JANUARY 1989

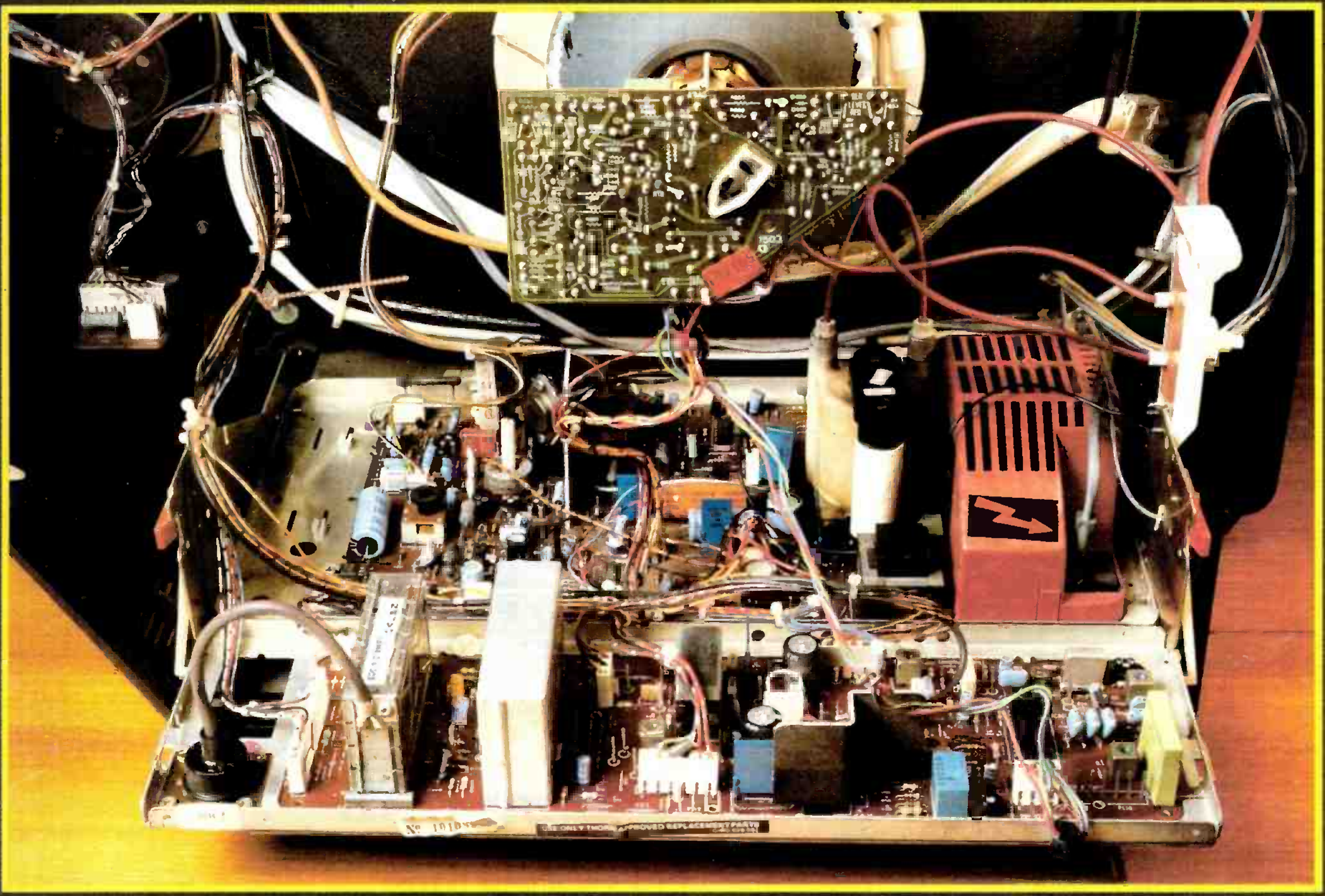
Australia $3·25, New Zealand $4·40 (inc. GST), Malaysia $6·30, Ireland £IR2·13 (inc. VAT) £1·40

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

Extra this month

The Celtel Year Planner

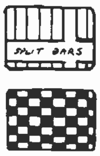


Servicing the Ferguson TX10
TTL Logic Probe/Analyser
Practical Guide to Satellite TV
How to Stop EHT Arcing
VCR Clinic • IBC 88 Report
TV Fault Finding • DX-TV

MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR FOR DOMESTIC TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE



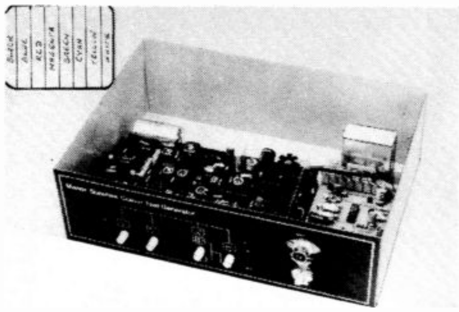
- ★ 40 different patterns and variations.
- ★ Fully interlaced sync pulses with correct picture blanking.
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- ★ Chequerboard.
- ★ Mono outputs with 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 £3.00
Add VAT 15% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)



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

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 £3.00).

MK 4 (BATTERY) BUILT & TESTED £58.00 + £3.00 P & P.
MK 4 (MAINS) BUILT & TESTED £68.00 + £3.00 P & P.
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £5.75.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

ADD VAT 15%

PAL DECODER KIT (Video to RGB) for Monitors **£27.00** p.p. £1.00.
PAL ENCODER KIT (RGB to Video) **£18.50** p.p. £1.30.
CROSS HATCH UNIT KIT, Aerial Input type, incl. T.V. sync. and UHF Modulator, Battery Operated, also gives Peak White & Black Levels, can be used for any set. **£13.50** p.p. 80p. (Alum. Case **£3.20** p.p. £1.40.)
ADDITIONAL GREY SCALE Kit **£2.90** p.p. 45p.
UHF SIGNAL STRENGTH METER KIT £22.00 Alum. Case **£3.20**. De Luxe Case **£8.60** (Built & Tested **£48.00**) p.p. £2.50.
CRT TESTER & REACTIVATOR KIT For Colour & Mono complete with Case, Panel Meter Indicator – can be adapted for latest CRTs **£29.50** p.p. £3.00.

TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

LOPTs, TRIPLERS, PANELS, TUNERS, SELECTORS ETC.

PHILIPS SPARES

KT3, K30 PANELS, tested, exchange, sound, power, bridge rect, frame, RGB **£7.50** each. Decoder (Non-text) **£10.00** p.p. £1.50.
G11 PANELS (tested), frame, IF, decoder **£12.50** each. p.p. £2.00. Scan **£20.00** p.p. £2.80. Power tested exchange **£18.00** p.p. £2.80.
G11 PANELS EX-RENTAL (untested) Scan, Frame, Decoder **£5.00** p.p. £2.00.
G11 IF PANEL (new) less Tuner **£2.50** p.p. £1.30.
G9 POWER SUPPLY UNIT £5.00 p.p. £2.30.
G8/G9 IF/DECODER PANELS for small spares incl. IC's **£2.50** p.p. £1.60.
G8 6 Position Channel Selector (sloping buttons) **£2.50** p.p. £1.00.
HANDSETS (new replacements) p.p. £1.50.
G11 ULTRASONIC non-text **£19.50**, infra-red text **£19.50. Others available.**
KT3 non-text (RC4001) **£22.50.** KT3, K30 etc. Text **£22.50.**
HANDSETS EX-RENTAL, TEXT UNTESTED. KT, TEXT/VIDEO TYPE £3.50 p.p. £1.00.
MANUALS p.p. 80p. G11, K35, 2A **£3.50.** KT3 **£4.50,** CTX-E, CTX-S, CF1 **£1.50** each.

THORN/FERGUSON SPARES

8000, 8500, 8800, 9800 PANELS tested, exchange. Power **£8.80,** Frame **£10.00** p.p. £2.30.
8800, 9800 Touch Tune facia unit **£3.50** p.p. £1.50.
8000/8500 IF/Decoder panels salvaged **£3.20** p.p. £1.80.
9000 Series IF/Decoder **£10.00** p.p. £2.30.
9000 IF/Decoder panels salvaged, for spares **£2.50** p.p. £1.80.
TX9 Panels complete & tested **£28.00** exchange (shop only)
TX9 Panels ex-factory for small spares includes IC's & semiconductors, etc. **£3.00** p.p. £2.00.
TX9 panels salvaged ex-factory for spares incl. electronic & mains transformer. **£8.50** p.p. £3.00.
TX9/TX10 Facia, control panel incl. infra-red receiver **£8.50** p.p. £2.00
TX10 Focus control **£8.50** p.p. £1.00.
TX9/TX10 Saw filter IF panel **£5.00** p.p. 80p.
TX9/TX10 Remote & tuning control panel 1515 (incl. SAA5012) **£7.50** p.p. £1.80.
TX Remote & tuning control panel 1509 (incl UAA1008A, battery) **£5.00** p.p. £1.80.
REMOTE CONTROL HANDSETS — TX9, TX10 infra-red (non-text) **£18.00, TX9, TX10** inred-red text **£19.50** p.p. £1.20. Large selection of others available: Grundig, Sony, etc.

ITT SPARES: CVC30 series convergence & purity panels **£2.50** p.p. £1.50.
CVC30 series panels surplus (untested) **£2.50 each, CMP31, CMF31, CMA30, CM532** p.p. 80p, **CMD33** p.p. £1.80.
CVC20/30 series chassis for small spares (shop only) **£2.50.**

BUSH SPARES: T20/T22 panels, tested, exchange, power **£18.00.** Scan **£25.00** p.p. £2.50. **T20/T22** touch tune facia unit **£7.50** p.p. £2.00.

GEC SPARES: 20AX MKII line time base **£18.00** p.p. £2.00. Power (PC778) tested exchange **£18.00** p.p. £2.00.
TELETEXT DECODER PANELS (tested) — Mullard VM6101 Type **£25.00,** Philips KT3, K30 **£20.00** p.p. £2.30.
MULLARD VM6230 teletext decoder (similar to VM6101) plus additional Prestel units.
VM6330 & line coupler **£20.00** p.p. £3.00.
GRUNDIG 8630 Series Varicap Tuners **£5.00** p.p. £1.00.
VARICAP TUNERS U321, U322/204, ELC1043 (equiv.), SC4, **£7.80** p.p. £1.00.
VHF Philips, NSF **£6.80** p.p. £1.00.
VARICAP UHF-VHF ELC 2000S **£9.80** p.p. £1.00.
UHF/625 TUNERS, many different types in stock. JAP Rotary **£4.80** p.p. £1.80.
LOPTS New and guar. P/P **£1.50,** Bobbins **80p.**

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1590, 1591, 1612, 1613, 1712	£4.80	R.B.M. T20, T22	£9.80
FERGUSON 3787 (Normende)	£9.80	R.B.M. T20, T22 Bobbin	£5.60
THORN 1600, 1615, 1690, 1691, 1790	£9.00	DECCA Bradford (state Mod No)	£8.80
THORN 3000/3500 SCAN, EHT	£6.90	DECCA 100	£8.80
THORN 8000	£12.80	FIDELITY ZX2000, 3000 (Not 22″)	£15.50
THORN 9000 to 9600	£9.80	GEC 2110 series	£10.60
THORN TX9	£12.50	ITT CVC 5 to 9, CVC20	£9.80
THORN TX10	£16.50	ITT CVC25, CVC30 series	£8.80
SPECIAL OFFER		ITT CVC45	£9.80
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ITT VC300	£4.80	PHILIPS G8	£8.80
GEC 2114J/Junior Fineline	£2.80	PHILIPS G9	£7.80
PHILIPS 320	£2.80	PHILIPS KT3	£9.80
PHILIPS G11	£5.00	PHILIPS K30, K35	£27.00
GEC 2028, 2040, 2100	£2.80	PHILIPS CTX-E	£22.50
PYE 691-7 chassis type only	£5.00	PHILIPS CTX-S	£22.50

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TRIPLERS Full range available. Mono & Colour.
SPECIAL OFFER TRIPLERS
THORN 1500 5 Stick **£1.50,** 1500 3 Stick **£1.50** p.p. 80p.
6·3V CRT Boost Transformers for Colour & Mono **£5.90** p.p. £1.40.
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VHF to **UHF** Converters **£26.50** p.p. £2.50.
HELICAL POTS (standard 100K). 6 for **£1.00** p.p. 50p.

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THOUSANDS OF ADDITIONAL ITEMS, ENQUIRIES INVITED
LARGE SELECTION TESTED COLOUR PANELS POPULAR MODELS

Goods available if in stock immediately over shop counter (Mail order between 3 days and 1 week from receipt of order). ADD VAT 15%

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TELEVISION

January 1989

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Issue 459

On sale December 21st

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

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this month

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THERE IS VAT ON P.P. ... request. Give us a ring – we'll give you service. Please ask if what you need is not listed – we will try to help. Prices are subject to change without notice. In some cases we may have to supply an equivalent. We need expiry dates for credit card orders.

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HA1342	5.58
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HA11219	4.21
HA11244	4.04
HA11741	23.22
HA13008	13.58
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SN76666N	1.52
SN76530A	1.47
STR5412	8.45
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STK436	6.50
STK437	6.00
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TAA570	3.98
TAA310	2.83
TAA320	2.00
TAA550	55
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TBA120SA	1.49
TBA120B	1.30
TBA120SB	1.37
TBA120T	1.47
TBA120U	1.49
TBA1440G	2.50
TBA395	50
TBA396	67
TBA440N (TBA1441)	2.75
TBA440P (TBA1440G)	2.50
TBA480Q	1.82
TBA510	3.00
TBA520(Q)	1.10
TBA530(Q)	1.00
TBA540	1.10
TBA560(Q)	1.10
TBA570	1.79
TBA690	1.50
TBA700	2.12
TBA720	2.64
TBA750	2.98
TBA800	1.60
TBA810AS	58
TBA820	1.70
TBA820M	1.25
TBA890	3.94
TBA920(Q)	1.20
TBA950(2X)	1.08
TBA970	4.09
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TCA760	2.30
TCA270SQ	2.50

TCA800	5.95
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TCP4621AF6	13.87
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TDA1003A	5.50
TDA1006A	7.58
TDA1005	3.60
TDA1010	3.30
TDA1011	4.00
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
TDA1083	1.68
TDA1170S	3.00
TDA1190	3.50
TDA1190P	3.50
TDA1180	2.91
TDA1236	3.44
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	95
TDA1415	1.40
TDA1470	4.67
TDA1770	5.60
TDA1908A	1.95
TDA1950	2.39
TDA2002	75
TDA2003	1.10
TDA2004	1.60
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TDA2020	4.66
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TDA3330	2.21
TDA3500	6.90
TDA3540	2.35
TDA3541	2.24
TDA3560	6.00
TDA3561A	6.66
TDA3562	8.60
TDA3571	3.75
TDA3650	3.85
TDA3651A	4.50
TDA3652	6.00
TDA3950	4.37
TDA4420	5.55
TDA4500	5.84
TDA4503	5.68
TDA4505	6.03
TDA4600	2.95
TDA4600-2D	2.95
TDA8180	4.00
TDA8190	4.94
TDA9503	4.21
TEA1009	1.86
UPC554	2.63
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UPC575C2	89
UPC576H	1.90
UPC585	3.06
UPC587C2	2.34
UPC1025H	2.15
UPC1026H	90
UPC1028H	90
UPC1032H	58
UPC1042C	1.56
UPC1156H	2.45
UPC1158H	3.50
UPC1163H	2.48

UPC1167C2	2.70
UPC1168C	3.20
UPC1176C	2.53
UPC1177H	3.15
UPC1178C	4.21
UPC1180C	1.84
UPC1181H	1.00
UPC1182H	1.00
UPC1183H	2.48
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UPC1223C	2.20
UPC1225H	2.00
UPC1226C	1.50
UPC1227V	1.20
UPC1230H	4.39
UPC1238	2.50
UPC1245V	1.35
UPC1277	4.81
UPC1350C	4.15
UPC1353C	4.76
UPC1365C	6.38
UPC1356C2	2.08
UPC1367	2.00
UPC1358H	1.88
UPC1360C	2.20
UPC1363C	2.16
UPC1368H2	2.15
UPC1370C2	2.58
UPC1382C	1.08
UPC1384	3.78
UPC1394C	3.07
UPC1447H	58
UPC41C	2.80
UPC577H	2.46
UPC585C	1.28
UPC1167C2	2.70
UPD553C164	20.76
UPD7519G	17.13
UPD7538C020	11.06
UPD546C107	22.28
UPD547C049	11.18
UO5G	1.27
V11N	1.27
10E2	43
10VT05	8.74

COMPUTER ICs

74LS260	55
2732	3.30
2764	3.75
27128	4.95
27256	5.90
6264	2.75
6522	4.00
TMS1000	8.95
8271	60.00

COMMODORE ICs

6510 CPU	7.07
6526 CIA Keyboard Int.	5.11
6561	7.74
6569 Col. Vid. Cont.	20.77
6581 Sound Gen.	7.79
901225 Char. ROM	3.37
901226 Basic ROM	6.45
ROM	6.20
906114 PLA	4.51
4164 RAM	1.95
Timer 555	46
8501	4.18
8701 Clock Chip	5.46
8360	19.61

NEWS SPECTRUM + 3 CASSETTE LEADS £1.95

NEW PRODUCTS

Sanyo 5000 PS3BSF Video Head	29.95
Amstrad 4600 PSF2 Video Head	25.80
Amstrad 9000 PSF1 Video Head	25.80
Amstrad 7000 3HSSR Video Head	25.00

BELT KITS

VK32 Sanyo 1100/1300/1500	.75
VK33 Ferguson 3V35/6	.69
VK34 Ferguson 3V42/5/8	.90
VK35 Fisher SVHP 710 716 722	1.20
VK37 Hitachi 9300	.85

TAKE UP IDLERS

Fisher 143-0-4904-00900	3.95
Fisher 143-0-4204-00300	4.50

SUPERWICK DESDLDER BRAID

2mm × 1.6m	.89
1.5mm × 1.6m	.89
2mm × 30m	11.99
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P5245 Teletwist (12"-20")	24.16
P6045 Designer Twister	27.00
P6041 Little Twister	14.08
P5218 Swivel and Tilt Bracket	24.67

NEW POWER SENSOR SET TOP AERIAL WITH BUILT IN AMPLIFIER £24.90

GENERAL EQUIPMENT

Degaussing Coil Stick	19.00
Electric Circuit Tester	1.50
Probes (×10) or (×1)	10.90
Philips Switchable Probes	13.25
Automatic Wire Strippers	6.95
I.C. Inserters	1.18
Micro Pliers	4.20
Micro Cutters	5.00
Trim Tools Metal Ended	60
Side Cutters sm.	1.20
Long Nose Pliers	1.20
Sm. Neon Screwdriver	Sm. 40 Lg. 65
Quick Set Adhesive (Superglue)	75
Avo Meters Factory recon.	119.00
Avo Battery	2.09
Solder Sucker Antistat min.	4.50
Solder Sucker Antistat std.	5.40
Solder Sucker Antistat lge.	6.20
Solder 500g	See Special Offer
D.I.Y. Solder Small Pack	45
Solder Sucker Nozzles	81
Solda Mop Stnd.	77
For sold. irons see Antex/Weller Under Specific Spares	
Choc Bloc 5A	20
Fuse Wire 5A, 15A, 30A	05
Fluorescent Starter (4-80W)	45
Battery Press Studs min.	11
Battery Press Studs std.	15
Vero Type Board	Lg. 2.59
Double Sided Adhesive Tape	5.75
Tinned Copper Wire	
18SWG 45 Amp	1.00
14SWG 100 Amp	1.00
17SWG 60 Amp	1.00
19SWG 45 Amp	1.00
20SWG	1.00
Insulated Copper Wire	9.11
Cable Ties ALT21 per 100 (large)	1.69
Power Adaptor (12v)	5.95
Reg. 88 Power Adap.	5.50
Reg. 650 Power Adap.	6.50
Philips Screwdriver	Sm. 1.95 Lg. 2.35

WE NEED EXPIRY DATES FOR CREDIT CARD ORDERS.

