with the recorded images. To reduce the flicker that a 30 picture per second rate would produce Toshiba propose to use a field store so that each frame is presented to the eye twice. No marketing plans for the system have been announced.

BUSINESS MOVES

Goodmans Loudspeakers Ltd. has re-entered the TV market with two models. The GTV9100 is a 6in. portable colour receiver with an a.m./f.m. radio and three-way power supply. The suggested retail price is £199. The 20in. GTV9151 has infra-red remote control with 16-channel access, on-screen display of tuning scale/volume level and channel number, an FS tube and removable tinted screen, and audio/video input/output sockets. The suggested retail price is £339.

Poly Peck International has quadrupled the size of its audio/TV business with the purchase for £20.6m of the Hong Kong based Capetronic Group. Capetronic designs and manufactures consumer electronics products, including audio and TV equipment, for leading brand name customers. Over 60 per cent of its output goes to the USA. Earlier this year Capetronic was sold by BSR to an

Australian financier. Among its other businesses, Poly Peck International owns the leading Turkish brand/TV manufacturer Vestel whose sets are sold in the UK under the Bush brand name.

Alba plc, part of the Harvard International Group, has raised finance through an issue of shares on the USM. Amongst other plans the company intends to start TV manufacture at a new factory in Barking.

NEW CATALOGUE

Greenweld's 1988 electronic component and equipment catalogue is now available for £1 from Greenweld, 443S Millbrook Road, Southampton SO1 0HX. The 88-page catalogue lists a wide range of items from resistors to keyboards and disco mixers, also "star buys" and a "bargain list" of surplus electronic items generally not available elsewhere.

NEW PANASONIC CAMCORDER

Panasonic's latest VHS-C camcorder, Model NVMC5B, offers a host of features for its price of £1,300. The drum has four SP heads, four LP heads, and an erase head to ensure noise-free insert editing and cutting between scenes. The autofocus system uses a vibrating piezoelectric element for fast, accurate operation and a two-stop zone setting which concentrates the focus in one of two areas. The two-position, high-speed shutter (1/500th and 1/1,000th sec.) gives blur-free recording of fast moving objects. Other features include a character generator offering four sizes, a ten page non-volatile memory, a scrolling facility, auto-white balance, backlight control, power zoom and an adjustable electronic viewfinder.

Servicing the Sony SLC6UB VCR

David Botto

We rather like the Sony SLC6UB VCR which dates from the early 1980s. It's a front-loading Betamax machine and large numbers are still giving good service. Fortunately it's straightforward to service: properly maintained, this VCR will give you an excellent picture. An optional remote control unit was available initially.

There's a Mark II version. You can distinguish at a glance between the two versions because the front panel layouts differ. In the Mark II version all the function controls except record are arranged in a straight line: in the earlier version the controls are arranged in a sort of short, cut-off T formation. Fig. 1 shows the differences.

Access

To remove the cabinet, first remove the two screws at each side of the top cover then lift it away to reveal the inside of the VCR. If you need to work on the underside, remove the seven screws from the metal bottom plate – it will then come away easily. To remove the front panel, simply remove the three screws that pass through the lugs at the top: then lift the panel away gently. To prevent cabinet damage, we use a special rubber bench of the type available from Philips, RS Components etc. in our workshop.

The tape mechanism is to the right of the machine, viewed from the front. The tuner/timer/power block is at the left. To remove this block, take out the two screws at the lower front, then the four screws you'll see at the left-hand side looking down from the top, and finally the two screws at the top of the unit, at the rear: unplug connectors CN1007 and CN1004 from board YC18, connector CN2008 from board SS9 and connector CN5001 from board DR1. When the block is pulled slightly towards you it will lift away easily.

Board YC18, which contains the luminance and chroma circuitry, is below the cassette mechanism. With the VCR standing on its left side panel – don't forget to provide a rubber mat – remove three screws and board YC18 will hinge upwards and outwards.

Power Supply Circuitry

As with any VCR it's a good idea to spend a bit of time studying the circuitry. This is especially true of the power supply because absence of just one voltage from this can result in puzzling symptoms.

The Mark I power supply circuit is shown in Fig. 2 – the Mark II version is almost identical.

The a.c. mains input is fed via the mains power switch S901, which is at the back of the machine, to board LF22 which contains fuse F101 and the mains filter capacitor C101. A white lead from this board goes to one end of the

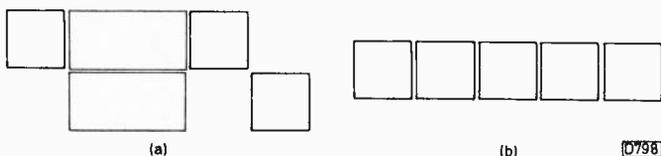


Fig. 1: Function control layout on early versions of the machine (a) and on the Mk. II version (b).

mains transformer's (T901) primary winding. The red lead goes to the other end of the primary winding via the voltage selector S902. The selector's grey lead goes to the 240V tap and the blue lead to the 220V tap. It pays to check the setting of this before plugging the machine into the mains supply – someone may have put a screwdriver in the adjustment slot at the rear and turned it.

The secondary windings on the mains transformer are as follows. Two red leads from one secondary supply 16V a.c. to pins 1 and 2 of connector CN002 on board TP12. The two blue leads from another 16V a.c. winding supply pins 3 and 4 of connector CN002. The two yellow leads supply 3V a.c. to pins 5 and 6 of connector CN003 on board TP12. The remaining secondary has four tappings. The brown lead supplies 110V a.c. to pin 4 of CN003, the grey lead supplies 5V a.c. to pin 3, the violet lead supplies –20V to pin 1 while the white lead to pin 2 is the chassis connection.

The 16V a.c. supply at pins 1 and 2 of CN002 goes via fuse F002 to a bridge rectifier formed by four diodes, D301-4, all type 30D2FA. An 18V d.c. supply is developed across reservoir capacitor C002.

Note IC001 (STK5314) which is mounted on the small TP16 board. This i.c. contains two separate regulators, each with its own muting circuit. The 18V d.c. across C002 is fed to pin 8 of IC001, where it forms the input to the second regulator whose 12V output appears at pin 7. This output is taken to pins 1 and 2 of connector CN5001, where it forms the "SYS 12V d.c. supply" for board DR1.

The 16V a.c. supply at pins 3 and 4 of CN002 is taken via fuse F001 to another bridge rectifier (D305-8, all type 30D2FA) which develops 17.3V d.c. across C001. This supply is used for a number of purposes. It's taken to the collector of transistor Q255 which, together with R270 and zener diode D251, form a regulator that produces the "ever-12V" supply. The 17.3V is also fed to regulator one in IC001, at pin 6: the regulated 12V output appears at pin 4 and is taken to pins 3 and 4 of connector CN001, where it goes to the SS9 board. This supply also feeds the power indicator LED D501 via R206. A further use for the 17.3V supply is to power transistors Q002, Q009 and Q011 and the base of Q010.

When the power switch S501 on board TP14, which is mounted at the top, front left of the machine, is depressed the ever-12V supply is applied to the base of Q002 via R256. Q002 thus turns on, its collector voltage dropping to almost zero. As a result Q009 is switched off and Q011 turns on. Because Q011's collector is connected to IC001's two muting pins, 2 and 9, the result of this is that the two 12V outputs from IC001 are now present: the power lamp lights and the VCR can operate.

Q002's collector voltage also controls Q010, whose collector is connected via pin 9 of connector CN001, pin 9 of connector CN8 on the SS9 board and R624 to pin 6 of the microcomputer chip IC501. The microcomputer chip is thus informed as to whether S501 is in the on or off position.

When the machine is waiting to make a timed recording the two regulators in IC001 are switched off. At the switch-on time selected by the user IC301 (TCP4621AF) on timer board TP13 generates a signal voltage at pin 2.

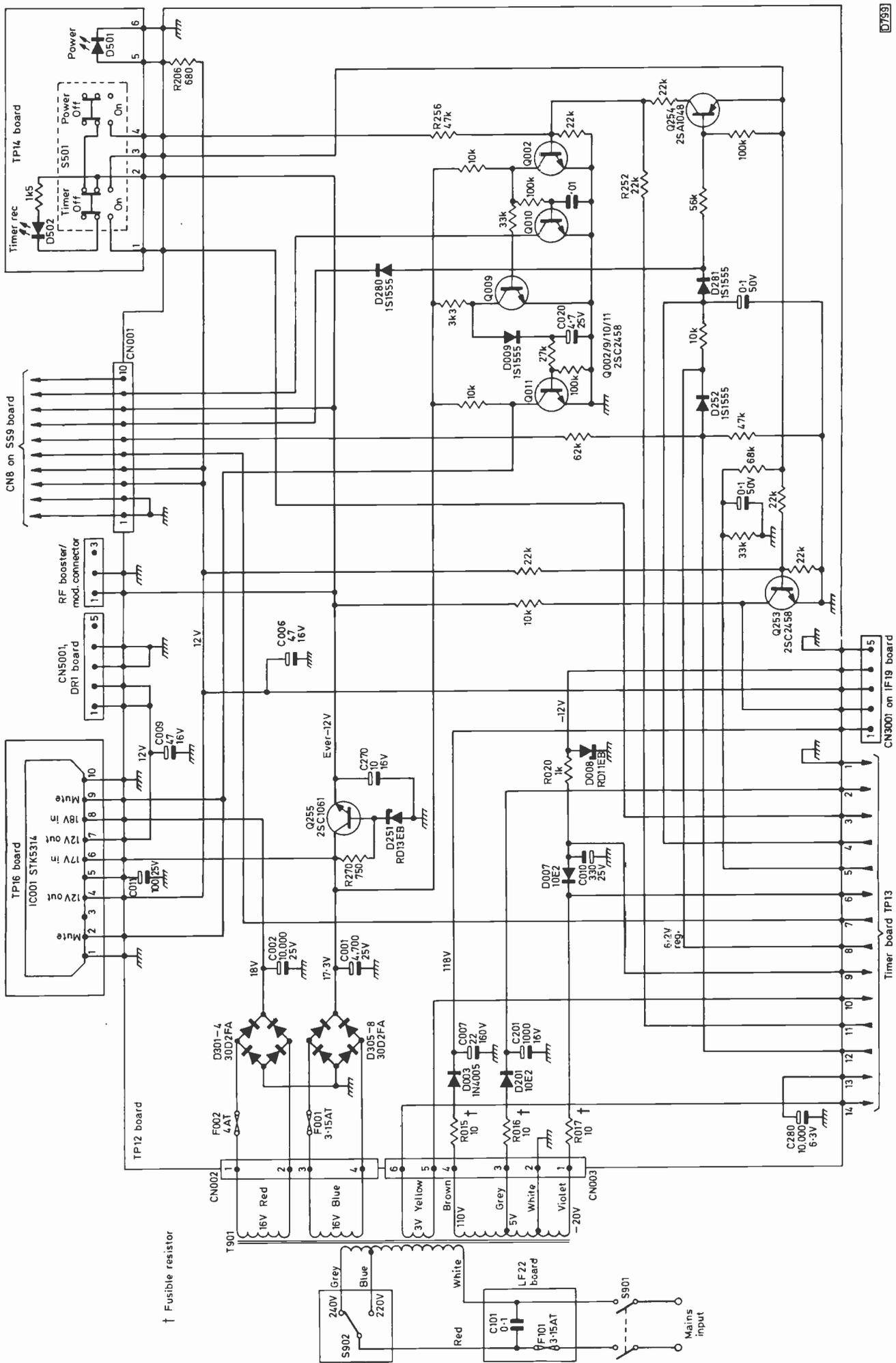


Fig. 2: Power supply circuitry used in the earlier version of the machine. The Mk. II version is almost identical.

This voltage is fed via R252 on board TP12 to the base of Q002 which thus conducts, switching on the two regulators in IC001 so that the machine comes into operation.

The 3V a.c. supply at pins 5 and 6 of connector CN003 supplies the filaments of fluorescent display FL301 on board TP13.

The 110V a.c. supply at pin 4 of CN003 is rectified by D003 which produces about 118V d.c. across C007. This voltage is taken via pin 1 of connector CN3001 to the collector of the 2SC1890A switching transistor Q011 on board IF19. At the emitter of Q011 114V is available to power the neon channel indicators and feed the 33V tuning voltage regulator circuit.

The 5V a.c. supply at pin 3 of CN003 is rectified by D201 whose output is stabilised by the 6.2V zener diode D271 on the timer board TP13. The -20V a.c. supply at pin 1 of CN003 is rectified by D007 which produces a negative d.c. supply for the timer i.c. and display circuitry on timer board TP13. D007's negative output is also fed to zener diode D008 which produces a -12V supply for board IF19.

The a.c. voltage at the junction of R017/D007 is taken to timer board TP13 where, after clipping by diodes D204/3, it provides a reference source to synchronise the timer chip IC301 at pin 30.

Power Supply Faults

The power supply has proved to be very reliable. But problems can occur. Before investigating what may appear to be complex electronic faults in the machine check that all the d.c. outputs from board TP12 are present and correct. This could well save you the strain and frustration caused by hours of fruitless testing! Use an accurate digital voltmeter (one with a 10M Ω input resistance) to make these measurements.

The cause of a completely dead machine can simply be failure of F101 due to old age – though in our experience this occurs only on rare occasions. If fuse F002 has blown, check diodes D301-4. If fuse F001 has failed, check diodes D305-8. An overload due to a fault on one of the other boards could of course be the cause of failure of one or other of these fuses.

The first voltage check to make on the power supply is for 18V d.c. at pin 8 of IC001. The next check should be for 17V d.c. at pin 6 of IC001. If these voltages are present check that the ever-12V supply is present at pin 8 of CN001.

If this ever-12V supply is missing or incorrect, test transistor Q255 and zener diode D251 (RD13E-B1) and ensure that C270 hasn't dried up and lost capacitance. If any of these items turn out to be defective, check the value of R270 before fitting replacement(s).

The regulator chip IC001 can cause a number of problems. A machine that won't switch on, with the power light remaining off, because of the absence of the regulated 12V supply at pin 4 of IC001 suggests that the chip is faulty. An internal fault in the chip can result in anything from 14V to 18V being supplied to pins 1 and 2 of connector CN5001, causing all manner of strange conditions on board DR1 – this situation can upset or stop the capstan motor.

Before replacing IC001, check that the voltage at pins 2 and 9 is zero with the power switch in the on position. If a d.c. voltage is present, muting the two regulators in the chip, test transistors Q002, Q009, Q011 and Q010 in that order, then diode D009. If these are in order, check that 12V is present at connection 4 on board TP14 (with the

power switch on). Make sure that this voltage arrives at the end of R256 nearest to the edge of the board. Finally check R256.

Should the 118V, the -20V supply or the output from D201 be missing, remember that one of the fusible resistors R015/6/7 could be open-circuit. It's important to replace these special resistors with the correct Sony type. It's also worth checking all thirteen electrolytic capacitors on the power panel – they can lose capacitance over the years.

I'll remind you once again that you'll enjoy big savings in time and energy when you use a component tester (see *Television* June 1984) to test items on the power panel.

Timer Board

We've not had much trouble with the TP13 timer panel – the TCP4621AF timer chip IC301 is very reliable and seldom fails. If the timer record LED D502 fails to light when the timer mode is selected, check transistor Q251 (2SC2458) first. If the timer record start switching transistor Q252 (2SC2458) fails, transistor Q002 on the power panel will not switch on in the timer mode – neither will the VCR when the time comes for the clock to switch it on.

A nasty fault is when the timer turn-on at the set time is intermittent. If this happens check the soldered joints of the connections to CN004 first (Mark II version).

Tuner and IF Board

It's a curiosity of this machine's layout that the tuner is mounted on the power panel but connects to panel IF19. A simplified block diagram of the tuner and i.f. circuitry is shown in Fig. 3. As we've already seen, a supply of some 118V is supplied to the switching transistor Q011 on this panel.

The tuner itself is reliable and hardly ever fails. Should it tend to drift off tune, make sure that IC002 (μ PC574J) is in order and has exactly 33V d.c. across it.

Strange things can happen if one or more of the neon channel indicator bulbs dim, as they tend to do with age. When a channel with a faulty neon bulb is selected the 114V supply will be low, and so will the bias on transistor Q010 (2SA893A). This transistor's collector is linked to the base of the 2SC2785 audio muting transistor Q001 which thus turns on, producing the puzzling symptom of poor sound on channels with dim neon indicators! The link between Q010 and Q001 is via D010, Q009 and D005; distorted sound on all channels occurs when Q009 (2SA1175) fails.

If R015 on the power panel (TP12) goes open-circuit the tuner board goes dead, the neon channel indicators remain out and channels cannot be selected.

We've perhaps been fortunate in never having to replace IC001 (CX885A) on panel IF19. R045 (100 Ω , 1/8W fusible) sometimes decides it's time to go however. This removes the supply to the sound i.f. transistor Q002 and some of IC001's pins. Before replacing R045, check Q002 (2SC2785).

An audio signal tracer is useful for checking the sound output at pin 6 of connector CN002. With a colour bar input signal, an oscilloscope connected via a 10:1 probe to pin 5 of CN002 should display a composite video signal.

Loading Problems

What if the cassette won't load, jams on loading or tangles the tape? Before you search for complex elec-

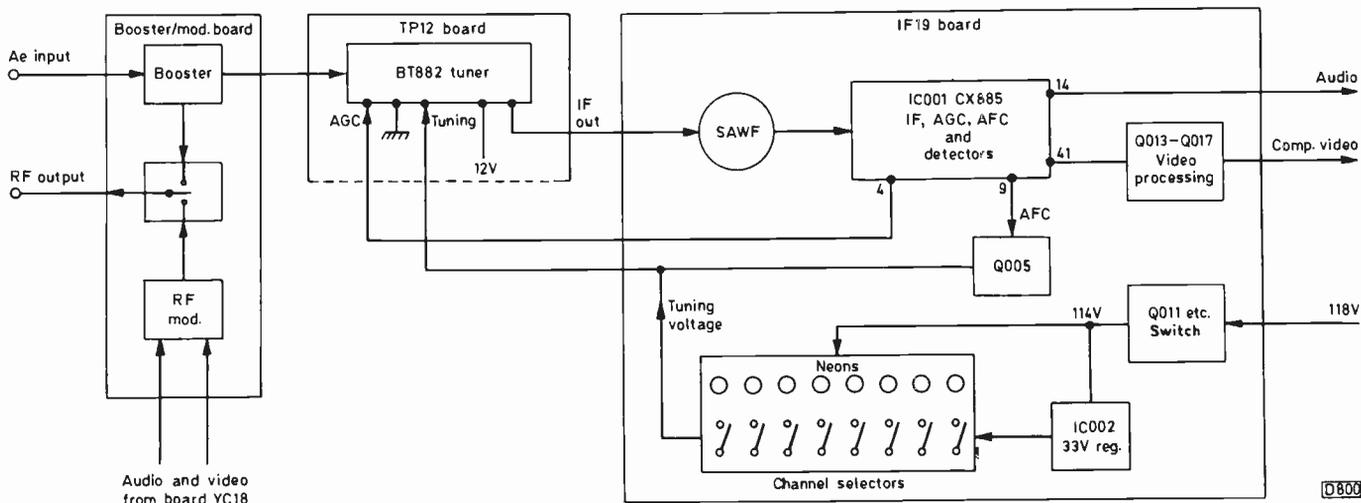


Fig. 3: Simplified block diagram showing the booster/modulator, tuner and i.f. sections of the machine.

tronic faults, check the mechanism to ensure that it's perfectly clean and free to move. To the left of the mechanism there's a little board mounted flat at the top – the TT5/FLD (front loading motor) board. It has six connections (see Fig. 4). You can check the loading sequence without inserting a cassette by carefully shorting pins 4 and 6. Next short pins 5 and 6 and the mechanism should go through the motions of loading the tape. This procedure is helpful when you want to check the loading mechanism without damaging a cassette.

At the top of the cassette mechanism there's an idler wheel that connects four belts. Clean this wheel carefully – if it's in bad shape, replace it. At the same time examine the belts. If you find that they are the original ones it's sound policy to replace the lot. If you don't the machine may well bounce back to your bench in the very near future. Belt wear can cause intermittent stopping or failure to unthread. With very intermittent problems of this sort it's advisable to replace the small relay pulley, the large relay pulley and the phosphor-bronze bearing through the chassis between the two pulleys. Be sure to clean the two microswitches on the underside of the cassette mechanism.

With the Mark II version there's an official modification to prevent tape damage when a cassette is inserted. First locate the microcomputer chip IC501 on the SS9 panel. Some extra components are required – three 1S1555 diodes and a 3.9k Ω , 1/4W carbon resistor. Carefully cut the print between pin 23 of IC501 and R530. Connect the anode of one of the diodes to pin 23 and the cathode to R530. Connect the anode of the second diode to pin 30 of

IC501 and its cathode to the junction of R530 and the first diode. Connect the anode of the third diode to pin 37 of IC501 and its cathode to pin 2. Finally connect the extra resistor across R579.

With the Mark II version various troubles such as no rewind or no fast forward can be due to nothing more than poor contact with connectors CN606 and CN608 on board DRD1. If you suspect this, remove and clean all the connectors on this board with a little Castrol DWF. In fact when removing any connector in the VCR it's good sense to clean it with just a trace of DWF before replacing it.

Servo and System Control Circuitry

The microcomputer chip IC501 seldom gives problems, though it can fail. A logic probe is essential to check the circuitry, and a logic pulser is very useful. Table 1 shows the logic conditions at IC501's pins.

If you decide that IC501 is faulty, fit a 42-pin i.c. holder before fitting the replacement chip. If you then discover that the fault lies elsewhere it's easy to refit the original chip. It has been known for the microcomputer to refuse to reset, paralysing the system control circuitry. This can happen if the VCR is plugged into the mains with the front panel power switch depressed. You can then spend a considerable time trying to find out what has happened. The solution is to switch the power switch off and disconnect the mains supply. Then, when the mains supply is reconnected and the power switch is depressed, everything will work correctly. We've had this problem with various VCRs.

There are several Darlington transistors on the DR1 board (Mark I version). These like to fail, causing various puzzling faults. For example if Q022 (2SD1164) fails the capstan motor will stop.

The CX143A capstan servo chip IC001 on board SS9 hasn't let us down yet. If you suspect trouble in this area, check the surrounding components and make sure that the voltage at pin 24 is 12V (the power supply regulator chip could be faulty). If the capstan speed sometimes seems to vary suspect the tantalum capacitors C007 and C008 (both 0.22 μ F, 16V) connected to pins 8 and 9. We find it best to replace these with standard Sony electrolytic capacitors.

Drum motor problems can be caused by several things. Resistors R045 (1 Ω , 1W) and R060 (4.7 Ω , 1/8W fusible) on board DR1 can go open-circuit. After fitting new

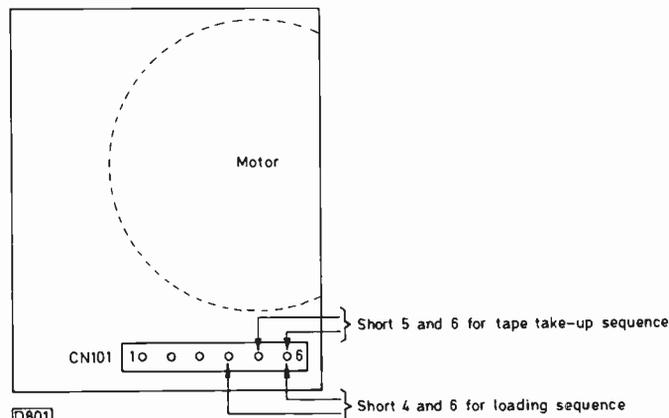


Fig. 4: Front loading board viewed from the top of the VCR.

resistors it's as well to check transistors Q017 and Q018 (both 2SC2785), Q019 (2SA1175), Q020 (2SC1061) and the Darlington transistor Q021 (2SD1164). If the drum speed is not constant the cause is likely to be the CX186 drum servo chip IC003 on board SS9 or one of the associated electrolytics.

When Q025 (2SD1164) on board DR1 (Mark I version) fails the symptom is no fast forward operation. If this transistor has failed be sure to check Q023 (2SD788) and Q024 (2SC2785) as well. On both versions of the machine, always suspect the various low-value fusible resistors. On the Mark II version (DRD1 board) resistor R665 (4.7Ω, 1/4W fusible) tends to go open-circuit with the result that the loading motor won't operate. Fortunately IC601 (M54543L) seems content to go on and on and on.

Failure of R061 (1Ω, 1W fusible) on board DR1 will stop the reel motor. So will failure of Q010 (2SD355) – it tends to go short-circuit collector to emitter. On the Mark II version failure of R653 (2.2Ω, 1W fusible) will halt the reel motor.

YC18 Board

We've not had many problems with the YC18 board. Noise on the picture can be caused by C018 (10μF tantalum in early versions) or C016 (0.47μF, 50V electrolytic) drying out.

A nasty fault to find is no colour during pause. This is due to C083 or C084 (both 27pF, 50V working) playing up. If one is faulty it's best to replace them both. Then clean the preset RV011 (1kΩ, carbon) with a trace of Castrol DWF.

RF4 Board

The RF4 board is mounted upright at the back of the machine, on the right-hand side. We've had few faults with this board, but watch out for Q7 (2SC945). If this transistor has only a slight leak (the leak will show up nicely on your component tester) the luminance record current will be upset. If you find that RV5 (1kΩ preset) needs constant adjustment, check Q7.

There's a fair number of 8.2Ω fusible resistors on this board, but they rarely fail.