★ NEW ★ WICKMANN WERKE FUSE KITS £33.95

These are a new range of sub-miniature, circuit protection Fuses, and are used in most modern TVs, Videos, etc. This kit has 170 asstd. plug in Fuses and 10 holders.

Q.B. 250ma 1A, 1.6A, 2A.
A.S. 160ma, 200ma, 315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 4A.

LABGEAR

CM7261 P.U.	11.80
CM7262 P.U.	12.86
CM7065 UHF/VHF WB	15.05
CM7066 UHF WB	14.04
CM7068 VHF H.Gain A/B CO	16.74
CM7253 Behind Set (mains)	15.06
CM7243 Second Set Amp	14.03
CM7093 Three Set Amp	16.83
CM7063 Dist. Amp VHF/UHF	25.77
CM7108 8+1 Dist. Amp	45.42
CM9700 27MHz CB Suppressor	4.90
CM6011 Outdoor Splitter	8.22
CM9003/00 Flush Sing. Outlet	1.95
CM9003/01 Flush Sing. Out. Isolat.	2.15
CM9010 Flush Twin Outlet	2.25
CM9034 UHF Filters A/B CD	8.89
CM9033 6 Way Pass Split	10.72
CM7042 TV Games Combiner	3.24
CM9009 Flush TV/FM Emulator	3.53
CM9006 VHF/UHF Diplexer	4.17
CM7122 Televerta Up VHF to UHF	39.91
CM7057 Televerta Down UHF to VHF	45.21
CM7294 Dist Amp. UHF/VHF	23.78
CM7274 4 Way Dist Amp	21.45
CM7082 UHF/VHF Dist. Amp	68.98
CM7080/10 UHF MHA	15.71
CM7271 UHF Wideband 15db	8.66

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30FL2	1.70
DY802	98
DY86/7	66
ECC81	1.50
ECC82	98
ECC83	1.07
ECC84	80
ECC85	98
ECC88	1.35
ECF80	1.38
ECF82	88
ECH81	1.60
ECH84	1.66
ECL80	84
ECL82	1.30
ECL86	1.99
EF80	95
EF86	2.20
EF183	99
EF184	1.09
EL90	1.75
EL34	3.50
EL84	1.05
EY86/7	68
EY500A	2.25
EZ80/81	56
GY501	1.45
GZ34	3.50
KT66	9.75
KT77	8.50
KT88 (alt type)	12.00
PC92	4.50
PC97	1.65
PCC85	85

PCC805	1.40
PCF80	1.00
PCF200	1.35
PCF800	1.38
PCF801	1.13
PCF802	1.12
PCF805	1.80
PCF808	1.63
PCH200	1.45
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PCL84	1.20
PCL805	1.09
PCL86	92
PFL200	1.86
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PL508	1.50
PL509/19	3.50
PY88	81
PY500A	1.75
PY800/1	69
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UCL83	1.82
UY85	1.35
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40KD6	5.30
21LU8	3.00
17DW4A	4.50
3AT2B	5.00
12BH7A	3.75

AERIAL EQUIPMENT

10 Ele. UHF	1.85
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4 Ele. VHF	8.03
Omnidirect (Round) F.M.	8.93

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Olympic II	2.30
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FULL RANGE LISTED IN CATALOGUE.

NOTE: Most aerial equipment has to be sent by carrier (not set tops) £7.50 + VAT

NEXT DAY DELIVERY

NEW FULL RANGE OF TELESCOPIC AERIALS IN STOCK SEE CATALOGUE

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Philips G8 (early)	17.82
Philips G8 (late)	18.97
Philips G11 Tip Switch unit	29.09
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Decca 7 way piano key rep. kit	15.62
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GEC 6 way slim	10.29
GEC/ITT/PYE 7 way	16.67
GEC Conversion kit	16.50
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Thorn 8500	6.50
GEC 7 B/P c neons	10.50

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ELC1043-06	8.40
ELC2003	19.50
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TX90	16.34
U322	10.50
U341	9.50
U342	8.50
U411	13.50
U343 (2A chassis)	16.50

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Multimeter HT7000 20,000Ω/V **£10.99**

PL509/19	£3.50
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PL508	£1.50

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Solder 500G £5.00

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ALL IN ONE KIT **£27.95**

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JUST ASK!! We cannot advertise our complete range of products. Please ask if you require something which is not listed, ie: Stationery, Styli, Axial/Radial Electrolytics, Mixed Dialectric Caps., Polyester Caps., Carbon Resistors, Wirewound Resistors, Filament Lamps, Thermistors, LEDs, IC Sockets, Floppy Discs, Computer Cassettes, Thorn New Life Tubes (collection only), New Mono Tubes, Crystals, Cables (post chgs extra), Aerial Equipment, Electrical Plugs/Sockets, Components for Sinclair, Amstrad and Acorn, Unisef Audio Range.

VIDEO SPARES

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

Equivalents Chart in Catalogue

THORN NEW LIFE (Most VHS types)	19.00
THORN NEW LIFE (National Panasonic)	21.00

ORDERS WELCOME FROM SCHOOLS, COLLEGES, GOVERNMENT ESTABL.

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★ PRICES DOWN ★

VKIT 1	AKAI	9300/9500/9800	2.40
	JVC	HR3300/3320/3360	
	TCE	8903/3V00/16/22	
VKIT 2	PANASONIC	NV7000/7200	1.45
VKIT 3	SONY	SLC5/7	2.25
VKIT 4	SONY	SL8000/8500/8600	3.60
VKIT 5	SONY	SL3000UB	2.10
VKIT 6	PANASONIC	NV3000B	1.99
VKIT 7	SANYO	9300P	2.75
VKIT 8	PANASONIC	NV2000B	1.73
VKIT 9	PANASONIC	NV8600/8610/V011	1.50
VKIT 10	TOSHIBA	V8600	1.45
VKIT 11	SHARP	VC7300	1.50
VKIT 13	SANYO	VTC5000	0.50
VKIT 14	SANYO	VTC5300	1.85
VKIT 15	JVC	HR7650-3V31	2.00
VKIT 16	HITACHI	5000	1.90
VKIT 17	SHARP	8300	1.76
VKIT 18	SHARP	9300	1.50
VKIT 19	HITACHI	VT8000	1.05
VKIT 20	HITACHI	VT11/33	1.50
VKIT 21	HITACHI	9500	1.12
VKIT 22	SONY	SLC6	1.90
VKIT 23	SANYO	5500	1.05
VKIT 24	PANASONIC	NV300/333	1.55
VKIT 25	TOSHIBA	V7540	1.90
VKIT 26	JVC	HR7000	0.96
VKIT 27	THORN	3V29/HR7200	1.75
VKIT 28	AMSTRAD	7000	1.45
VKIT 29	PANASONIC	NV777	1.80
VKIT 30	SONY	T9	2.20
VKIT 31	TOSHIBA	9600	1.20

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SANYO	VTC9300/VBS7000	3.75
SONY	C7/J7/SL17	3.75
JVC	TCE3V00/01/06/16/23/24	3.75
JVC	HR2200/3320/3330/3660/1100/7700	3.75
AKAI	VS9700	3.75
HITACHI	VT5000	3.75
SHARP	VC6300/6500	3.75
SONY	TC6 GEN	3.75

★ PRICES DOWN ★

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

SPECIAL PRICES ON 5+ MIX VIDEO HEADS PLEASE ASK

REPLACEMENT VIDEO HEADS

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VS3	3HSSV	18.00
VS5	3HSSV	18.00
VS10	3HSSV	18.00
VS77	3HSSV	18.00
VS88	3HSSV	18.00
VS7100	3HSSV	18.00
VS7200	3HSSV	18.00
VS9300	3HSSV	18.00
VS9500	3HSSV	18.00
VS9700	3HSSV	18.00
VS9800	3HSSV	18.00

FERGUSON

3V00	3HSSV	18.00
3V01	3HSSV	18.00
3V06	3HSSV	18.00
3V16	3HSSV	18.00
3V22	3HSSV	18.00
3V23	3HSSV	18.00
3V24	3HSSV	18.00
3V29	3HSSV	18.00
3V30	3HSSV	18.00
3V31	3HSSV	18.00
3V35	3HSSV	18.00
3V36	3HSSV	18.00
8903	3HSSV	18.00

HITACHI

VT6500	3HSSHA	25.50
VT7000	3HSSHA	25.50
VT8000	3HSSHA	25.50
VT8040	3HSSHA	25.50
VT8100	3HSSHA	25.50
VT8500	3HSSHA	25.50
VT8700	3HSSHA	25.50
VT9000E	3HSSHA	25.50
VT9300	3HSSHA	25.50
VT9500S	3HSSHA	25.50
VT9700	3HSSHA	25.50
VT9900	3HSSHA	25.50
VT4000	3HSSH	25.50
VT4200	3HSSH	25.50
VT5000	3HSSH	25.50
VT5500	3HSSH	25.50
VT11E	3HSSHB	25.50

ORION

VH1	3HSSN	21.95
VH2	3HSSN	21.95

JVC

HRD110	3HSSV	18.00
HRD111	3HSSV	18.00
HRD120	3HSSV	18.00
HRD121	3HSSV	18.00
HRD220	3HSSV	18.00
HRD225	3HSSV	18.00
HR2200	3HSSV	18.00
HR3300	3HSSV	18.00
HR3320	3HSSV	18.00
HR3330	3HSSV	18.00
HR3350	3HSSV	18.00
HR3360	3HSSV	18.00
HR3660	3HSSV	18.00
HR3860	3HSSV	18.00
HR4000	3HSSV	18.00
HR4100	3HSSV	18.00
HR7200	3HSSV	18.00
HR7600	3HSSV	18.00
HR7610	3HSSV	18.00
HR7650	3HSSV	18.00
HR7700	3HSSV	18.00

NEC

PV760	PS38S	19.00
PV764	PS38S	19.00
PV774	PS38S	19.00
N830	3HSSV	18.00
N831	3HSSV	18.00
N832	3HSSV	18.00
N833	3HSSV	18.00
PV2300	PS38S	19.00
PV2400	PS38S	19.00

SONY

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SLC5	PS38S	19.00
SLC6	PS38S	19.00
SLC7	PS38S	19.00
SLC8	PS5B3S	39.95
SLC9	PS5B3S	39.95
SLC20	PS4B2S	29.95
SLC24	PS4B2S	29.95
SLC30	PS4B2S	29.95
SLC33	PS4B2S	29.95
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NV100	3HSSU1N	25.99
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NV250	3HSSU2N	36.97
NV270	3HSSU2N	36.97
NV280	3HSSU2N	36.97
NV300	3HSSN	18.00
NV322	3HSSN	18.00
NV330	3HSS3N	35.99
NV333	3HSSN	18.00
NV340	3HSSN	18.00
NV366	3HSS4NA	43.40
NV370	3HSSU1N	25.99
NV380	3HSSU1N	25.99
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NV470	3HSSU2N	36.97
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NV2000	3HSSN	18.00
NV3000	3HSSN	18.00
NV7000	3HSSN	18.00
NV7200	3HSSN	18.00
NV7500	3HSSN	18.00
NV7800	3HSSN	18.00
NV7850	3HSSN	18.00
NV8170	3HSSN	18.00
NV8200	3HSSN	18.00
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NV8600	3HSSN	18.00
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384	3HSSSP	26.95
385	3HSSSP	26.95
386	3HSSSP	26.95
387	3HSSSP	26.95
388	3HSSSP	26.95
481	3HSSSP	26.95
482	3HSSSP	26.95
2000	3HSSSP	26.95
3300	3HSSSP	26.95
9100	3HSSSP	26.95
9300	3HSSSP	26.95
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V5470	PS3BS2	25.00
V9600	PS3BT	30.00

SANYO/FISHER

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FVHP910	3HSSSF	35.00

PHILIPS

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6520	3HSSU1N	25.99

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SHARP REEL MOTOR	19.50
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0006/GEZZ	2.20
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MS20	011 On/Off Remote	1.58
MS03	Rotary On/Off Gen	0.66
MS02	1TT CUCS On/Off	1.24
MS25	1TT With Solenoid	5.31
MS20	Rank 120 On/Off	2.50
MS21	Rank with Solenoid	4.50
MT01	Thorn 1591	2.90
MS48	Thorn TX9/10 with solenoid	3.42
MS14	Thorn TX10	2.74
MS09	GEC 2040	0.97
MS31	Philips KT3	3.84
MS30	Philips K30	2.60
MS32	Fidelity 70109 Front Panel	0.91
MS33	Fidelity 70150 Remote	2.43
MS43	Fidelity 70170	0.94
NI130440	Amstrad UCR7000	5.32
NI150433	Amstrad VCR7000	1.87
NI150441	Amstrad VCR7000	1.87
NI1400009	Amstrad CTV1400	5.31
NI1402010	Amstrad CTV1401	3.56
NI1422017	Amstrad CTV2200	1.87
1-534-967-11	Sony KU14/2022/2060	4.14
1-552-116-11	Sony KU Gen Power	5.12
1-554-820-11	Sony KU Gen Power	5.12
1-552-836-00	SL 8000UB Slide Rec/fback	1.82
1-552-834-00	SL 8000UB Slide Rec	1.27
	Sony W114 Stop/Eject	1.27
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MS12	Fidelity 70110 Rear Mount	0.94

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SAME DAY DESPATCH FAST – FAIR – EFFICIENT SERVICE

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1422187	CTV2200	15.00
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1409221	CTV1409	15.00
151175	VCR5200	17.00
150563	VCR7000	10.00
150878	VCR9000	10.00

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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 20R/22R/140R	4 butt.	13.75

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RTP20/VRC112	TP16-21-21VHR	IR	13.50
RTP05/VRC138	TP8-120-120E	IR	13.50
RTP06/IR107N	TP160-160E	IR	13.50
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C9	RMT213	45.00

ITT

305	IR8649	29.04
306	IR8650	22.65
CVC45 RG5	VS8262	25.00
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PLEASE NOTE THAT SOME HAND-SETS ARE MANUFACTURERS ORIGINALS BUT SOME MAY BE AN ALTERNATIVE TYPE.

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T725	TX9	NON TXT IR	13.00
T731	TX9/10/100	TXT/STEREO IR	13.00
T732	TX10	TXT IR	13.00
T736	TX9/10/100	TXT IR	13.00
T739	TX100		13.00
3V23	IR 8817		14.95
3V31	IR 8945		14.95
3V35	IR 8946		14.95
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GCA512220	C1653	22.00
GCA512230	C2086H, C2087H	23.50
GCA510710	C2067H	23.50
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*Price includes Multi Adaptor to use with "C" type bell boxes

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S22	DYNABLAST	(127db)	18.14
S13	SOUND BOMB 1	(104db)	3.37
S14	SOUND BOMB 2	(111db)	5.17
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S17	MIKRO	(110db)	5.28
S18	362 PIEZO	(110db)	7.80
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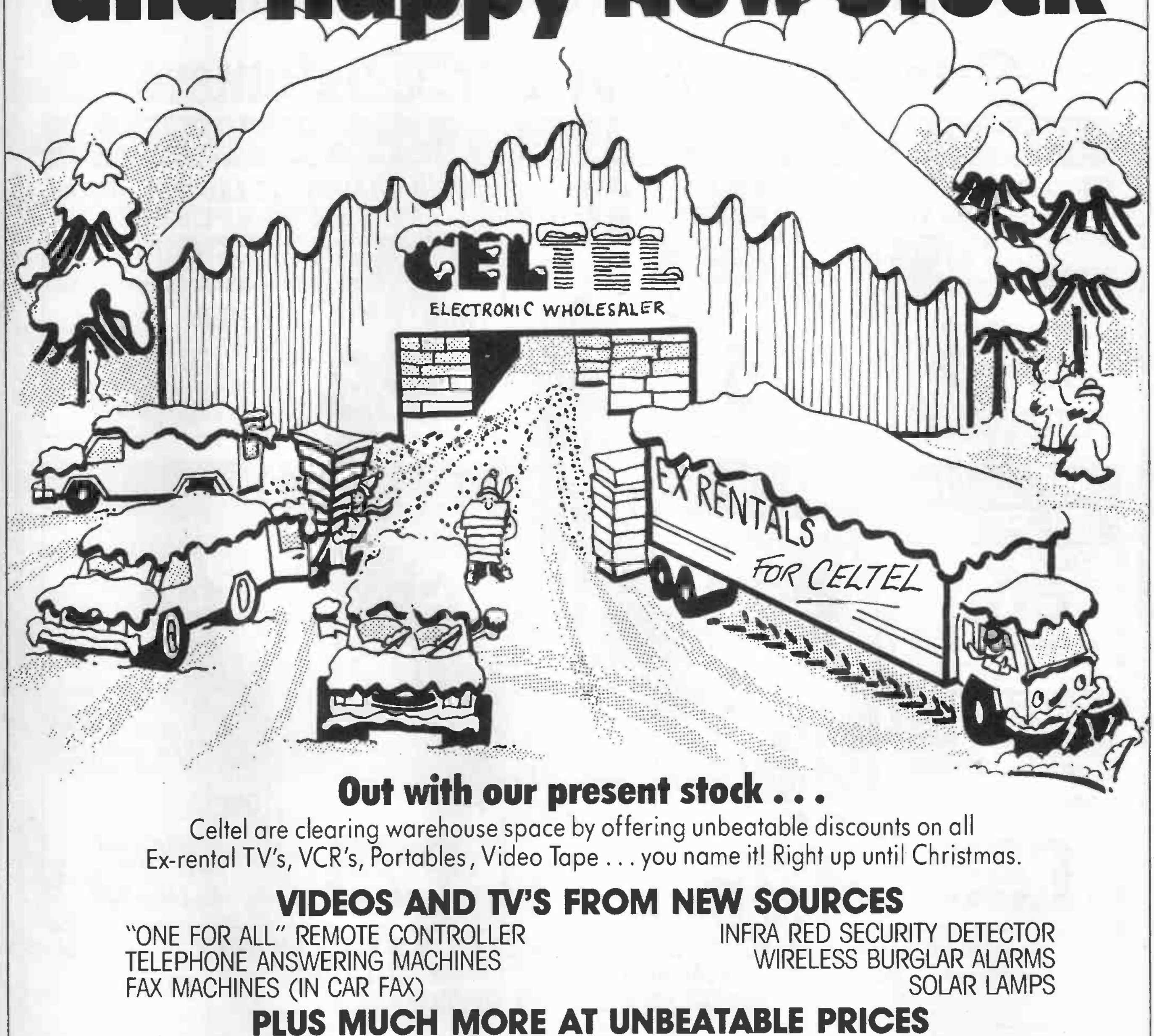

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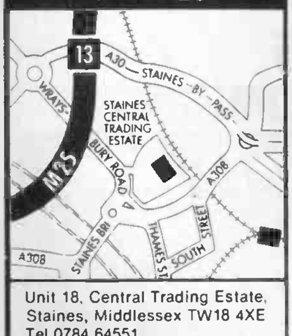

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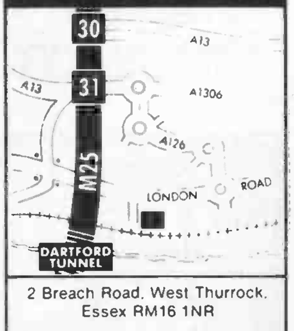

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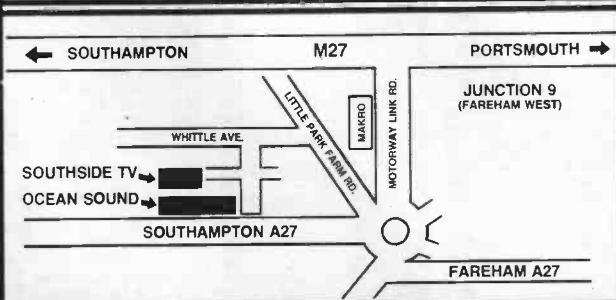

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BD2	5	13A spurs provide a fused outlet to a ring main where device such as a clock must not be switched off
BD7	4	in flex switches with neon on/off lights, saves leaving things switched on
BD9	2	6v. 1A mains transformers upright mounting with fixed clamps
BD11	1	6½" speaker cabinet ideal for extensions, takes your speaker. Ref BD137
BD13	12	30 watt reed switches, it's surprising what you can make with these – burglar alarms, secret switches, relay etc. etc.
BD22	2	25 watt loud speaker two unit cross-overs
BD29	1	B.O.A.C. stereo unit is wonderful value
BD30	2	nicad constant current chargers adapt to charge almost any nicad battery
BD32	2	humidity switches, as the air becomes damper the membrane stretches and oeprates a microswitch
BD34	48	2 meter length of connecting wire all colour coded
BD42	5	13A rocker switch three tag so on/off, or change over with centre off
BD45	1	24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day. Original cost £40 each.
BD49	10	neon valves, with series resistors, these make good night lights
BD56	1	mini uniselector, one use is for an electric jigsaw puzzel, we give circuit diagram for this. One pulse into motor, moves switch through one pole
BD59	2	flat solenoids – you could make your multi-tester read AC amps with this
BD67	1	suck or blow operated pressure switch, or it can be operated by any low pressure variations such as water level in water tanks
BD91	2	mains operated motors with gearbox. Final speed 16rpm. 2 watt rated
BD103A	1	6 750MA power supply, nicely cased with input and output leads
BD120	2	stripper boards each contains a 400v 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers etc
BD122	10m	twin screened flex with white pvc cover
BD128	10	very fine drills for p.c.b. boards etc. Normal cost about 80p each
BD132	2	plastic boxes approx. 3" cube with square hole through top so ideal for interrupted beam switch
BD134	10	motors for model aeroplanes, spin to start so needs no switch
BD139	6	microphone inserts – magnetic 490 ohm also act as speakers
BD148	4	reed relay kits you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets
BD149	6	safety cover for 13A msockets – prevent those inquisitive little fingers getting nasty shocks
BD180	6	neon indicators in panel mounting holders with lens
BD193	6	5 amp 3 pin flush mounting sockets makes a low cost disco panel
BD196	1	in flex simmerstat – keeps your soldering iron etc always at the ready
BD199	1	mains solenoid very powerful has 1" pull or could push if modified
BD210	8	keyboard switches – made for computers but have many other applications
BD210	4	transistors type 2N3055 probably the most useful power transistor
BD211	1	electric clock mains operated put this in a box and you need never be late
BD221	5	12v alarms make a noise about as loud as a car horn. Slightly soild but OK
BD242	2	6" × 4" speakers 4 ohm made from Radiomobile so very good quality
BD252	1	panostat, controls output of boiling ring from simmer up boil
BD259	50	leads with push on ¼" tags – a must for hook ups – mains connections etc
BD263	2	oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into pattress
BD268	1	mini 1 watt amp for record player. Will also change speed of record player motor
BD283	3	mild steel boxes approximately 3" × 3" × 1" deep – standard electrical
BD293	50	mixed silicon diodes
BD305	1	tubular dynamic mic with optional table rest
BD667	2	4.7uf. non-polarised block capacitors, pcb mounting
BD400	4	Books. Useful for beginners. Describes amplifiers, test equipment and kit sets
BD653	2	Miniature driver transformers. Ref LT44. 20k to 1k, centre tapped
BD553a	2	3.5 volt operated relays, each with two pairs CO contacts

Most other packs still available and you can choose any as your free one.

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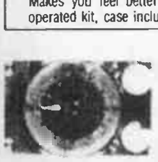

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JOYSTICK FOR ATARI OR COMMODORE for all Atari and Commodore 64 and Vic20. New Price £5. Order ref 5P126.

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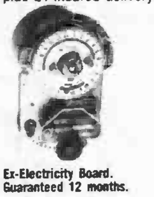
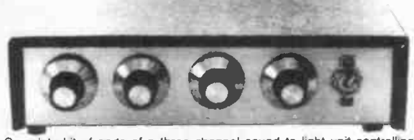


Ex-Electricity Board. Guaranteed 12 months.

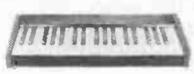
VENNER TIME SWITCH

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 24 hr. time switch but with the added advantage of up to 12 on/offs per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is **£2.30.**

SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 wats 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 aduio input and outputs are by ¼" sockets and three panel mounting fuse holders provide thyristor proection. A four pin plug and socket facilitate ease of connecting lamps. Special price is **£14.95** in kit form.



ORGAN MASTER is a three octave musical keyboard. It is beautifully made, has gold plated contacts and is complete with ribbon cable and edge connector. Brand new, only **£12 plus £3 postage.** Order ref 12P5.

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CAMERAS. Three cameras, all by famous makers, Kodak, etc. One disc and two different instant cameras. All in first class condition, believed to be in perfect working order but sold as untested. You can have the three for £10 including VAT, which must be a bargain – if only for the lenses, flash gear, etc. Our ref 10P58.

ALBA TWIN CASSETTE RECORDER AND PLAYER WITH STEREO RADIO. This is a mains/battery portable made to sell, we understand, at about £50 but the ones we have are line rejects. They are brand new still in the manufacturers' boxes but have a slight defect associated with the cassette section. The radio and amplifier section, both mono and stereo, is perfectly OK. If you are handy at mending things then this should be for you. Price **£20 or two for £38 plus £3 insured post, either package.** Our ref 20P7 or 2 × 20P7.

1/8th HORSEPOWER 12 VOLT MOTOR. Made by Smiths, the body length of this is approximately 3in. the diameter 3in and the spindle 5/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts. A very powerful little motor which revs at 3,000rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price **£6.** Our ref 6P1, discount for quantities of 10 or more.

PHILIPS LASER

This is helium-neon and has a power rating of 1.6mW. Completely safe so long as you do not look directly into the beam when eye damage could result. Brand new, full spec, £30 plus £3 insured delivery. Mains operated power supply for this tube gives 8kv striking and 1.25kv at 5mA running. Complete kit with case £13. No extra for post if ordered with tube.

HIGH RESOLUTION MONITOR. 9in black and white, uses Philips tube M24/306W. Made up in a lacquered frame and has open sides. Made for use with OPD computer but suitable for most others. Brand new, **£16 plus £5 cost.** Our reference 16P1.

TANGENTIAL HEATERS. We again have good stocks of this quiet running, instant heat units. They require only a simple case or could be fitted into the bottom of a kitchen unit, etc. 1.2kw, which is a very compact little unit and also a 2.5kw, which is approximately 10in long plus motor. Price for either model £5. Being rather fragile needs special packing so add £2 per heater for post and packing. Control switch for 2.5kw model giving full heat, half heat or cold blow. Price 50p.

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ASTEC PSU. Mains operated switch mode so very compact (6½" × 4" × 2" approx.). Outputs: +5 Volts 3.5 amp. +12 Volts 1.5 amp. –5 Volt 1.5 amp. Brand new. Normal price £30+. Our price only £10. Ref. 10P34.

APPLIANCE THERMOSTATS – spindle adjust type suitable for convector heaters or similar. Price 2 for £1. Ref. BD582.

3 CORE FLEX BARGAIN No. 1 – Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. Order Ref. 2P189.

3 CORE FLEX BARGAIN No. 2 – Core size 1.25mm so suitable for long extension leads carrying up to 13 amps – or short leads up to 25A. 10m for £2. Order Ref. 2P190.

CASE WITH 13A PRONGS – to go into 13A socket, nice size and suitable for plenty of projects such as car battery trickle charger, speed controller, time switch, night light, noise suppressor, dimmers etc. Price – 2 for £1. Ref. BD565.

ALPHA-NUMERIC KEYBOARD – this keyboard has 73 keys with contactless capacitance switches giving long trouble free life and no contact bounce. The keys are arranged in two groups, the main area field is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" × 4" – brand new but offered at only a fraction of its cost namely £3, plus £1 post. Ref. 3P27.

TELEPHONE EXTENSIONS – it is now legal for you to undertake the wiring of telephone extensions. For this we can supply 4 core telephone cable, 100m coil £8.50. Extension BT sockets £2.95. Packet of 50 plastic headed staples £2. Dual adaptor for taking two appliances from one socket £3.95. Leads with BT plug for changing old phones 3 for £2.

WIRE BARGAIN – 500 metres 0.7mm solid copper tinned and p.v.c. covered. Only £3 + £1 post. Ref. 3P31 – that's well under 1p per metre, and this wire is ideal for push on connections.

INTERRUPTED BEAM KIT – this kit enables you to make a switch that will trigger when a steady beam of infra-red or ordinary light is broken. Main components – relay photo transistor, resistors and caps etc. Circuit diagram but no case. Price £2. Ref 2P15.

CAPACITOR BARGAIN – axial ended – 4700uf @ 25v Jap made. Normally 50p each, but you will get 4 for £1. Ref. 613.

SPRING LOADED TEST PRODS – heavy duty, made by the famous Bulgin company. Very good quality. Price four for £1. Ref. BD597.

SOLAR POWERED NI-CAD CHARGER 4 NI-CAD batteries AA (HP7) charged in eight hours or two in only 4 hours. It is complete, boxed ready to use unit. Price £6. Our Ref. 6P3.

50v 20A TRANSFORMER 'C' Core construction so quite easy to adapt for other outputs – tapped mains input, only £25, but very heavy so please add £5, if not collecting. Order Ref. 25P4.

FREE POWER! Can be yours if you use our solar cells – sturdily made modules with new system bubble magnifiers to concentrate the light and so eliminate the need for actual sunshine – they work just as well in bright light. Voltage input is .45 – you join in series to get desired voltage – and in parallel for more amps. **Module A** gives 100mA. Price £1. Our Ref. BD631. **Module C** gives 400mA. Price £2. Our ref 2P199. **Module D** gives 700mA. Price £3. Our Ref. 3P42.

SWITCH AC LOADS WITH YOUR COMPUTER. This is easy and reliable if you use our solid state relay. This has no moving parts, has high input resistance and acts as a noise barrier and provides 4kW isolation between logic terminals. The turn-on voltage is not critical, anything between 3 and 30V, internal resistance is about 1K ohm. AC loads up to 10A can be switched. Price is £2 each. Ref. 2P183.

METAL PROJECT BOX. Ideal size for battery charger, power supply etc, sprayed grey, size 8" × 4¼" × 4" high, ends are louvered for ventilation other sides are flat and undrilled. Order Ref. 2P191. Price £2.

BIG SMOOTHING CAPACITOR. Sprague powertytic 39,000uF at 50V. £3. Our Ref. 3P41.

4-CORE FLEX CABLE. Cores separately insulated and grey PVC covered overall. Each copper core sized 7/0.2mm. Ideal for long telephone runs or similar applications even at mains voltage. 20 metres £2. Our Ref. 2P196 or 100 metres coil £8. Order Ref. 8P19.

TWIN GANG TUNING CAPACITOR. Each section is .0005uF with trimmers and good length ¼in spindle. Unused but old and may be slightly soiled. Sleeved prong type. £1 each. Our Ref. BD630.

13A PLUGS. Good British make complete with fuse, parcel of 5 for £2. Order Ref. 2P186.

13A ADAPTERS – Takes 2 13A plugs, packet of 3 for £2. Order Ref. 2P187.

20v – 0 – 20v – Mains transformers 2½ amp (100 watt) loading, tapped primary. 200-245 upright mountings £4. Order Ref. 4P24.

POWERFUL 12V MOTOR was Intended for Sinclair Electric Car, rating approx. ⅓ HP. Price £15 plus £2 post.

RE-CHARGEABLE NICADS 'D' SIZE these are tagged for easy joining together but tags can easily be removed, virtually unused, tested and gntd. £2.00 each. Ref. 2P141, 6 for £10. Ref. 10P47.

FLIP-OVER DIGITAL CLOCK – Quite an eyecatcher, this is mains operated. The figures flip-over per minute and per hour and give a larger than usual visual display. Supplied complete with front and perspex panels to glue together to make its case. £2.00 each. Our Ref. 2P205.

QUICK FIX MAINS CONNECTOR – A must for your workshop. Saves putting on plugs as you just push the wires under the spring clips. Automatically off when lid is up. Price £7.50. Our reference 7P5/1.

BT HANDSET with curly lead terminating at BT plug. Colour cream. Price £5.00. Our reference 5P123.

SINGLE SCREENED FLEX 7.02 copper conductors, pvc insulated then with copper screen, finally outer insulation. In fact quite normal screened flex. 10m for £1. Our ref BD668. Ditto, but solid conductor. 10m for £1. Our ref BD668A.

WHITE CEILING SWITCH 5 amp 2 way surface mounting with cord and tassle. Made by the famous Crabtree Company. Price £1 each. Our ref BD528.

13A SWITCH SOCKETS – Top quality made by Crabtree, fitted in metal box with cutouts so ideal for garage, workshop, cellar, etc. Price £2 each. Our ref 2P37.

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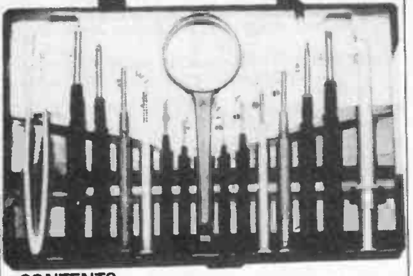

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Six plain slot screwdrivers: 1, 1.2, 1.8, 2.4, 3
Six cross slot screwdrivers: 1.4, 1.6, 2, 2.4, 3, 3.5mm blade diameter
Cushion grip tweezers, magnifying glass, pick up tool.

PRICE £4.99

FM TRANSMITTER

Very High Quality 'MINI-BUG' – Ideal for Baby Alarm etc.!!
A Very good range is obtainable – we have obtained over 1/2 mile, but it does depend on conditions.
Simply remove cover – insert battery – and you're ready to go.
Reception can be obtained on any F.M. Radio.
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Dimensions: 4.25" × 2.25" × 0.75".
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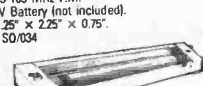
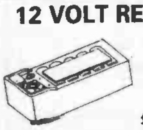


12V Twin Fluorescent Lamp 12" Double Tubes
Attractive white fitting, ribbed perspex diffuser. On/off switch. 3ft cable. Transistorised circuitry. Keyhole fixing. 12V D.C. 8W Tubes. Dimensions: 368 × 67 × 43 mm.
Ideal for Caravans, Boats, Vans etc.

	1+	10+	50+
PRICE	£5.99	£4.99	£4.50

12 VOLT RECHARGEABLE UNIT



10 × D × Size Ni-Cads (4 Ah) encapsulated in a black plastic case. Fuse holder. Gives 12 volt output when charged. Ex-equipment. Fully guaranteed. Dimensions: 245 × 75 × 75mm.