AD6 Board

If the cassette tape doesn't erase properly, connect a scope to pin 2 of connector CN6502. A nice 65kHz sine wave (±6.5kHz) should be present here. If not, check Q1 (2SD774) and R025 (4.7Ω, 1/4W fusible).

Relay RY1 on this board can stick, giving rise to troubles such as weak or distorted audio. Before condemning it check the 1S1555 diode D001 (1SS119 in the Mark II version).

Booster/modulator

If there's loss of gain in the r.f. booster/modulator, causing a noisy picture in the E-E mode or weak loop-through signals, it's generally best to fit a new booster. Before discarding the old unit however check the four 2SC3037 transistors for leakage. If you replace any faulty ones there's a good chance that the booster will work correctly. Don't try substitute transistors.

The Video Heads

When properly cared for the video heads should enjoy

Table 1: Microcomputer chip logic levels.

| Pin | At switch on | Other conditions |
|-----|--------------|--------------------------------------|
| 1 | H+P+L | H for load and play |
| 2 | H | L+P for eject |
| 3 | H | L+P for rewind |
| 4 | H | L+P for fast forward |
| 5 | H | H for load, L+P for play |
| 6 | H | H for load and play |
| 7 | L | H then L+P for load |
| 8 | H | L+P then H for record |
| 9 | H | L for load |
| 10 | H | — |
| 11 | L | H for ff video search |
| 12 | H | L for play and record |
| 13 | H | L for play |
| 14 | H | L+P for load, L for play |
| 15 | L | L for load and record, H for play |
| 16 | L | H then P for load and play |
| 17 | L | H then P then L for load, P for play |
| 18 | L | L for load, H then P then L for play |
| 19 | L | L for load, P for play |
| 20 | H | Test – always H |
| 21 | H | Voltage supply pin |
| 22 | L | H+P for eject |
| 23 | L | H for eject |
| 24 | L | H+L for load, L for play |
| 25 | L | L+P for load, L for play |
| 26 | L | L for load, H for play |
| 27 | L | L for load, H for record |
| 28 | L | H for fast forward |
| 29 | L | L for load, H for rewind |
| 30 | L | H for eject |
| 31 | L | H for pause |
| 32 | H | H for load |
| 33 | L | H when cassette in |
| 34 | L | H when cassette in |
| 35 | L | H then L for load |
| 36 | H | L for load and play |
| 37 | H | L for load and play |
| 38 | L | L for load and play |
| 39 | L | L for load and play |
| 40 | L | L for load and play |
| 41 | L | Chassis connection |
| 42 | H+P | Oscillator – always H+P |

H = high, L = low, P = pulse.

a long life. Use only a proper VCR video kit to clean them. After doing so, be sure to clean the control and audio heads.

A 3mm Allen key is required to remove the two cap screws that secure the upper drum. If new video heads are fitted a special gauge available from Sony is required to position them with the necessary degree of accuracy (to

Table 2: Board changes.

| Board | Mk. I | Mk. II |
|-----------------------|-------|--------|
| Power | TP12 | TPD1 |
| Regulator | TP16 | TPD4 |
| Timer/power switches | TP14 | TPD3 |
| Timer | TP13 | TPD2 |
| IF/tuning | IF19 | IFC1 |
| Motor/solenoid drive* | DR1 | DRD1 |
| Capstan FG control | FG2 | DRD12 |
| Front loading motor | TT5 | FLD |

The FS11 and FS12 cassette control switch boards in the Mk. I version are replaced by board DRD2 in the Mk. II version.

* The circuitry on boards DR1 and DRD1 differs.

microns). Colleague Pete however possesses the amazing ability to set the heads up quickly and accurately by eye without the use of the gauge. A check afterwards always proves him to be 100 per cent accurate!

Board Changes

The board numbers used in this article have mainly been those found in the Mark I version of the machine. The most important differences between the two versions are listed in Table 2.

Remote Control

The remote control unit is of the wired type and plugs

into a socket at the front of the machine. The signals from this unit go via pin 1 of connector CN11 on board SS9 to R603 then D509 (the positions of these two components are interchanged in the Mark II version). If the remote control doesn't work, before condemning the unit check the print between CN11 and R603/D509.

Concluding Notes

When it's necessary to replace a transistor the correct Sony type should be used. This will prevent various awkward problems arising. For a professional job it's important to apply circuit varnish to any newly soldered joints. Do this with a small brush, because circuit varnish reaching the wrong places can do horrible things.

Coincidence Detection

Chris Avis

To all you hi-tech readers for whom the title of this article might suggest a mouthwatering dish of vectors, waveforms and formulae, my apologies. For those of you who find a diet of Tiny Tim, Ike Hodge and co. less indigestible, read on and ponder the mysterious mathematics of chance . . .

Within twenty-four hours we received from different sources two identical Sanyo 12T280 monochrome portables for repair, one for a customer and the other for resale. Both displayed 100Hz hum bars, but while one had low l.t. rail volts the other had a high l.t. line with no regulation at all. Checks on the 2SD313 series regulator transistor in the first set revealed that its base-collector forward junction resistance was high (50Ω instead of the average 10Ω). The same transistor in the second set read perfectly and was only proved to be faulty by eventually fitting a substitute.

We don't, fortunately, see many of the old hybrid GEC colour sets any more, but were recently persuaded by a dotting owner to repair a 26in. version. The tube was still in reasonable condition and after replacing a few of the usual resistors, resoldering an infinite number of dry-joints and fitting a new PL509 line output valve we received quite a presentable picture – and the effusive thanks of the owner. His gratitude had faded a week later when he returned complaining of loud noises from the rear of the set. The new PL509 had proved too much for the tripler's insulation – it was arcing to chassis. I pacified the owner with the promise of a repair "under guarantee", and then discovered that we had no suitable secondhand replacement in our tripler scrap box. My colleague Tim (no relation to Tiny) then returned to the workshop with four old sets we'd agreed to buy at a pound a piece from a local workshop for the disabled. One was a 26in. A823 Bush ready for the tip, another a clapped out Doric hybrid monochrome set. The 24in. Thorn 1600 was easily repaired and soon sold for £39. Finally there was a 26in. GEC hybrid colour set with a sick tube but a very healthy e.h.t. tray. This was speedily transplanted into its waiting twin. We ran the set on test, just in case. This was fortunate as it soon lost its luminance output. Again fortunately, the other set had a healthy PL802.

An even older hybrid relic is the metal-cased Teleton 20in. Model TVC14 colour receiver. One was brought in by a scruffy individual.

"Bought it off me mate for a fiver. Says it only wants a

valve – 'ave you got one?"

The missing valve turned out to be the 3LJS6A line output pentode, and we still had one in stock. But an initial check on the tube revealed zero emission and assorted interelectrode shorts. The bargain hunter was given the bad news and carried the set out, muttering dire threats about the fate of his erstwhile mate.

Two days later the set returned in the company of another shabby character.

"Gave a bloke ten quid for this, but it wants a valve – 'ave you got one?"

The next few minutes do not bear repeating. Suffice it to say that the set departed in a blue haze, and was illegally dumped in a cul-de-sac opposite the shop. Next day someone brought in a TVC14 with a missing 3LJS6A – a doubly strange coincidence, as the previous wreck was still visible across the road! This time the tube seemed to be o.k., so the valve was fitted. After a quick tweak on the grey scale and convergence the set produced a remarkably good picture – apart from the limitations of using a "simple PAL" decoder.

Although most of our TV sales consist of reconditioned sets, we do supply the occasional new Samsung colour portable to order. Personally I consider these economic, two-year guaranteed (labour costs reimbursed by Samsung) sets, with their good quality and reliability, far better value than much of the rubbish available from your friendly hypermarket – but I digress.

We recently supplied a 14in. Samsung to Derek and Alma at the local post office. When I delivered the set and checked it I discovered that Derek had for disposal an old Marconi Model 4816 12in. monochrome portable (Thorn 1590 chassis). I offered him a fiver for it and he accepted.

"I'll call at the shop with a cheque when we get our expected tax refund" said Derek. A dubious and unacceptable promise from some people, but you get to know who's dependable – besides, we could always threaten to buy our stamps elsewhere . . .

The 1590's faults included a dud zener diode in the l.t. regulator circuit, a dirty tuner and a low tube. The latter was successfully revived by our B & K 467 reactivator. We then displayed the set at £35 inc. VAT, with our usual six months' parts/labour guaranteee.

The following week a satisfied purchaser was writing out his cheque when, of course, in walks Derek to settle his account. Fortunately he's perceptive and didn't appear to jump to conclusions about profiteering on his £5 TV. But after the customer had left he couldn't resist a dry comment. "That looked like a highly negotiable asset, Chris." There was a twinkle in his eye – or was that just coincidence?

TV Services in Ireland

Christopher Holland

Despite the great optimism voiced only a few years ago it looks as if cable television is not going to take off in the UK in the way some people had hoped and felt it would do, at least not in the immediate future. Only a few towns or areas of larger cities are cabled, and even where a cable network has been installed the proportion of people subscribing to it has remained disappointingly low. Cable TV is now available to about one and a quarter million households in the UK, but the number of subscribers is around 200,000. The prospects for growth in the short term do not look good, and with satellite TV about to take on a greater role many viewers are probably waiting to see how things develop.

How different the story across the Irish Sea! Here the various cable systems in the major cities and towns are thriving: there has been a major expansion in recent years. Dublin has a population approaching 600,000 and virtually the whole city is cabled. There are estimated to be about 230,000 colour TV sets in the Dublin area and Cablelink, the Dublin cable company, boasts of over 200,000 subscribers. While Dublin has been cabled for some twenty years, the cable systems elsewhere are in relative infancy – but business is booming. Cork, with a population of 136,000, had 26,000 subscribers at the last count. This healthy picture is reflected in the other major population centres – Limerick, Galway and Waterford. The obvious question is why the startling difference between the two countries?

The Dublin Cable Network

The answer lies in a point just mentioned, the fact that Dublin has been substantially cabled for twenty years. Consider the situation when RTE, the Irish broadcasting service, started TV transmissions in 1963. It was the only station that could be received over most of the country. UK stations could be picked up along much of the east coast however, while those areas adjacent to the border could receive transmissions from the stations in Northern Ireland. These areas thus had a choice of three channels from the early 1960s.

Dublin was only in the fringe area for reception of UK transmissions however, so cable companies were set up to bring the BBC, ITV and in due course BBC-2 and Channel 4 to the people of Dublin. The number of companies involved has diminished over the years, to the extent that today just one company provides the service. The two indigenous Irish TV services RTE1 and RTE2 are also included in the system, so until recently subscribers had a choice of six different channels as against the two available if they stick with their own aerial. No wonder Dublin today has one of the biggest cable systems in Europe.

Adding Satellite TV channels

Nor has it stopped at six channels. Two of the channels beamed by satellite, Sky and Super, are now included in the annual subscription fee of approximately I£70. These last two additions were incorporated in the system only this February, at no extra cost to subscribers, though this

could alter if the satellite channels prove to be popular. There are plans to put another two satellite TV channels on to the network.

Technicalities

The technicalities of the system are straightforward. With the exception of the satellite TV channels all the signals involved are originally transmitted at u.h.f. There would of course be severe signal losses if distribution at u.h.f. was used in a system of this size, so all the channels are remodulated on to carriers in the v.h.f. Bands I and III. It follows that dual-standard v.h.f./u.h.f. receivers are required – the u.h.f. section being necessary for use with a VCR. Dual-standard sets are in fact used throughout the country, since RTE uses both the v.h.f. and the u.h.f. wavebands for its transmissions. So it's no problem to the nation's TV suppliers to provide such sets. Both v.h.f. wavebands are used by the cable system, with two stations modulated on to Band I carriers and six on to Band III carriers – the intention is to include a further channel in each band. The resultant quality is good, with few problems of interference between signals.

Elsewhere

What of the rest of the country? Cable TV is a relatively recent feature in the country's second largest city, Cork. Cabling started only in the last few years, the problem being that the UK channels required had to be brought by a relay link from a mountain receiving site some miles to the east of the city. While the people of Cork could receive only the two RTE stations with their own aerials, the advent of cable immediately gave them a choice of six high-quality stations. Little wonder then that people clamoured to be connected to the system.

When satellite TV transmissions became available Cork had a distinct advantage over Dublin in that the much newer system could handle more channels without interference problems arising. Thus it is that subscribers to Cork's system already have a choice of ten programmes at any one time – and by time-shifting some of the satellite transmissions available, so that as one channel stops broadcasting another one is switched in, it's possible to receive a grand total of 14 channels.

What Viewers Want

Cork's success story has been repeated in the country's other main population centres of Limerick, Galway and Waterford. What's interesting is the fact that in large towns close to the border with Northern Ireland, where spill-over reception of the UK channels is readily available, there are no signs of extensive cable networks being laid on. The point of course is that what people really want is the BBC and ITV broadcasts. If a few satellite TV channels are thrown in as well, so much the better, but unless the programme content being beamed down from the satellites improves greatly no cable system is likely to be introduced just to make them available.

In a nutshell, this is why cable TV hasn't taken off in

the UK. When you already have what are arguably the best stations available anywhere, why pay more for extra inferior ones?

In an understandable search for extra revenue the Irish cable companies propose to charge for the extra satellite TV channels eventually and are undertaking market research to find out how much they might expect to get as a supplement to the standard connection fee. The answer seems to be not a lot. After the initial interest, most viewers have reverted to watching the normal terrestrial channels. Only TV addicts seem happy with the constant repeats and reruns shown on the satellite TV channels. What the public would like is an up-to-date film channel, which is something that's not yet available. The real popularity of the satellite TV programmes as they stand at present will be gauged accurately only when a charge for them is made.

Use of S Channels

A few other points are of interest technically. First, when the initial test transmissions of the extra satellite TV programmes were carried by the Cork cable system they were not distributed at the usual v.h.f. frequencies but rather on the S channels or Hyperbands – the “extra” channels used by some Continental cable networks, set to either side of the standard Band III group of channels. There are seven channels in Band III, with vision carrier frequencies ranging from 175.25MHz to 223.25MHz. The S channels are divided into two groups, S1-10 using vision carrier frequencies from 105.25MHz to 168.25MHz and S11-20 using vision carrier frequencies above Band III, i.e. from 231.25MHz to 294.25MHz.

The panic that these early test transmissions caused is understandable. Only a few modern sets, mainly of West European origin, have tuners that are capable of receiving these channels. Dealers were bombarded with complaints that “the new set you sold me won't get the new stations”. The situation of the rental companies looked even bleaker – all their rented sets were virtually obsolete overnight. Representations were made to government ministers and as a result the use of the S channels stopped, the cable company reverting to use of the traditional Band III frequencies. The panic for sets with wideband tuners eased, and salesmen could once again refer to their sets as being “state of the art”.

Channel Selection

Not that the rental companies are out of the woods. As in the UK, set rental is very popular in Ireland, and most of the sets out on rent are of the six-eight button variety. In Dublin, the availability of six terrestrial channels plus two satellite TV channels and the need for a video channel means that nine buttons are required as a minimum: in Cork with its ten channels the position would appear to be even more critical. In practice however the expected stampede for replacement sets did not materialise – and the reason for this would appear to be that of the programme quality on offer on the satellite TV channels. The programme content of these channels is not up to what the viewing public has come to expect from the BBC, ITV and RTE. For example, the Cork cable system carries RAI, the Italian national network, but unless you are fluent in Italian the novelty of this soon wears off. The current feeling in the trade is that set changeover will be relatively gradual. There's also the possibility that when the cable companies start to charge for the extra channels

they will do so via a small set-top box of tricks whose output will be available via one of the existing set buttons.

Position of RTE

How does RTE feel about all this? You might imagine that it would be none too happy about the competition being generated by the cable systems. But in the true spirit of “if you can't beat them, join them” RTE actually owns eighty per cent of Cablelink, the Dublin cable company. RTE claims to be unconcerned about the extra competition, and its viewing figures tend to justify this confidence.

Rebroadcast Systems

What RTE does frown upon is the number of illegal rebroadcasting systems that have sprung up in the rural areas of the south and west. There are estimated to be hundreds of such systems, of varying size, operating in areas where cabling is never likely to be a viable proposition. The usual technique is for a high-gain aerial system for reception of the UK transmissions to be sited on a suitable hill top. The signals are then rebroadcast at u.h.f., after remodulation on to a different group of channels. The results vary from very good to poor, but then even poor reception is better than none at all. Strictly speaking all this is totally illegal, but if the local population is happy and there's no interference with the legal RTE transmissions such systems are usually left alone. There have been attempts to use signal scrambling on these illegal systems, but these have by and large proved to be impractical. Those who set up the systems normally recoup their investment through the upsurge in set replacement business and the demand for new aerial installations.

Satellite TV Reception

The alternative for viewers outside the range of UK services and in areas that are not cabled is of course to purchase a satellite TV system. There was considerable interest in such systems at first, but by and large they are for the present confined to hotels and pubs – due to the high installation cost and the fact that BBC and ITV programmes are not available via this mode of reception. The advent of DBS in conjunction with the much lower cost receiving equipment that has been promised is likely to change this situation. The trade holds its breath waiting for an anticipated upsurge in business!

Cable Prospects

In the meantime the cable companies will continue to prosper. There are estimated to be some 800,000 households in the country, and while it's difficult to assess accurately the number of sets in use because of smuggling (smuggling? I hear you ask – but that's another story!) it is generally thought that about a million colour TV sets are at present in use. Given that there are over 300,000 cable subscribers, cable can only be described as a success. As we've pointed out, the main reason for this success is the demand for the BBC and ITV programmes, the existing satellite TV channels merely being a bonus. A large percentage of the population of Ireland is now in the enviable position of being able to get at least eight channels, yet you still get the complaint that “there was nothing worth watching on TV last night”!

TV Fault Finding

Reports from D.H. Davies, S. Pearson, Steve Leatherbarrow, Gerry Hoey, R.S. Narwan, Nick Beer, Les Grogan, Alfred Damp and Philip Blundell, Eng. Tech.

Philips KT3 Chassis

The problem with this set was very intermittent tripping accompanied by a white raster. Because of the nature of the fault it was impossible to follow normal fault-finding techniques. During one spell of tripping however we were able to determine that the line frequency was a long way off. Replacing the TDA2571 sync/line generator chip put matters right. S.L.

Sanyo CTP6112

This one was a real monster. Initially the set was dead, with the 39 Ω , 5W line output stage h.t. feed/antibreathing resistor R378 open-circuit. This was found to be due to the fact that the efficiency diode D371 was short-circuit. On replacing these items and switching on all that greeted me was an overbright raster with flyback lines. R605 and R609 (both 330k Ω) on the c.r.t. base panel were both open-circuit. Strange: no change at all in the display when these were replaced. Further checking revealed that R397 (1k Ω , 1/2W) was open-circuit – this resistor is associated with the c.r.t.'s grids. There was plenty of voltage at the junction of R608/9 but -25V at the other side of R608. Putting this right still didn't restore normal operation, and it took us rather longer than it should to discover that there was no h.t. supply to the RGB output transistors because R393 (1.5k Ω , 5W) was open-circuit.

A catalogue of disaster if ever there was one! What happened to cause so much damage isn't clear – one is always left wondering what the sequence of events had been in such a situation. The negative grid voltage was presumably caused by valve action within the c.r.t. S.L.

Panasonic TC2205 (U2 Chassis)

The customer's complaint was of mysterious faint light bands on the screen and occasional volume variations. The two h.t. reservoir capacitors C854 (195V supply) and C852 (160V supply) were found to have only one leg each! They are 10 μ F and 100 μ F respectively, 250V. S.L.

Tensai TCT1025P

This 10in. colour portable is very similar to various Amstrad/Orion chassis I've seen. The problem was that on the odd occasion the line would collapse and the set would then go off. After a long wait for the fault to occur a scope check was made in the line driver stage. The drive waveform here was found to be normal. The waveform at the collector of the line output transistor was low in amplitude however, with ringing at the end of the trace. The transistor fitted in this position was a 2DS917. Replacing it with a BU508A cured the fault. S.L.

Decca 130 Chassis

This set had a very dim picture. The cause was no c.r.t. first anode supply. Simple you say. The supply is derived from the focus module however, a self-contained unit with four leads. The prospect of a spares order and a wait

didn't appeal, so a further check was made. Sure enough there was no voltage at the c.r.t. pins and it did appear that the focus unit was responsible. On disconnecting the lead to the c.r.t. base however ample voltage was found to be present. A resistance check was then made from the first anode supply to chassis. As the reading was 1k Ω and there's a 1k Ω resistor in series with the three c.r.t. first anode pins one of them was clearly shorting to chassis. Pin 5 was found to be responsible for the trouble. It was shorting to the ring in the c.r.t. base – this acts as a spark gap. Stripping the base down and gently bending the ring slightly away provided a cure. Simple indeed! S.L.

Fidelity CTV14 (ZX2000 Chassis)

The symptoms with this set were field roll with a snowy picture. We suspected the tuner and found that one of the cover tags which are pressed out in manufacture was touching the print inside the tuner. Removing this tag cured the fault. D.H.D.

Waltham W199

There was no sync, motorboating sound and we were unable to set up the 10-5V supply. The series regulator driver transistor TR702 (2SC945) turned out to be faulty. D.H.D.

Monelectric Minimatic Mono Portable

The mains supply had been fed to the 12V input. There was burnt print, blown fuses and the transistors in the power supply had to be replaced. After carrying out the repairs required in the power supply we found that there was no field scan. Fitting new output transistors put that right and we then had no sync due to the 1 μ F electrolytic C651. After four hours on test the e.h.t. went. Fitting a new BY176 e.h.t. rectifier, with rubber cement to provide insulation, put that right and the set has been working satisfactorily now for over a year. The basic problem is that the same socket is used for the mains and 12V inputs, with different leads. The owner can mistake the leads and fit a three-pin plug. It's rather a dangerous arrangement. D.H.D.

Sony KV2704

There was a narrow picture, bowed at the sides. Adjusting the width and pincushion amplitude controls had no effect. As the SG264A pincushion output thyristor can cause this trouble a replacement was tried but made no difference. When voltage checks were carried out in the pincushion correction circuitry we found that Q510 was biased off. A look around the timebase panel revealed that the soldering to the flyback transformer was extremely messy. A blob of solder hung from one of the pins and rested on an adjacent track, the green varnish providing insulation between the two. It would appear that flyback pulses had eventually punctured this barrier – taking about seven years to do so – thus shorting together the transformer's ABL and 14V pins. Removing the

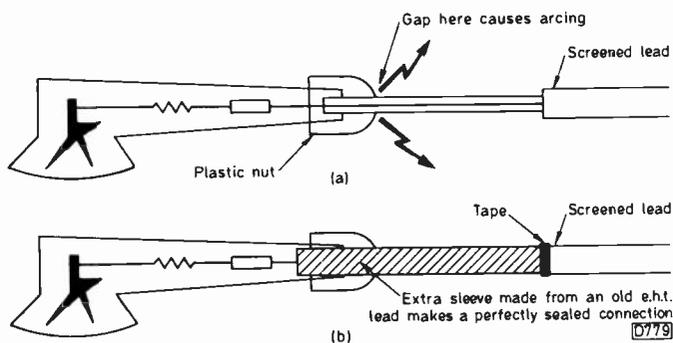


Fig. 1: Method of curing e.h.t. arcing in the Philips CTX chassis. (a) Cause of the problem. (b) Recommended cure.

solder bridge and tidying up the soldering on the other pins cured the fault – once the width and pinchion amplitude controls had been returned to their original settings.

Incidentally the e.h.t. lead was nicked where it rests against the degaussing shield. We added sleeving to prevent possible flashover problems. This is something that's worth checking whenever one of these sets comes in. S.P.

Philips CTX Chassis

I've found that a lot of faults in these sets are caused by arcing at the e.h.t. cap – this happens even when the set is used in a dry environment. The arcing occurs at the point where the e.h.t. lead enters the cap, not around the edge of the cap. Fig. 1(a) illustrates the problem: even when the plastic nut is fully tightened there's a slight gap because the cable is so thin. The remedy I use is shown in Fig. 1(b): adding the outer insulation from an old e.h.t. lead gives a perfectly sealed connection, eliminating the cause of the arcing. The tape is used only to keep the lead tidy and has no insulating role. I find that this works very well, with no further problems. G.H.

Panasonic TC492G

These sets have two apparent weaknesses. The 190V supply reservoir capacitor C555 (10 μ F, 250V) dries up, with the result that the brightness varies and the set occasionally trips to standby (this also applies to Models TC682G and TC381G). The other problem is that the case of the line output transformer cracks and the e.h.t. arcs – with disastrous results! N.B.

Decca 80 Chassis

This set was the touch-tune type (square buttons/red lights). All the buttons were alight except no. 8. Both the 15k Ω h.t. feed resistors were open-circuit. N.B.

Finlux 1000 Series

For a dead set with no output from the power supply, check the supply to the TDA4600 chopper control chip. There can be dry-joints on thermistor PTCu2 or an open-circuit in the parallel resistor network Ru3/4/6/7.

If a teletext set has no +vol, +step, FT or memory functions, check that when the dealer fitted the text panel he didn't accidentally cut through the print to pin 28 of the microcomputer chip.

One of these sets produced the longest list of symptoms

imaginable. As you watched the picture would go all blue, all green, off altogether, show false line lock or line tearing. A voltage check at Da1 proved that the 12V line was low at 9.5V. The cause was a defective BD241 transistor in position Ta8. Da1 also has a reputation for going high-resistance. P.B.

Metz Haiti Model 6972

For no sound and a blank raster check D666 on the line output transformer subpanel – it goes open-circuit. For tripping check whether D688 (BY223) is short-circuit. P.B.