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Converted from "Fast Charge" to "Standard Charge" to prolong life of battery unit. Full charge obtained in 10-12 hours (overnight). Complete with mains lead and charging lead fitted with 4-pin plug (6-pin version available on request).
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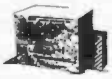

4-PIN £10
6-PIN £10

NI-CAD BATTERY CHARGER

Universal PRICE:
1+ £4.50 each
10+ £4.25 each
100+ £3.75 each

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AAA	£1.25	£1.20 ea/10
AA	.90	.85 ea/10
C	£2.10	£1.90 ea/10
D	£2.50	£2.20 ea/10
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QUICK BLOW – 80mA, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1A, 1.25, 1.5, 1.6, 2, 2.5, 3.15, 4, 5, 6.3 — 45p/10
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2A, 3A, 5A, 13A — £1.00/10

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Comprising: 1 × CAMERA 1 × MONITOR 1 × CAMERA BRACKET

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SOLDER: 60% TIN 40% ALLOY

22g Non-corrosive Multi-core Solder. 500gm Reel £4.99 each. 10 Reels £3.75 each

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Free standing or hanging. 15ft. of cable terminating in cigar lighter plug. Ideal for car, boat, caravan, van etc.
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1/2W pack 5 each value E12 – 2R2 to 2M2 365 pieces	4.70
1/2W pack Popular – 2R2 to 10M 1000 pieces	9.50
1W pack 5 each value E12 – 2R2 to 1M 353 pieces	13.75
2W pack 5 each value E6 – 10R to 2M2 317 pieces	21.75

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Aero-Klene	1.16	**Solda-Mop**	
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AC128K	0.38	BD587	0.88	MJ3001	1.10
AC141	0.58	BDX32	1.75	MJE341	0.70
AC141K	0.38	BF115	0.32	MJE371	0.85
AC142	0.40	BF125	0.42	MP8111	0.40
AC142K	0.38	BF127	0.42	MP8112	0.44
AC152	0.48	BF157	0.46	MPS6521	0.40
AC153K	0.46	BF167	0.30	MPSA12	0.30
AC176K	0.32	BF178	0.30	MPSA55	0.30
AC187	0.40	BF180	0.27	MPSU05	1.05
AC187K	0.42	BF182	0.32	MPSU51	1.04
AC188K	0.38	BF183	0.32	MPSU56	1.40
ACY22	1.50	BF195	0.12	MPSU60	1.48
AD142	0.88	BF224J	0.20	MR510	0.55
AD161/162	1.60	BF240	0.15	MR815	0.78
AF114	0.88	BF270	0.30	MR854	0.86
AF115	2.10	BF271	0.28	MRF475	3.25
AF124	0.70	BF273	0.22	OA10	0.45
AF125	0.50	BF337	0.38	OA47	0.20
AF127	0.50	BF338	0.28	OA85	0.25
AF139	0.56	BF371	0.27	OA90	0.06
ASY80	5.20	BF450	0.30	OA91	0.14
ASZ17	2.00	BFR61	0.32	OA95	0.20
AU110	2.90	BFR90	0.86	OA200	0.06
AY102	4.32	BFT41	0.68	OA202	0.10
B40C200	1.03	BFY50	0.32	OC42	0.71
BA115	0.12	BFY51	0.32	OC44	0.72
BA121	0.40	BFY90S	1.34	OC139	1.30
BB105B	0.32	BR100	0.20	ORP12	0.95
BB105G	0.30	BR101	0.76	R2008B	1.40
BC108	0.10	BR103	0.60	R2010B	1.20
BC115	0.15	BRY39	0.80	R2540	2.70
BC119	0.43	BRY56	0.42	TIC47	0.70
BC125	0.14	BSX20	0.20	TIP29	0.30
BC141	0.36	BSY52	0.35	TIP30A	0.35
BC147	0.12	BSY95A	0.25	TIP31B	0.34
BC149	0.14	BT100A/02	0.68	TIP32B	0.28
BC149C	0.14	BT101/300	2.73	TIP33A	0.75
BC159	0.14	BT101/500	3.25	TIP34B	1.00
BC161	0.30	BT106	2.00	TIP36B	1.40
BC170/A/B/C	0.12	BT151/650R	0.90	TIP41C	0.24
BC182	0.10	BU133	1.90	TIP42B	0.42
BC182L/LB	0.10	BU208A	0.78	TIP42C	0.25
BC183L/LA/LB	0.10	BU326S	0.85	TIP110	0.45
BC184	0.08	BUY69A	2.90	TIP122	0.45
BC184B/C/L/LC/LB	0.10	BUY69B	1.62	TISp2	0.34
BC212/B/C	0.10	BY100	0.80	TV20	2.45
BC212L/LA/LB	0.10	BY103	0.50	Y969	2.80
BC213L/LA/LB	0.10	BY122	0.60	ZTX212	0.26
BC237	0.06	BY126	0.10	ZTX300	0.13
BC238	0.07	BY127	0.30	1N4001	0.03
BC302	0.38	BY133	0.10	1N4002	0.03
BC317B	0.26	BY164	0.35	1N4003	0.03
BC323	0.90	BY182	0.80	1N4004	0.03
BC327	0.06	BY184	0.38	1N4005	0.03
BC328	0.07	BY187	0.65	1N4006	0.03
BC337	0.08	BY189	6.75	1N4007	0.04
BC338	0.10	BY198	0.64	1N4148	0.02
BC350A	0.24	BY199	0.72	1N5400	0.08
BC351	0.16	BY206	0.21	1N5401	0.08
BC547	0.08	BY210/400	0.21	1N5402	0.09
BC548A	0.08	BY226	0.24	1N5403	0.10
BC549C	0.07	BY238	0.65	1N5404	0.10
BC550	0.08	BYX10	0.68	1N5405	0.11
BC558A	0.10	BYX22/400	0.68	1N5406	0.12
BCY70	0.18	BYX38/300	0.60	1N5407	0.12
BCZ10	3.28	BYX55/350	0.26	1N5408	0.12
BCZ11	2.60	BYX70/500	0.28	2N222A	0.32
BD129	0.68	BYZ12	0.78	2N3053	0.28
BD130Y	0.46	C106D (400V)	0.44	2N3055	0.70
BD131	0.30	D40C1	1.08	2N3773	1.05
BD132	0.50	E1222	0.30	2N3903	0.10
BD135	0.18	E5024	0.30	2N3904	0.10
BD137	0.20	GET872	0.60	2N4248	0.45
BD138	0.20	GET881	1.70	2N4427	1.80
BD139	0.29	ITT827	1.20	2N5415	1.02
BD140	0.25	ITT921	0.10	2N6109	0.40
BD142	1.60	ITT2001	0.18	2SC1172Y	1.70
BD145	1.82	KP3002	0.88	2SC1413A	2.70
BD160	1.50	ME0462	0.26	2SC1678	1.80
BD183	0.70	ME4101	0.28	2SC1758	0.68
BD235	0.40	ME4102	0.28	2SC1957	0.95
BD236	0.28	ME8003	0.34	2SC1969	2.80
BD237	0.38	MJ2995	0.50	40409	1.80
BD410	0.50			40595	1.25
				40673	1.80

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DY802	0.95	KT88(G.E.C.)	19.00
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CV4015	2.85	PC92	3.05
E180F	6.55	PC900	1.45
EABC80	0.85	PCC88	0.85
EAF42	1.55	PCC89	0.80
EB91	1.35	PCC189	0.90
EBC41	3.50	PCF80	0.95
EBF80	0.80	PCF82	1.00
ECC81	1.05	PCF84	0.80
ECC82	0.95	PCF86	1.30
ECC83	1.20	PCF87	0.60
ECC84	0.78	PCF200	2.00
ECC85	0.95	PCF201	2.00
ECC88	1.25	PCF800	1.25
ECC189	0.90	PCF801	1.10
ECF80	0.85	PCF802	1.10
ECF82	0.85	PCF805	1.75
ECF83	1.95	PCF806	1.25
ECH35	3.80	PCF808	1.60
ECH81	1.45	PCL82	1.05
ECH84	1.55	PCL83	2.55
ECL85	0.80	PCL84	1.05
ECL86	1.80	PCL86	0.90
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EF86	1.85	PCL805	1.05
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EF95	1.70	PFL200	1.80
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EF184	1.05	PL36	1.80
EH90	1.00	PL82	0.80
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EL36	2.30	PL504	1.55
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EL84	1.05	PL519/509	5.20
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EL86	6.95	PY81/800	1.15
EL509	7.90	PY82	1.80
EL519	8.00	PY88	0.80
EM80	0.90	PY500A	2.25
EM84	1.80	PY801	0.69
EM87	3.90	UABC80	0.85
EY51	0.95	UAF42	1.30
EY86/87	0.68	UBC41	4.35
EY88	0.80	UBC81	1.75
EY500A	2.20	UCC85	0.80
		UCF80	1.25
		UCH42	5.65
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NEW REDUCED PRICES FOR TELEVISION SPARES

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AKAI		**JVC Cont.**	
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VP88EG	18.00	HR-D120E	18.00
VS1EG	18.00	HR-D120EG	18.00
VS2EG	18.00	HR-D121E	18.00
VS10EG	18.00	HR-D121EG	18.00
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VS9300EG	18.00	HR-D125EG	18.00
VS9500EG	18.00	**N.E.C.**	
VS9700EG	18.00	N-830EG	18.00
VS9800EG	18.00	N-831EG	18.00
FERGUSON		N-832	18.00
3V00	18.00	N-833EG	18.00
3V01	18.00	PVC-2300	19.00
3V16	18.00	PVC-2400	19.00
3V22	18.00	**NATIONAL PANASONIC**	
3V23	18.00	NV2000	18.00
3V24	18.00	NV3000	18.00
3V29	18.00	NV332	18.00
3V30	18.00	NV333	18.00
3V31	18.00	NV370	25.99
3V35	18.00	NV430	24.70
3V36	18.00	NV460	24.70
3V38	18.00	NV730	46.75
3V39	18.00	NV7000	18.00
3292	18.00	NV7200	18.00
HITACHI		NV8400	18.00
VT3000	19.55	NV8600	18.00
VT11EG	26.75	NV8610	19.50
VT14	26.25	VEH0121	18.00
VT33	26.75	VEH0218	20.10
VT34	28.00	**SANYO**	
VT4000	26.75	VTC3000P	23.10
VT4200	26.75	**SHARP**	
VT5000	26.75	VC200	26.95
VT7000	25.50	VC300	26.95
VT8000	25.50	VC3300	26.95
VT9300	25.50	VC387	26.95
VT9500	25.50	VC9300	26.95
VT9700	25.50	VC9500	26.95
JVC		VC9700	26.95
HR2200E	18.00	**SONY**	
HR2650E	18.00	SL-C44E	28.00
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HR3660E	18.00	SL-C6ES	19.00
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HR7200E	18.00	SL-F1	28.00
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HR7610MS	18.00	SL-C20E	28.00
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HR7700E	18.00	SL-C30E7	28.00
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HITACHI. VT3000/11EG/14/33/34/4000/4200/5000/7000/8000/9300/9500/9700	2.85
J.V.C. HR2200/2200/2650/3300/3330/3160/4100/7200/7600/7610/7650/7700/D110/D111/D120/D121	2.85
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NAT. PAN. NV2000/3000/332/333/370/430/460/7000/7200/8400/8600/8610	2.85
SANYO. VTC3000P	3.45
SHARP. VC200/300/3300/387/60000/9300/9500/9700	2.85
SONY. SL-C44/5/6/7/F1/F30/3000/20/24/30	3.45
TOSHIBA. 5470/55/57	3.45
V-LAMP 01	0.45

VIDEO BELT KITS

AKAI		2.15
HITACHI	VT5000E	1.05
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JVC/FERG	3V29	1.30
JVC/THORN	3V35	1.45
JVC	3330	2.40
	3360	2.34
	7700	0.56
	7650	0.68
NAT. PAN.	NV300	1.62
	NV777	1.16
	NV2000	1.44
	NV3000	1.50
	NV7000	1.30
	NV7200	1.30
SANYO	VTC5000	0.45
	VBS9000	1.25
	VTC9300	2.48
SHARP	SHARP 5	1.62
	SHARP 11	3.05
	VC6300	2.10
	VC7300	1.72
	VC9300	1.10
SONY	SL-C5/7	1.64
	SL-C8000	2.58
	SL-C6	1.90
TOSHIBA	V7540	1.85

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SHARP	NIDL 0006 GEZZ	1.55
HITACHI	6886971	1.50
FISHER	IDLER 143-0-4204-00400	2.95
FISHER	GEAR IDLER 143-0-4204-00900	4.50
SANYO	REEL DRIVE PULLEY VTC 5150 143-0-662T-01201	4.85
FERG/JVC	TAKE UP IDLER PU51402/A	1.30
THORN/JVC	PU48967B	2.25
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TELEVISION

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John A. Reddihough

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CORRECTION
On page 838 of the September issue under the heading Some Quickies Ferguson 3878 should have read Ferguson 3787.

COVER PHOTO
This month's cover photograph shows the Ferguson TX10 chassis – see article on pages 192-5. Note the later, replacement type focus unit on the right.

The Great Gamble

So now we know the government's intentions about the future of broadcasting in the UK, outlined in last month's white paper. They are much as had been predicted, but the more one thinks about the implications the more the whole thing takes on the appearance of being a colossal gamble. Not just by the government with the present arrangements and future possiblities, but also for those companies prepared to take part in the proposed new regime of unregulated broadcasting.

The changes could turn out to be profound in comparison to anything that's gone before. In the past the UK's TV services have evolved in a very orderly manner, with the additional networks as they have come on the scene complementing the services already in existence. The smoothest operation of all was Channel 4. Viewers required no new aerial, tuner or what have you: just push an extra button on the appointed day and there it was. Previous changes had not been quite so smooth. The advent of ITV in the mid-fifties called for a new aerial and maybe an adaptor, though suitable sets had been available for some time in preparation for the day. The ITV companies went through a worrying period initially as advertisers held off before the audience grew to appreciable figures, but the days of the "licence to print money" were not long in coming. The advent of BBC-2 coincided with the plan to move all transmissions to u.h.f. and add colour. Careful planning was the order of the day as the services expanded.

What we have in prospect this time is something quite different. Channel 5 will call for nothing more than a second aerial, but the satellite services will call for a new type of receiving set-up and the latest idea, terrestrial microwave TV, will require a further dish and tuner. The government would like to see all these services in operation by the mid-nineties at the latest – along with Astra's channels of course.

The past expansion of TV in the UK also took careful account of what was likely to be feasible economically – the BBC with its licence revenue, advertising to support ITV, and a carefully worked out method of arranging for Channel 4 to receive adequate revenue. While there is no doubt an unsatisfied demand for advertising slots, and the ITV companies have done quite nicely thank you out of their regional monopolies, it's unlikely that there is enough unsatisfied advertising demand to support all the extra services envisaged. So the public is going to be asked to contribute through subscription payments, while the extra competition will result in reduced rates to capture advertising revenue. No careful planning this time. Push 'em in the water and see who sinks or swims, one problem being that some of the present, acclaimed services could suffer in the process. The past history of UK TV broadcasting can provide no clues as to the eventual outcome if full use is made of the opportunities that will become available in the next two-four years: in addition to BBC-1/2/ITV/Ch. 4 up to 16 Astra channels, five DBS channels, Ch. 5, a suggested sixth and seventh u.h.f. service where it can be squeezed in, twelve or more terrestrial s.h.f. channels plus the cable services.

Freedom of the air is a fine concept; freedom of choice even more so. But it's possible to have excessive choice – you would find it hard to make sensible use of the options when some forty channels are on offer, quite apart from the fact that a plethora of channels does not of itself guarantee a wide choice of programme material.

The new generation of programme providers is not going to have an easy time. Viewers are renowned for their conservative habits. They will have to be persuaded not only to change channels but to contribute to the cost of many of them and to invest in extra receiving equipment. The new programme providers are going to have to show that they have something special on offer, hence all the current bidding for film rights, a hugely expensive business that starts long before any revenue begins to come in. Failures in the broadcasting field have in the past been unknown in the UK, though not elsewhere. Suddenly we have the problems of SuperChannel and its huge losses and Sky's more modest loss-making. Past experience in the USA has been of stations opening and closing while the main networks kept their hold on the majority of viewers.

At the end of the day the question will arise as to whether deregulation will have been worthwhile. At this point one simply cannot begin to try to make an informed guess. The main problem would seem to be that broadcasting revenue will be spread over too many operators and that some current, valued services may not be able to survive in a more astringent commercial atmosphere. The disturbing thing is that the changes are being introduced for ideological reasons rather than strict broadcasting ones. It could be that the only winners will be the Far Eastern manufacturers of hardware.

APOLOGY – COMMODORE SPARES CATALOGUE

Unfortunately the HRS Commodore Computer Spares Catalogue was not available in time for inclusion in last month's issue. It is being distributed with the present issue instead. Our apologies to those inconvenienced by this omission.

PRICE INCREASE

The price of *Television* is being increased to £1·50 from next month's issue dated February. We regret the need to make this increase, which is due to the effects of inflation on the cost of producing and distributing the magazine.

Letters

DEALING WITH SURFACE-MOUNTED CHIPS

With reference to Nick Beer's article on dealing with surface-mounted devices, I find that to lift each leg in turn rather than cutting the legs off with a knife is the best way. If you cut through the legs you not only destroy the chip but also stand a good chance of breaking the connection pads away from the very fine circuit tracks and causing other board damage. When a knife is run along the line of pins on the side of a chip several times it's all too easy to slip off the end and cut into the board or, as the last cut is made, the legs may twist in the direction of cutting and lift the print. Another problem is that if too deep a cut is made when the legs are cut the tracks that run from the legs and underneath the chip can be severed, something you might find out only after fitting a new chip and discovering that it doesn't work. The equipment I use consists of an anti-static work area, an earthed variable-temperature soldering iron, and a set of three soldering aid tools from RS with the spike tool filed down to a point. Also low melting-point solder, desoldering braid and good lighting.

To disconnect an i.c., first remove as much of the solder from the pins as possible, using desoldering braid with the iron temperature at maximum. Turn the iron temperature down, then insert the spike end between the upright edge of the chip and the vertical section of the first leg – see Fig. 1. Apply slight pressure to the leg, using the chip to lever against, then apply the iron to the outer end of the leg. The solder will melt and the leg will lift upwards away from the board. Move the iron to the outer underside of the inclined leg, heating and bending the leg up farther. This will melt any solder that's still holding the inner end to the pad in a way that avoids peeling the pad from the board. With the leg raised high enough the spike can be moved to the next leg and so on. After removing the chip, clean off any remaining lumps of solder with the iron and braid. I've had no board damage problems since adopting this method rather than cutting chips out. With a bit of practice an 84-pin chip can be removed in a few minutes.

When fitting a new chip I use 22-gauge low melting-point solder to avoid overheating problems. First align the chip, checking that all pins line up with the board print (also check that you have it the right way round!). Start by soldering two legs at opposite ends of the chip to stop it moving. Put the iron's tip vertically on to the outer section of the leg, then dab the solder on to the outer edge – it should flow evenly round the leg.

Soldering each pin individually is o.k. with chips that have wider spaced pins (24 pins etc.) but with larger types (e.g. 84 pins) this is very difficult. It's easier to solder opposite corner pins as before – to hold the chip – then to solder all the pins of each side by starting at one end and moving both the iron and the solder along the line of pins. What usually happens is that two or three blobs of solder form, each across several pins, rather than a line connecting them all. This doesn't matter as long as all the pins are soldered. It's then just a matter of removing most of the solder with braid, leaving only the solder between the pins and the board.

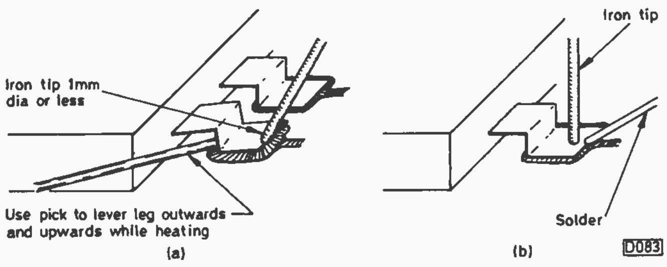

Fig. 1: (a) Unsoldering a surface-mounted chip. Leave each leg bent upwards to enable the pick to reach the next one. (b) Soldering a surface-mounted chip.

I've tried using solder cream, which is a mixture of tiny blobs of solder held in suspension within flux. You apply this to the board before placing the chip on it. But what has tended to happen is that any excess solder flows behind the legs. This can cause shorts between them.

To reuse a chip it's just a matter of bending down all the pins so that they are level and making sure that none are twisted out of line.

This method of removal causes least damage to the board and saves the chip, which might not be faulty after all. I recently replaced an 84-pin surface-mounted chip in a CD player only to find that the fault was still present. It was caused by another component, but the replacement chip was also faulty, causing a different set of symptoms. The player worked perfectly when the original chip had been refitted.

I'd be interested to know if any readers use hot-air irons and whether these have any real advantages over the conventional type for this and other work.

Ian Bowden,
Barnstaple, N. Devon.

ESTIMATES AND VAT

In his otherwise excellent article on setting up a workshop David Botto has I think slipped up on one point regarding estimates. His idea of fixing an agreed sum below which a repair will be carried out is fine, but to slap VAT on top can be upsetting to the customer. It's just as easy to set the charge at an arbitrary whole number, e.g. £20, and work out the VAT backwards. This is done by dividing by 1·15 (where the VAT rate is 15 per cent) to get the base price, in this case £17·39 plus £2·61 VAT. Few if any customers having entertainment equipment repaired are likely to be VAT registered. I'm sure that if the engineer gives the customer the feeling that he cares about the cost, however high, the customer is more likely to respond favourably.

John de Rivaz, B.Sc. (Eng.), A.M.I.E.E.,
Porthtowan, Cornwall.

SIGNALS FOR 405-LINE RECEIVERS

A few further points have occurred to me since writing my articles on keeping vintage TV equipment going.

First, to eliminate moiré patterning with optical standards conversion, simply reduce the height on the monitor until the scan lines just merge. Reduce the camera height by the same amount. Warning: this will put a new scan burn on the camera tube after a period of use, ruining it for normal critical applications.

Secondly, the photos of 405-line pictures in the November issue did not do justice to the original display, which was really excellent, with full resolution and good grey scale. The interpolation effects were reasonably clear however. The picture source was a Marconi BD617 monoscope at the Vintage Wireless Museum.

Thirdly, the Rediffusion tuners mentioned in the article are now also available from Stan Willetts of West

Bromwich (see advertisement on page 20 of the November issue). At the price asked it would be economical to buy two of them just to obtain the Rediffusion h.f. modulators, which are the basis of an excellent Channel 1 modulator. A follow-up article describing the modifications required to the Rediffusion units will appear in the February or March issue of *Television*.

It's possible that I will be able to design a digital 625-405 converter over the next year or so. The likely cost of parts, including a PCB, would be in the region of £200 to £300. An interpolator, if this is designed, would add a further £50 to £100, but would be an optional extra. I would like to assess the potentional demand, so would anyone interested please write to me care of the magazine? A guaranteed batch size, especially if it exceeded 50, would help to keep the cost down as it would allow bulk purchase of components and PCBs.
Jeffrey D. Borin, B.Sc. (Eng.), A.M.I.E.E.
Harrow, Middlesex.

IMPROVED FIELD FLYBACK BLANKING

I read with interest the article (November issue) by John de Rivaz, B.Sc. (Eng.) on a blanking pulse generator circuit for use in the Rank A823 chassis, having myself had this problem of teletext interference. Others may be interested in the somewhat different approach I adopted to obtaining improved field blanking. I run four of these receivers and derive a great deal of enjoyment from maintaining them and carrying out the occasional modification, such as adding emitter-followers in the RGB output stages to improve the definition. Realignment has been carried out since in some sets, particularly those with varicap tuners, the ex-factory alignment wasn't very good, giving rather poor picture performance. But that's another story.

The field blanking modification I carried out is shown in Fig. 2 and involves alterations on only the c.r.t. base panel. The idea is to increase the amplitude of the field flyback blanking pulse from −40V to −140V. To achieve this 4R3 (220kΩ) is replaced with two 110kΩ resistors as shown and 4VT2 is changed to a high-voltage type such as a BF337. The collector of 4VT2 is disconnected from its previous point (the junction of 4D1/4VT1 emitter): instead the lead is bent round and connected via the components shown to the c.r.t.'s grid circuit. After doing this 4R4 must be replaced with a diode. Everything else is left as before – the additional components can be fitted on the component side of the panel.

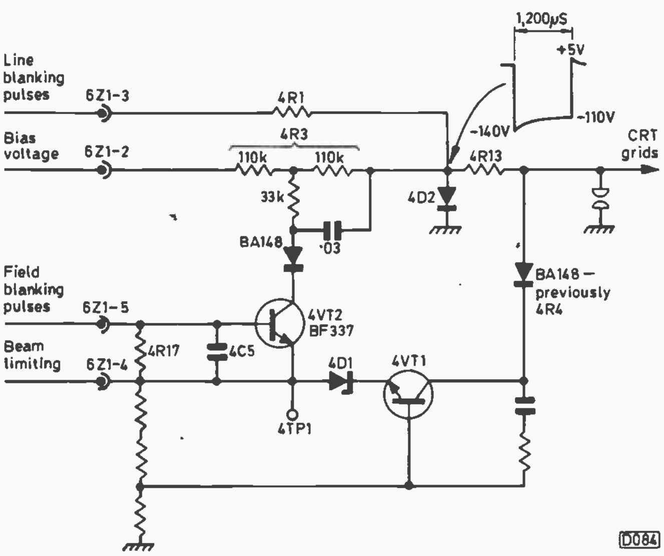

Fig. 2: Modification to the Rank A823 series chassis to obtain improved field flyback blanking. The amplitude of the blanking pulse is increased to −140V.

This modification has been working perfectly in all four sets for some time now, with no sign of the accursed lines. It has the advantage that no connection is made to the signal path and, like the circuit in the article, it doesn't affect the field flyback resonance conditions.

Incidentally, I would be happy to correspond with other like-minded enthusiasts of these old sets.
Colin Doman, 6 Churnet Close,
Bedford, Beds MK41 7ST.

FERGUSON 3V42/3/4 AND EQUIVALENTS

The problem of the take-up/supply poles not reaching the fully laced position in JVC HRD140/Ferguson 3V44 VCRs, mentioned in the December Service Bureau, is a common one on these machines – also the 3V42, 3V43 and the JVC, ITT and Toshiba equivalents. It's caused by the original grease applied to the plastic runners for the take-up/supply poles having become hardened and sticky. For a complete cure all grease should be removed from the plastic runners and fresh grease applied. To do this the video drum assembly has to be removed. This is easily done as it's held in by only three screws. Clean all grease from the locating notches for the poles, then apply fresh grease. Fresh grease should also be applied to the worm gear beside the control motor (part of the mode control assembly).

On the underside of the deck both gears should be removed and their centres cleaned – grease was applied to the shafts on which they are mounted. With these gears removed, the groove in the underside of the mode control assembly can be cleaned and regreased.

The manual contains all the relevant information for setting up the mode control timing. This should be strictly followed when reassembling the mechanism.

Alcohol can be used to remove the old grease. The replacement grease should be a molybdenum-based type.
Alfred Damp,
Ryde, Isle of Wight.

TELETEXT INTERFERENCE PROBLEMS

I've had the same trouble (teletext interference) described by John de Rivaz, B.Sc. (Eng.) in sets fitted with the Rank T20/T22 series chassis and the Philips G8 chassis. With the T20/T22 the problem can sometimes be overcome by adjusting the field output stage bias control, though to obtain a good picture it's often necessary to adjust the field linearity as well. With the G8 the problem has often been associated with other faults, i.e. one of the line output transistors has gone leaky and, to obtain a decent picture, the line output transformer may also need to be replaced.
Rothley Stevens,
Coventry.

USE MANUFACTURERS' SPARES

I feel I must comment on Dave Mackrill's letter (December) regarding the use of a BU208D as the chopper in the Amstrad Models CTV2200/2210. I would seriously question the use of this device, especially as it contains an efficiency diode connected between its collector and emitter. My policy is to fit genuine manufacturer's approved parts wherever possible, bearing in mind that repairs must conform to BEAB requirements and that in the event of a fire etc. the engineer could be held responsible if incorrect parts had been fitted.

Whilst on this subject I would also recommend using genuine manufacturers' parts when servicing VCRs. I have a large stock of useless belts, idlers, etc. that are pattern parts which will not work, or in some cases belts that bear no physical relationship to the genuine items. In most cases there's very little difference between the price of pattern parts and genuine parts.

So take the trouble to track down genuine parts and stick to manufacturers' recommendations and instructions. This may put a few pounds on the final bill, but the repair will be that much more reliable and your business reputation can only improve.

S. J. Cain, Valley Electronics,
Holyhead, Gwynedd.

THE HITACHI VT17

In the October VCR Clinic Mick Dutton mentioned no clock display with the Hitachi VT17, due to absence of the 10V supply on the timer panel. Readers should note that there's an official Hitachi modification for this problem, as follows. Replace Q1795 with either a 2SD468 or a 2SD882 transistor, replace wire link K1788 with a 1S2076 diode (types 1S2473 of 1SS133 can also be used), and add an 0·022μF capacitor between pins 4 and 5 of RC1795 (10V generator).

Jeff Crocker,
Bargoed, Mid-Glamorgan.

MORE ON THE AMSTRAD CTV2200/2210

I would like to thank Dave Mackrill for his article on the Amstrad CTV2200/2210 (November issue). It was a great help in repairing one of these sets that no one else wanted to know about. The original problem was low, distorted sound. I didn't have a manual but found that R313 (100Ω) was open-circuit. The sound was o.k. after putting this right.

A week later the set came back dead. I couldn't believe it! The fuse, the chopper transistor, the 27Ω resistor (R814, 20W) in the feed to the line output stage and the line output transistor had all failed. The capacitor that Dave mentioned had not so far given him trouble, C845 (4·7μF, 250V), was short-circuit. So beware of this one! It might in some cases cause tripping.

J. E. Jones,
Lampeter, Dyfed.

PANASONIC U2 CHASSIS AND D1 DECK

I think John Coombes (TV Fault Finding, December) must have had the Panasonic TC2205 rather than the TC2207 in mind – the TC2207 doesn't have remote control. D552 is however a trouble-maker in these sets (U2 chassis), usually going short-circuit rather than open-circuit. The associated diode D553 (BY299) then very often suffers. The EW modulator driver transistor Q753 (BD237) can fail, usually when the diodes have done so, resulting in EW pincushion distortion. D552 should always be replaced with a Panasonic type – I've seen BYX71-600 or BY223 diodes fitted in this position but, as in other Japanese sets, their long-term reliability is poor.

In the same issue Eugene Trundle mentions (VCR Clinic) trouble with the mode switches in the Panasonic D1 deck. A point worth making here is that it's worthwhile changing the securing bolt at the same time to prevent callbacks. Also VS0110 is not the only switch in use: the G7/10/12 use the VSS0135 while the NV830 uses another type again.

An extremely common fault with these decks is a knocking noise during reel movement. In some cases this can be caused by a dent in the VXP0521 idler (as in BSR turntable wheels!) but more commonly the cause is the VXP0600 reel clutch. We find that about 75 per cent of the machines that come in have this problem in varying degrees.

Nick Beer,
Bideford, N. Devon.

KEEPING 405-LINE TV ALIVE

Jeffrey Borin's articles (November and December) were much appreciated by the growing number of enthusiasts who are doing their best to keep 405-line TV alive.

The Rediffusion units mentioned make an ideal modulator. I've now built two of them: both worked first time, with absolutely no tuning or fiddling.

Most people seem to use VHS tapes for storing programme material. There's an urgent need to co-ordinate library material – I'd be pleased to hear from anyone who wishes to exchange some. Meanwhile I can supply tapes of test cards C and D as well as various tuning signals and apology messages.

It's important that 405-line enthusiasts should keep in touch with one another. The ideal means is through the British Amateur Television Club, mentioned by Jeffrey, which has been promoting home-generated 405-line TV since 1949 – yes, forty years!

Andy Emmerson, G8PTH, 71 Falcutt Way,
Northampton NN2 8PH.

SONY SLC5/6/7 – CAPSTAN LOCK PROBLEM

I noticed the mention of loss of capstan servo lock (VCR Clinic, December) as being a common problem with Sony SLC5/6/7 VCRs. By coincidence I happened to be working on an SLC6 at the time, the symptoms being that the capstan was running slow with the speed control unable to provide sufficient correction. After much checking and head scratching, including replacement of the capstan servo chip IC1, I discovered that the defect was due to C8, an 0·22μF electrolytic capacitor whose value had increased to 0·31μF. As C7 is the same type I checked this as well and found that it measured 0·32μF. After replacing these capacitors and resetting the capstan free-running speed, which was then too fast, the machine operated correctly. So maybe this could be the component ageing fault suggested.

S. Herman,
Stanmore, Middlesex.

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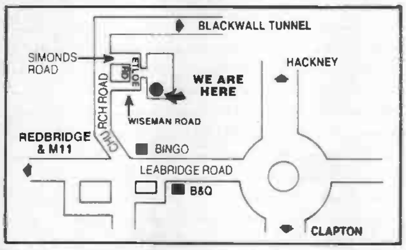

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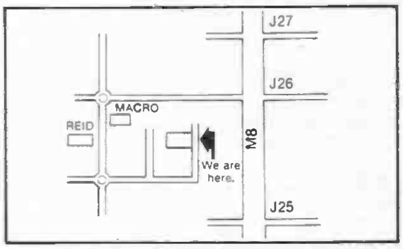

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A TTL Logic Probe/Analyser

Stuart Anderson, B.Ed. (Hons.)

When building or servicing logic circuits it's of considerable advantage to have a piece of equipment that will readily reveal the logic state at any given point in the circuit. It's also useful if the unit can not only indicate logic one or zero but will also indicate whether or not a point is floating, i.e. not connected to anything at all.

The operation of the unit to be described relies upon two main factors: (1) the tri-state nature of the exclusive-or logic gate (to be described later) and (2) the fact that the inputs to TTL gates rise to the logic one state when they are left unconnected.

Basic Gates

Before considering the probe circuit in detail it's relevant to take a look at basic logic gates. A logic gate performs a certain action under specified conditions, its output being totally dependent on the input(s).

The simplest logic gate is the not gate (inverter). Its output is simply not its input, hence a logic one input produces a logic zero output and vice versa. Fig. 1 shows the circuit symbols used and a simple single transistor implementation.

The nor gate is really a two-input not gate. Its output is high when neither input is high, i.e. when neither A nor B (see Fig. 2) is high.

The or gate is simply the inverse of the nor gate, see Fig. 3. Its output is high when either input, A or B, is high. The output is also high when both inputs are high. As the two-transistor circuit shows, the or gate is a nor gate followed by an inverter.

The output from an and gate (Fig. 4) is high only when both inputs are high, i.e. A and B must both be high.

The nand gate is the inverse of the and gate: it gives a logic zero output when both inputs are at logic one. Fig. 5 shows the symbols.

We have not shown simple transistor circuits for the and and nand gates. This is because they can be made up from the or, nor and not gates previously described. This is useful because it means that gates can be connected together in order to carry out different functions. This is known as combinational logic.

Combinational Logic

At this point two important rules concerning logic gates can be stated: (1) any logic gate can be constructed using only nand or nor gates; (2) a nand or nor gate with its inputs connected together becomes an inverter.

The simplest example of how nand gates can be used to implement a different gate is that of the and gate: as Fig. 6 shows, the and function can be obtained simply by inverting the nand function.

A more complicated piece of combinational logic is shown in Fig. 7. Careful analysis of this circuit will show that it provides the nor function. You might ask why it might ever be necessary to use four nand gates in this way

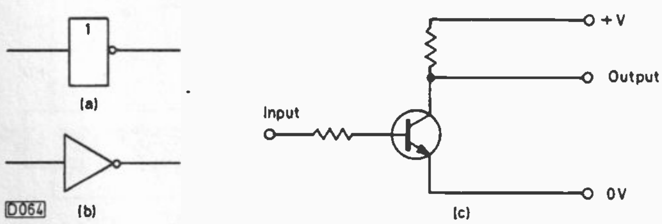


Fig. 1: The not gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Single transistor implementation.

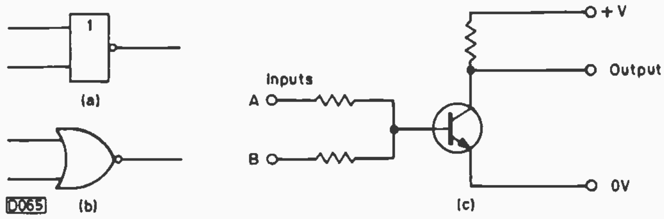


Fig. 2: The nor gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Single transistor implementation.

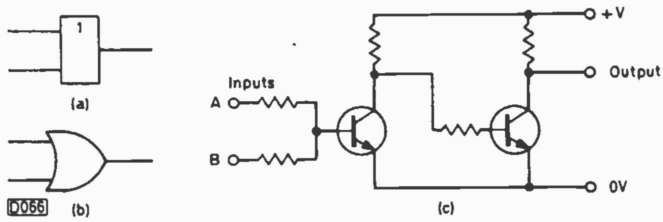


Fig. 3: The or gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Two transistor implementation.

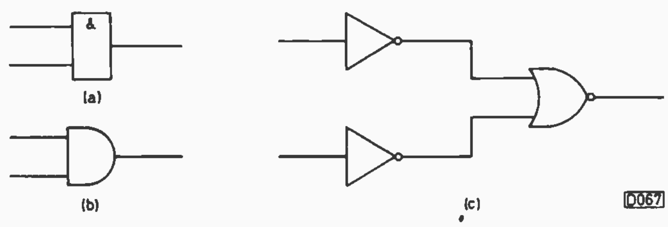


Fig. 4: The and gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Implementation using two not gates followed by a nor gate.

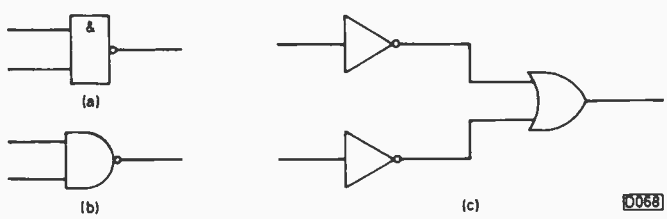


Fig. 5: The nand gate. (a) Latest BS symbol. (b) Conventional symbol. (c) Implementation using two not gates followed an or gate.