Philips K30 Chassis

My thanks to the nice man at Philips Technical for helping me with this one! There was no picture as the c.r.t.'s cathodes were at 160V, cutting off the tube. The signal was going missing at the RGB output panel, though a replacement made no difference. The sandcastle and blanking pulses were o.k. but there was a 10V ripple on the -20V line as C1586 (100 μ F) was open-circuit. P.B.

Fidelity CTV14 (ZX2000 Chassis)

The line output transformer is a common cause of tripping in this chassis. As a quick check, lift the green wire connected to the collector of the line output transistor. If a dead short can be measured between this lead and chassis you can be reasonably sure that the line output transformer is defective. L.G.

Philips System 4 Chassis

A fault we've encountered several times with later versions of this chassis is R3192 (680 Ω) going open-circuit to give the dead set symptom. It's the line driver transistor's feed resistor and is located on the SOPS panel. L.G.

Philips K30 Chassis (Pye 1060)

There was no channel tuning with this set. The supply to the tuner was present but the supply to the tuning bank presets was missing. The brown wire on plug/socket M63 on the tuning bank panel was open-circuit. R.S.N.

Bush 2044

This set is imported by Morris Lewis and Co. from the Far East – I suspect it's an Hinari chassis. It suffers from buzz and whistle on one or two channels. The cure is to adjust the 6MHz coil, which is on a small subpanel adjacent to the line output transformer. Failure of the on/off switch is another common problem. R.S.N.

Ferguson TX90 Chassis

Three separate sets had three different faults, but one component was the common cause. The sets were of both the basic and remote control type and the symptoms were intermittent "clicking", intermittent field roll and loss of tuning memory. The set with the loss of memory was initially repaired by replacing the memory chip but came back a week later with the report "same as before" – the chip had again failed. In each of these sets the c.r.t. was faulty, with a flashover in the neck between pin connec-

tions. The tubes were all Mullard ones. Is this just an unfortunate coincidence, or have other dealers had this experience?
A.D.

Philips CTX-E Chassis

The symptom was no results and voltage checks threw suspicion on the line output transformer. This was proved to be faulty by disconnecting the anode cap and removing the solder from pin 7 (the earthy end of the e.h.t. section). On doing this the set came to life and the c.r.t. heaters lit up. When a new transformer was fitted the set again went dead, only this time when the solder was removed from pin 7 there was arcing between this pin and the print. This led us to assume that the new transformer

was all right, so attention was turned to the power supply. We found that D6317 (BA317) which removes the drive from the TDA2577 chip when the trip operates had a reverse leak of 80kΩ.
A.D.

Bush BM6514 (T16A Chassis)

The fault was no results. We found that a.c. was apparently reaching the two mains rectifier diodes but there was no d.c. output from the rectifier circuit. The cause of the trouble was traced to the plug between the mains transformer and the rectifier circuit – there was a high-resistance connection between the transformer's centre tap and chassis. Replacing the connector restored the supply.
A.D.

Long-distance Television

Roger Bunney

Traditionally September brings a marked fall-off in Sporadic E reception while a good tropospheric opening is often experienced. This year we didn't get the tropospheric opening but SpE was unusually active, with several exotic signals for good measure.

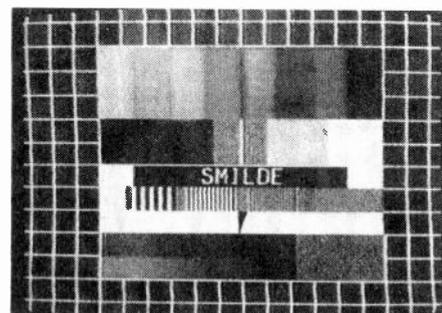
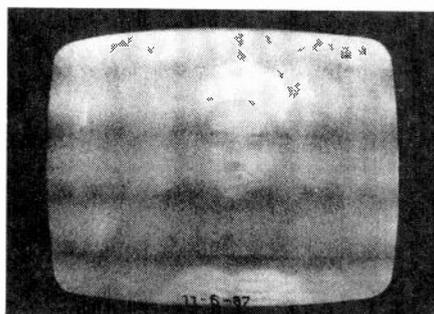
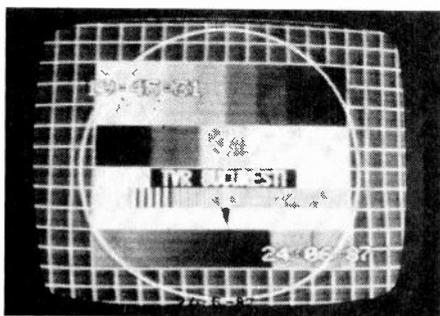
There was a period of tropospheric enhancement over the weekend 19/20/21st, with Band III giving the more encouraging results. Luxembourg ch. E7 and several W. German stations were received here at Romsey, Hants. U.H.F. was generally quiet apart from high-level French and Benelux stations. NRK (Norway) and DR (Denmark) were received elsewhere. Simon Hamer in Powys had a good catch – DFF (E. Germany) ch. E6. Unfortunately however the conditions didn't come up to those experienced at the end of August. Incidentally the RSGB reports that excellent signals from much of Europe, including Hungary and Yugoslavia, were present at 144/432MHz at the end of August Bank Holiday (29/30th). This must surely act as a pointer to enhanced DX-TV possibilities at u.h.f. – we should perhaps consider signals farther afield than ORF (Austria).

Auroral propagation was noted in Scotland during the evening periods of the 22nd and 23rd.

The collated SpE log for the period is as follows:

- 4/9/87 TVE (Spain) ch. E3; SR (Sweden) E2; DR (Denmark) E3; TSS (USSR) R1.
- 5/9/87 TVE E2, 3, 4.
- 6/9/87 TVE E2, 3, 4; RAI (Italy) ch. IA; RTP (Portugal) E2.
- 9/9/87 TVE E3.
- 10/9/87 NRK (Norway) E2, 3; SR E2, 3, 4.
- 13/9/87 TVE E3; DR E3; RAI IA; ARD (West Germany) E2; TVP (Poland) R1.
- 14/9/87 NTA (Nigeria) E3; CST (Czechoslovakia) R1; TVE E2.
- 15/9/87 TVE E3.
- 17/9/87 GBC (Ghana) E3; NTA E3; DR E3, 4; NRK E4; RAI IA, IB; TVE E2, 3, 4; unidentified Arabic signal on ch. E3; French TV audio ch. E2.
- 18/9/87 TVE E2; +PIT (Switzerland) E4.
- 19/9/87 TVE E3; RAI IA; TVR (Rumania) R2.
- 21/9/87 TVE E3.
- 27/9/87 TVE E3; RAI IA.
- 29/9/87 JRT (Yugoslavia) E3.
- 1/10/87 RTP E3; TVE E3; RAI IA.

Keith Watkins (Redruth) logged Sokoto, Nigeria ch. E3 on the 14th. A coloured gentleman with white gown/head-dress was reading the news (caption "HR"). This was preceded by commercials for English products. The signal direction was to the south. Later in the week, on the 17th, Cyril Willis (Norfolk) received both GBC (Ghana) and NTA, Sokoto on ch. E3 from 1800, with the signals becoming smeary by 1830 – at 1815 French sound was noted on ch. E2. Interesting that during the same period Garry Smith (Derby) logged an Arab educational programme (an announcer pointing to Arabic script on a blackboard) on ch. E3 while a Lichfield DXer noted an African participant on this channel. Ray Davies (Norwich) didn't see anything on ch. E3 but did log TVE (Spain) and an African station on ch. E2. Obviously an interesting evening. It does seem that there's a North



Left: The new TVR Bucharest, Rumania test pattern received in Holland by Ryn Muntjewerff on ch. R2. Centre: Egypt ch. E3 received by Ryn Muntjewerff via SpE last July. Right: FUBK test pattern test transmission from Smilde ch. E44 (NOS-3) received by Mark Baldwin in Rugby.

African Arabic station currently in operation on ch. E3, using the FUBK pattern with Arabic script across the centre. Can any reader in the Mediterranean area advise on this matter?

All in all then a very interesting month – it's most unusual to see so much exotic reception at this time of the year. My thanks to the following for sending in reception reports: Gareth Foster (Whitton), David Oliver (Birmingham), Roger Fussell (Torpoint), Peter Schubert (Rainham), Bill Coterill (Tipton), Keith Watkins (Redruth), Simon Harmer (Powys), Cyril Willis (Norfolk), Iain Menzies (Aberdeen) and Garry Smith (Derby).

On a personal note I've recently bought small dishes for use at 4GHz and 12GHz and some other satellite TVRO equipment. Once various domestic painting tasks have been completed experiments will commence and I'll be reporting on results achieved using budget equipment.

News

Reports on the proposed Sealand-TV off-shore commercial station continue to appear. The station would be located on an ex-WW2 fort in the Thames estuary some seven miles from the Essex coast and would use a spare channel in Group A. The Sealand managing director Ken Hanlon claims that "Chanriel Five" would be legal, not a pirate station, but there is doubt about this.

Various f.m. stations are using Band III for studio/transmitter links across London – Community Development Radio uses 187.45MHz and Time Radio 192.15MHz. These transmissions have been noted by TV-DXers.

A cheap dual-band (v.h.f./u.h.f.) System I TV set is being marketed by Gateway under the Binatone label. Called the Minivision Mk. 2, the 4.5in. monochrome set covers chs. E2-12 and 21-69. It can be operated at 12V or from the mains and sells for under £60. No other details are known.

The New Zealand Broadcasting Corporation is radiating multichannel TV sound test transmissions from the Wellington TV2 transmitter, using the UK Nicam 728 digital coding system. The tests are being conducted to assess performance under NZ operating conditions and there are at present no plans to start a dual-language/stereo service.

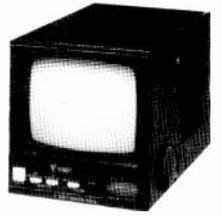
The government of Gibraltar is considering whether to issue licences permitting satellite TV reception. The main uncertainties relate to whether the government can "authorise" reception of signals beamed from space, the implications for the GBC (Gibraltar Broadcasting Corporation) and the environmental effects of numerous dish aerials.

Ariane's September 15th launch was successful, putting ECS-4 into orbit. This satellite carries twelve TV transponders capable of providing reception with 80cm dishes. Thanks to North East Satellite Systems for this news. Hopefully the W. German TV-SAT 1 will be operational within a matter of weeks, providing four channels at 65dBW capable of reception with 45cm dishes.

Aerial Equipment

Whilst looking around for suitable cable for use with satellite TV equipment I came across some ultra low loss Japanese cable which is available from Telecomms, London Road, Portsmouth (0705 698 113). The cable has a white PVC sheath and is more flexible than types such as the H100. Type 5D-FB at 95p per metre has a loss of 0.121dB/m at 400MHz; type 8D-FB at £1.85 per metre a

NEW FROM YOKO MODEL F6/I VHF/UHF SYSTEM B/G/I/L Operation £95.00



Yes, the ubiquitous Yoko 5" black & white TV for reliable VHF/UHF TV/DXing is back – but in an improved version. Model F6 incorporates not only **SYSTEM I** (6MHz sound for UK/Eire/South Africa) but **SYSTEM B/G** (5.5MHz sound for Europe, Middle East, Australasia and other parts) **AND SYSTEM L FRENCH** standard (6.5MHz sound). The 5.5/6MHz sound switching is automatic within the receiver, the 6.5MHz and positive/negative video switch is situated at the rear of the television.

It's restyled too, featuring a sleek black monitor look and with rotary drum continuous band tuning. A telescopic whip antenna is situated at the rear, together with a 75 ohm coaxial aerial input socket.

Versatile 3 way powering for AC Mains, internal batteries or an external 12v DC source (lead supplied), its ideal for the home, mobile, camping/caravanning or that 'DX-pedition' to the local mountain (and we'll supply the aerials if needed!). Completely compatible for use in the UK and throughout the Continent (including **FRANCE**). It's just the answer for a compact – 5.7(H) x 5.5(W) x 8.6(Deep) inches – high gain and comprehensive TV-DX installation and at a reasonable price.

Stocks of this new receiver have just arrived from the Far East, – so don't delay, order today and maximise your loggings.

YOKO model F6 multistandard VHF/UHF 5" screen TV (System B/G/I/L) £95.00. Carriage UK £4.95; elsewhere POA.

Aerial Techniques, the company that knows the TV-DXing hobby carry a comprehensive range of aerial equipment for every type of installation – and with a huge range of filters, amplifiers, cables, rotators, masts and supporting hardware. Send for our illustrated **Catalogue at 75p**, if it doesn't list what you want, then we can obtain it quickly.

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AERIAL TECHNIQUES (T)

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Poole, Dorset, BH12 2EH. Tel: 0202 738232.



loss of 0.085dB/m; and type 10D-FB at £2.85 per metre a loss of only 0.068dB/m.

QA Electronics Ltd (Unit 10, Parsons Green, Boulton Road, Stevenage, Herts SG1 4QJ – telephone 0438 318 228) have introduced an aerial socket that helps to prevent lightning strike damage to radio/TV equipment. Although the socket looks like a standard aerial one it's designed to bypass to earth excessive currents generated during storms. It's claimed that a 100kV input surge produces only 1V at the socket's output. The socket will handle a 40kA single discharge pulse or 5kA pulses at ten minute intervals and has a signal insertion loss of 1.5dB.

The Revco PA3 Head Amplifier

Revco Electronics is perhaps best known for its range of amateur, mobile and monitoring aerials, the Revcone aerial being particularly popular. The firm has recently introduced a compact, in-line head amplifier intended for use with wideband monitoring aerials, particularly the Revcone, that are omnidirectional and thus have low or unity gain. The use of an amplifier adjacent to the aerial improves the sensitivity and the overall system noise performance – and of course helps to reduce cable loss, particularly where there's a long run or a cheap coaxial cable in use.

Revco is noted for its high mechanical standards, and this amplifier module maintains the tradition. The highly polished steel module is of circular section, approximately 3¼in. long and 13/16in. at its widest. The input termination is a body mounted PL259 plug and the output termination an integral SO329 socket. Thus the module can be screwed directly into the output of any communica-

tions type aerial, such as the Revcone, optimising the matching and connection efficiency and reducing any loss to the absolute minimum. The downfeeder, which would be terminated with a standard PL259 plug, connects with the in-built SO329 socket at the amplifier's output, ensuring complete screening throughout and overall mechanical/electrical efficiency. The module weighs approximately three ounces.

The matching indoor power supply unit is housed in an attractive plastic case which is some 4¾ × 1⅞ × 3¾in. Its bright red cover clips off to reveal a compact, well-made, fused power supply. Two holes in the side provide access for the feeder input and a coaxial connection to the receiver system. The PVC grommets allow for the thinner type of coaxial feeder such as RG58; thicker types such as the M67 would require enlargement of the hole. The saddle-clamp connections within are again intended for use with the thinner type of coaxial cable. On connec-

tion I found that the earth/screen clamping metalwork is perhaps a little too close to the inner centre conductor screw connection so that it would be quite easy to get a screen-inner short via strands of braid. Care should therefore be taken when making the connections. There's a three feet length of three-core mains lead.

The heart of the amplifier is a monolithic chip of US origin. Specific minimum performance characteristics are quoted. The PA3 has a claimed minimum gain of 13dB over the bandwidth d.c. to 1GHz and a maximum noise figure of 5dB at 1GHz. It's capable of handling high input signal levels (15dBm at the intercept point, third order) and requires 5V at 17mA. On test I found that the following gain figures were achieved over the v.h.f./u.h.f. spectrum: 18.25dB at 45MHz; 21dB at 100MHz; 19.25dB at 155MHz; 17dB at 205MHz; 19dB at 255MHz; 22.5dB at 470MHz; 18dB at 700MHz; 16dB at 860MHz.

Apart from its use for v.h.f./u.h.f. monitoring the PA3

Table I: French fifth and sixth network transmitters.

C5 transmitters already in service

| | | | | | |
|-------------------------------|------|------------------------------------|------|------------------------------------|------|
| Ales L'Hermitage..... | 62 H | Grenoble Tour SS Venin..... | 59 H | Nice Mont-Alban..... | 51 H |
| Amiens Dury..... | 49 H | La Baule Saint Clair..... | 38 H | Niort Maisonnais..... | 38 H |
| Angers Rocheford/L..... | 50 H | La Rochette Mireuil..... | 48 H | Orléans Trainou..... | 52 H |
| Angoulême Saint-Saturnin..... | 31 H | Le Creusot Mont Saint-Vincent..... | 38 H | Paris tour Eiffel..... | 30 H |
| Avignon Le Pontet..... | 47 H | Le Havre Harfleur..... | 53 H | Pau Assat..... | 60 H |
| Bayonne La Rhune..... | 56 H | Lens Bouvigny..... | 51 H | Poitiers Hôpital des Champs..... | 41 H |
| Beauvais Saint Just..... | 49 H | Lille Lambersart..... | 65 H | Reims Hautvilliers..... | 53 H |
| Besançon Bréguille..... | 45 H | Limoges Puy Las Rodas..... | 38 H | Rennes Saint-Pern..... | 34 H |
| Bordeaux Bouliac..... | 65 H | Lorient Ploemeur..... | 62 H | Rouen Grand-Couronne..... | 59 H |
| Bourg-en-Bresse Ramasse..... | 38 V | Lyon Fourvière..... | 28 H | Saint-Étienne Croix de Guizay..... | 65 H |
| Bourges Neuvy..... | 21 H | Mantes Maudetour..... | 55 H | Saint-Nazaire Étoile du Matin..... | 55 H |
| Brest Roc Tredudon..... | 34 H | Marseille Grand Étoile..... | 32 H | Saint-Quentin Cauchy..... | 30 H |
| Caen C.H.U..... | 38 H | Marseille Pomègues..... | 54 H | Toulon Cap Sicié..... | 57 H |
| Cannes Vallauris..... | 63 H | Maubeuge Rousies..... | 32 H | Toulouse Bonhoure..... | 32 H |
| Chartres Montlandon..... | 47 H | Montluçon Marignon..... | 49 H | Tours Chissay..... | 57 H |
| Cherbourg Digosville..... | 35 H | Nancy Malzeville..... | 55 H | Troyes Les Riceys..... | 29 H |
| Clermont-Ferrand Royat..... | 58 H | Nantes Haute Goulaine..... | 21 H | Valence Saint-Romain..... | 53 H |
| Dijon Gal Ruffey..... | 46 V | Nevers Chally..... | 41 H | Valenciennes Marly..... | 49 H |
| Dunkerque Tour de Reuze..... | 59 H | Nîmes Bas-Rhône..... | 31 H | Vannes Moustoir'Ac..... | 58 H |

C5 transmitters in service by end 1987

| | | | | | |
|-----------------------------|------|---------------------------------|------|-------------------------|------|
| Paris-Nord Sannois..... | 65 H | Belfort Valdoie..... | 30 V | Mont-Saleve..... | 66 H |
| Paris-Est Chennevières..... | 48 H | Montpellier Saint-Baudille..... | 48 H | Paris-Sud Villebon..... | 59 H |
| Meaux..... | 61 H | Saint-Raphaël Pic/L'ours..... | 36 H | Mont-Pilat..... | 59 H |
| Melun..... | 59 H | Le Mans Mont Mayet..... | 32 H | Puy-de-Dome..... | 30 H |
| Plessis Robinson..... | 44 H | Metz Lutange..... | 39 H | Perpignan Néoulous..... | 38 H |

M6 transmitters already in service

| | | | | | |
|-------------------------------|------|----------------------------------|------|------------------------------|------|
| Ales L'Hermitage..... | 60 H | La Rochette Mireuil..... | 51 H | Paris Tour Eiffel..... | 33 H |
| Amiens..... | 52 H | Le Creusot Mt Saint Vincent..... | 60 H | Pau Assat..... | 63 H |
| Angers Rochefort..... | 53 H | Lens Bouvigny..... | 54 * | Poitiers Couronneries..... | 44 H |
| Angoulême Saint-Saturnin..... | 34 H | Lille Lambersart..... | 53 H | Rennes Saint-Pern..... | 31 H |
| Avignon Le Pontet..... | 54 H | Lorient Ploemeur..... | 65 H | Rouen Grand-Couronne..... | 62 H |
| Bordeaux Bouliac..... | 43 H | Lyon Fourvière..... | 22 H | Saint-Quentin Gauchy..... | 33 H |
| Bourg-en-Bresse..... | 32 V | Marseille Gde Étoile..... | 38 H | St-Étienne Cx de Guisay..... | 62 H |
| Caen C.H.U..... | 60 H | Montluçon Marignon..... | 52 H | St-Nazaire Étoile Matin..... | 52 H |
| Clermont-Ferrand Royat..... | 61 H | Nancy Malzeville..... | 43 H | Toulon Cap Sicié..... | 60 H |
| Dijon Gal Ruffey..... | 43 V | Nantes Hte Goulaine..... | 65 H | Toulouse Bonhoure..... | 34 H |
| Dunkerque Tour de Reuze..... | 62 H | Nevers Challuy..... | 46 H | Valenciennes..... | 34 H |
| Grenoble Tour Sans Venin..... | 62 H | Nîmes Bas-Rhône..... | 37 H | | |

* H to north, V to south

M6 transmitters in service by end 1987

| | | | | | |
|---------------|------|-------------------|------|---------------|------|
| Beauvais..... | 52 H | Chennevières..... | 58 H | Villebon..... | 36 H |
| Orléans..... | 36 H | Meaux..... | 58 H | Brest..... | 60 H |
| Mantes..... | 53 H | Melun..... | 64 H | Reims..... | 56 H |
| Sannois..... | 62 H | Besançon..... | 21 H | | |

module can be used as a short-wave radio preamplifier and as an instrument gain block, i.e. for use in r.f. measurement etc.

Revco mention that a variable gain version is under consideration and that an indoor version is currently available. The later is designated type PA31 and can be operated from any power supply providing a 12V output. The input/output terminations can be varied to suit the customer - BNC, PL259/SO329 etc.

In its intended role as a wideband aerial amplifier the unit will lift all signals within its passband, which of course includes all local TV signals, local radio stations, taxi services etc. It's unlikely to overload, but a wideband scanner at the end of the feeder may be subjected to signal input levels that its front end cannot handle. If the receiver has a limited dynamic range spurious signals, overloading and breakthrough could well occur - particularly if bipolar transistors are used in the front end. So be warned!

The Revco PA3 amplifier module is a very well made, stable and compact unit giving excellent performance within its quoted passband. The in-line method of connection ensures optimum efficiency and minimum loss. The power supply is well made and runs very cool. Revco equipment is available from aerial dealers and selected radio enthusiast outlets. The PA3's price, with PSU, is typically £40 including VAT.

Regular readers will be aware of my recent experiments with Les Wallen helical aerials in Band I. Two such aerials have been in use at my home during the past SpE season. These aerials have an SO329 output termination making them ideally suited for use with the PA3 - which makes the aerials "active".

French C5 and M6 Network Listings

David Moller of Eastbourne has sent us the current list of French fifth and sixth network transmitters. Although these networks tend to use much lower output powers than the older ones a number of the transmitters have been received in the UK and identification can be a problem. The lists were taken from the French publication *Tele 7 Jours* which can be obtained on subscription from Dawson Subscription Service, Cannon House, Folkestone, Kent CT19 5EE (0303 57 421, ext. 60). A point of interest is the fact that the magazine is always received a week prior to the programmes listed in it. Our thanks to David Moller and to *Tele 7 Jours* for this information - see Table 1. The fifth network (C5) will cover 90 per cent of the French population and the sixth network (M6) 65 per cent of the population by the end of the year.

Obituary

We have heard of the death of Jim Maden, a well known TV-DXer, from Ian Roberts in South Africa. He died of a heart attack in April. Jim spent a considerable time in the forces in Cyprus, returning to the UK in the late 60s. He eventually left for South Africa where he settled and continued with his DX-TV activities - both terrestrial reception and later satellite reception including the Russian Ekran satellite. This still provides 714MHz transmissions which are receivable in South Africa despite the very poor side-lobe radiation in that direction. Ekran provided an inspiration for Jim, who spent much time experimenting with reception techniques - photos of his equipment and reception appeared in this column. Rest in peace, Jim.

TELEVISION DECEMBER 1987

next month in

TELEVISION

● TV AND VCR STANDARDS CONVERSION

Service departments are often asked to convert, or advise on converting, TV and video equipment bought abroad so that it will work on the UK TV standard. Whether such conversion is feasible depends on the condition of the equipment and the standards involved. Some conversions are relatively simple others quite impractical. Next month's article by Eugene Trundle considers all these points and offers practical guidance on simple conversions that can be profitable. It looks at the whole field, including tape.

● DUAL-CHANNEL SOUND

TV sound in stereo is likely to be introduced in the UK before long - the system and technology have already been agreed. In several other countries stereo TV sound has been available for some years. Apart from stereo, dual-channel operation offers the possibility of bilingual sound transmission. A number of systems have been devised to make compatible dual-channel sound feasible. With new transmission standards, such as those devised for satellite TV broadcasting, multi-channel sound capability is built in at the outset. Geoff Lewis reviews the various systems and the technology involved in a new series starting next month.

● SERVICING VHS CASSETTES

Because of the high cost of replacing a head drum, dodgy cassettes are often put aside. There must be many cassettes laying around that could be used quite safely after a little care and attention. Harold Peters provides details of the repair procedure he uses and summarises the cassette faults usually encountered.

● METER REPAIR

Bob Walker was recently asked to look at an Eagle minimeter that had been damaged through misuse. The details of what had happened and the steps necessary to effect a cure could help in dealing with other, similar meters and offer an insight into this branch of electronics.

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and gave the fast forward and rewind functions.