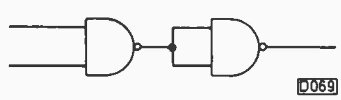


Fig. 6: And gate implementation using two nand gates.

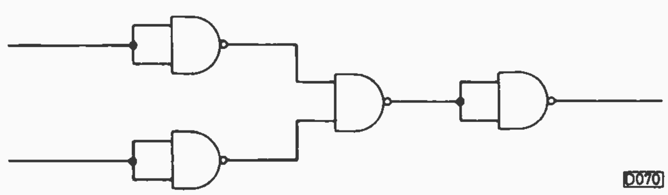


Fig. 7: Nor gate implementation using four nand gates.

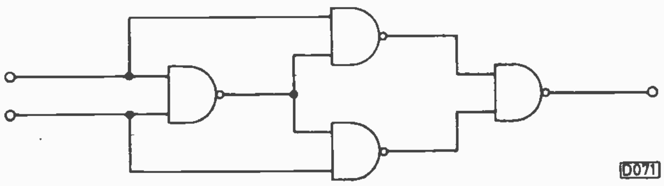


Fig. 8: Exclusive-or gate implementation using nand gates.

Not gate

In	Out
0	1
1	0

Nor gate

A	B	Out
0	0	1
0	1	0
1	0	0
1	1	0

Or gate

A	B	Out
0	0	0
0	1	1
1	0	1
1	1	1

And gate

A	B	Out
0	0	0
0	1	0
1	0	0
1	1	1

Nand gate

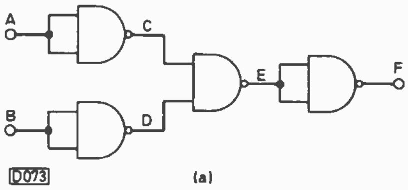
A	B	Out
0	0	1
0	1	1
1	0	1
1	1	0

Exclusive-or gate

A	B	Out
0	0	0
0	1	1
1	0	1
1	1	0

D072

Fig. 9: Truth tables for logic gates.



A	B	C	D	E	F
0	0	1	1	0	1
0	1	1	0	1	0
1	0	0	1	1	0
1	1	0	0	1	0

(b)

Fig. 10: Analysis of nor gate implementation using nand gates, (a) circuit, (b) truth table.

Fig. 11: Exclusive-or gate symbols, (a) latest BS, (b) the conventional symbol.

instead of using a single nor gate. There are two answers to this. First, in a more complicated logic circuit design several gates may be left over – gates are usually packaged in i.c. form in groups of four. Thus spare gates can be used to implement other gates required. Secondly reduction to nand gates can be used for minimisation, i.e. you might find that in a very complicated circuit two inverters follow each other and can thus be eliminated.

Fig. 8 shows another example of combinational logic. Four nand gates are once again used, but in a different configuration. In fact we have here a completely different gate, the exclusive-or gate. It provides a high output when either input is high but not when both inputs are high. The best way to see how it achieves this is to draw up a truth table. Truth tables show the output state for all possible input state(s). Thus the simplest truth table is that for the not gate (inverter) which has only two rows and two columns – see Fig. 9 where the truth tables for the gates described so far are shown.

Fig. 10 shows how the truth table for the nor gate conditions is obtained with the circuit shown in Fig. 7. The first two nand gates are connected as inverters, so that their outputs at C and D are the inverse of the inputs at A and B. The third gate performs the nand function whose conditions are listed in columns C, D and E. The fourth gate again provides inversion, its output being shown in column F. To see the actual function provided by this combination of gates, refer to columns A, B and F of the truth table: these represent the nor function.

With this kind of analysis it can be shown that the exclusive-or configuration shown in Fig. 8 provides the truth table shown in Fig. 9. Fig. 11 shows exclusive-or circuit symbols.

Circuit Description

The exclusive-or gate is of particular interest to us since it forms the heart of our logic probe. The exclusive-or gate has a tri-state nature, though this must not be confused with a real tri-state device. These can be used as buffers whose outputs take up a logic one or zero state or a high-impedance output condition. They can be used for example in data lines in microprocessor systems. In the present context tri-state means that there are three variables associated with the input and output logic conditions. The significance of this is that since the output is logic one in accordance with the or function and zero in accordance with either the nand or the or functions we have, in combination with other gates, the three output possibilities required for our logic probe.

Fig. 12 shows the circuit diagram of the probe. We can now examine its mode of operation.

Although ready-made exclusive-or gates are available the function has been implemented using a 7400 quadruple nand gate (IC2). This readily available device costs no more than an exclusive-or gate and takes up no more space.

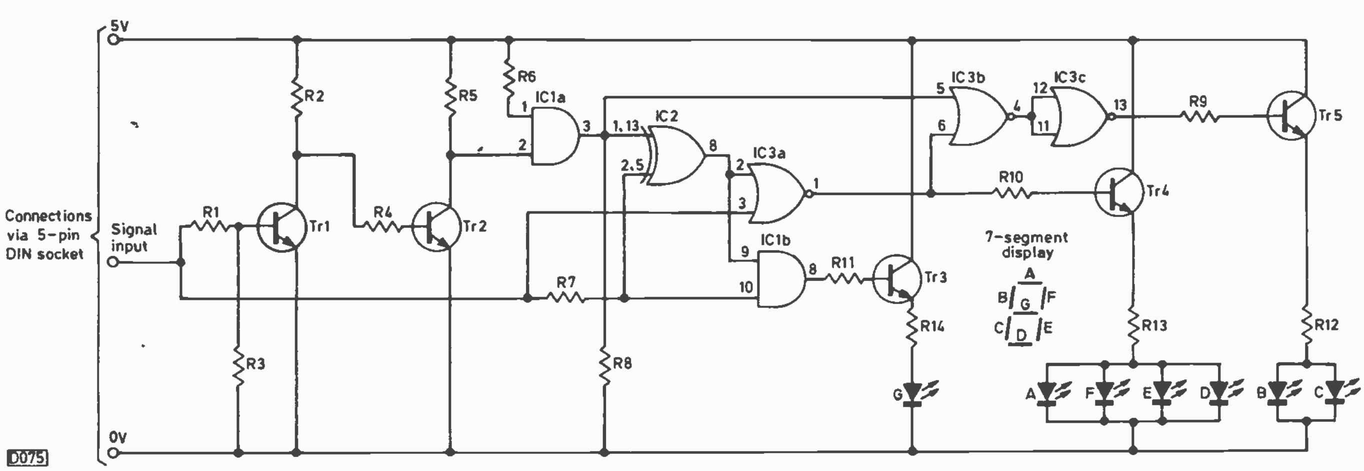


Fig. 12: Circuit diagram of the logic probe/analyser. Note that the nor gates IC3b and c are used to implement the or function, while IC2, a 7400 quad nand gate, implements the exclusive-or function.

The probe input is fed to the two-transistor buffer Tr1 and Tr2 and also to pin 3 of the nor gate IC3a. It is also connected via R7 to pins 2 and 5 of the exclusive-or gate IC2 (7400) and pin 10 of the and gate IC1b. Thus all these pins take up the value of the input.

Let's assume first that the input is a logic one. Pin 1 of and gate IC1a is always at logic one since it's connected via R6 to the 5V line. Pin 2 will become logic one via the transistor buffer, so pin 3 will also be at one. This output is connected to pins 1 and 13 of the exclusive-or gate IC2. Under these conditions both inputs to IC2 are at one and its output at pin 8 is zero. Thus one input of nor gate IC3a is at zero and the other at one, so its output at pin 1 is zero. One input of and gate IC1b is at zero (from pin 8 of IC2) while its other input is at one, so its output is at zero. Finally, pin 3 of and gate IC1a is connected to pin 5 of the or gate made up from nor gates IC3b/c whose output at pin 13 rises to one. Thus Tr5 conducts and the seven-segment display indicates one.

If the probe's input is logic zero, a similar analysis will show that IC1b gives zero output while the outputs from IC3a and IC3b/c are at one. This gives a zero indication.

If there's no input at all, pin 2 of and gate IC1a is at zero since the input to the transistor buffer is connected to the negative side of the supply via R3. Pins 2 and 5 of IC2 and pin 10 of IC1b will rise to logic one however. Following through the rest of the logic you can see that the only high output is at pin 8 of IC1b. Thus only the central portion of the seven-segment display lights up, indicating a floating input. Pin 3 of IC1a is connected to the negative side of the supply via R8 to prevent it rising to logic one in the absence of an input signal.

These logic sequences are summarised in Fig. 13, where Z indicates a floating input.

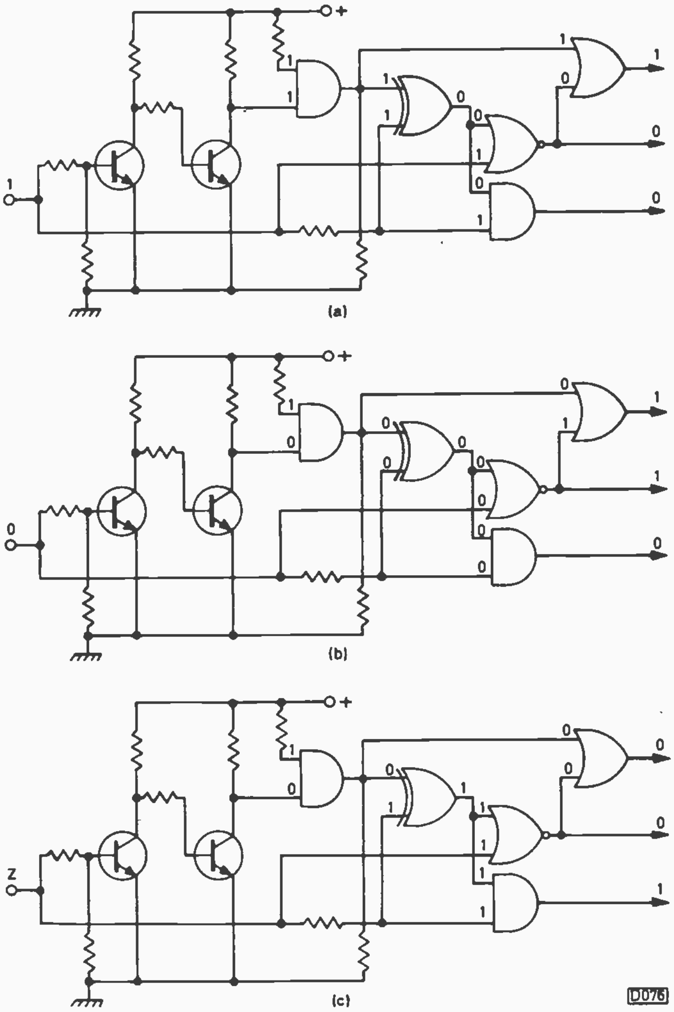


Fig. 13: Analysis of the logic probe conditions (a) with logic one input, (b) with logic zero input and (c) with a floating input.

Construction

The probe can be built on a Veroboard strip or a printed circuit board can be made. In my opinion the use of Veroboard is simplest, so we'll describe this first.

The prototype was built on a piece of Veroboard less than 10 × 6cm (36 × 24 holes). Fig. 14 shows the method of implementing the exclusive-or gate using a 7400 i.c.

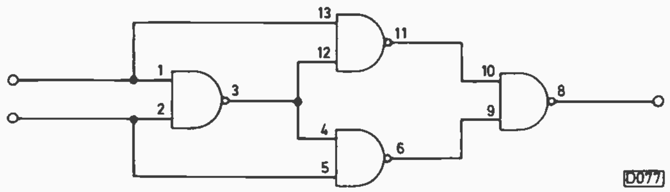


Fig. 14: Exclusive-or implementation using a 7400 chip containing four nand gates.

The inputs are pins 1/13 and 2/5 while the output is pin 8. The method of connecting the 7402 chip to implement the or function is clear from the circuit diagram.

Fig. 15 shows an outline layout as used in the prototype while Fig. 16 shows the completed circuit. The seven-segment display and its associated limiting resistors R12/3/4 are mounted on a separate piece of Veroboard with connections to the main board via wires. The size of the seven-segment display is a matter of choice, but the design assumes the use of common cathodes. With a small display size R12 is 18Ω, R13 10Ω and R14 33Ω. With larger displays, e.g. half inch, these values should be approximately doubled (see components list).

Fig. 17 shows a suitable PCB design if this is preferred while Fig. 18 shows a layout for the display.

Nine wire links or jumpers are required. It's probably best to fit these first since two are underneath i.c.s. Fitting the links is no problem if i.c. holders are used and this is generally to be recommended. It's even easier if i.c.

Components List

R1	2·2k	R6	1k	R11	22k
R2	1k	R7	2·2k	R12	33Ω*
R3	1k	R8	47k	R13	22Ω*
R4	15k	R9	4·7k	R14	68Ω*
R5	2·2k	R10	10k		

Tolerance and power ratings are not critical. All resistors could for example be 10%, 0·5W.
*See text.

Tr1-5	BC108 or equivalent
IC1	7408 quad and gate
IC2	7400 quad nand gate
IC3	7402 quad nor gate

Maplin 0·3in FR38R or 0·5in FR41U seven-segment displays are suitable.
Maplin LH14Q plastic box was used for the prototype.
5-pin DIN plug and socket, crocodile clips plus Veroboard or PCBs. Prototype used 10 × 6cm and 4 × 3cm boards.

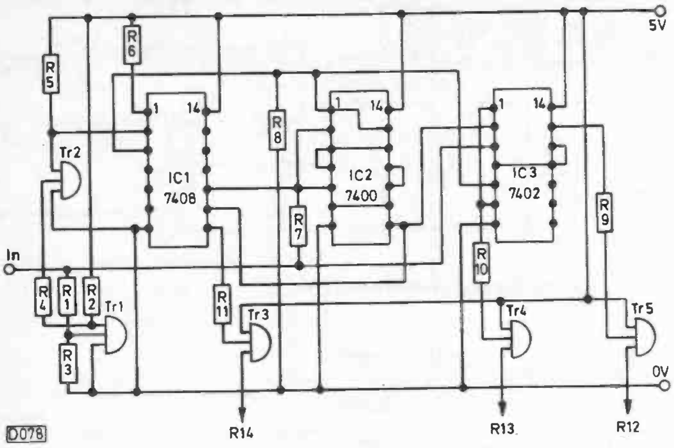


Fig. 15: Outline layout for construction using Veroboard.

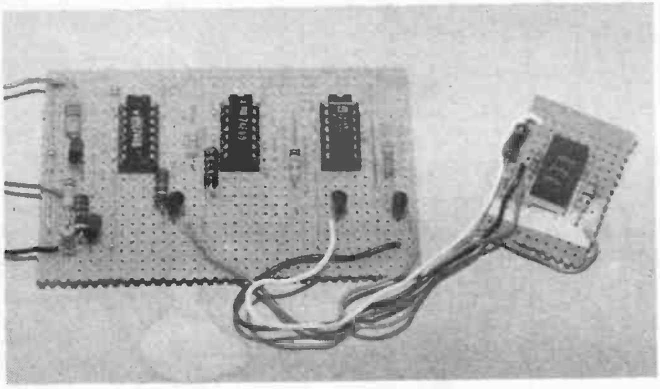


Fig. 16: The completed unit, built on Veroboard.

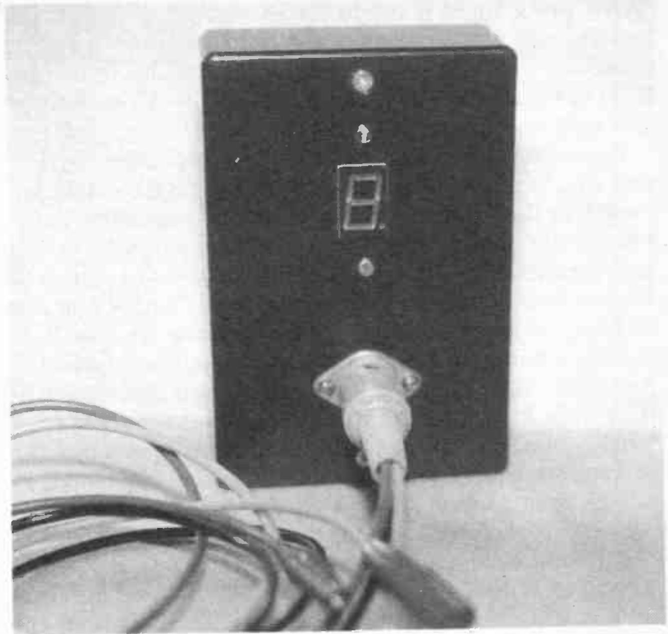


Fig. 19: The completed unit in its case.

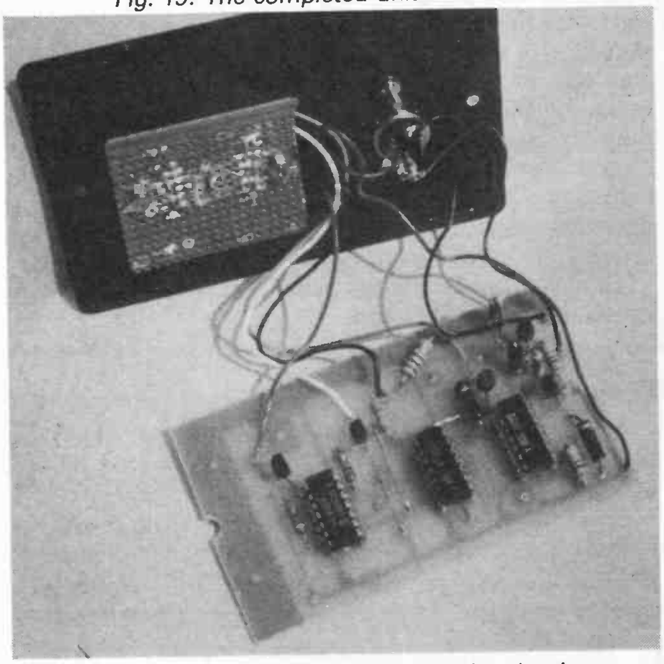


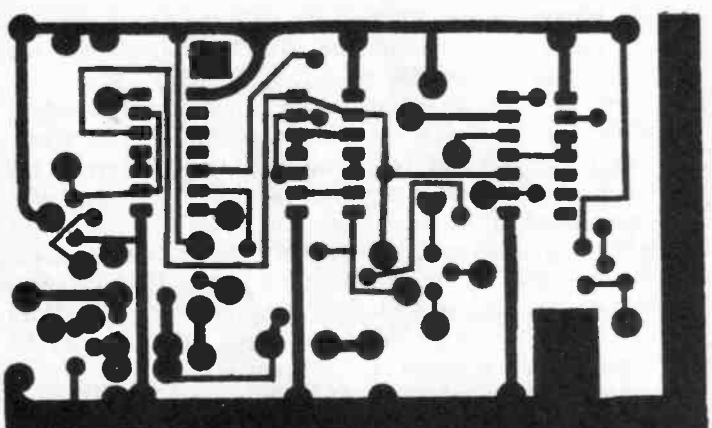
Fig. 20: Internal view of the completed unit.

socket strip is used as there is no plastic base in between. These strips are very versatile and there is no waste.

After fitting the links and i.c. holders, fit the five transistors then the eleven resistors. The seven-segment display panel can then be made and the two linked together with colour-coded wires.

Once these operations have been completed the i.c.s can be slotted into place and the unit tested. This can be accomplished simply by connecting a 5V supply. With no input only the central segment of the display should light. One and zero should be displayed when the input is connected to 5V and 0V respectively.

If the checks prove satisfactory the unit can be housed. The prototype was incorporated in a box measuring 11 × 7·5 × 3cm. Holes for the display and a five-pin DIN socket were made in the lid, these items being bolted in place. The probe was made from an old meter probe, the other connections being made via standard crocodile clips. These details can of course be varied to suit individual requirements.



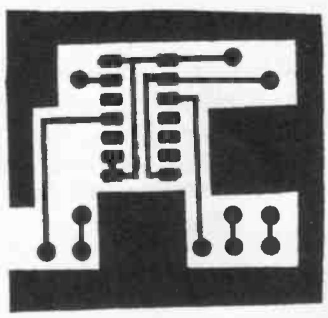


Fig. 17 (left): PCB layout for the logic unit. Scale 1:1.

Fig. 18 (right): PCB layout for the display unit. Scale 1:1.

Camera Workshop Accessories

Nick Beer

Servicing cameras and camcorders is a specialist business that should be tackled only by those equipped and competent to do so. The increasing number of cameras and camcorders now on the market means that few dealers will not come into contact with them.

A considerable investment is required to set up a complete camera/camcorder workshop. As a result, many people fall into the trap of attempting repair and alignment without any form of aid. If you have a technically competent staff (and a VCR engineer does not automatically qualify as a camera engineer) but your camera turnover does not justify spending several thousand pounds on a workshop, a usable servicing area can nevertheless be constructed without immediate need for that most expensive item of camera test gear the vectorscope. The camera workshop should however be in a separate room which is whited out, and rather more stringent rules of cleanliness than in the average TV workshop should be observed. Accurate lighting of a specific intensity and temperature is required — obviously alignment calls for a standard.

In additiona to the usual workshop equipment — scope, meter, etc. — the accessories mentioned in this article are required. Operation along these lines should provide a workable alternative to a dedicated camera/camcorder servicing department. If you cannot justify this amount of effort your camera servicing should be subcontracted to someone with the necessary facilities.

Alignment Charts

Most camera head alignment is based on the use of viewing charts. These are viewed under accurate lighting conditions. It's important that both the charts and lighting are accurate. Some service manuals, notably those produced by Panasonic, include some very basic charts to check linearity and focusing, but the most important charts are those required for alignment of the vision circuits.

The first of these is a colour-bar chart. This is self-explanatory, usually resembling the pattern produced by your current pattern generator. A quick check with various manufacturers indicates that the average price of such a chart is in excess of £100 — this may come as quite a shock for a single chart. We have some good news on this score however — see later.

Secondly comes a logarithmic grey-scale chart. This consists of a series of accurately painted grey bars from white to black and black to white. This is again used for white balance alignment. It tends to be even more expensive — typically around £150.

A resolution chart provides a way of determining focus accuracy and the horizontal resolution of the pickup device/camera head.

Another type of chart is used to align camera geometry. It comes in several forms but basically consists of a crosshatch pattern and a circle.

Obviously the total cost of a set of charts could be considerable. Now for the good news: PAG Ltd., Video Division, 565 Kingston Road, London SW20 8SA (telephone 01-543 3131) has available a set of charts consisting of colour bars, a logarithmic grey scale, resolution and registration patterns in a sturdy folder at a trade price of £94 plus VAT. They are of superb quality, presented in a folder with a calibration slip and instruction leaflet. Representing a massive saving, they are thoroughly recommended. These charts have a laminated finish to enable them to be cleaned. The firm also has a series of matt finish charts of US origin available. These can be bought separately and are somewhat more expensive. A shiny surface is no problem with diffused lighting.

Illumination

The charts are normally positioned about 2m (depending on chart size) from the front of the pickup device. They should be on a flat, level, perpendicular surface — as should the camera under test.

The level of illumination required varies with different manufacturers. Typical values are 1,400 and 2,200 lux (3,200°K). The illumination must be very even, with no other light sources (from a window for example) affecting the chart area. The most practical way to achieve this is to paint the whole area white — matt to avoid reflections.

There are several sources of the required light. We use a 1,000W tungsten halogen unit from RS. Aico International, the camera accessories firm, do a fan-cooled 1,000W Braun unit that's suitable and is not expensive. To vary the light level at the chart you can incorporate a dimmer or physically move the light. Either way you will need a light meter to set the level.

Light Meter

Again, RS have a suitable unit. As you would expect, it's well built and comes with a carrying case and strap. The light sensor is separate from the meter itself, connected by a small lead. It sits in the top half of the case, being strapped in. According to the instruction leaflet you can use the sensor in this position, but since the strap runs through its centre some of the light is blocked, giving a slightly low reading. We found the best approach to be to lift the sensor out and sit the meter on a nearby bench, making use of the amply long lead. The meter is battery powered (one PP3 battery), is guaranteed for a year and is covered by the RS repair/exchange service (for the appropriate fee).

Those determined to do the job without the equipment and expertise required — there will always be a few — will probably be saying that they can use their stills camera light meter. This is not the same thing however. When we tried a couple against the RS one we found that there were inaccuracies.

The RS meter has four ranges, 50, 250, 500 and 2,500 lux f.s.d., also a battery test. Its order number is 610-815 and the trade price is £135 plus VAT. We found it to be ideal for use in our camera workshop and thoroughly recommend it. A ×10 neutral density filter is available at £53·50 trade plus VAT, order number 610-821.

This concludes my round-up of the accessories required for camera servicing. Finding supplies of, in particular, the charts can be difficult, so I hope this piece may save you some time and money. Thanks are due to Steve Beeching, T. Eng., for his assistance.

How to deal with EHT arcing

Nick Beer

The problem of e.h.t. tracking, arcing or flashing – call it what you will – comes up from time to time in these columns. The thing that concerns me is the way in which some "engineers" deal with it.

The trouble usually arises because of breakdown of an insulator, maybe the e.h.t. or focus lead, the tripler or line output transformer casing, or the e.h.t. cap itself. Particularly in the latter case damp, condensation and dirt are well known contributory factors: the e.h.t. tracks along this resistive path and the resulting heat causes damage to the cap, thus making the problem worse.

Initial Steps

When confronted by an e.h.t. problem the first thing to do is to switch off and discharge the c.r.t., if it has remained charged (obviously the tube will be discharged if the leak is large enough). The correct way to do this is via a large resistance to the Aquadag earth strip – a convenient method is to use the e.h.t. probe you employ with your meter. Unfortunately many people still discharge to the metal chassis, then wonder why the set has a fault it didn't have previously – remember that most chips operate with a supply of between 5V and 12V!

Once you've established that the tube is discharged, examine all the suspect areas – obviously if you saw a flash from the tripler's case you needn't look much farther for the fault, but whenever you have a flashover the cap, tripler and line output transformer cases, the e.h.t. leads, the focus potentiometer and spark gap and the area of the c.r.t. surrounding the e.h.t. rose should be checked. If there are any signs of perishing, tracking, cracking, cuts or other damage the item concerned should be replaced.

EHT Caps and Leads

The most common thing to fail is the cap itself. Many people just pour on sealer or silicone grease until the arcing quietens down, only to find themselves facing the set again days later. Unless it's perfect, an e.h.t. cap should always be replaced. Many people seem to be unaware that separate caps are available from suppliers, e.g. the HRS EHTCAP1 at 59p + VAT, the Willow Vale 03425 at 74p + VAT and the SEME ANODECAP at 99p + VAT (one off prices). Thus from the price point of view it's not worth thinking twice before changing a cap.

Before you do so, the rose of the tube should be scrubbed: the best fluids for the job are methylated spirit, RS solvent cleaner or RS aerosol demoisturising lubricant (purple squirt as we call it). Use a rag to remove all dirt, rust and moisture from the area. When you've finished, remove all traces of the fluid. The cap should then be pressed home so that it's a tight fit – adjust the clips if it's slack – and the lead routed as it should be, clipped and tied correctly.

Another thing that can be overlooked when a cap is replaced is the series resistor (if one is fitted). If at all possible, save the original one. It's usually fitted in the neck of the cap, so bear this in mind before removing the old one.

Finally on the subject of caps don't smother them with silicone grease, rubber or other gunges. This will only attract muck and start the problem up again. Look at a new set: it doesn't have gunge around the cap does it?!

Leads from diode-split line output transformers are another favourite for this kind of trouble – I think of Philips, ITT and B and O sets in particular. The leads usually plug or push into the transformer at one end, with the cap on the other end. Again, replace the lead if you are in the least bit suspicious. Don't do what I've seen done – the lead taped up or a section cut out. Remember that the leads are tuned lengths, and again usually have a series resistor. It's perfectly in order to fit a new cap to one of these leads so long as the rules outlined above are observed.

Triplers and LOPTs

If the case of a tripler or line output transformer breaks down the action required is replacement without question, not as some people would have it a quick squirt of plastic seal over the fracture. These items are critical to safety. The cost of replacement may be high, and this could mean writing a set off and loss of a repair job, but is this worse than being sued for damages when the customer's house burns down as a result of the economy repair? Don't say this won't happen – it has.

Plastic Sealing and Silicone Rubber

I am absolutely against the use of plastic sealing material in e.h.t. areas: it just seals in the fault which will reappear soon. As an aside however I would recommend the use of plastic sealing as the perfect solution for noisy transformer coils, transductors and suchlike – forget wood glue and rawlplugs or whatever else you might use. This is far and away the easiest and cleanest as well as the most effective way of silencing wound components, but always allow plenty of time for the sealing to set before switching the receiver on again.

Silicone rubber, which again shouldn't go within a mile of e.h.t. areas, is perfect for repairing VCR fronts where the buttons that are hinged by the elasticity of the plastic have snapped, usually necessitating replacement which is expensive.

If you're thinking what a load of rubbish this concern for correct action is, just remember Denis Mott's article on "The Legal Aspect" (July 1988).

Still Confused

Les Lawry-Johns

I'm still confused but people keep asking me to do things they can't do. Like the Decca set that came in yesterday. The owner asked if he could stay as he lives a long way from here.

Trouble with Triplers

As it was tripping I started by disconnecting the tripler. This stopped the tripping so I told him how much it was going to cost him. He agreed and I reached for the last new universal tripler. I didn't get it down but instead I looked at the one fitted. As it didn't have a diode lead I decided to fit a spare Philips G8 tripler which was next to the universal one. This was duly fitted and connected – as the e.h.t. lead was a bit short it had to be fitted with the chassis lowered. I then switched on. The sound boomed out and I waited for a picture to appear. And waited. I turned up the brightness. Still no picture.

I checked the e.h.t., which was present, so I moved to the tube base voltages. No first anode supply. Something stirred in my befuddled mind. I cut the mauve lead at the bottom of the right side panel, intending to try an alternative supply. Big sparks came from under the line output transformer, so I hurriedly reconnected the cut lead. There was no model number on the rear cover but I was pretty certain it was an 80 series chassis, so I looked up the circuit, aware that I'd done this only a short time ago. There's no separate rectifier diode for the first anode supply. I then recalled that last time I'd changed the tripler I'd fitted a universal type with the diode and earth leads connected.

So I reached up for the last universal type and hurriedly fitted it. A picture appeared, too bright because I'd turned up the first anode controls. I turned them down and then turned down the colour to set up a good black-and-white display. Having done this I turned the colour up and the customer commented that it was the best picture he'd seen on the set. I apologised for the delay and he continued:

"You ought to be working in a government factory experimenting with things that won't go right . . ."

He paid up and departed and just at that moment Rick Kinslow drew up in his car. In his hand he had a tripler that looked like the one I'd just changed.

"Have you got a tripler for a Decca Les?"

"I've just used my last one."

He looked up on the shelf. "There's one" he said.

He took down one that I'd taken to be another type, but I could see the difference.

"Take it and try it" I said, ashamed of myself for not having seen it. All the trouble I'd brought upon myself for not looking properly. Oh well.

Processions

I then had to cross the road to post a letter. Half way across I was amazed to see an army of ants marching down the road in perfect step, carrying banners.

"What's that on the banner?" I asked.

The ant carrying it looked up and angrily snapped "it's God of course".

"But it looks like an ant to me."

"Of course it does. What do you think God looks like?"

"Well", I faltered, "God made man in His own image".

"What do you mean His own image? You've given Him a gender!"

"Those males always do" a female ant shouted. "They think they're God and they could well destroy our planet within a few years. Why doesn't their God stop them?"

I ran over to the post box, a bit fed up with these processions that keep coming by. They'd gone by the time I got back.

Teletopics

THE WHITE PAPER

The government's white paper on the future of broadcasting in the UK was published a few days after our last issue went to press. The main proposals about TV broadcasting are as follows. ITV to be known as Channel 3, with ten-year licences going to the highest bidder after a process of vetting. The IBA and the Cable Authority would be replaced by an Independent Television Commission which would be responsible for all commercial TV including cable and satellite broadcasting. While being responsible for licensing and laying down programme requirements it would not be concerned with detailed programme scheduling. The BBC to lose one of its channels during the night-time hours and be subject to a licence revenue squeeze to encourage it to seek alternative ways of raising revenue. Its other channel to be retained for night-time broadcasting only if used for subscription services. Channel 5 to be established as a national service reaching some seventy per cent of the population by 1993, financed by subscription and advertising. Broadcasters would apply for time segments. Viewers would require a separate aerial with probably different polarisation. The main area where a Channel 5 service will not be possible, due to interference problems with Continental stations, is along the south coast. The two unallocated DBS channels to be made available at an early date. In fact the franchises are to be advertised by the IBA this January and services could start in 1990, within a year of the start of BSB's three DBS channels. BSB and Virgin are amongst the organisations that have already expressed an interest in bidding for the two channels. Following a study that has confirmed its feasibility, local MVDS (microwave video distribution systems) TV services are to be encouraged — local in the geographical rather than the programming sense. The feasibility study carried out for the Department of Trade and Industry by Touche Ross Management Consultants confirmed that an extra twelve national channels could be made available to viewers in this way within two years, so terrestrial microwave TV might be with us by 1991, probably in the 12GHz band. The 2·5GHz band is believed to be too crowded while the technology is not yet available to use the 30GHz band. The study emphasised that MVDS would be cost competitive with other methods of broadcasting.

The suggestions contained in the white paper remain for the time being as proposals, and a great deal of debate on them is expected during the early months of 1989. A government bill implementing the proposals is expected to be put before parliament in late 1989 or early 1990.

ASTRA

Following the successful launch of the French TDF-1 TV satellite, Astra is due for launch on December 9th. W. H. Smith Television has signed a multi-million pound contract to lease two of Astra's transponders for its Lifestyle and Screensport channels. Transmissions will initially be to the PAL standard, changing to D-MAC with Eurocrypt scrambling in mid-1989. Financing will be by both advertising and subscription.

A number of manufacturers have announced plans to launch equipment for the reception of Astra transmissions. Of particular interest is Toshiba's plan to market a PAL-only, upgradeable receiver in March: purchasers will be able to have their receivers upgraded for PAL/D-MAC operation by buying an add-on unit. A PAL/D-MAC receiver with the full range of broadcast hi-fi, text and digital enhancements will be released by Toshiba in October.

Rupert Murdoch's Sky Television is to add a fifth channel to its Astra TV services. Sky has set up a joint venture with the Walt Disney Company to make available as a subscription service costing viewers £12 a month Sky Movies and The Disney Channel. The latter will be operated by Disney and will provide 18 hours of programming daily. A smart-card system is to be used for this service. Subscribers will be sent a card — similar to a credit card but incorporating some electronics — to enable their decoders once a month or quarterly. Scrambling is to start on September 1st, before which the channels will be available free.

Robert Maxwell plans to lease two transponders on Astra for the MTV-Europe pop music service and a news and information channel.

Satellite Supplies Ltd. (234 High Street, London NW10 4TD — telephone 01-961 1346) will be supplying a complete TVRO package for reception of the Astra transmissions from February. The Sakura system features a twenty-channel memory and infra-red remote control at a trade price of £160. It's upgradeable for MAC via a five-pin DIN socket.

Tatung is holding a countrywide series of satellite workshops to prepare dealers for the new TV services. Further information is available via the Tatung dealer hotline 0952 290 111 ext. 251.

SATELLITE TV

BSB is to pay over $160m for the exclusive right to broadcast some 175 feature films owned by Columbia pictures. The company previously concluded other, smaller deals with Cannon, Warner, MGM-UA and a new company set up by David Putnam. BSB is to ask its investors for more money to cover the cost of securing these film rights. A second round of financing this summer is expected to raise £500-£600m instead of the originally planned £400m.

SuperChannel has been placed under court-appointed administration. The Italian company Beta Television (Videomusic TV) which took a majority interest in the channel last month has announced that SuperChannel's debts and liabilities for future commitments are greater than expected.

The Department of Trade and Industry has awarded licences to six companies to provide satellite information services, including TV, to closed-user groups, e.g. betting shops, securities houses etc. Licencees include BSB, Maxwell Satellite Communications and British Aerospace.

The IBA has announced that its two eight metre dishes which will provide the uplink for the DBS services are now in position at Chilworth, Southampton. Acceptance tests have started.

SATELLITE TV BOOKS

Swift Television Publications, 17 Pittsfield, Cricklade, Swindon, Wilts SN6 6AN has just published at £8·95 the *Satellite Television Installation Guide* by John Breeds. This well produced and extensively illustrated book provides a thorough, practical guide to installing satellite TV equipment. Footprint contours for the main European satellites are included along with dish setting up angles covering the whole of the UK. There's a very helpful glossary at the end. The book has been adopted by the Confederation of Aerial Industries for trainees on CAI courses accredited by the City and Guilds of London Institute.