After replacing IC807 the capstan wouldn't turn and the deck wouldn't load. The loading motor chip IC808 was found to be open-circuit and the loading motor itself had been damaged – it took 2A off load (a replacement took 100mA). Replacing these last two items finally put the machine in working order. With the price of Sharp spares what they are these days the repair was not cheap. P.H.

Letters

VIABILITY OF SERVICING

I would like to comment on two points raised in the October issue. First, in your editorial about high-technology servicing you mentioned the "daunting prospects in terms of viability" in view of the costs involved in providing such a service. I agree that if high-technology servicing is carried out in the traditional way, i.e. identifying and repairing stock faults, it will fail. The national servicing organisations will not be able to handle technology on a large scale unless some serious rethinking is done. High-technology servicing will have to be carried out by small, well-equipped units or cells, well backed by the manufacturers in terms of information, spares and technical communications. Highly skilled personnel are required, with plenty of space in which to work and minimal interruptions.

Secondly there was M.D. Maurice's letter on cowboy outfits who overcharge without necessarily carrying out the work – and who often get their fault information from *Television!* Don't overlook the friend of a friend "who knows about these things" and works for "National Rentals". He gets the parts cheap and then cocks it up for £20. Like most others I've had Saishos, Amstrads etc. that have been "looked at" and twiddled. Why do the twiddlers always go for the set carrier/deviation and the white/dark clip levels? Once the original fault is cleared considerable setting up is then required. Like Mr. Maurice, I can provide examples. Here are a couple.

A Saisho customer whined about the cost of repair. "I brought it to you because they said you could do it." Others had tried! Costs: original a.g.c. fault, £35; additional three-four hours for setting up, £56; total £91 for a machine worth about £130.

Secondly a Sony SLF1 portable VCR. Estimate to replace the audio/control head assembly, the video heads and upper cylinder, then realign the mechanics after wholesale twiddling of every screw on the audio/CTL head assembly, £400. The cowboy had estimated £30 to sort out poor rewind, had charged £20 and left the owner facing a large bill to sort out the damage. The estimate was not taken up.

Many low-cost, high-technology VCRs and compact disc players are "disposable" in that the repair costs are a significant proportion of the purchase price. For example, to supply and fit a new optical unit in a £199 compact disc player would cost £120.

I now charge £25 an hour to the next half hour. Why? Because it has cost me around £5,000 to set up a laboratory style service department to repair camcorders, cameras and the higher technology VCRs, not to mention the £1,700 vectorscope plus specialist connectors, jigs, grey-scale and colour-bar charts etc. etc.

The point is that with the experience and equipment

available most general faults and quite a few complex ones can be diagnosed, if not repaired, within a time scale of one to one and a half hours. That is, £25-£37.50 plus parts plus VAT. This assumes that the equipment has a virgin fault. It doesn't take much brain work to figure out the cost of a long period of time spent sorting out spurious faults and setting up.

As to estimates, since I no longer repair TV sets I cannot comment on these. With a standard VCR estimates of less than £50-£60 are not viable unless the fault is a common one. With cameras, camcorders and portable videos, no estimates less than £100.

It's a sorry state for the public, but I think we can all agree that it is its own worst enemy. I don't know how to educate people to the fact that high-technology products that are cheap to buy will not be cheap to repair. A professional service unit, while having a high hourly charge, can do the work quicker than a cowboy and thus at less cost in the long run whilst maintaining manufacturers' standards. Do any of the TV consumer programmers read *Television!*

Steve Beeching, T.Eng.,
Newark, Notts.

FREE ESTIMATES

I found M.D. Maurice's letter in the October issue highly offensive. Is he suggesting that all firms who offer free estimates are cowboys? His examples are of course the customer's version of what the quote was. Anyone quoting £80 to repair a G11 can't want to earn a living! Even the thickest customer isn't going to pay that!

Don't think for a minute that I'm taking the side of the rip-off merchants. Maybe the folk living in Wembley can afford whatever Mr. Maurice's call out charge is, only to be told that the set is beyond economic repair. In this part of London, and I suspect many other parts of the country, they can't. It's firms who give free estimates that will see the difficult times through.

D.C.J. Tilley,
London N16.

SET AND SERVICE COSTS

In reply to M.D. Maurice's letter, with the advent of cheapo TV set sales by large rental companies over the last few years to even larger wholesale TV outlets anybody with a good set of eyes can now go and buy a 22in. G11 for £25 to £30 plus VAT and flog it at £60 to £70. Easy money for those with a little knowhow.

What happens when this set goes faulty however? The seller quotes a stupid, trumped up price so that the buyer either decides to buy another set with a picture or the seller gets another engineer to have a look at it. Both ways the seller wins.

So how do you stop it? I sell a G11 with a six-months warranty at only £50. This makes me between £25 and £30, depending on where I buy it. After the warranty period I'll repair the set cheaper, but only on the labour part of the bill. Over the past three years I've sold some 400 of these sets. I get about 30-40 back each year for repair.

It seems to me that wherever you live these days you will find the get-rich-quick cowboys. But they all end up in financial trouble because they depend too much on the £70-£80 job twice a week.

Perhaps readers would like to collaborate in a national

survey of TV repair rates. Let's say for a G11 with field collapse. Parts: two 1.5kΩ resistors, a TDA2600 plus holder and 470μF block. With a call out fee and without. I hope to see some replies in later issues.

L. Goodwin, Village TV Services,
Chorley, Lancs.

BATTERY ELIMINATOR MODIFICATIONS

Many readers may, like myself, have built the 15V battery eliminator for Model 8 Avos (see *Television*, August 1984). Although it draws only a few milliamps the 1.5V cell will be drained if the Avo's selector is left in the resistance position for long periods. A blinker light, as used at road works, makes a good reminder to switch over. Fig. 1(a) shows the circuit I adopted. It uses just three components, an LM3909 chip, a 220μF tantalum capacitor and a 2.5mm LED. Wire it up on a piece of Veroboard and mount it so that the LED can be seen through the glass scale. Connect it across the 1.5V supply to the eliminator. The consumption is less than 1mA and the flash rate once a second.

I also have a 100kΩ/V Simpson meter that uses a 22.5V battery. This costs around £3 to replace. I found that a few modifications to the original eliminator circuit would increase its output – the revised circuit is shown in Fig. 1(b).

William Harrison,
Windsor, Berks.

FREE POWER SOURCE

Readers may be interested in a free power source that's being thrown away every day. The lithium batteries used in the Sinclair FTV1 are made by Polaroid and cost £10 for three. The film packs for the SX70 Polaroid camera also contain a lithium battery which can be extracted when the film has been used up, before the pack is thrown away. Apart from being on a white card mount slightly

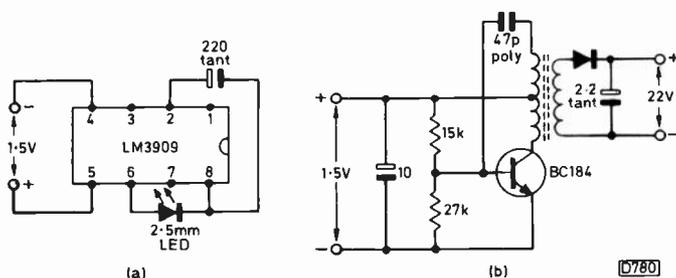


Fig. 1: Blinker circuit for use with a battery eliminator (a). Modified battery eliminator circuit to provide a higher output (b). The transformer is an audio driver type from a Japanese transistor portable radio receiver.

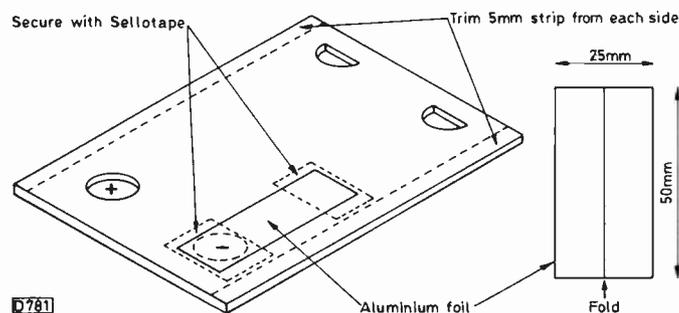


Fig. 2: Modifications for using the lithium battery from a Polaroid SX70 camera film pack in a Sinclair FTV1 pocket TV receiver.

larger than the Sinclair battery it's otherwise identical – except for the fact that the position of the negative terminal pad differs – and with slight modification as shown in Fig. 2 can be slid into the Sinclair TV set's battery slot and used in the normal way.

These lithium batteries have a very long shelf life and are far from exhausted when the film pack has run out. Tested with an Avo 8 they read a full 6V, and touch tested on the 10A d.c. range they give a vigorous full-scale deflection. My current specimen has so far given over four hours' running in the Sinclair TV set with no sign of deterioration. A little ingenuity can provide battery power for other small portable items – so ask your friends to save their old film packs for you.

Now to the details of the modification for use in the Sinclair set. Cut piece of kitchen foil 50 × 25mm and fold it lengthways. Insert one end of the doubled strip into the receiver (right hand) contact aperture and secure both ends of the strip in place with Sellotape – see diagram – taking care to leave the middle of the strip clear to act as the negative contact. Trim a strip 5mm wide from both sides of the battery card. For safety reasons, take care not to cut into the actual battery bubble itself on the underside of the card – the contents are highly toxic.

John C. Priest,
Blackpool.

SAISHO AND TRIUMPH SPARES

With reference to my mention of Saisho and Triumph spares in VCR Clinic, October, I have been asked by Mastercare to point out that original manufacturer's replacement parts are available from the Mastercare Components Division at Maylands Court, Maylands Avenue, Hemel Hempstead, Herts HP2 7DE (0442 232000).

Nick Beer,
Bideford, N. Devon.

THE G11's HT RESERVOIR

I think I've come up with a cure for those notorious 470μF h.t. reservoir electrolytic capacitors used in the Philips G11 chassis. These sets are very popular and refurbishing them is rewarding. I've had to change many of these electrolytics and kept them on the waste not, want not principle. One evening I decided to solder the rivets of these salvaged capacitors to the tags, using a Multicore solder for aluminium (RS stock no. 555-099). To do this, first brush around the tag and rivet using a stiff wire brush, then solder generously around the rivet to tag – I use a no. 8 tip in my Weller soldering gun. This needs to be done fairly quickly for obvious reasons.

I've in this way revived all the capacitors changed over the past year and haven't had a single failure (or a return) since. What's more, I now have a good supply of usable 470μF capacitors of varying manufacture – all good uns!

Bernard Mannas,
Huntingdon, Cambs.

FOR DISPOSAL

The following are available free to anyone who can collect – most copies of *Television* from March 1971 to the present date. Anyone interested should call me first on Woking (048 62) 22380, evenings or weekends.

Mike Hurdle,
Woking, Surrey.

ECONOMIC DEVICES & QUICK SAVE T.V. SPARES

| | | | | | | | | | | | | | | | | | |
|---------|------|----------|-------|----------|-------|---------|-------|---------|-------|------------|------|---------|------|------------|------|---------------|-------|
| 15/80H | 3.30 | 2SA940 | 0.59 | 2SC535 | 0.79 | AF180 | 0.55 | BA656 | 1.00 | BC560C | 0.14 | B0X63A | 1.96 | BF52 | 0.27 | BYX71-350 | 0.95 |
| 15/85R | 3.30 | 2SA940.2 | 2.14 | 2SC536 | 0.33 | AF181 | 0.53 | BA7100 | 11.25 | BC635 | 0.30 | B0Y20 | 1.21 | BFY79 | 0.49 | BYX4 | 1.20 |
| 16039 | 0.79 | 2SA950 | 0.72 | 2SC537 | 0.54 | AF186 | 0.53 | BA841A | 28.98 | BC636 | 0.28 | B0Y81 | 1.05 | BFY90 | 0.61 | BY56 | 1.16 |
| 16181 | 1.04 | 2SA951 | 1.75 | 2SC605L | 1.16 | AF239 | 0.43 | BA843 | 3.96 | BC637 | 0.24 | BF115 | 0.40 | BLY49 | 0.20 | BZ793C30 | 1.86 |
| 16182 | 1.04 | 2SA966-Y | 1.16 | 2SC620 | 0.95 | AF279 | 0.88 | BA854 | 5.76 | BC639 | 0.20 | BF117 | 0.66 | BR100 | 0.25 | BZ788 RANGE | 0.10 |
| 16334 | 0.98 | 2SA999 | 1.36 | 2SC668 | 0.67 | AL113 | 1.36 | BAV18 | 0.21 | BC640 | 0.24 | BF118 | 0.67 | BR101 | 0.69 | BZ787 RANGE | 0.18 |
| 16335 | 0.94 | 2SB774 | 1.15 | 2SC681 | 4.40 | AN115 | 3.98 | BAV20 | 0.35 | BC680 | 0.31 | BF123 | 0.25 | BR103 | 0.56 | BZ779 RANGE | 0.10 |
| 16446 | 0.98 | 2SB185 | 1.13 | 2SC682 | 1.88 | AN155 | 1.89 | BAV21 | 0.12 | BCX24 | 0.18 | BF127 | 0.21 | BR303 | 1.23 | C1060 | 0.46 |
| 16600 | 1.38 | 2SB375 | 3.87 | 2SC684 | 1.65 | AN206 | 2.58 | BAW62 | 0.11 | BCY70 | 0.30 | BF137 | 0.29 | BR316 | 0.67 | C106M | 0.76 |
| 16802 | 1.27 | 2SB400 | 0.40 | 2SC683 | 0.63 | AN208 | 3.55 | BAX12 | 0.48 | BCY71 | 0.30 | BF153 | 0.58 | BR300 | 2.01 | CA3046 | 0.58 |
| 17052 | 5.61 | 2SB405 | 1.03 | 2SC710 | 0.69 | AN210 | 2.28 | BAX13 | 0.11 | BCY72 | 0.20 | BF154 | 0.26 | BR309 | 0.87 | CA3089 | 1.53 |
| 17053 | 5.61 | 2SB449B | 6.98 | 2SC711A | 0.50 | AN211 | 3.25 | BAX16 | 0.11 | BD115 | 0.34 | BF157 | 0.33 | BR325 | 0.73 | CA3090AQ | 0.83 |
| 17074 | 9.30 | 2SB511 | 2.26 | 2SC717 | 1.28 | AN214Q | 1.50 | BC107 | 0.13 | BD116 | 0.30 | BF158 | 0.18 | BR328 | 1.08 | CA3094 | 3.25 |
| 17089 | 3.45 | 2SB54 | 1.39 | 2SC734 | 1.43 | AN234 | 5.92 | BC107A | 0.11 | BD124 | 1.31 | BF159 | 0.18 | BR329 | 2.19 | CA3131EM | 2.95 |
| 17127 | 3.51 | 2SB546 | 3.75 | 2SC761-Y | 0.95 | AN236 | 3.78 | BC107B | 0.18 | BD124P+KIT | 0.69 | BF160 | 0.31 | BR348 | 2.08 | CBF16848N-071 | 1.56 |
| 17376 | 1.58 | 2SB56 | 2.80 | 2SC783 | 3.98 | AN239 | 4.68 | BC108 | 0.15 | BD131 | 0.57 | BF167 | 0.38 | BR344 | 0.60 | CD4001 | 0.34 |
| 1N4001 | 0.04 | 2SB618A | 2.22 | 2SC790Y | 1.85 | AN240P | 1.25 | BC108B | 0.15 | BD132 | 0.20 | BF173 | 0.34 | BR349 | 0.67 | CD4002 | 0.27 |
| 1N4002 | 0.06 | 2SB631 | 1.45 | 2SC828 | 0.28 | AN241 | 1.71 | BC109 | 0.12 | BD133 | 0.53 | BF177 | 0.35 | BR339 | 0.69 | CD4008 | 1.35 |
| 1N4003 | 0.06 | 2SB643 | 0.80 | 2SC867A | 3.84 | AN245 | 4.49 | BC109B | 0.15 | BD135 | 0.36 | BF178 | 0.40 | BSS38 | 0.87 | CD4011 | 0.29 |
| 1N4004 | 0.05 | 2SB669 | 3.67 | 2SC876 | 0.96 | AN253 | 1.10 | BC109C | 0.12 | BD136 | 0.26 | BF179 | 0.36 | BSTBD140G | 6.25 | CD4012 | 0.24 |
| 1N4005 | 0.05 | 2SB681 | 3.96 | 2SC930 | 0.54 | AN260 | 3.85 | BC113 | 0.14 | BD137 | 0.36 | BF180 | 0.36 | BSTC0246 | 5.99 | CD4013 | 0.33 |
| 1N4006 | 0.08 | 2SB695 | 1.98 | 2SC935 | 4.13 | AN262 | 1.20 | BC119 | 0.36 | BD138 | 0.46 | BF181 | 0.32 | BSTC0233 | 7.25 | CD4016 | 0.46 |
| 1N4007 | 0.07 | 2SB75 | 1.04 | 2SC936 | 8.66 | AN272 | 8.25 | BC126 | 0.23 | BD139 | 0.28 | BF182 | 0.34 | BSTC0143 | 3.07 | CD4017 | 0.82 |
| 1N4148 | 0.03 | 2SB774 | 0.61 | 2SC940 | 4.68 | AN295 | 5.52 | BC132 | 0.14 | BD140 | 0.29 | BF183 | 0.39 | BSTC0143 | 3.07 | CD4020 | 1.23 |
| 1N4448 | 0.05 | 2SB819 | 1.13 | 2SD1128 | 2.90 | AN301 | 3.60 | BC135 | 0.14 | BD144 | 1.70 | BF184 | 0.43 | BSTD1043 | 2.85 | CD4021 | 0.39 |
| 1N5401 | 0.14 | 2SC1034 | 6.75 | 2SD1138 | 1.00 | AN303 | 3.60 | BC137 | 0.18 | BD150 | 1.25 | BF185 | 0.39 | BSV57B | 3.49 | CD4023 | 0.28 |
| 1N5402 | 0.15 | 2SC1050 | 5.06 | 2SD1273 | 1.56 | AN302 | 3.99 | BC138 | 0.34 | BD157 | 0.67 | BF194 | 0.14 | BSV68 | 0.60 | CD4025 | 0.64 |
| 1N5403 | 0.16 | 2SC1096 | 1.16 | 2SD1453 | 1.40 | AN303 | 4.39 | BC139 | 0.28 | BD160 | 1.60 | BF195 | 0.14 | BSX19 | 1.29 | CD4028 | 0.84 |
| 1N5404 | 0.15 | 2SC1104 | 3.98 | 2SD152K | 2.64 | AN305 | 8.95 | BC140 | 0.45 | BD163 | 0.71 | BF196 | 0.11 | BSX20 | 1.00 | CD4040B | 0.85 |
| 1N5404 | 0.15 | 2SC1106 | 4.54 | 2SD198 | 3.87 | AN315 | 2.46 | BC141 | 0.34 | BD165 | 0.62 | BF197 | 0.18 | BSY52 | 0.50 | CD4047 | 1.06 |
| 1N5408 | 0.35 | 2SC1114 | 3.25 | 2SD234 | 0.49 | AN316 | 5.53 | BC142 | 0.23 | BD166 | 0.62 | BF198 | 0.17 | BSY79 | 0.51 | CD4049 | 0.46 |
| 1N914 | 0.04 | 2SC1116 | 4.95 | 2SD235 | 0.60 | AN318 | 5.25 | BC143 | 0.19 | BD168 | 0.73 | BF199 | 0.17 | BT100A | 1.61 | CD4052 | 0.75 |
| IR3043 | 5.00 | 2SC1124 | 1.28 | 2SD24 | 2.29 | AN320 | 5.47 | BC147 | 0.08 | BD175 | 0.20 | BF200 | 0.37 | BT108 | 1.45 | CD4066 | 0.20 |
| 1S1555 | 0.31 | 2SC1129 | 1.65 | 2SD257 | 2.94 | AN321 | 2.25 | BC148A | 0.11 | BD179 | 0.45 | BF218 | 0.36 | BT119 | 1.76 | CD4069 | 0.29 |
| 1S44 | 0.10 | 2SC1131 | 0.64 | 2SD292 | 2.59 | AN322 | 5.85 | BC148B | 0.13 | BD181 | 0.99 | BF224 | 0.17 | BT120 | 2.17 | CD4070 | 0.66 |
| 1S5012A | 0.81 | 2SC1158 | 3.33 | 2SD313 | 2.59 | AN331 | 4.59 | BC148C | 0.11 | BD182 | 0.99 | BF237 | 0.65 | BT121 | 2.48 | CD4081 | 0.35 |
| 1S921 | 0.10 | 2SC1162 | 0.55 | 2SD325D | 2.26 | AN337 | 3.81 | BC149 | 0.11 | BD183 | 0.99 | BF240 | 0.17 | BT123 | 1.98 | CD4083 | 0.35 |
| 2N1303 | 0.38 | 2SC1172 | 2.22 | 2SD348 | 16.13 | AN340P | 1.17 | BC149B | 0.13 | BD184 | 1.21 | BF241 | 0.17 | BT151-800R | 0.89 | CD4511 | 1.10 |
| 2N2129A | 0.33 | 2SC1195 | 5.90 | 2SD350 | 5.20 | AN355 | 5.98 | BC153 | 0.14 | BD187 | 0.57 | BF245 | 0.50 | BT16018 | 2.42 | CD4528 | 2.04 |
| 2N2222 | 0.38 | 2SC1212A | 1.97 | 2SD350A | 3.05 | AN362 | 1.50 | BC154 | 0.14 | BD189 | 0.69 | BF245A | 0.52 | BT18124 | 4.89 | CD4556 | 1.47 |
| 2N2646 | 0.80 | 2SC1213 | 0.89 | 2SD353 | 8.38 | AN370 | 3.95 | BC159 | 0.36 | BD190 | 0.72 | BF245B | 0.49 | BU106 | 1.90 | CRO2AM-8 | 1.70 |
| 2N2904 | 0.36 | 2SC1226 | 1.46 | 2SD389 | 2.41 | AN5010 | 5.70 | BC160 | 0.40 | BD201 | 0.40 | BF246A | 2.52 | BU108 | 1.50 | CV12E | 4.09 |
| 2N2905 | 0.59 | 2SC1293 | 0.90 | 2SD401 | 0.97 | AN5111 | 2.92 | BC161 | 0.28 | BD202 | 0.60 | BF255 | 0.20 | BU109 | 2.65 | CO905D | 3.14 |
| 2N2906 | 0.38 | 2SC1306 | 1.98 | 2SD414 | 1.98 | AN5120N | 4.50 | BC168 | 0.36 | BD203 | 0.50 | BF256 | 0.38 | BU110 | 5.69 | CX104 | 9.64 |
| 2N2926 | 0.15 | 2SC1316 | 10.25 | 2SD471 | 2.13 | AN5132 | 5.39 | BC169C | 0.16 | BD204 | 0.61 | BF256LB | 0.42 | BU111Y | 4.16 | CX108 | 10.50 |
| 2N3053 | 0.27 | 2SC1371 | 0.47 | 2SD560 | 2.95 | AN5250 | 3.98 | BC170 | 0.16 | BD207 | 1.79 | BF256LC | 0.82 | BU125 | 2.48 | CX109 | 7.86 |
| 2N3054 | 0.99 | 2SC1364 | 0.89 | 2SD588A | 2.36 | AN5435 | 2.25 | BC171 | 0.11 | BD208 | 0.34 | BF257 | 0.34 | BU126 | 1.23 | CX130 | 8.76 |
| 2N3055 | 0.61 | 2SC1383 | 1.20 | 2SD600 | 3.25 | AN5610 | 7.42 | BC172 | 0.13 | BD222 | 0.38 | BF258 | 0.36 | BU137 | 6.53 | CX134 | 12.32 |
| 2N3442 | 1.56 | 2SC1391 | 2.45 | 2SD601R | 0.65 | AN5612 | 4.68 | BC172B | 0.27 | BD225 | 0.49 | BF259 | 0.34 | BU205 | 1.35 | CX136 | 11.49 |
| 2N3702 | 0.14 | 2SC1398 | 0.79 | 2SD613 | 1.03 | AN5613 | 4.63 | BC173 | 0.17 | BD228 | 0.63 | BF262 | 0.28 | BU206 | 1.27 | CX139 | 11.83 |
| 2N3703 | 0.18 | 2SC1413A | 3.05 | 2SD621 | 12.85 | AN5630 | 3.95 | BC174B | 0.27 | BD229 | 1.05 | BF263 | 0.57 | BU207 | 1.65 | CX157 | 4.84 |
| 2N3705 | 0.16 | 2SC1446 | 1.25 | 2SD636 | 0.55 | AN5701N | 1.66 | BC177 | 0.35 | BD232 | 0.90 | BF271 | 0.34 | BU208 | 1.20 | CX158 | 5.52 |
| 2N3706 | 0.14 | 2SC1447 | 2.07 | 2SD639-R | 0.72 | AN6250 | 2.95 | BC178 | 0.26 | BD234 | 0.42 | BF273 | 0.20 | BU208/02 | 1.97 | CX177 | 6.46 |
| 2N3707 | 0.16 | 2SC1475 | 0.60 | 2SD655 | 0.98 | AN6300 | 4.40 | BC179 | 0.25 | BD237 | 0.47 | BF274 | 0.20 | BU208A | 1.12 | CX187 | 6.84 |
| 2N3711 | 0.13 | 2SC1505 | 1.00 | 2SD657 | 3.50 | AN6310 | 8.74 | BC182 | 0.06 | BD238 | 0.39 | BF324 | 0.35 | BU208D | 1.95 | CX755 | 12.95 |
| 2N3711 | 0.13 | 2SC1514 | 1.69 | 2SD661A | 0.80 | AN6320N | 4.28 | BC182L | 0.10 | BD239 | 0.45 | BF336 | 0.33 | BU209 | 1.92 | CD885A | 6.85 |
| 2N3712 | 1.71 | 2SC1573Q | 1.05 | 2SD731 | 1.05 | AN6340 | 10.14 | BC182LB | 0.07 | BD240 | 0.57 | BF337 | 0.45 | BU226 | 2.95 | DC1 | 2.20 |
| 2N3773 | 1.65 | 2SC1578 | 8.74 | 2SD773 | 0.60 | AN6341 | 2.02 | BC183L | 0.11 | BD241 | 0.39 | BF338 | 0.33 | BU326 | 2.20 | DEC2 | 2.20 |
| 2N3819 | 0.42 | 2SC1583 | 0.50 | 2SD811 | 3.30 | AN6342 | 2.77 | BC183LB | 0.26 | BD242 | 0.39 | BF355 | 0.31 | BU326A | 2.00 | DS3486N | 4.33 |
| 2N3822 | 1.17 | 2SC1617 | 3.89 | 2SD823 | 1.98 | AN6363 | 16.00 | BC184 | 0.14 | BD243A | 0.35 | BF362 | 0.62 | BU326S | 2.20 | DS3487N | 4.95 |
| 2N3904 | 0.62 | 2SC1675 | 1.41 | 2SD837 | 1.56 | AN6371 | 9.24 | BC184L | 0.13 | BD243C | 0.29 | BF363 | 0.60 | BU406 | 1.49 | E1222 | 2.20 |
| 2N3908 | 0.62 | 2SC1678 | 1.98 | 2SD841 | 2.60 | AN6387 | 10.65 | BC184LB | 0.26 | BD244 | 0.45 | BF371 | 0.50 | BU406D | 1.79 | E5024 | 0.28 |
| 2N4101 | 1.73 | 2SC1741 | 1.25 | 2SD856 | 1.55 | AN6531 | 1.95 | BC186 | 0.27 | BD244C | 0.79 | BF391 | 0.25 | BU407 | 0.82 | E5386 | 0.25 |
| 2N4240 | 3.30 | 2SC1810 | 1.70 | 2SD857Q | 1.84 | AN6551 | 1.35 | BC187 | 0.28 | BD245C | 0.98 | BF417 | 0.84 | BU407D | 0.95 | E9005 | 0.46 |
| 2N4444 | 0.99 | 2SC1826 | 0.67 | 2SD882 | 0.68 | AN6552 | 0.68 | BC204 | 0.16 | BD246C | 1.25 | BF418 | 1.87 | BU412 | 3.19 | ESM310BP | 4.15 |
| 2N5293 | 0.50 | 2SC1829 | 3.34 | 2SD898 | 1.63 | AN6610 | 2.40 | BC207 | 0.11 | BD253 | 1.05 | BF422 | 0.29 | BU426A | 1.13 | FN0500 | 5.78 |
| 2N5294 | 0.50 | 2SC1875 | 5.85 | 2SK105H | 1.85 | AN6677 | 10.45 | BC212 | 0.14 | BD278A | 0.60 | BF423 | 0.52 | BU500 | 1.45 | GC374 | 1.65 |
| 2N5296 | 0.49 | 2SC1881K | 2.98 | 2SK152 | 2.50 | AN711E | 1.25 | BC212B | 0.26 | BD317 | 2.60 | BF450 | 0.35 | BU508A | 1.25 | GD243 | 4.95 |
| 2N5297 | 0.50 | 2SC1893 | 3.02 | 2SK234 | 0.76 | AN7115 | 3.38 | BC213L | 0.10 | BD318 | 2.85 | BF451 | 0.29 | BU536 | 1.60 | GF243 | 1.65 |
| 2N5298 | 0.61 | 2SC1906 | 0.98 | 2SK41 | 1.07 | AN7120 | 4.65 | BC214 | 0.15 | BD375 | 0.42 | BF457 | 0.41 | BU608 | 1.80 | GF758 | 0.84 |
| 2N5771 | 1.18 | 2SC1921 | 1.37 | 2SK79 | 2.98 | AN7145 | 2.80 | BC214LB | 0.26 | BD4 | | | | | | | |

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|------------|--------|------------|-------|-----------|-------|------------|-------|----------|-------|------------|-------|----------|------|------------|------|------------|-------|
| HA1374 | 4.80 | LR3419 | 9.37 | NE565N | 1.33 | SKE4F2/08 | 0.80 | STK3042 | 9.95 | TA7312P | 2.45 | TD62105P | 2.50 | TDA3560 | 5.25 | TUA2000 | 8.98 |
| HA1377 | 1.75 | LR3471 | 9.37 | NE645BN | 3.35 | SKE4F2/06 | 0.44 | STK3044 | 5.75 | TA7313AP | 1.36 | TD62104P | 2.50 | TDA3571Q | 3.48 | TV106 | 2.37 |
| HA1389R | 2.05 | LU1141 | 7.27 | NP1106 | 8.60 | SKE4G2/10 | 1.24 | STK4019 | 4.50 | TA7314 | 5.94 | TD62706P | 4.50 | TDA3576 | 5.98 | TY6010B | 2.97 |
| HA1389 | 2.39 | LU52012 | 5.95 | OZ202 | 0.11 | SKE4G2/02 | 0.26 | STK4300 | 10.55 | TA7323P | 3.15 | TD10010B | 2.31 | TDA3590 | 6.45 | U056 | 1.14 |
| HA1392 | 3.65 | LU52011 | 14.95 | O447 | 0.16 | SKE5F3/10 | 1.60 | STK4333 | 6.25 | TA7325P | 1.15 | TD1003A | 2.28 | TDA3591 | 6.45 | ULN2204 | 10.55 |
| HA1394 | 3.95 | LU03112 | 12.37 | O491 | 0.09 | SKS1/10 | 2.15 | STK4332 | 8.25 | TA7339P | 1.85 | TD1005A | 2.35 | TDA3650 | 7.95 | UAS53C | 4.94 |
| HA1397 | 3.76 | M193 | 6.83 | O495 | 0.13 | SL1310 | 3.14 | STK4355 | 5.94 | TA7340P | 5.95 | TD1006A | 2.11 | TDA3652 | 3.25 | UPC1003 | 5.95 |
| HA1398 | 2.95 | M21C | 1.13 | OC28 | 2.95 | SL1430T | 2.32 | STK4352 | 12.25 | TA7607AP | 3.10 | TD1010AF | 4.25 | TDA3651AQ | 2.95 | UPC1009C | 8.95 |
| HA1406 | 1.30 | M23C | 2.83 | OC36 | 1.28 | SL414 | 3.69 | STK436 | 4.70 | TA7609 | 3.91 | TD1011 | 1.65 | TDA3651A | 1.95 | UPC1025H | 3.00 |
| HA1452 | 0.85 | M293 | 6.95 | OC44 | 0.35 | SL432A | 2.44 | STK437 | 9.65 | TA7611AP | 2.35 | TD1010 | 1.03 | TDA3950 | 2.95 | UPC1026C | 1.24 |
| HBFA4030AF | 2.48 | M51102L | 4.95 | OC45 | 0.18 | SL439 | 3.48 | STK4372 | 11.15 | TA7616P | 5.25 | TD1011A | 1.08 | TDA4050B | 3.95 | UPC1020H | 2.00 |
| HD14538 | 2.07 | M5115P | 5.24 | OC72 | 0.44 | SL471 | 4.78 | STK439 | 7.25 | TA7622AP | 12.87 | TD1028 | 2.45 | TDA4280 | 5.95 | UPC1032H | 2.00 |
| HD38702-A2 | 8.05 | M51203L | 3.15 | OC75 | 0.44 | SL480 | 3.98 | STK441 | 10.25 | TA7628P | 5.06 | TD1034B | 2.42 | TDA4290 | 4.47 | UPC1042C | 8.95 |
| HD38750A53 | 11.78 | M51231P | 0.95 | ON236 | 1.06 | SL490 | 1.25 | STK443 | 10.25 | TA7629P | 7.50 | TD1035S | 2.95 | TDA4400 | 4.02 | UPC1156H | 5.84 |
| HD38750A-7 | 7.25 | M5134-9341 | 4.13 | ON782 | 1.98 | SL901B | 6.95 | STK457 | 13.49 | TA7630P | 1.55 | TD1035T | 1.85 | TDA4420 | 4.02 | UPC1158 | 5.84 |
| HD38800A50 | 14.09 | M51353P | 5.25 | OT121 | 1.45 | SL918A | 6.98 | STK460 | 6.10 | TA7640AP | 2.29 | TD1037 | 1.95 | TDA4422 | 3.65 | UPC1161C | 1.62 |
| HD44801A05 | 19.98 | M51381P | 5.09 | PT6042 | 2.45 | SN18861ANO | 1.65 | STK461 | 9.68 | TA7672P | 2.55 | TD1037D | 2.05 | TDA4427S | 9.00 | UPC1182H | 1.22 |
| HEF4001BP | 0.97 | M51393AP | 9.35 | PT8504 | 4.98 | SN18862AN | 2.98 | STK463 | 11.85 | TA7676P | 2.81 | TD1044 | 2.41 | TDA4431 | 2.27 | UPC1186H | 1.05 |
| HISH1010 | 8.59 | M51394P | 14.05 | R1038 | 2.19 | SN189666N | 10.25 | STK466 | 11.77 | TA7728P | 12.50 | TD1047 | 4.10 | TDA4440 | 3.26 | UPC1181H | 1.25 |
| HISH1004 | 6.00 | M5142P | 6.85 | R1039 | 2.19 | SN29717N | 7.19 | STK466 | 11.85 | TA7728P | 1.27 | TD1059B | 0.98 | TDA4442 | 4.15 | UPC1185H | 1.60 |
| HISH1002 | 9.50 | M5144P | 2.97 | R2008B | 1.33 | SN29716N | 3.66 | STK501 | 6.32 | TAA320A | 6.45 | TD1059M | 1.35 | TDA4500 | 4.75 | UPC1188 | 7.40 |
| HM6231 | 9.81 | M51513L | 2.06 | R2009 | 1.98 | SN29715N | 6.04 | STK502 | 5.40 | TAA350A | 1.74 | TD1060 | 2.50 | TDA4500 | 1.78 | UPC1212C | 3.72 |
| HM6232 | 10.65 | M51517L | 2.90 | R2029 | 1.33 | SN29723AN | 1.77 | STK5314 | 12.32 | TAA621AX1 | 4.85 | TD1082 | 2.95 | TDA4620 | 6.78 | UPC1230 | 1.78 |
| HM6251 | 4.95 | M5192 | 2.20 | R2030 | 1.33 | SN29764AN | 8.65 | STK5730 | 2.99 | TAA621A12 | 2.14 | TD1151 | 1.22 | TDA4620 | 4.18 | UPC1238 | 4.09 |
| HM7103 | 4.85 | M5194AP | 5.74 | R2257 | 3.71 | SN29767 | 4.98 | STK7216 | 14.50 | TAA661B | 2.62 | TD1170S | 2.25 | TDA4700 | 2.75 | UPC1263 | 4.09 |
| HM9032 | 9.98 | M5231L | 1.95 | R2265 | 1.49 | SN29770BN | 1.96 | STK772 | 6.95 | TAA691 | 8.58 | TD1190 | 2.11 | TDA4727S | 2.25 | UPC1277H | 4.95 |
| HM9012 | 3.22 | M53274P | 1.33 | R2305 | 1.18 | SN29772BN | 2.95 | STR1096 | 5.45 | TAA700 | 3.75 | TD1190Z | 3.96 | TDA48190 | 2.47 | UPC1278H | 2.15 |
| HM9015 | 3.24 | M54532P | 1.71 | R2322 | 0.59 | SN29771BN | 1.48 | STR4090 | 10.55 | TAA930 | 4.87 | TD1200 | 1.50 | TDA9403 | 2.35 | UPC1351C | 1.81 |
| HT4207 | 17.16 | M54544L | 3.45 | R2323 | 0.76 | SN29791 | 5.98 | STR440 | 5.79 | TAA970 | 2.83 | TD1235 | 3.88 | TDA9503 | 1.95 | UPC1350C | 1.85 |
| HT4208 | 20.65 | M58478P | 8.77 | R2354A | 2.01 | SN29798N | 2.56 | STR441 | 3.95 | TAA110 | 2.52 | TD1236 | 3.88 | TDA9513 | 5.44 | UPC1353 | 7.40 |
| IN5401 | 0.11 | M58485P | 13.65 | R2354B | 2.01 | SN2709 | 0.44 | STR451 | 5.36 | TAG232-600 | 0.79 | TD1270 | 3.50 | TDB1033 | 2.68 | UPC1355C | 2.13 |
| IR2403 | 1.45 | MA06 | 1.07 | R2443 | 0.88 | SN7400N | 0.34 | STR453 | 8.16 | TAG626-600 | 1.20 | TD1270 | 3.50 | TDI081 | 7.05 | UPC1363 | 4.20 |
| IR2C05 | 4.25 | MA8001 | 0.82 | R2461 | 1.50 | SN7401N | 0.36 | STR454 | 5.36 | TBA120AS | 0.69 | TD1327A | 1.33 | TE626 | 1.49 | UPC1362 | 2.98 |
| IR3P06 | 2.25 | MA8003 | 1.16 | R2540 | 2.05 | SN7402N | 0.65 | STR6020 | 4.95 | TBA120AS | 1.05 | TD14112 | 1.05 | TEA1002 | 1.49 | UPC1365C | 6.98 |
| IR3P08 | 4.95 | MA8009 | 0.86 | R2540X | 3.30 | SN7404N | 0.22 | T6029V | 5.75 | TBA120T | 0.65 | TD1420 | 2.55 | TEA1009 | 1.86 | UPC1366 | 2.25 |
| IR94558 | 6.25 | MB3712 | 1.85 | R2615 | 0.67 | SN7408N | 0.27 | T6035V | 0.73 | TBA120U | 0.62 | TD1440 | 3.45 | TEA1014 | 2.50 | UPC1360C | 4.51 |
| IS751 | 2.85 | MB3713 | 1.69 | RC1A16029 | 2.01 | SN7410N | 0.27 | T6036 | 2.11 | TBA120A | 1.05 | TD1470 | 2.75 | TEA1020SP | 8.21 | UPC1378H | 2.44 |
| IT1425 | 0.18 | MC13002 | 2.94 | RC1A16000 | 1.38 | SN74121 | 1.60 | T6037 | 0.67 | TBA1440 | 1.65 | TD1470P | 4.25 | TIC106C | 0.61 | UPC141C | 3.75 |
| L20033GE | 5.37 | MC1310P | 3.59 | RC1A16802 | 1.08 | SN7413N | 0.37 | T6044V | 0.97 | TBA1441 | 1.95 | TD1506 | 7.85 | TIC106M | 0.57 | UPC1458 | 8.66 |
| L20020GE | 5.33 | MC1327P | 2.25 | RC1A17074 | 6.60 | SN74141N | 2.65 | T6045 | 1.20 | TBA1440G | 1.95 | TD1510 | 4.60 | TIC116Y100 | 2.07 | UPC151C | 2.95 |
| K1749P | 3.46 | MC1330P | 1.45 | RC1A17376 | 1.58 | SN74151AN | 1.51 | T6049 | 1.45 | TBA240A | 2.65 | TD1512 | 3.69 | TIC44 | 4.07 | UPC2002 | 1.48 |
| KA2101 | 2.32 | MC1350P | 1.61 | RC1A17524 | 0.83 | SN74154N | 1.27 | T6052V | 0.87 | TBA395 | 1.10 | TD1515 | 6.68 | TIC45 | 0.50 | UPC30C | 2.51 |
| KC581C | 6.32 | MC1351P | 3.96 | RC1A2060 | 2.00 | SN74190 | 1.35 | T6058 | 3.08 | TBA395Q | 1.10 | TD1559 | 3.15 | TIC47 | 0.35 | UPC324C | 4.17 |
| KC582C | 3.97 | MC1352P | 2.50 | RC1A2060 | 2.00 | SN7420N | 0.34 | T6059 | 2.77 | TBA396 | 2.90 | TD1670 | 4.42 | TIP120 | 1.06 | UPC32C | 5.25 |
| KC583C | 6.63 | MC1357P | 2.15 | RC1A2060 | 2.00 | SN7430 | 0.49 | T9003V | 1.25 | TBA400 | 2.39 | TD1770 | 3.85 | TIP110 | 0.54 | UPC339C | 4.35 |
| L200CV | 1.69 | MC1358P | 1.35 | RC1A2060 | 2.00 | SN7440N | 0.49 | T9005V | 2.38 | TBA400P | 1.55 | TD1905 | 1.76 | TIP112 | 0.45 | UPC41C | 4.10 |
| LA1201 | 1.02 | MC14001 | 2.40 | RT402 | 1.58 | SN74472 | 0.57 | T9011V | 0.49 | TBA480Q | 1.30 | TD1908 | 1.95 | TIP117 | 0.50 | UPC4558C | 2.15 |
| LA1210 | 1.56 | MC14013 | 0.41 | RT905A | 2.38 | SN7474N | 0.44 | T9013V | 7.22 | TBA510 | 2.11 | TD1940 | 1.95 | TIP121 | 0.45 | UPC474 | 5.11 |
| LA1230 | 1.10 | MC14493P | 5.64 | SI299 | 7.98 | SN74749AN | 0.93 | T9014V | 1.02 | TBA520 | 1.84 | TD1950 | 2.45 | TIP126 | 0.73 | UPC554C | 1.85 |
| LA1320 | 2.87 | MC14494P | 2.15 | S175 | 31.48 | SN74749AN | 0.53 | T9016 | 1.80 | TBA520Q | 1.68 | TD2005 | 1.95 | TIP132 | 1.40 | UPC566H | 2.95 |
| LA1352 | 1.15 | MC14497 | 3.15 | S2062D | 0.95 | SN76013ND | 3.96 | T9019W | 1.98 | TBA530 | 1.30 | TD2006 | 1.55 | TIP137 | 1.50 | UPC574 | 4.09 |
| LA1357N | 11.07 | MC14510BAL | 3.75 | S2800D | 5.54 | SN76023ND | 2.75 | T9034V | 1.45 | TBA530 | 1.30 | TD2006 | 1.45 | TIP139 | 0.84 | UPC575C2 | 2.40 |
| LA1363 | 1.05 | MC14511BCP | 1.10 | S2802 | 3.47 | SN76023ND | 3.96 | T9034V | 1.45 | TBA540 | 1.15 | TD2002 | 0.90 | TIP295S | 0.95 | UPC576H | 1.25 |
| LA1364 | 3.02 | MC14528BCP | 2.15 | S2818 | 4.05 | SN76033ND | 3.65 | T9054V | 0.77 | TBA540Q | 1.15 | TD2003 | 1.75 | TIP298A | 0.46 | UPC577H | 2.58 |
| LA1365J | 0.95 | MC1712 | 3.88 | S3702S | 6.15 | SN76110AN | 1.60 | T9057V | 0.70 | TBA560CQ | 1.60 | TD2020 | 1.95 | TIP298B | 0.63 | UPC578C | 8.70 |
| LA1385 | 1.94 | MC1952 | 19.50 | S40W | 10.50 | SN76115AN | 1.61 | T9062V | 0.49 | TBA570Q | 1.60 | TD2030 | 1.99 | TIP29D | 0.75 | UPC580C | 4.13 |
| LA1387 | 8.10 | MC7724CP | 3.49 | S680B | 8.80 | SN76131 | 1.32 | T9064 | 1.00 | TBA570A | 1.71 | TD2140 | 1.68 | TIP305S | 0.75 | UPC587C2 | 1.34 |
| LA3155 | 1.25 | MC7818C | 2.18 | S8063 | 5.17 | SN76227N | 1.93 | T9064 | 4.35 | TBA641A12 | 4.13 | TD2150 | 6.20 | TIP30A | 0.41 | UPC595 | 2.95 |
| LA3301 | 1.65 | MCR100-7 | 1.65 | SAA1006 | 1.75 | SN76226DN | 1.98 | TA7027 | 4.80 | TBA641B72 | 3.03 | TD2151 | 4.07 | TIP30C | 0.16 | UPC596 | 1.95 |
| LA3350 | 1.43 | MCR106-5-6 | 0.95 | SAA1020 | 4.40 | SN76228N | 3.27 | TA7050 | 1.74 | TBA651 | 0.87 | TD2160 | 2.01 | TIP31A | 0.34 | UPD1514C | 8.98 |
| LA3361 | 3.89 | MCR220-7 | 2.28 | SAA1025 | 4.40 | SN76242 | 8.95 | TA7051 | 1.74 | TBA673 | 2.60 | TD2161 | 1.88 | TIP31B | 0.38 | UPD2819C | 4.98 |
| LA3365 | 3.98 | ME0402 | 0.17 | SAA1024 | 2.81 | SN76243 | 8.50 | TA7054 | 2.55 | TBA700 | 1.85 | TD2170 | 2.85 | TIP31C | 0.50 | UPD4013B | 4.00 |
| LA3390 | 5.52 | ME0404/2 | 0.47 | SAA1075 | 6.25 | SN76396 | 2.90 | TA7060AP | 1.71 | TBA720 | 3.50 | TD2270 | 7.25 | TIP32A | 0.53 | UPD4066B | 4.95 |
| LA4030P | 3.16 | ME0411 | 0.28 | SAA1121 | 7.44 | SN76533N | 2.40 | TA7061AP | 0.27 | TBA730 | 3.55 | TD2510 | 1.85 | TIP32B | 0.69 | UPD553-164 | 19.25 |
| LA4031P | 3.20 | ME6002 | 0.26 | SAA1124 | 3.30 | SN76532N | 2.95 | TA7069 | 3.13 | TBA750Q | 2.90 | TD2520 | 2.90 | TIP32C | 0.80 | UPD6049C-1 | 11.50 |
| LA4032P | 2.35 | ME6102 | 0.28 | SAA1130 | 4.99 | SN76545 | 1.25 | TA7070P | 1.83 | TBA760 | 1.71 | TD2522 | 3.47 | TIP33 | 0.45 | X00077A | 4.68 |
| LA4100 | 1.25 | ME8001 | 0.34 | SAA1174 | 7.77 | SN76546N | 3.47 | TA7072P | 2.57 | TBA800 | 0.85 | TD2524 | 4.50 | TIP33A | 1.05 | X0022CE | 5.75 |
| LA4101 | 1.30 | ME0411 | 0.75 | SAA1250 | 4.15 | SN76549 | 2.59 | TA7073P | 5.86 | TBA810S | 1.61 | TD2521 | 3.71 | TIP33C | 0.80 | X0029CE | 7.09 |
| LA4102 | 0.75</ | | | | | | | | | | | | | | | | |

Vintage TV: The Ferguson 842T and 843T

Chas E. Miller

In this series of articles we've often looked at the many odd-ball sets of the early days, usually made by firms that have long since ceased to trade or left the consumer electronics field to others. I thought I'd make a change this time and take a look at an eminently sensible design from a setmaker who is still very much in production. I venture to suggest that few engineers would deny that Ferguson receivers have been almost consistently successful during the forty year period since TV transmissions recommenced after the second World War. There were one or two sets that didn't come up to standard, but these were soon replaced or modified. Let's go back in time to the late forties, when there was only one TV station in the UK - Alexandra Palace, North London. At the time Ferguson offered two console models, the 842T and 843T, which used a similar chassis but had 9 and 12in. tubes respectively. The valve complement was 18 plus c.r.t.: in addition the 843T incorporated a Westector diode in the sync separator circuit - it had a more elaborate field filtering circuit than the 842T.

Receiver Circuits

In those single channel days there was no incentive to use superhet circuitry, and in common with many of their contemporaries these sets had t.r.f. vision and sound receiver circuits. The valves chosen were the well known (one might almost say notorious!) EF50s, all-glass but metal screened steep-slope pentodes that had been developed during the war for use in radar equipment. They were good electrically but suffered badly from bad contacts at the bases, due mainly to the diminutive pins. Most TV sets that used them had spring-loaded valveholders which held with a grip like that of a Scotsman to his wallet . . .

The vision channel had four EF50s, the first two being used for the sound signal as well. Contrast could be varied by means of a potentiometer that adjusted the bias applied to the first r.f. pentode. The sound signal was extracted via a trap in the cathode circuit of the third r.f. pentode. An EB41 double diode served as vision detector and interference limiter and the vision channel was completed by yet another EF50 in the video amplifier position. The sound only channel had two EF50s followed by an EB41 for detection and interference suppression and finally a PL33 output pentode. You might have expected to find the volume control somewhere in the vicinity of this latter valve, but no - the designers of the time had to have at least one quirk per chassis, and in this case volume was controlled by using a potentiometer to vary the voltage applied to the screen grid of the first sound only EF50. Examination of all this circuitry shows almost unbelievable simplicity compared to other sets of the day. The basic design was obviously sound, with no bits and pieces added during the production run to make good deficiencies as they came to light.

Timebase Circuits

Three more EF50s, making ten in all, were used in the timebase section, one as the sync separator and the other two as the line and field timebase oscillators. The extra

diode in the 12in. model functioned as an interlace filter: it was presumably felt that poor interlace would show up markedly on the larger screen size. Both timebases employed blocking oscillators of almost identical design, with the hold controls affecting the oscillation time-constants. The only basic difference was that the height control set the charging voltage in the field oscillator circuit. Width was adjusted by varying the cathode bias applied to the PL38 line output pentode.

Both output valves were matched to the low-impedance scan coils by means of simple two-winding transformers. In the case of the field output stage the transformer was RC coupled to the anode of the output valve. Simple negative feedback was applied to both output valves by the omission of cathode decoupling capacitors: in the field output stage there was also a negative feedback loop of the type that remained in use for many years. These arrangements were presumably successful in producing linear scans as no separate controls were provided.

Power Supplies

The power supply section, which was mounted on a separate chassis, was interesting in that it bridged the gap between the old massive mains transformer type and the later simple a.c./d.c. arrangement. An autotransformer was employed but was unusual in having a centre-tap and driving, from the ends of the winding, a PZ30 valve in a full-wave rectifier circuit. A series heater chain with a thermistor was used and as the heater voltages totalled just over 220V they were fed from the transformer's 230V tapping. The thermistor was included to limit the switch-on current surge.

The e.h.t. was provided by an oscillator working at 80kHz and an EY51 rectifier. Fig. 1 shows the circuit. The EY51 was one of the very few valves of the forties that survived into the colour TV age - it was used as the focus rectifier in the Philips G6 chassis. The e.h.t. circuit produced 6.5kV in both the 9 and 12in. versions of the set.

Focusing

Electromagnetic focusing was used, some 70-80mA being drawn though the coil to give optimum results - this

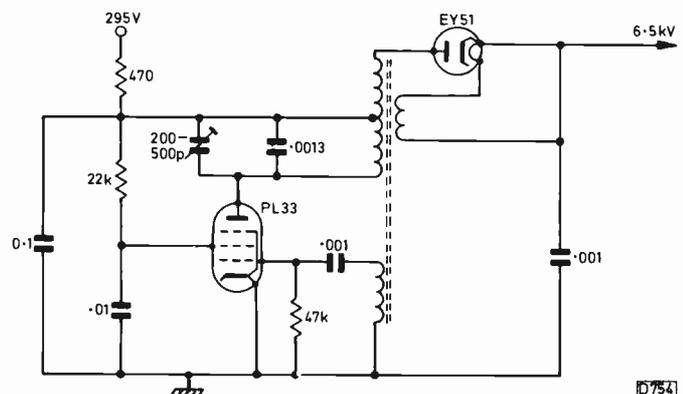


Fig. 1: The e.h.t. generator circuit used in the Ferguson Models 842T and 843T.

was adjusted by means of a shunt potentiometer. The coil was also used to provide additional h.t. smoothing for those valves whose anode currents were not affected by adjustment of the various controls.

Alignment

In keeping with the circuit simplicity, the alignment procedure was commendably uncomplicated. In a t.r.f. receiver the valve interelectrode capacitances could have a significant effect on the tuning. Realignment was often necessary as valves aged or had to be replaced, and in

most receivers this was a long-winded process with coil damping and a multitude of steps. With these Ferguson sets just ten straightforward steps were prescribed, the last being a repeat of the first. This must have helped in keeping down manufacturing as well as servicing costs.

In Conclusion

In being simple and effective the design was probably ahead of its time. It was certainly a welcome respite from some of the strange beasts that came our way in those early days.

Series and Parallel Networks

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

Those involved with electronics soon become aware of a correspondence between series-connected and parallel-connected circuits. There are in fact a number of respects in which these arrangements are analogous.

For example, the significant feature of a series-connected circuit is that there is only one current. This current, in flowing through the components, develops across each one a voltage that's proportional to its impedance. Similarly, with a parallel-connected circuit a single voltage is present across all the components: it drives through each component a current that's proportional to the component's admittance. Moreover the individual voltages across the components in a series circuit add up to the applied voltage: similarly the individual currents flowing via parallel-connected components add up to the total current flowing into the circuit. Summarising, we can say that in comparing parallel with series circuits voltage corresponds to the current, current to voltage and impedance to admittance. These equivalents are the essence of what we will call circuit duality, but the correspondence between the circuits is not confined to words. It extends to mathematical expression too, as we shall now see.

As a very simple illustration, consider first the voltage divider circuit shown in Fig. 1(a). The current flowing in the circuit is given by $V_{in}/(R1 + R2)$ and the voltage this develops in flowing through $R2$, i.e. V_{out} , is therefore given by $V_{in}R2/(R1 + R2)$. Thus

$$V_{out}/V_{in} = R2/(R1 + R2) \tag{1}$$

This circuit can be fully defined by quoting one current and two voltages. The corresponding "dual" is characterised by a single voltage and two currents. It thus takes the form of two resistors connected in parallel as shown in Fig. 1(b) – a current divider in fact. If we represent the two resistors as conductances $G1$ and $G2$ we can say that the effective conductance of the two in parallel is $G1 + G2$, so that the voltage generated across the circuit by an input current I_{in} is given $I_{in}/(G1 + G2)$. This voltage drives a current I_{out} through $G2$ given by $I_{in}G2/(G1 + G2)$. Thus the current division ratio is given by

$$I_{out}/I_{in} = G2/(G1 + G2) \tag{2}$$

The equation has precisely the same form as (1) and constitutes a simple example of circuit duality.

The analogy between the two circuits extends also to the terminations. We assume that the source resistance feeding the voltage divider is very low so that the divider has negligible effect on V_{in} . Similarly the load resistance is taken to be very high so that it has negligible effect on $R2$. Ideally the source resistance should be zero and the

load resistance infinite. So the circuit is well suited for use where the load is a valve or a field-effect transistor.

The current divider must be fed from a source of very low conductance so that the addition of the divider leaves the input current unaffected, while the conductance of the output load must be very high otherwise it will reduce the effective value of $G2$. Thus the ideal source conductance is zero and the load conductance infinite. These values compare directly with the ideal source and load resistances for the voltage divider. The terminations required by the current divider make this circuit well suited for coupling one bipolar transistor to another.

Although equation (2) was deduced from first principles, we could have obtained it from equation (1) by substituting V for I , I for V and G for R . Symbol substitution is in fact a rigorous method of deriving the form of circuit dualities – some examples will be given later. Alternatively it's possible to obtain the form of a dual circuit from first principles by replacing current with voltage and vice versa.

As a simple example of this method consider Fig. 2(a) which shows an arrangement that was used years ago for analysing triode valve circuits. The valve is represented as a generator of voltage μV_g , with an internal resistance r_a . R_L is the resistive load. This circuit has one current and three voltages, one of them a generator. The dual circuit therefore has one voltage and three currents, again one of them a generator – see Fig. 2(b). This is the circuit of a current source with an internal conductance g_0 driving a load of conductance g_L . It's familiar because it is often used in circuit analyses where a pentode valve or transistor is involved, the active device in this case being best regarded as a current source.

As an example of the rigorous mathematical method of finding duals, suppose we have a circuit consisting of five resistors in series with a battery, as shown in Fig. 3(a). From Ohm's Law we know that the current is given by

$$I = V/(R1 + R2 + R3 + R4 + R5) \tag{3}$$

Using the substitutions appropriate to the dual circuit we have

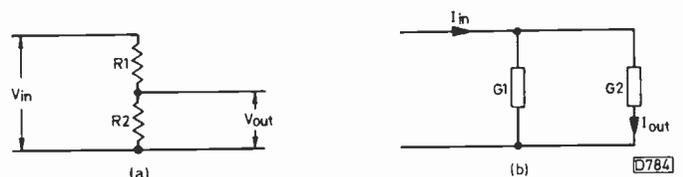


Fig. 1: Simple potential divider (a) and its dual, the current divider, (b).

$$V = I/(G1 + G2 + G3 + G4 + G5). \quad (4)$$

This is the expression for a circuit consisting of five resistors in parallel, as shown in Fig. 3(b).

Expression (3) can be written in the form

$$IR1 + IR2 + IR3 + IR4 + IR5 - V = 0,$$

i.e. the sum of the e.m.f. and all the potentials developed around the closed loop is zero – a familiar statement to those who indulge in circuit analysis because it's one of Kirchhoff's laws.

Expression (4) can be written

$$VG1 + VG2 + VG3 + VG4 + VG5 - I = 0.$$

VG1, VG2 etc. are produced by the currents I1, I2 etc. flowing in the parallel branches. Therefore

$$I1 + I2 + I3 + I4 + I5 - I = 0,$$

i.e. the total current flowing into and out of point P in Fig. 3(b) is zero – this is another of Kirchhoff's laws. This particular example has been useful in showing that one of Kirchhoff's laws is the dual of the other.

We will consider next a network containing series and parallel combinations. We all know that the effective resistance of the network shown in Fig. 4(a) is given by

$$[(R1R2)/(R1 + R2)] + R3 + [(R4R5)/(R4 + R5)].$$

What is the form of its dual? Take R1R2 first. These resistors are in parallel and thus have a common voltage across them and individual currents flowing through them. The dual of this particular combination therefore has a single current and two voltages. It thus clearly consists of two resistors (conductances) in series. Similarly the dual of R4R5 consists of two conductances in series. If we treat R1R2 and R4R5 as single equivalent resistors, the circuit consists of three resistors connected in series, with a single current and three voltages. The dual thus has a single voltage and three branches in parallel, as shown in Fig. 4(b). It will come as no surprise to learn that the net conductance of this network is given by

$$[(G1G2)/(G1 + G2)] + G3 + [(G4G5)/(G4 + G5)],$$

which is of precisely the same form as that for the resistance of the network shown in Fig. 4(a), with the usual symbol change.

In this way the principle of duality can be extended to networks of any degree of complexity, but enough has been said to show the usefulness of the concept when purely resistive circuits are being considered.

CR and LR Networks

What happens when the circuit contains reactance? Remember that the dual of inductance is capacitance and vice versa. As a simple example of an a.c. circuit containing reactance, suppose that R1 in Fig. 1(a) is replaced with a capacitor. We thus have the simple RC network shown in Fig. 5(a). This familiar arrangement is used for signal-frequency coupling in analogue circuits and, when the time-constant of RC is small compared with the signal period, as a differentiating circuit. If we treat the combination as a voltage divider the relationship between Vin and Vout is

$$V_{out}/V_{in} = R/(R + 1/j \omega C) \quad (5)$$

To find the dual of this circuit, replace V with I, I with V, R with G and C with L. This gives us

$$I_{out}/I_{in} = G/(G + 1/j \omega L) \quad (6)$$

This is the expression for a current divider consisting of resistance and inductance in parallel, the output current being taken from the resistive branch – see Fig. 5(b).

The significant feature of circuits containing reactance is of course that their characteristics depend on frequency. So it will be interesting to see how the voltage and current division ratios of the dual circuits vary with frequency. We

are all familiar with the behaviour of the circuit shown in Fig. 5(a). Its response has a 3dB loss at the turnover frequency (the frequency at which the capacitor's reactance is equal to the value of the series resistor), becomes level above that frequency and has a 6dB/octave fall below that frequency. The asymptotes to the curves above and below the turnover frequency meet at that frequency, as shown in Fig. 6. Because equations (5) and (6) are identical in form it's clear that the current divider circuit has the same frequency response as the voltage divider, being 3dB down at the frequency at which the inductive reactance is equal to the resistance in parallel.

Just as the voltage divider circuit can be used to provide differentiation by making RC small compared with the signal period, so also can the current divider when L/R is sufficiently small.

If the output of the circuit shown in Fig. 5(a) is taken from across the capacitor we have

$$V_{out}/V_{in} = (1/j \omega C)/(R + 1/j \omega C)$$

and for its dual

$$I_{out}/I_{in} = (1/j \omega L)/(G + 1/j \omega L).$$

This applies to a parallel circuit consisting of a resistor and an inductor with the output taken from the inductive branch. The two circuits are shown in Fig. 7. Both have a frequency response with a 3dB loss at the turnover frequency, a level response below that frequency and a 6dB/octave fall above it – the curve is in fact the mirror image of that shown in Fig. 6. Both circuits can be used for integration provided the time-constant (RC or L/R) is large compared with the signal period.

If the capacitor in Fig. 5(a) is replaced with an inductor, the inductor in its dual is replaced by a capacitor and the frequency response is level up to the turnover frequency, falling at 6dB/octave above this frequency – a response that's identical to that given by the circuit shown in Fig. 7. If the output is taken from the inductor, the dual has the form shown in Fig. 7(b) – with L replaced by C – and the frequency response is as shown in Fig. 6.

If the capacitor in Fig. 5(a) is shunted by resistor R1 as shown in Fig. 8(a) the dual has the form shown in Fig. 8(b). The response now can't fall indefinitely as the frequency is lowered, being limited to R2/(R1 + R2) or G2/(G1 + G2) as shown in Fig. 9. If the output is taken from across the RC combination the loss is R1/(R1 + R2) at the low frequency end, as for Fig. 8(a), but falls to zero as the frequency increases – see Fig. 10. If C is replaced by L in Fig. 8(a) the dual has a form similar to that of Fig. 8(b) but with L replaced by C. The response curves, whether the output is taken from R2 or LR1, are mirror images of those for Fig. 8, the loss at very high frequencies being given by the ratio of the two resistors and increasing towards infinity as the frequency is lowered.

Other Arrangements

Fig. 11(a) shows a circuit incorporating L, C and R. The current is given by

$$I = V_{in}/(R + j \omega L + 1/j \omega C)$$

and rises to a maximum of Vin/R at resonance (when L ω = 1/ ωC). The voltage across C also rises to a maximum equal to Q times Vin at resonance. To obtain the form of the dual, replace the single current and four voltages of the arrangement shown in Fig. 11(a) with a single voltage and four currents as shown in Fig. 11(b). Here again the output (Iout) rises to a maximum of Q times Iin at resonance. See Fig. 12.

At the beginning of this article we showed that there is

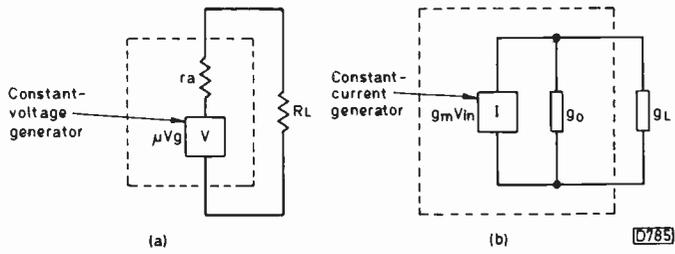


Fig. 2: Triode valve equivalent circuit (a) and the equivalent circuit for a bipolar transistor (b).

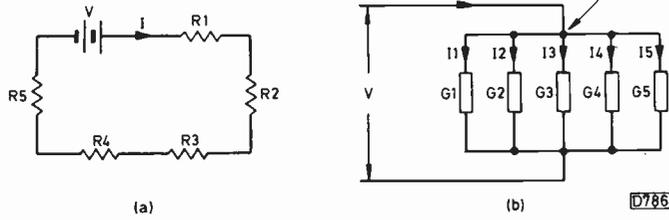


Fig. 3: Series-connected circuit (a) and its dual, a parallel network, (b).

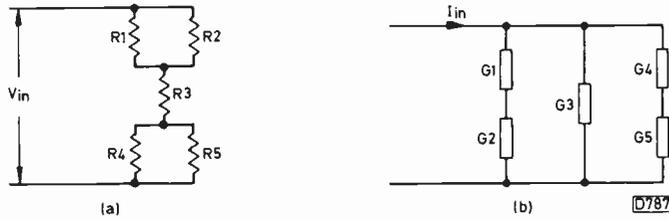


Fig. 4: A resistive series-parallel network (a) and its series-parallel dual (b).

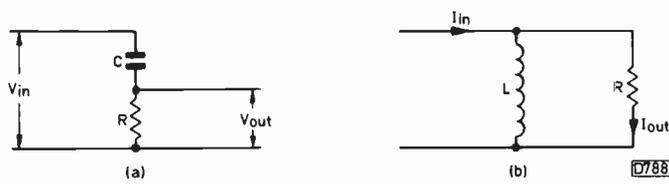


Fig. 5: An RC circuit with the output taken from across R (a) and its LR dual (b).

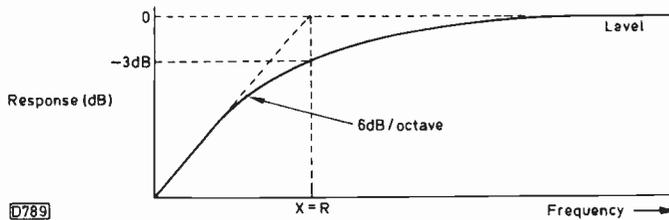


Fig. 6: Frequency response of the circuit shown in Fig. 5.

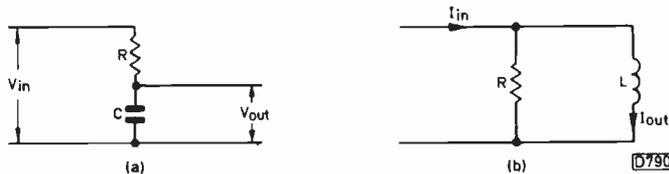


Fig. 7: An RC circuit with the output taken from across C (a) and its LR dual (b).

an equivalence between dual circuits provided the resistance in one circuit is compared to the conductance in the other. Thus an open-circuit in one corresponds with a short-circuit in the other.

There are other examples of such correspondence in electronics. Consider for example the dipole aerial. This is a conductor, half a wavelength long, broken at the centre

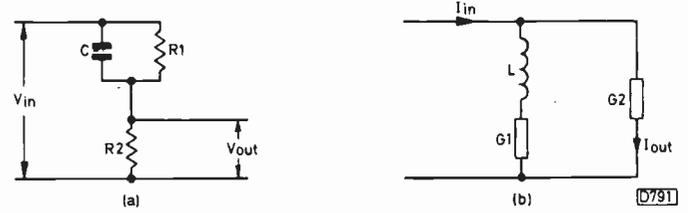


Fig. 8: The circuit shown in Fig. 5(a) with a resistor across C (a) and its LR dual (b).

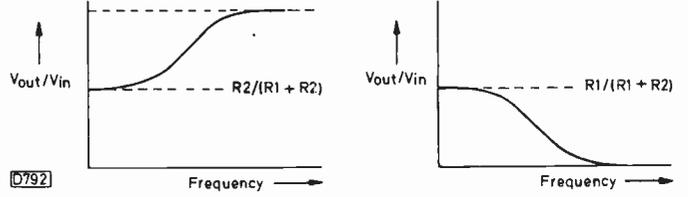


Fig. 9 (left): Frequency response of the circuit shown in Fig. 8(a) when the output is taken from across R_2 .

Fig. 10 (right): Frequency response of the circuit shown in Fig. 8(a) when the output is taken from across CR_1 .

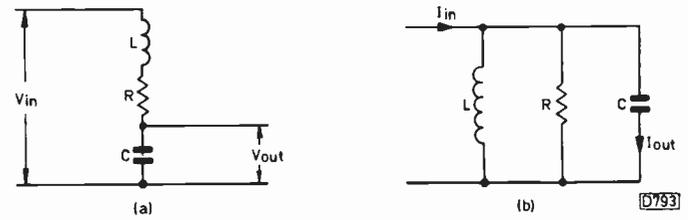


Fig. 11: Series LRC circuit (a) and its LRC dual (b).

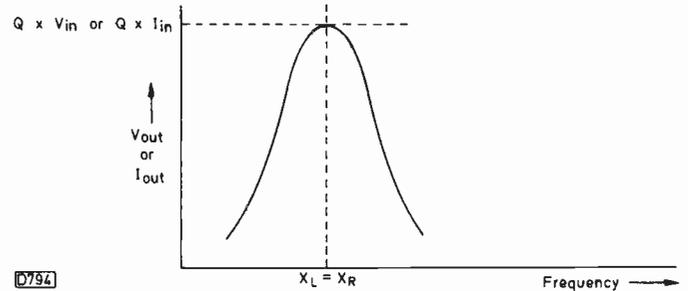


Fig. 12: Frequency response of the circuits in Fig. 11.

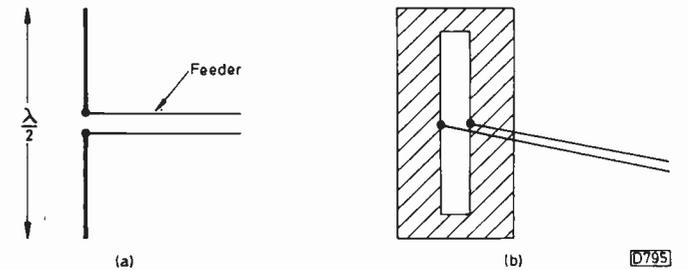


Fig. 13: The dipole aerial (a) and its dual the skeleton slot aerial (b).

to permit connection to a feeder – see Fig. 13(a). Such an aerial consists of a conductor (i.e. an approximation to a short-circuit) situated in non-conducting space (an approximation to an open-circuit). The dual of this arrangement is an elongated hole, half a wavelength long, in a conducting sheet – see Fig. 13(b). This type of aerial is known as a slot aerial, the feeder connections being made to the conducting sheet at opposite sides of the slot, half way along its length. Slot aerials are extensively used by the broadcasting authorities at v.h.f. and u.h.f. transmitters.

Service Bureau

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REDIFFUSION Mk. 4 CHASSIS

The BU208A line output transistor in this set keeps failing. Fitting a replacement restores normal operation for anything from two hours to two weeks, then the BU208A again fails. When present, the picture is excellent. When the transistor has failed the set makes a slow tripping noise. I'm not familiar with this chassis and wonder whether the fault is a stock one.

These symptoms have often been traced to intermittent connections between the pins of the chopper transformer 4T1 on the power supply panel and the board. The dry-joints are seldom obvious or visible, so each joint should be stripped down, re-tinned and resoldered. Pay particular attention to the corner pin A. Also ensure that the h.t. is correctly set – for 125V with 90° 20in. models and 150V with other models.

PANASONIC NV7000

There's a clock display fault on this machine. It occurs when any function is selected, or when cue or review is selected in the play mode, or when stop is selected in the play, fast forward or rewind modes, and shows up in two ways. First, the segments which display the time and the colon blank out, giving no time display. Secondly the day of the week display and the programme numbers at the bottom of the clock display all go very bright. This happens when the clock display blanks out and lasts for about a quarter of a second, after which the display returns to normal.

A common cause of this sort of thing is failure of the HA1780S 6V regulator chip IC1501. Check also the "reg. 12V" line. If these points are in order, and there are no dry-joints on the timer panel, check to confirm that there's a steady 262kHz clock signal at pin 40 of IC7505 before suspecting the chip itself.

ITT CVC20 CHASSIS

We have a dead set problem with this receiver. Initially we found that there was no output from the chopper power supply. The BU126 chopper transistor was short-circuit and the two resistors R84 and R86 in its base circuit were burnt and open-circuit. The trouble is that when these items are replaced they blow again at switch on.

Disconnect the set from the mains supply and apply 12V from an external source to pin 1 of the TDA2640 chopper control chip. Check that the drive waveform it supplies at pin 6 is of 3V peak-to-peak amplitude with a sharp fall time. If not, check the chip and its peripheral components. If the output from the TDA2640 chip is correct, first check the value of the driver transistor's base

bias resistor R80 (150k Ω) – it tends to go high. Then if necessary check for shorts in the h.t. rectifier diode D18 and the line output transistor T14.

GRUNDIG 5010

The TBA970 luminance signal processing chip went open-circuit for no apparent reason. After fitting a replacement the set was left on test. Three hours later the chip again failed.

It's unusual for the TBA970 in this set to "blow up" – it normally leads a quiet life. We suggest you replace the associated capacitors and check that the i.c.'s supply is correct (14V at pin 2), then suspect that tube flashover is responsible. The latter can be caused by excessive e.h.t. or failure of the earthing of the c.r.t.'s spark-gap system. Check the lead between the spark gap "common" and the c.r.t.'s outer conductive coating, then to the receiver chassis.

PANASONIC NV7200

There's wow on sound due to varying capstan speed in both the record and playback modes. The supply voltages are stable, also the 25Hz reference. All waveforms etc. are substantially as shown in the manual, but there's a phase lock drift at TP2009.

The fact that the phase lock at TP2009 cycles suggests that the servo circuit is trying hard to overcome some mechanical loading. Confirm by injecting a suitable voltage from an external low-impedance source at pin 7 of IC2005. Adjust the voltage for about half the correct speed. If wow is still present, feel the capstan motor for tight bearings etc. and check the tape back-tension. If these are in order the capstan motor itself is suspect.

CONTEC COLOUR PORTABLE

Picture and sound are perfect but the aerial socket appears to be live. The chassis is live but I would have expected the aerial socket to be isolated.

One can very often feel a "tingle" from the aerial socket of a live chassis set. This is harmless. If you can measure, preferably with a Megger, a resistance of greater than 2M Ω between either pin of the aerial socket and the shorted together live and neutral pins of the mains plug the set is safe – carry out this test with the mains switch on and the set disconnected from the mains supply. If the reading is less than 2M Ω , fit a new aerial socket. This must be a BEAB approved type.

HITACHI VT11

Playback of known good recordings from another machine is o.k. Playback of the machine's own recordings produces a grainy or snowy picture that changes every five or six seconds to a perfect picture then slowly gets snowy again for two-three seconds and so on. The fault is also present when the tape is played back on another machine. The heads and pinch wheel have been replaced.

This "cycling snow" effect is symptomatic of lack of servo control in the record mode. It's sometimes due to failure of the output coupling capacitor C821 on the tuner/i.f. panel. If replacing this fails to cure the fault an oscilloscope will be required to check that the head drum servo is correctly locking to the incoming field sync pulses, which enter IC601 (servo board) at pin 16, and that control track pulses from pin 17 of IC602 are being recorded on the tape. Record head servo lock can be

checked at test plug PG601. Details are given in the service manual.

TEST CASE

300

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.

Test Case 300! This is something of a milestone, since the feature has now been running for twenty five years. Test Case 1 appeared in our December 1962 issue. It described a "ballooning" picture. Several possible causes were discussed in the solution published in the following month's issue – the EY51 rectifier valve, the ion trap magnet, the line output valve . . . Happy days!

On to business however. The subject of this month's conundrum is also passing into history now – a set fitted with the Rank-Bush-Murphy T22A chassis. Various repairs had been carried out on the set over the years, as the owner's carefully filed bills showed: new EW modulator diodes, field output transistors, a 910Ω resistor (of course!), assorted electrolytic capacitors, and attention to dry-joints in various departments. All fairly run-of-the-mill stuff with this chassis, but how the bottom lines of the invoices reflected the inflationary years spanned! The biggest bill was for a new picture tube fitted in 1985 – hence the presentation of the set for repair so late in its life.

The present problem was not to do with the picture at all but with the audio section, which is normally trouble free with this design. It seemed that the sound was very "thin" and tinny before it disappeared completely. The job was taken on by Resident Workshop Sage, for the very good reason that only he amongst the staff had known these sets in their prime – and his, perhaps?

There was some evidence of overheating in the TDA2190 intercarrier sound channel/audio amplifier chip IC2, on the T130A signal panel, and the fact that the feed resistor R39 had gone open-circuit suggested that all was not well with the chip. Sage found a TDA2190 in the cobwebbed depths of his stores department, and a 3.3Ω resistor (which may or may not have met with the approval of the BEAB) was also obtained. Having fitted these in the set Sage switched on in confident anticipation of hearing the dulcet tones of Kathy Alexander, a newscaster whose charms are exclusively reserved for those in the TVS area. Her voice was nasal and crackly! The test card music on Channel 4, similarly distant and distorted, indicated to Sage that he had a problem on his hands. To hear the sound at all the volume control had to be well advanced, and after a few minutes of this the new TDA2190 and its feed resistors were finger-sizzlingly hot.

There's not much to go wrong in this set's audio

department – only the chip and a handful of peripheral components. The chip was allowed to cool down then, with the volume control set to minimum, voltage checks were made at its pins. Nothing far wrong was discovered. At high volume control settings however the voltage at pin 15 (d.c. input) dropped below its specified 21V and things started to warm up. The investigation had not proceeded far before the replacement TDA2190 died – on the operating table as it were.

To cut a long and sad story short, after another replacement chip had been fitted and Sage had had to put up with the derision of the younger workshop staff over his attempts to diagnose the problem, the situation could be summed up as follows. At zero setting of the volume control all appeared to be in order, but at high settings the sound was low and distorted – despite the fact that every significant passive component in the sound section of the T130A panel had been checked. What unusual failure had occurred? See next month for the answer.

ANSWER TO TEST CASE 299 – page 49 last month –

Wandering tape guides were at the root of the problem described last month. Realignment with a test tape, then locking the guides, seemed to have solved the problem initially, but you'll recall that the adjustment was difficult and critical. The problem was not the usual one of bottlenecked or round-shouldered ends to the f.m. envelope pattern, but of difficulty in getting consistent "meat" in the centre of each envelope.

In retrospect we were surprised that the tracking was maintained at all in the circumstances – and we certainly deserved to have the job bounce back on us! For the tape was passing right round the drum without touching the inclined guide shelf (sometimes called a rabbit) machined into the lower drum assembly. It was poised a fraction of a millimetre above all the way round, due to too high settings of both guides, entry and exit. No wonder the tracking was unpredictable towards the centre of the scan!

The machine was put to rights when the guides had been slackened off again and screwed down to the point where the bottom edge of the tape was seen to touch the rabbit while maintaining a full f.m. envelope trace. After tightening and sealing the lockscrews, good and consistent results were obtained with all the tapes tried. The machine was then apologetically returned to its owner . . .

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TELEVISION DECEMBER 1987

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A CHRISTMAS CAROL

In the centre of 'Hardup Village' was a shop called "Scrooge Electronics." It's proprietor, Ebenezer, was infamous for his money grabbing antics and everyone knew that he would buy his televisions and videos at the lowest price possible without any concern for quality. Consequently Bob Cratchett, his engineer, worked many long hours refurbishing and repairing sets, earning just enough money to survive.

"Scrooge Electronics" had a reputation for poor quality and Bob, who spent all his spare time on service calls, knew that because of this, potential new customers were wary of buying. But it wasn't Bob's fault — after all you can only work with the materials you're given. One Christmas Eve, whilst all were asleep and the snow was falling silently on the rooftops, Ebenezer had a dream. First he saw the ghost of Christmas past — and he recognised all the customers to whom he had sold poor quality sets. They were now sitting at home looking very miserable, for their televisions were

beyond repair and out of guarantee. This scene started to affect his conscience.

Then he met the ghost of Christmas present — and he saw Bob Cratchett's family sat at home, without any food on the table, waiting for Bob who was working long hours still doing service calls. Ebenezer didn't realise the misery he had created and knew something must be done.

Whilst he worked on a solution, the ghost of Christmas future arrived and started to ask him questions:

"Would you like to buy televisions and videos in showroom condition?" "Yes," said Ebenezer.

"Does it annoy you that all the profits you make are being spent on service calls and maintenance?"

"Yes," said Ebenezer.

"Do you now realise that if you buy the right quality sets in the first place, your customers will be hassle free and happier, and that with the extra profit you save from service calls you can pay poor Bob a decent wage?"

"Yes! Yes! Yes!" said Ebenezer. "But what do I do? I have travelled the length and breadth of this country wasting time and money, calling at wholesalers, and I am fed up spending half the day there, sorting through stock, only to find that the handful of sets I come away with start causing me problems as soon as I get home. I am at the point of despair and there is no-one who can help!"

"Oh yes there is!" said the ghost. "But only one!"

"Who is it?" said Ebenezer.

"Pro-Vision" said the ghost. "They're the Professionals. Give them a call."

Ebenezer did, and ever since that day he has realised that reputation and profits go hand in hand. So why not take Ebenezer's advice, contact Pro-Vision and have yourself a very merry Christmas and a prosperous New Year.

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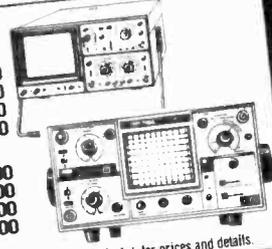
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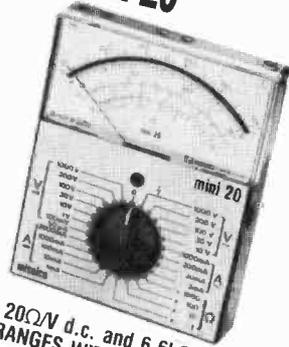


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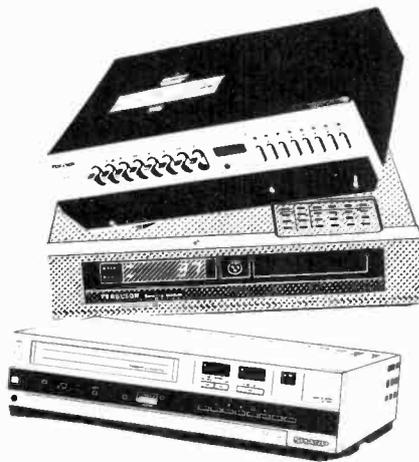
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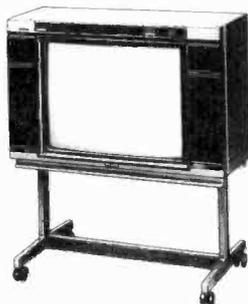
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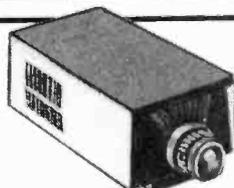
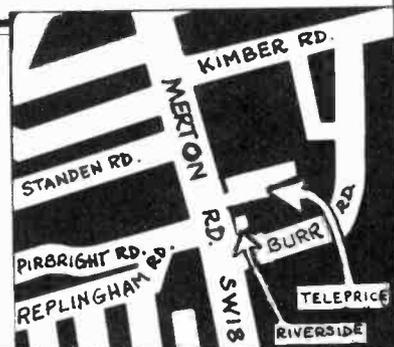
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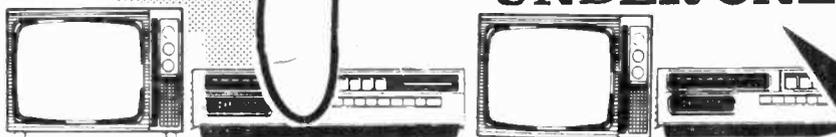
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| A.S. 20mm 315ma to | |
| 6.3A | 1.20 |
| 0/5 20mm 250ma to | |
| 0A | 0.70 |

MIXED ELECTRICS

| | |
|---------------|-------|
| .01mfd 1000v | £0.25 |
| .047mfd 1000v | £0.45 |
| .1mfd 1000v | £0.45 |
| .22mfd 1000v | £0.65 |
| .47mfd 1000v | £0.95 |
| 10mfd 1250v | £0.60 |
| 22mfd 1250v | £1.15 |

VIDEO HEADS

| | |
|--------------------------------------|--------|
| Sony Universal Eq. DSR 36 | £24.99 |
| Sony Universal Eq. DSR 43 | £24.95 |
| Sony C-9 | £39.99 |
| Ferguson/JVC Universal | £23.99 |
| National Panasonic Universal | £23.99 |
| National Panasonic (370/380/430/460) | £27.99 |
| National Panasonic (777/330) | £39.90 |
| Hitachi 5000 (Not Genuine) | £24.99 |
| Hitachi VT11/VT33/HIVI | £24.99 |
| Toshiba 9600 | £33.00 |
| Sony (Genuine) | £44.95 |
| Fisher Universal Eq. FVH D720 | £31.45 |
| Akai Universal | £23.99 |
| Sharp | £33.95 |

VIDEO SPARES BELT KITS

| | |
|---------------|-------|
| Nat Pan NV300 | £2.00 |
| NV2000 | £2.00 |
| NV7000 | £1.90 |
| NV8600 | £3.00 |
| Sony VTC5500 | £1.20 |
| VTC9300 | £3.00 |
| Sharp VC6300 | £2.00 |
| VC7300 | £2.00 |
| VC9300 | £2.00 |

CAPACITORS - AXIAL

| | |
|-------------|-------|
| 10mfd 25v | £0.10 |
| 22mfd 25v | £0.11 |
| 47mfd 25v | £0.12 |
| 1mfd 450v | £0.24 |
| 2.2mfd 450v | £0.30 |
| 3.3mfd 450v | £0.38 |
| 4.7mfd 450v | £0.42 |
| 10mfd 450v | £0.52 |
| 22mfd 450v | £0.85 |
| 47mfd 450v | £1.20 |
| 1mfd 63v | £0.10 |
| 2.2mfd 63v | £0.10 |
| 4.7mfd 63v | £0.11 |
| 10mfd 63v | £0.11 |
| 22mfd 63v | £0.13 |
| 47mfd 63v | £0.14 |
| 100mfd 63v | £0.26 |

CAPACITORS - RADIAL

| | |
|-------------|-------|
| 1-22mfd 25v | £0.06 |
| 47mfd 25v | £0.08 |
| 100mfd 25v | £0.10 |
| 220mfd 25v | £0.14 |
| 470mfd 25v | £0.16 |
| 2200mfd 16v | £0.60 |

OTHER ACCESSORIES

| | |
|--|--|
| Mod kits, Integrated Circuits, Idler Assy, Gear Idler Assy, Reel & Loading Belts, Capstan & Reel Motors, Reel Drive Pulley units also available in most models. Please call for full list. | |
| PLEASE NOTE OUR NEW ADDRESS AND TELEPHONE NUMBER | |

| | | | | | | | | | | | | | | | |
|---------|-------|---------|-------|-----------|-------|---------|-------|----------|-------|---------|--------|----------|-------|-----------|-------|
| AN103 | £2.20 | AN6610 | £1.95 | BA1320 | £1.25 | HA11749 | £4.75 | LA4440 | £2.75 | SK080 | £7.50 | STR4211 | £6.75 | TD2811A | £1.25 |
| AN1270 | £1.95 | AN6676 | £7.50 | BA1330 | £1.75 | HA11750 | £5.00 | LA4445 | £2.75 | SK082 | £7.75 | STR6020 | £6.75 | TD2653A | £1.80 |
| AN203 | £2.20 | AN6677 | £6.30 | BA1360 | £1.80 | HA11753 | £8.50 | LA4460 | £1.80 | SK084 | £7.60 | TA7063P | £1.50 | TD3450 | £4.75 |
| AN210 | £1.75 | AN6700 | £2.30 | BA5102A | £1.60 | HA11758 | £8.50 | LA4505 | £2.50 | SK043 | £5.50 | TA7066P | £1.50 | TD34540 | £3.80 |
| AN211A | £2.30 | AN6811 | £1.60 | BA5204 | £2.75 | HA11788 | £4.50 | LA4506 | £2.50 | SK043 | £5.50 | TA7073AP | £2.75 | TD34541 | £3.60 |
| AN217B | £2.20 | AN6873 | £3.50 | BA5402A | £2.75 | HA11788 | £4.50 | LA4507 | £2.50 | SK046 | £5.25 | TA7074F | £1.95 | TD34560 | £4.50 |
| AN228W | £2.90 | AN6875 | £3.50 | BA5406 | £2.75 | HA11816 | £6.50 | LA4508 | £2.85 | SK046 | £5.25 | TA7126P | £0.90 | TD34561A | £4.95 |
| AN236 | £2.50 | AN6884 | £2.75 | BA5408 | £2.75 | HA11828 | £9.50 | LA4509 | £2.85 | SK047 | £5.25 | TA7128P | £1.00 | TD34562A | £5.00 |
| AN240P | £1.50 | AN7105 | £2.75 | BA6104 | £2.80 | HA12001 | £6.50 | LA4520 | £2.85 | SK043 | £5.25 | TA7140P | £1.75 | TD2651 | £2.70 |
| AN241P | £1.50 | AN7106K | £2.95 | BA6124 | £2.80 | HA12002 | £2.95 | LA4570 | £3.75 | SK049 | £5.95 | TA7145P | £2.50 | TD34652 | £3.70 |
| AN248P | £1.50 | AN7110 | £2.95 | BA6208 | £2.95 | HA12035 | £9.50 | LA5112 | £1.85 | SK041 | £7.95 | TA7193P | £4.00 | TD44220 | £4.30 |
| AN259 | £2.75 | AN7111 | £1.50 | BA6209 | £2.75 | HA12038 | £6.75 | LA5527 | £1.95 | SK043 | £7.95 | TA7205AP | £1.00 | TD44500 | £3.95 |
| AN260P | £2.20 | AN7112E | £2.95 | BA6304 | £2.20 | HA12402 | £2.95 | LA6324 | £1.20 | SK049 | £6.75 | TA7208P | £1.75 | TD44600/2 | £2.95 |
| AN262 | £1.60 | AN7114E | £2.50 | BX342 | £5.00 | HA12413 | £2.75 | LA6358S | £1.20 | SK041 | £6.75 | TA7214P | £2.60 | TD47270 | £2.20 |
| AN264 | £3.75 | AN7115E | £1.60 | HA1124A | £2.75 | HA13001 | £2.95 | LA6458D | £1.20 | SK041 | £6.75 | TA7215P | £2.30 | UPC575C | £1.00 |
| AN271A | £2.75 | AN7116 | £1.50 | HA1124DS | £3.50 | HA13007 | £4.95 | LA7016 | £2.75 | SK043 | £6.75 | TA7217AP | £1.60 | UPC1001H | £2.20 |
| AN274 | £2.75 | AN7120 | £1.50 | HA1125 | £1.75 | HA13402 | £4.95 | LA7031 | £4.50 | SK051 | £6.25 | TA7220P | £2.50 | UPC1018C | £2.80 |
| AN277 | £2.50 | AN7130 | £1.30 | HA1137W | £1.75 | HA13402 | £4.95 | LA7032 | £4.50 | SK025 | £4.75 | TA7222AP | £1.30 | UPC1025H | £2.30 |
| AN295 | £3.60 | AN7131 | £2.75 | HA1144 | £4.25 | LA1111 | £0.95 | LA7215 | £2.75 | SK0029 | £4.75 | TA7225P | £2.30 | UPC1032H | £0.60 |
| AN301 | £3.50 | AN7140 | £2.20 | HA1151 | £2.50 | LA1130 | £2.50 | LA7224 | £2.95 | SK0029 | £4.75 | TA7227P | £2.20 | UPC1158H | £0.95 |
| AN302 | £3.30 | AN7143 | £2.95 | HA1156W | £1.20 | LA1140 | £2.20 | LA7505 | £2.95 | SK0049 | £6.50 | TA7229P | £3.25 | UPC1181H | £1.10 |
| AN303 | £2.75 | AN7145M | £2.50 | HA1167 | £3.75 | LA1222 | £1.00 | LA7520 | £2.00 | SK0059 | £7.00 | TA7230P | £1.95 | UPC1182H | £1.10 |
| AN305 | £2.75 | AN7146M | £2.80 | HA1196 | £3.70 | LA1231 | £1.00 | LA7521 | £2.00 | SK0060 | £7.00 | TA7232P | £2.95 | UPC1185H | £1.10 |
| AN313U | £2.95 | AN7154 | £2.95 | HA1197 | £1.80 | LA1240 | £2.95 | LA7551 | £2.00 | SK0080 | £7.75 | TA7233P | £2.95 | UPC1188H | £2.75 |
| AN315 | £2.30 | AN7156N | £2.50 | HA1199 | £1.85 | LA1240 | £2.95 | LA7555 | £2.00 | SK0080 | £7.75 | TA7240AP | £2.95 | UPC1188H | £2.75 |
| AN316 | £3.75 | AN7158N | £2.25 | HA1319 | £2.50 | LA1260 | £2.50 | LA7800 | £1.95 | SK1060 | £7.95 | TA7241AP | £2.95 | UPC1225H | £2.50 |
| AN318 | £4.95 | AN7160 | £3.75 | HA1366W | £1.80 | LA1353 | £2.50 | LA7801 | £1.95 | SK1060 | £7.95 | TA7241AP | £2.95 | UPC1230H | £2.50 |
| AN337 | £5.25 | AN7161 | £3.75 | HA1366WR | £1.85 | LA1365 | £1.50 | LA7802 | £1.95 | SK2025 | £7.50 | TA7269P | £5.50 | UPC1263C | £2.50 |
| AN340P | £1.50 | AN7166 | £3.95 | HA1367 | £1.90 | LA1368 | £2.50 | LA7808 | £1.95 | SK2029 | £5.75 | TA7270P | £2.75 | UPC1277H | £2.75 |
| AN350 | £1.30 | AN7168 | £2.75 | HA1368 | £1.90 | LA1368 | £2.50 | LA7820 | £2.75 | SK2038H | £9.50 | TA7271P | £2.75 | UPC1278H | £2.75 |
| AN352L | £1.60 | AN7178 | £2.95 | HA1368R | £1.90 | LA1368 | £2.50 | LA7910 | £2.20 | SK2125 | £6.75 | TA7272P | £2.75 | UPC1363C | £2.75 |
| AN363N | £3.50 | AN7213 | £1.95 | HA1370 | £3.70 | LA1460 | £3.20 | LA7920 | £1.75 | SK2129 | £6.75 | TA7274P | £2.95 | UPC1365C | £4.75 |
| AN366P | £1.70 | AN7218 | £1.75 | HA1372 | £3.50 | LA1464 | £3.20 | LA7920 | £1.75 | SK2129 | £6.75 | TA7280P | £3.50 | UPC1384C | £2.20 |
| AN374P | £2.20 | AN7222N | £3.50 | HA1374 | £2.50 | LA2100 | £2.95 | LB1405 | £2.20 | SK2230 | £6.50 | TA7281P | £2.95 | UPC1387C | £2.50 |
| AN377 | £2.00 | AN7223 | £3.95 | HA1377 | £2.20 | LA2101 | £3.30 | LB1409 | £2.95 | SK2250 | £9.50 | TA7282AP | £6.50 | UPC1391H | £1.95 |
| AN610P | £1.80 | AN7224 | £3.50 | HA1384 | £3.50 | LA3201 | £0.95 | LC1066B | £0.95 | SK3041 | £6.50 | TA7283AP | £6.50 | UPC1394C | £1.95 |
| AN612 | £1.80 | AN7256 | £3.50 | HA1388 | £3.50 | LA3210 | £0.75 | LC7131 | £3.75 | SK3042 | £6.50 | TA7288P | £2.95 | UPC2002 | £0.80 |
| AN5010 | £4.75 | AN7273 | £3.95 | HA1389 | £2.20 | LA3210 | £0.75 | LC7131 | £3.75 | SK3044 | £5.95 | TA7299P | £2.95 | UPC3569C | £2.50 |
| AN5033 | £5.25 | AN7310 | £1.20 | HA1389R | £2.20 | LA3220 | £2.95 | LC7132 | £4.00 | SK3062H | £6.75 | TA7317P | £2.75 | UPC3569C | £2.50 |
| AN5151N | £6.50 | AN7311 | £1.20 | HA1392 | £2.50 | LA3300 | £1.65 | LC7136 | £3.75 | SK4026 | £6.50 | TA7328P | £2.75 | UPC3569C | £2.50 |
| AN5265 | £3.20 | AN7410 | £3.90 | HA1394 | £2.95 | LA3301 | £1.30 | LC7137 | £4.50 | SK4060 | £6.50 | TA7343AP | £6.75 | UPC3569C | £2.50 |
| AN5410 | £3.50 | AN7415 | £3.90 | HA1396 | £3.75 | LA3310 | £2.75 | LC7800 | £3.95 | SK4060 | £6.50 | TA7358P | £7.50 | UPC3569C | £2.50 |
| AN5411 | £3.50 | AN7420 | £3.25 | HA1397 | £2.75 | LA3350 | £2.80 | M5134P | £1.25 | SK4131H | £6.75 | TA7358P | £7.50 | UPC3569C | £2.50 |
| AN5430 | £2.95 | BA301 | £0.80 | HA1398 | £2.75 | LA3361 | £2.80 | M51102L | £3.95 | SK4151H | £6.75 | TA7607AP | £2.95 | UPC3569C | £2.50 |
| AN5510 | £2.75 | BA311 | £0.80 | HA1457W | £2.75 | LA3370 | £2.75 | M51102L | £3.95 | SK4332 | £6.50 | TA7608CP | £2.70 | UPC3569C | £2.50 |
| AN5512 | £2.95 | BA313 | £0.80 | HA141215W | £4.35 | LA4030P | £2.00 | M51104L | £3.95 | SK4332 | £6.50 | TA7609CP | £2.70 | UPC3569C | £2.50 |
| AN5512 | £2.95 | BA314 | £2.20 | HA11219 | £3.25 | LA4031P | £1.95 | M51513 | £1.80 | SK4352 | £6.50 | TA7613AP | £2.75 | UPC3569C | £2.50 |
| AN5512 | £2.95 | BA316 | £1.50 | HA11221 | £2.75 | LA4032P | £1.90 | M51514 | £1.95 | SK4392 | £7.50 | TA7618AP | £2.95 | UPC3569C | £2.50 |
| AN5520X | £1.80 | BA328 | £2.50 | HA11223W | £3.80 | LA4100 | £1.20 | M51515BL | £2.50 | SK4803 | £8.50 | TA7628P | £2.95 | UPC3569C | £2.50 |
| AN5701 | £1.80 | BA328 | £2.50 | HA11225 | £1.95 | LA4101 | £1.00 | M51516BL | £2.80 | SK4833 | £9.50 | TA7640AP | £1.75 | UPC3569C | £2.50 |
| AN5722 | £1.60 | BA333 | £3.60 | HA11225 | £1.95 | LA4101 | £1.00 | M51516BL | £2.80 | SK4843 | £8.95 | TA7640AP | £1.75 | UPC3569C | £2.50 |
| AN5730 | £1.85 | BA335 | £3.60 | HA11226 | £4.50 | LA4102 | £1.40 | M51518L | £2.20 | SK5211 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN5732 | £1.85 | BA340 | £2.50 | HA11235 | £2.30 | LA4110 | £1.75 | M51521L | £1.90 | SK5315 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN5750 | £1.75 | BA343 | £2.75 | HA11251 | £2.75 | LA4112 | £1.75 | M51521L | £1.90 | SK5324 | £5.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN5753 | £3.95 | BA402 | £0.95 | HA11401 | £2.80 | LA4120 | £2.20 | MB3712 | £1.50 | SK5325 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN5750 | £2.30 | BA403 | £1.95 | HA11423 | £4.75 | LA4125 | £2.60 | MB3713 | £1.60 | SK5421 | £6.50 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6310 | £2.75 | BA511A | £1.85 | HA11440 | £3.95 | LA4126 | £2.60 | MB3717 | £1.95 | SK5451 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6326N | £3.70 | BA514 | £1.90 | HA11701 | £3.50 | LA4137 | £2.40 | MB3722 | £3.50 | SK5471 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6327 | £4.75 | BA516 | £1.90 | HA11703 | £4.50 | LA4140 | £0.90 | MB3730 | £2.50 | SK5476 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6328 | £4.20 | BA521 | £1.90 | HA11704 | £5.20 | LA4145 | £2.40 | MB3731 | £3.50 | SK5720 | £6.80 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6330 | £2.95 | BA524 | £2.75 | HA11705 | £6.95 | LA4160 | £2.40 | MB3731 | £3.50 | SK5730 | £4.25 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6340 | £7.85 | BA526 | £3.50 | HA11706 | £4.75 | LA4170 | £3.50 | MB3756 | £3.50 | SK7216 | £6.50 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6341N | £4.00 | BA527 | £1.75 | HA11710 | £3.75 | LA4178 | £2.20 | MB3759 | £3.85 | SK7308 | £5.95 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6342N | £2.50 | BA532 | £1.60 | HA11711 | £9.50 | LA4182 | £2.20 | SK011 | £7.25 | SK8250H | £10.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6344 | £4.75 | BA536 | £2.50 | HA11713 | £6.50 | LA4183 | £2.95 | SK011 | £7.25 | SK8250H | £10.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6350 | £3.85 | BA546 | £2.50 | HA11714 | £5.95 | LA4190 | £2.50 | SK015 | £5.20 | STR380 | £5.80 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6356N | £3.75 | BA547 | £2.20 | HA11716 | £4.75 | LA4192 | £1.95 | SK015 | £5.20 | STR440 | £5.80 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6357N | £4.95 | BA612 | £1.80 | HA11717 | £5.75 | LA4201 | £1.60 | SK020 | £6.25 | STR441 | £5.80 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6360 | £4.50 | BA631A | £5.75 | HA11718 | £4.75 | LA4220 | £1.50 | SK025 | £7.50 | STR451 | £5.80 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6362 | £5.50 | BA656 | £4.50 | HA11724 | £7.85 | LA4230 | £2.25 | SK043 | £7.95 | STR2012 | £6.50 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6363 | £8.50 | BA682A | £3.50 | HA11727 | £9.50 | LA4420 | £1.60 | SK077 | £6.50 | STR4090 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6371 | £4.25 | BA843 | £4.50 | HA11745 | £9.00 | LA4422 | £1.50 | SK077 | £6.50 | STR4090 | £6.75 | TD91068P | £4.95 | UPC3569C | £2.50 |
| AN6387 | | | | | | | | | | | | | | | |

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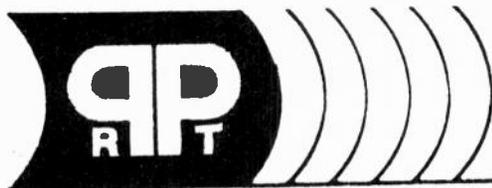
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| TELEQUIPMENT S54A. Single Trace 10MHz. Solid State. With Manual | £90 |
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| ADVANCE OS250TV. Dual Trace 10MHz. With Manual | £150 |
| HAMEG 207 Single Trace 8MHz. With Manual | £50 |

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| AVO 8 MkV Complete with Batteries, Leads & Case | £90 |
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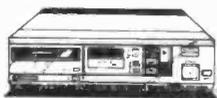
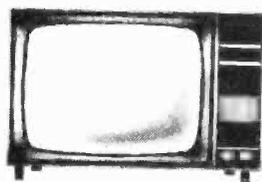
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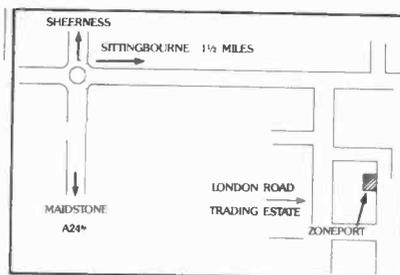
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| 25A-850 | £0.30 | 25B-837 | £0.50 | 25C-1567 | £0.50 | 25D-200 | £3.10 | AN-318 | £5.75 | TIP-32 | £0.22 | FISHER | £1.55 | 3V29 | £0.75 | 3V29 | | |
| 25A-893 | £0.30 | 25B-857 | £0.50 | 25C-1568 | £0.45 | 25D-235 | £0.35 | AN-340 | £1.20 | TIP-32A | £0.22 | VBS-7000 | £2.40 | | | | | |
| 25A-896 | £0.35 | 25C-352 | £0.60 | 25C-1577 | £1.70 | 25D-288 | £0.75 | AN-360 | £0.75 | TIP-32B | £0.22 | VBS-9000 | £2.80 | DRIVE BELTS FOR | £0.80 | DRIVE BELTS FOR | | |
| 25A-916 | £0.18 | 25C-372 | £0.10 | 25C-1550 | £0.60 | 25D-299 | £1.50 | AN-5010 | £2.50 | TIP-32C | £0.22 | VBS-9000 | £2.80 | AUDIO CASSETTE | £0.40 | AUDIO CASSETTE | | |
| 25A-921 | £0.10 | 25C-380 | £0.12 | 25C-1514 | £0.75 | 25D-313 | £0.30 | AN-5111 | £3.50 | TIP-33A | £0.22 | VBS-9000 | £2.80 | RECORDERS/ | £1.55 | RECORDERS/ | | |
| 25A-940 | £0.45 | 25C-458 | £0.15 | 25C-1584 | £3.50 | 25D-315 | £0.75 | AN-5410 | £2.80 | TIP-41 | £0.22 | | | TURNABLES | | TURNABLES | | |
| 25A-950 | £0.25 | 25C-460 | £0.06 | 25C-1586 | £3.50 | 25D-325 | £0.45 | AN-5431 | £2.20 | TIP-41B | £0.22 | HITACHI | £1.55 | | | | | |
| 25A-958 | £0.75 | 25C-495 | £0.60 | 25C-1627 | £0.20 | 25D-352 | £0.50 | AN-5435 | £1.80 | TIP-42 | £0.25 | | | SQUARE | | SQUARE | | |
| 25A-968 | £0.75 | 25C-497 | £0.75 | 25C-1667 | £0.75 | 25D-357 | £0.35 | AN-5440 | £2.15 | TIP-42A | £0.25 | JVC | £1.35 | 68x1.2 to | £0.12 | 68x1.2 to | | |
| 25A-985 | £0.60 | 25C-497 | £1.50 | 25C-1667 | £0.75 | 25D-357 | £0.35 | AN-5440 | £2.15 | TIP-42C | £0.24 | HR-3330 | £2.00 | 96x1.2 | £0.12 | 96x1.2 | | |
| 25A-992 | £0.30 | 25C-536 | £0.06 | 25C-1670 | £0.75 | 25D-381 | £0.90 | AN-5612 | £0.60 | TIP-102 | £0.50 | HR-3360 | £1.95 | 120x1.25 | £0.12 | 120x1.25 | | |
| 25A-1048 | £0.10 | 25C-544 | £0.25 | 25C-1675 | £0.10 | 25D-386 | £0.75 | AN-5700 | £2.80 | TIP-105 | £0.48 | HR-4100 | £1.95 | 135x1.25 | £0.12 | 135x1.25 | | |
| 25A-1060 | £1.50 | 25C-681 | £1.95 | 25C-1722 | £0.50 | 25D-388 | £1.80 | AN-5720 | £1.25 | TIP-121 | £0.40 | HR-4100 | £1.95 | | | | | |
| 25A-1062 | £1.20 | 25C-693 | £0.25 | 25C-1756 | £0.45 | 25D-389 | £0.95 | AN-5722 | £1.35 | TIP-125 | £0.40 | HR-7700 | £0.77 | FLAT | | FLAT | | |
| 25A-1094 | £1.90 | 25C-710 | £0.20 | 25C-1760 | £0.75 | 25D-400 | £0.15 | AN-5730 | £1.35 | TIP-126 | £0.40 | HR-7700 | £0.77 | 88x0.5x4 | £0.25 | 88x0.5x4 | | |
| 25A-1102 | £1.90 | 25C-717 | £0.25 | 25C-1775 | £0.15 | 25D-401 | £0.45 | AN-5732 | £1.25 | HCF40018E | £0.18 | HR-7650 | £0.77 | 122x0.5x5 | £ | 122x0.5x5 | | |
| 25A-1104 | £2.05 | 25C-733 | £0.25 | 25C-1815 | £0.15 | 25D-426 | £1.50 | AN-5738 | £1.00 | HCF4008BE | £0.50 | | | 189x0.5x5 | £0.60 | 189x0.5x5 | | |
| 25A-1106 | £1.50 | 25C-738 | £0.25 | 25C-1819 | £0.71 | 25D-428 | £1.50 | AN-5900 | £1.50 | HCF4017BE | £0.52 | NATIONAL | £1.35 | 205x0.5x5 | £0.60 | 205x0.5x5 | | |
| 25A-1110 | £0.45 | 25C-741 | £1.95 | 25C-1845 | £0.15 | 25D-438 | £0.30 | AN-6246 | £1.20 | HA-11225 | £1.70 | HA-11227 | £1.00 | NV-333 | £1.35 | NV-333 | | |
| 25A-1142 | £2.90 | 25C-783 | £1.10 | 25C-1875 | £2.40 | 25D-468 | £0.25 | AN-6249 | £1.20 | HA-11227 | £1.00 | HA-11227 | £1.00 | HCF4025BE | £0.48 | NV-8600 | £1.65 | NV-8600 |
| 25A-1145 | £0.20 | 25C-789 | £0.35 | 25C-1890 | £0.20 | 25D-476 | £0.45 | AN-6250 | £0.40 | HA-11235 | £1.70 | HA-11244 | £1.65 | HCF4050BE | £0.52 | NV-7200 | £0.84 | NV-7200 |
| 25A-1147 | £1.90 | 25C-790 | £0.90 | 25C-1906 | £0.25 | 25D-478 | £0.90 | AN-6320 | £2.00 | HA-11235 | £1.70 | HA-11251 | £2.80 | HCF4103BE | £0.52 | NV-7000 | £0.95 | NV-7000 |
| 25A-1156 | £0.60 | 25C-828 | £0.15 | 25C-1913 | £0.90 | 25D-525 | £0.75 | AN-6338 | £5.00 | HA-11244 | £1.65 | HA-11423 | £0.10 | HCF4106BE | £0.39 | NV-6000 | £1.45 | NV-6000 |
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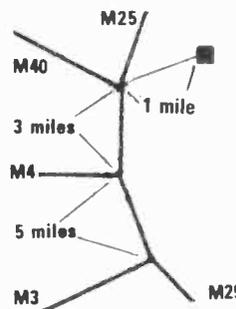
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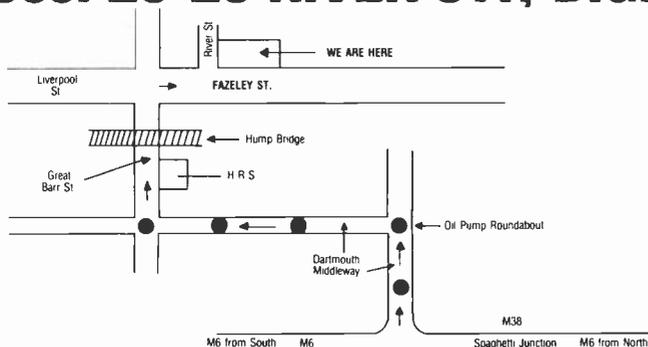
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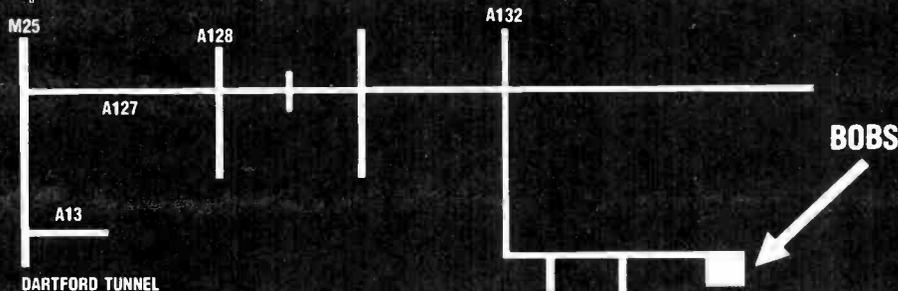
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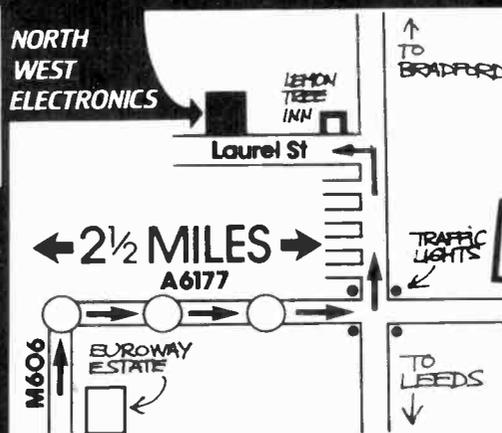
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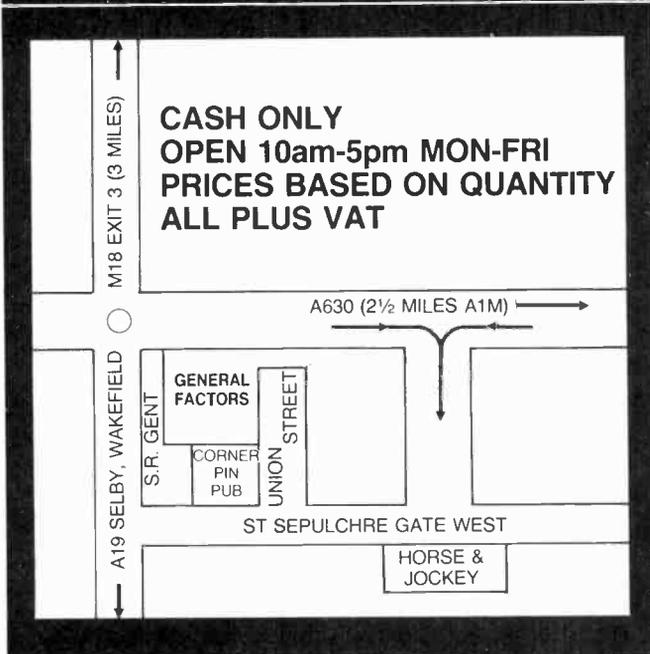
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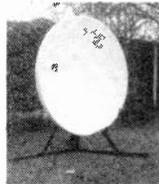
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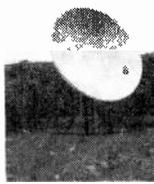
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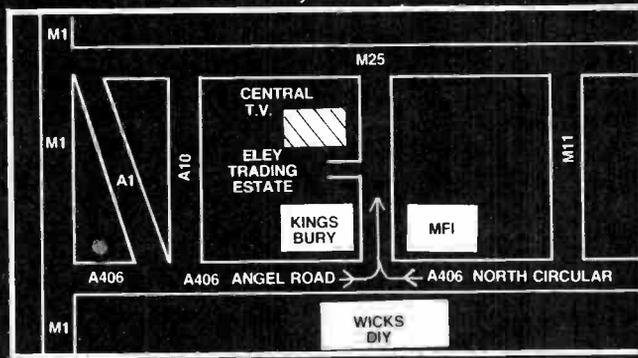
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| BY 179 | | 25p | |
| BY 184 | | 25p | |
| BY 187 | | 25p | |
| BY 190 | | 25p | |
| BY 196 | | 30p | |
| BY 198 | | 30p | |
| BY 204A | | 8p | |
| BY 206 | | 8p | |
| BY 208/209 | | 8p | |
| BY 210/400 | | 10p | |
| BY 210/800 | | 10p | |
| BY 223 | | 60p | |
| BY 224/600: 4.8A 600A bridge | | 50p | |
| BY 226 | | 15p | |
| BY 227 | | 15p | |
| BY 228 1500V | | 20p | |
| Flat BY229 black | | 15p | |
| BY 299 Red | | 30p | |
| BY 229/400 | | 30p | |
| BY 290/40p Tag | | 30p | |
| BY 237 | | 5p | |
| BY 242 | | 10p | |
| BY 255 | | 10p | |
| BY 298 | | 10p | |
| BY 299 | | 10p | |
| BY 400 | | 10p | |
| BY 527 | | 20p | |
| BY 407a | | 10p | |
| BY 527 | | 10p | |
| BY 602 | | 10p | |
| F 247 | | 10p | |
| GRP06G | | 10p | |
| GR190G (TX10) | | 60p | |
| XK 3102 | | 50p | |
| BY V 282/00 | | 20p | |
| 80R/2.75 amps | | 50p | |
| International Rectifier EHT Diodes G7701V34 6KV | 3 for 8p | | |
| 6A/600V Stud Diodes | 20p | | |
| 6A/1000V Stud Diodes | 20p | | |

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| Rank T20 Z136 Panel | |
| NEW 1617 THORN Chassis with IC's & AU113 | |
| NEW GEC 20AX Power Supply Switch Module | |
| Complete new GEC portable chassis M1201H/M15011H with P.B.U./v.cap/LOPT1 | £10.00 |
| Field + Jungle panel for GEC 3133/3135 | £1.50 |
| GEC 2110 line panel with transformer | £7.00 |
| GEC 2110 tuner unit + IF Panel | £12.00 |
| Pvc/Chelsea Line on panel | £3.90 |
| Pvc 205 Tamt | £2.75 |
| Pvc 205 Line on panel | £7.50 |
| Pvc 713 IF panel and tuner | £7.00 |
| Pvc 713 Chroma | £10.00 |
| Pvc/Chelsea Timebase panel with LOPT1 | £10.00 |
| Pvc 731 Frame Panel | £5.00 |
| Pvc 731 Convergence Panel | £5.00 |
| Pvc 731 Chroma | £10.00 |
| Pvc 731 IF panel + tuner | £10.00 |
| Pvc CD/2/25 panel | £6.00 |
| GEC portable chassis + LOPT1 2114 New | £4.00 |
| Thorn 1613/173 chassis | 9.75 |
| G9 Power Panel | £6.00 |
| Mono RANK Chassis 127A NEW | £10.00 |
| NEW G9 Frame Panel | £4.00 |
| NEW G11 IF Panel | £10.00 |

25% OFF ALL PANELS

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| G8 Tuner Unit + Panel | £4.00 | 22/1000 | 20p |
| G8 Power Supply | £5.00 | 1/250AC | 20p |
| G8 6 Sloping PBU | £8.00 | 1/100 | 5p |
| G8 IF & Chroma | £6.00 | 1MFD x 250AC | 25p |
| G8 Chroma | £3.00 | 1/100 x 10 | 10p |
| G11 IF Detector | £3.00 | 4.7M/100 | 10p |
| G11 Selector gain module | £3 | 470/100 | 20p |
| Complete CVC 825 Chassis (both panels) | £40.00 | 470/100 | 75p |
| AEC V/Cap Resistor Unit UHF with IC SA5060 SA5670 | £3.00 | 47/160 | 80p |
| Z714 RANK IF Panels 6M1Z 1 L.C. | £1.50 | 80/160 | 50p |
| SL437F | £3.00 | 1/250 Pulse | 5p |
| Z909B RANK IF Panels | £2.50 | 1/250 | 10p |
| Export 5.5MHz 2 L.C.'s | £3.00 | 1/250 | 10p |
| TBA1205B ICA27050 | £2.50 | 1/250 | 10p |
| K35 IF | £6.00 | 1/250 | 10p |
| Z743 RANK IF Panel | £2.50 | 1/250 | 10p |
| Export 5.5MHz 3 L.C.'s | £3.00 | 1/250 | 10p |
| TBA750+SC9504P+ | £1.50 | 1/250 | 10p |
| SC9503P | £1.50 | 1/250 | 10p |
| Pvc G11 Front panel with transducer, pots, tuner pots, 6 pb switch + lead | £5.00 | 1/250 | 10p |
| Pvc 6 button switch portable | £1.00 | 1/250 | 10p |
| GEC V/cap V11F/UHF tuner and IF + sound O/P PC 70613 (Export) | £12.00 | 1/250 | 10p |
| GEC Line O/P PC 659B3 | £6.00 | 1/250 | 10p |
| 2110 GEC Power Panel | £8.00 | 1/250 | 10p |
| CVC 20 Front panel with sliders + mains input panel | £4 | 1/250 | 10p |
| CVC 40 PUSH BUTTON ASSY with 8 buttons; complete with lamp assy + pots | £9.00 | 1/250 | 10p |
| CVC 9 slider pots panel | 50p | 1/250 | 10p |
| CVC 5 Mains on/off + 5 pots | £2 | 1/250 | 10p |
| Universal Focus, Fits Pvc, Thorn and Decca Units. | | 1/250 | 10p |
| T147 Rank tube base on panel | £1.00 | 1/250 | 10p |
| Z718 Focus Unit | £1.50 | 1/250 | 10p |
| T20 Focus Unit | £1.00 | 1/250 | 10p |
| Large Type | 75p | 1/250 | 10p |
| Decca Small | 75p | 1/250 | 10p |
| KT3 Focus Unit | 75p | 1/250 | 10p |
| K30 Focus Pot | 75p | 1/250 | 10p |
| K30 Tube base on panel | £1.00 | 1/250 | 10p |
| TX10 Focus Units | £7.00 | 1/250 | 10p |
| CVC 32 Focus Unit | 75p | 1/250 | 10p |
| Fidelity Focus Unit 14R-14S | £1.00 | 1/250 | 10p |
| 3500 Thorn Focus Unit | £1.00 | 1/250 | 10p |
| ITT Small for use with Split | £2.00 | 1/250 | 10p |
| Z718 Bush focus | £2.00 | 1/250 | 10p |
| Diode | 50p | 1/250 | 10p |
| TV11 | 50p | 1/250 | 10p |
| Romo TV125P | 50p | 1/250 | 10p |
| 1600 Thorn EHT Rec and Lead | 50p | 1/250 | 10p |
| TV13 | 50p | 1/250 | 10p |
| TV14 | 50p | 1/250 | 10p |
| TV18 | 60p | 1/250 | 10p |
| TV20 | 60p | 1/250 | 10p |
| TV45 | 50p | 1/250 | 10p |
| Thorn 14/1500 rec stick | 5p | 1/250 | 10p |
| TX10 8 Button Unit | £10.00 | 1/250 | 10p |
| TX10/TX100 16 Button | £10.00 | 1/250 | 10p |
| G11 drawer ASS 3 pots Mains switch and lead | £2.00 | 1/250 | 10p |
| K30 Drawer Ass with pots cable | £1.00 | 1/250 | 10p |
| TX10 Drawer with 8 way pots. ass. | £2.50 | 1/250 | 10p |
| TX10 Ex. port with hand switch (drawer) | £2.50 | 1/250 | 10p |
| Line O/P panel GEC 2217/2218/2213/2214/2226/2227/2228 | £10 | 1/250 | 10p |

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| PHILIPS BATTERIES (Small Types) HAND SETS | | | |
| SR41 | 40p | | |
| SR43 | 40p | | |
| SR44 | 40p | | |
| SR54 | 40p | | |
| LR43 | 40p | | |
| LR44 | 40p | | |
| LR54 | 40p | | |
| CR2032 | 40p | | |
| CVC 20 25-30 Mains Switches | | | |
| Infra Red and Ultrasonic G11 Teletext Decoder Panel | £1.50 | | |
| RANK & T Mains Remote On Off Switch (720R) | £1.50 | | |
| RANK & T Remote Switch 2800 ohm | 50p | | |
| G11 Mains Switch | 50p | | |
| 4 amp Mains Switch | 50p | | |
| GEC Mains Switch 4 amp | 50p | | |
| K13 Mains Switch | 50p | | |
| G8 Mains Switch | 50p | | |
| G11 Preh Red LED P/Buton for C.H. Change | 50p | | |
| RANK T OZ11BA Transducers TPC-2011 | 50p | | |
| Mains Switch ITI Long Type Print | 50p | | |
| Mains Switch Philip Long Type TAG | 50p | | |
| Mains Switch GEC Long Type TAG | 50p | | |
| 2000 Chassis Fidelity Mains Switch (4 TAG) | 50p | | |
| 250V/4A White Lorlin Mains Switch | 50p | | |
| KT3-K30-K35 Full Remote Mains Switch (6-TAG) | 50p | | |
| Teletext Acceptor Kit FY-500 Panasonic | 50p | | |

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| Tube Thermaph 167 | £1.00 |
| Rank Secam Decoder Panel U11F & V11F | £1.00 |
| T115A | £13.00 |
| 10 off 91 CAP G11 | £2.00 |
| Philips K4 CAP 150M/385V | 50p |
| Multi-Caps | |
| 220 MFD Sprague 385V | 50p |
| 350V 300M + 300M | £1.00 |
| 400V 400M | 60p |
| 350V 400M | 60p |
| Thorn 3500 | £1.00 |
| 150V/100V/350V | £1.00 |
| KT3/200/252/535 | £1.00 |
| KT3-K30 220+40+40 | 75p |
| 200+200+75+25M 325V | £1.00 |
| 300+300+150+100+50MFD | £1.00 |
| 350V | £2.00 |
| G11 CAP 470/250 | £2.00 |
| 47/20/350 | 60p |
| 150V/50/100/100/320v | £2.00 |
| 2500/2500/63v | 70p |
| 150/200/200/300v | 50p |
| 300/100/100/16/275v | £1.50 |
| 100/200/325v | 40p |
| 150/150/100/375v | £1.50 |
| 200/200/75/25M 375V | £1.00 |
| Thorn TX9 Caps 500+500M 175V | £1.75 |
| 300/300/100/325/300v | 2.00 |
| 100/200/300 | 50p |
| 150/150/100/320v | £2.00 |
| 100/350 + 300/200/100/16/275v | £2.00 |
| 225+25/380 GEC | 70p |
| 200/100/100/350v | £1.50 |
| 500/500/25v | 50p |
| 150/150/100/300v | 75p |
| 200/150/150/300v | 1.00 |
| ITT 8 and 6 Push Button | £1.00 |
| Pvc 725 L.O.P.T.S. | £6.00 |
| Pvc 731 L.O.P.T.S. | £6.00 |
| Thorn 8500-8800 L.O.P.T.S. | £5.00 |
| CMC 301 front panel | £8.00 |
| CMC 303 front panel | £8.00 |
| CMC 302 Panel with IC mains switch etc | £8.00 |
| CMD 800 Decoder | £8.00 |
| UPC 574 | 30p |
| BSS | |