All You Need to Know about Satellite TV by S. Guest-Lee at £2·99 is a well-produced book intended for the general public. It's available from Satellite TV Publications, 79a Bournemouth Road, Chandlers Ford, Southampton, Hants SO5 3AP.

BUSINESS NEWS

According to the latest figures from BREMA, CTV deliveries during the third quarter of 1988 were 1·3m compared to 1·1m in the previous year. Imports took 47 per cent of the market compared to 40 per cent, led by a surge in small-screen CTV deliveries from the Far East. VCR deliveries increased by nine per cent in the third quarter and by 22·6 per cent during the first three quarters of the year.

The European Commission has extended the scope of its investigation into charges of CTV dumping from South Korea, started in February 1988, to include China and Hong Kong. The three countries increased their exports of small-screen CTVs to the EC from 35,000 in 1985 (three per cent of the market) to 620,000 in 1987 (21·5 per cent of the market).

The South Korean manufacturer Daewoo is to set up an £18m VCR plant in Antrim, Northern Ireland with a production capacity of 500,000 machines a year.

Rumbelows has taken over the Surrey-based Ketts chain of 36 radio and TV stores. Polly Peck is taking over the Italian CTV manufacturer Imperial Electronics which was at one time part of Telefunken. Imperial has a capacity of 200,000 sets a year and for thirty years has produced sets for the own-brand market. Poly Peck's main CTV production is in Turkey.

Sony (UK) Ltd.'s manufacturing plant at Bridgend, South Wales has won the 1988 Quality Award. The award, made by the British Quality Association, is the premier UK award for quality achievement in British manufacturing and service industries.

S-VHS NEWS

Arrangements have been made to enable European Super-VHS equipment to be used with TV sets having a scart connector. There are three different methods. First, S-VHS equipment can be connected via the composite video signal input of a TV set's standard scart socket. Some sets however now have a second scart socket with pins 15 and 19 modified for Y/C signal input. This approach reduces cross-colour and dot interference. S-VHS VCRs and camcorders are switchable between composite video and Y/C outputs. It's also possible to split the S-VHS signal into its RGB components and feed these into an RGB compatible scart input: JVC is to release an S-VHS/RGB converter, Model KM-V7EG, for this purpose.

JVC is also releasing two high-resolution TV sets for use with the S-VHS format. Models AV-S250 and AV-S280 have 63 and 70cm screens respectively and feature wideband video processing circuitry which provides a horizontal resolution of 560 lines with the AV-S250 and 630 lines with the AV-S280. Both sets feature an S (Y/C) terminal, phono audio sockets and twin scart sockets, one of which is modified for Y/C signal input. Other features include teletext, a 24-hour on/off timer, a two-way, four speaker system and surround sound circuitry.

Mitsubishi and Ferguson have introduced S-VHS VCRs. Ferguson's Model FV39S includes nicam 728 capability, VHS hi-fi stereo, long play and advanced indexing facilities. It's expected to sell at around £1,000 with a comprehensive package of accessories. Mitsubishi's HS-B70 has a similar specification and price, with automatic digital tracking, an LCD programmable remote control system and full on-screen operating and programming graphics.

Mitsubishi has also launched two large-screen TV sets equipped with nicam decoders and S connectors. The CT3703STX has an 89cm screen and dynamic beam focusing. The suggested price is £2,500 and the weight 92kg! The CT2553STX has a 59cm screen, an automatic switch-off timer and sells at a suggested £650. There are optional video cabinets for these two sets.

S-VHS tape for European use has been introduced by TDK: the XP (extra professional) tape has superfine particles and a coercivity of 900 Oersteds. A new calendering process is used to improve the surface smoothness and a new binder and backcoating have been developed. TDK claims that a special additive improves head friction and durability. A permanent anti-static shell reduced dust contamination. The tape is available in two lengths, SE-120XP and SE-180XP at £10 and £11 respectively.

WIZARD DISTRIBUTORS

The Manchester-based component wholesaler Wizard Distributors of Empress Street Works, Empress Street, Manchester M16 9EN (061 872 5438) has produced its 1989 catalogue. Copies are available free of charge to trade customers. The new 84-page edition includes a section devoted to Hinari spares and a comprehensive video head identification list.

CABLE TV

The CATV franchises for Avon and Thames Estuary North and South, covering some 700,000 homes, have been awarded to United Cable, one of the largest US cable operators.

The Cable Authority is considering cancellation of the franchises awarded to some companies that have failed to start installing cable. Of the 27 franchises that have been awarded, covering some six million homes, well under half are in operation.

PANASONIC'S VIDEOPHONE

Panasonic intends to launch a videophone, Model WGR2, in the UK this summer at around £200. The unit has a camera and 4·5in. screen and can transmit and receive a monochrome still picture via the telephone line in about ten seconds. Transmission with a picture costs about the same as a standard phone call.

VIDEO NEWS

A digital VCR, Model VR6648, has been added to the Philips range. Digital features include picture-in-picture (PIP), multi-PIP, nine-picture tuner scan and strobe. The suggested price is £540.

We have been asked to correct the price of the Pentax 8mm camcorder Model PV-C840E mentioned in this column in the October issue (page 902). The suggested price is £899.

IN BRIEF

Finlux has developed an experimental 12in. flat monochrome TV display screen using electroluminescence as the light source. . . Philips has introduced a programmable universal remote control unit, Model RC775, at £70. It has an LCD screen and can memorise up to 370 commands applicable to up to ten appliances. . . Maplin has available a high-gain amplifier intended mainly for use when two TV sets or radios or a combination of these is used with a common aerial downlead. Model YP42V has a bandwidth of 40-860MHz, a typical gain of 15dB and is available at £17·95. Operation is from the mains. Other Maplin amplifier products include a battery-powered unit and units to drive up to three or four sets. . . Oracle has started its own soap opera called Park Avenue. It's updated at 1700 each day and occupies ten pages.

IBC '88

Geoff Lewis, B.A., M.Sc.

This was without doubt the largest and best-supported IBC to date, with large increases in the number of visitors to all aspects of the event. Even the typical IBC weather had an all time high: the tail end of hurricane Gilbert swept in soon after the opening, to provide some problems for the dish farm on the esplanade. It also ensured that visitors moved between the various venues in double quick time.

IBCs are intended to provide a forum for the exchange of the latest technological ideas and to make it possible to look at new practices and developments that affect the broadcast industry in general. This is done by the presentation of papers at the technical sessions and through the hardware displays in the exhibition. In one particular respect IBC '88 was again very thought provoking — the question of new TV standards was very much to the fore.

General View

From the advance list of papers it seemed that 1988 was to be the year of high-definition TV (HDTV). This was true, up to a point. If you step back a couple of years, you might then have supposed that by now the question of standards would have been settled. Not so! One began to wonder which of the 57 varieties was going to surface next. While Europeans have been trying to resolve the MAC-D/D2 problem, yet further MAC possibilities have been presented. Similarly in Japan variants on the NHK Muse system have been spawned, while reports from the USA confirmed that a lot of development work is going into HD-NTSC.

Slightly more than half the technical papers related to HDTV or satellite TV feeds to cable systems, and it might be pertinent to ask where this leaves terrestrial broadcasting systems? At present in the UK we have four channels of pretty good quality, and a fifth is on its way. Viewers have VCRs to enable programmes to be time-shifted and give access to a wide range of prerecorded materal. The system is well understood. Will HDTV and satellite systems really give us a much wider viewing experience? And will they be economically viable?

It may be recalled that following the HDTV '87 colloquium in Ottawa last October there were to be public demonstrations of HDTV in its various forms, enabling comparisons to be made with high-quality NTSC images. Some 7,000 people took part in the survey, and the results are just becoming available. Whilst nearly everyone preferred HDTV, support fell when cost considerations were taken into account. Provided the extra cost of a top-of-the-range receiver was about $300-$400, there was considerable support for a change to HDTV. But when a more realistic figure of $1,500 per receiver was suggested interest waned considerably. It seems that there is considerable consumer demand provided the improvement in video and audio quality is accompanied by good quality programming and that the extra cost is reasonable.

IBC '88 brought out the rapid expansion in the application of digital techniques throughout broadcasting in general. Many systems are now computer or microprocessor controlled. Many electronic graphics and digital effects systems are based on the familiar IBM or look-alike personal computers. Digital effects machines are certainly becoming an important tool for the programme maker.

Satellite TV

The technical sessions provided information on developments for the Astra and BSB satellites, and some of the associated hardware was on display. The first Astra transmissions will use PAL, though MAC-D2 may well come into use as the number of channels increases. BSB is to use MAC-D from the start. It's a good job that dual-standard chip sets are likely to be available fairly soon to resolve at least one standards problem. BSB's diamond-shaped Squarial was to be seen, but few details of its performance were available. A gain of 12dBi was suggested. This compares reasonably well with the gain of 28dBi quoted for the BBC's steerable flat-plate aerial which has about ten times the surface area. If the Squarial has a beamwidth of 4-6° however, as is commonly expected, adjacent satellite interference could be a problem. Some brief details of the Eurocypher system to be used by BSB were made available. It uses the US G.I.-Videocypher system, which is fast becoming an industry standard, with an additional facility that allows the encrypting algorithm to be changed at will.

HDTV Systems

The Japanese NHK/Muse system was well presented in several displays. A production facility was shown in the Sports Hall of Sussex University, complete with a video effects and graphics machine. Further displays of the Electronic Cinema and Videoconferencing were available and were well patronised. From some of the comments overheard from the American contingent it seems that many in North America are glad that the Europeans didn't accept Muse as a world standard at the CCIR Dubrovnik meeting in May 1986. The delay has given them time for thought and consideration of the possibilities of their own evolutionary approach to HDTV, i.e. systems that are compatible with current NTSC broadcasting. Possibly as a result of this delay Muse-E and Muse-T now have three further relatives. There are Muse-6 and Muse-9 which require one and one and a half 6MHz channels respectively, and Narrow-Muse. But the standards conversion is at present costly, as the 1,125/525 lines and 60/59·94 fields/second standards have no convenient ratios.

As reported after HDTV '87 in Ottawa, the search for an NTSC-compatible HDTV system continues. Of the five or six well-known centres that are carrying out research into this, probably the front-runner is the David Sarnoff Research Laboratories (ex-RCA) which has come up with two proposals, level-1 using a single 6MHz channel with enhanced definition and level-2 using two channels that provide NTSC-compatible HDTV.

The MAC family is not without a new offshoot, MAC-T, which has been proposed for electronic news gathering links. The video components would be processed in the standard MAC fashion, with conventional sync pulses and a colour burst instead of the digital sync bits. This has been devised to provide studio-quality images from portable equipment, to allow MAC-type scrambling and controlled access to be used, plus sound in syncs.

The EUREKA-95 MAC-HD display in a separately constructed seafront pavillion showed what has been achieved by European cooperation in just two years. The display covered the studio, transmission and the MAC-HD concept including MAC-D and MAC-D2. Receivers ranged from domestic sets with inputs via a Scart/Peritel Euroconnector to wide-screen equipment using either front or rear projection. The quality of the displayed images was of a very high standard. The comparison with PAL pictures produced comments to the effect that Alan Sugar should view the stand then donate a million pounds to the charity of his choice.

Fig. 1 shows the general arrangement of this display. The signal originating equipment, all to the MAC-HD standard, consisted of a studio plus two outside broadcast (OB) vehicles. The first OB vehicle was equipped with a camera and a VTR while the second one was equipped with suitable VTRs, audio recorders, monitors and mixer desks, acting as a control centre whose output was fed to a MAC-HD encoder. This output was further encoded into both MAC-D and MAC-D2 signals which were sent over various transmission links including a simulated satellite TV path, 10km of 140Mb/sec optical fibre and a microwave distribution link. The received signals were then decoded and displayed on suitable receivers — as previously outlined. In addition LaserVision video disc players and VCRs provided outputs of prerecorded material to complete the domestic scene.

Compatible HDTV images are produced in the studio, with 1,250 lines per frame. This is reduced to 625 lines for the MAC transmission, to provide an input for a standard MAC receiver. The line reduction is done in such a way that an HD receiver can reconstruct the missing lines using a digital assistance signal encoded into the MAC data structure.

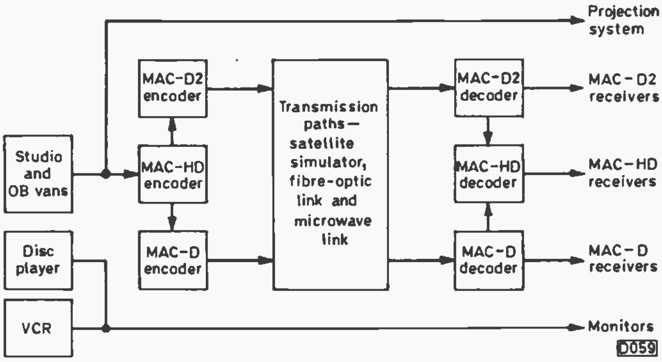


Fig. 1: The EUREKA-95 display at IBC '88.

Microwave TV

A particularly interesting distribution system was shown in operation and described in a paper entitled "M^{3}VDS — the cheapest, quickest and least obtrusive means of providing multichannel domestic TV?" M^3 means millimetre-wave, multichannel, multipoint, the frequency band being 29GHz. While it was shown that such a system could easily support MAC-HD signals or up to thirty standard TV channels, the title must have been chosen with tongue in cheek. The GaAs semiconductor technology required to provide suitable receiver LNBs is about two years away, while the cost of the head-end transmitters is unknown and would certainly be greater than for the previously proposed 2·5GHz systems. So much for the "cheapest and quickest" bits. The 15cm diameter dish and LNB assembly was certainly unobtrusive, and might provide a range of 2-9km. There's still a strong case to be argued with the Department of Trade and Industry to try to get it off the fence and provide a frequency allocation for such services in the 2·5GHz band. At least we would then have the cost and availability benefits of the research that has already been done.

All-electronic Video Recorder

The most intriguing device to be described and displayed was without doubt a video recorder with no moving parts. This has been developed by Questech Ltd., using digital techniques with 512 dynamic random access memories (DRAMs) for storage. It's capable of recording 78 seconds of video with variable speed playback without loss of quality. Whilst this is very short by present standards the recorder is nevertheless useful for action replay of sporting events. A unique feature is that the device has several output ports that allow a single frame and the events that led up to it to be displayed simultaneously. By 1989/90 it's anticipated that 4Mbit DRAMs will be available, enabling the recording time to be extended to more than five minutes. This would make the recorder a valuable tool for the producer of commercials, etc.

In Conclusion

From conversations with engineers on the stands of the UK broadcasting organisations I detected a degree of caution and concern regarding the future of British TV. Such is the impact of the government's ideas about deregulation of the industry. The effects that the proposals contained in the government's White Paper might have on research and development in the UK, which has always been in the forefront of advances in broadcasting, were being pondered. An interesting comment from one old-hand suggested that governments periodically dig at the roots of broadcasting just to see if they are still alive. This is acceptable — provided the roots aren't disturbed so much that the plant is killed off.

The next meeting of the CCIR, to discuss the question of a single world standard for HDTV, is scheduled for 1990. I wonder what the odds are that there will be a proposal to adopt three standards, Muse, MAC-HD and HD-NTSC, with a further proposal to meet again to decide on a single conversion standard in 1992 or subsequently?

Practical Guide to Satellite TV

Roger Bunney

In the March–May 1988 issues I described a simple, low-cost satellite TVRO system. The aim was to achieve efficient reception at minimal cost, and to that end a dish with patio mount was used. When I bought that package of equipment I knew very little about satellite TV reception. Since then I've learnt a lot, in particular from hands-on experience of playing with and modifying the system. This has enabled me to assess the merits and shortcomings of basic equipment.

With the ever increasing interest in satellite TV reception a wide range of equipment has become available at reasonable prices. My first package, which included everything, cost just £302 plus VAT. This included a 90cm dish with patio mount for reception from a single satellite.

Dishes

The dishes available on the domestic UK market fall into two categories, prime-focus and offset types. As the name suggests, the prime-focus type focuses the incoming signal at a point in front of the dish. This is where you mount the feed assembly and head electronics, normally by means of three or four support arms that provide rigidity and accurate alignment. The offset type of dish focuses the incoming signal at a point to one side of the dish. It's somewhat more efficient since the feed assembly, the head electronics and their supports don't obscure the incoming signal. Prime-focus dishes are usually spun or pressed to shape and are available in standard sizes ranging from 60cm to 3m. The usual sizes used in domestic installations for reception of low-power satellites, i.e. not Astra, are 90cm and 1·2m, though the sizes continue upwards through 1·5m, 1·8m, 2m, 2·5m and 3m. A 60cm dish is suitable for Astra's signals. Clearly the larger sizes will tend to dominate the location, hence the popularity of 90cm and 1·2m dishes. Provided you don't live in a conservation area a 90cm dish can be installed in a garden or on a house without the need for planning permission. The larger sizes require such permission in theory, but if the dish is in a very large garden and is not visible from outside your boundary who's to know? Offset dishes are usually formed in fibre-glass.

Mounts

The dish requires support. It can be fixed to a patio mount aligned for reception from a single satellite or attached to a tracking mount that gives reception from several satellites. The patio system supports the dish [illegible] via a rear prop arm that's adjustable for elevation. At its lower end the rear prop arm is welded to a steel hoop which is normally bolted down to the patio, flat roof or whatever. Once the system has been aligned for reception from the desired satellite the hoop is fixed (azimuth alignment) and the elevation adjustment is locked.

The satellites that transmit TV are in geosynchronous orbit above the equator, i.e. they are stationary relative to any point on the Earth's surface. To view these satellites in the UK we need to look to the south east/south/south west. If the dish is supported by a polar mount it will, once correctly set up, provide correct tracking of the equatorial arc. This is the recommended system.

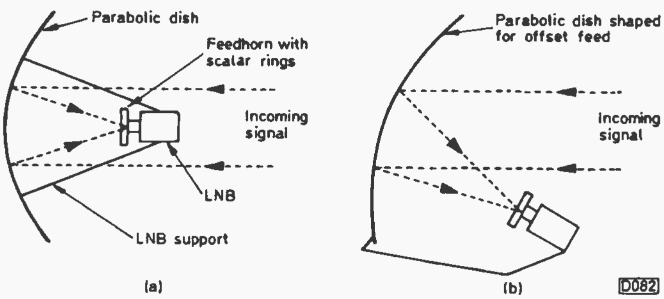


Fig. 1: Prime-focus (a) and offset (b) dishes.

Polar Mount Alignment

Unless you have experience, setting up a polar mount can be difficult. It's a task that must be done carefully. Normally the dish/mount supplier will provide alignment details. Two adjustments are required in the vertical plane. Elevation has already been mentioned. In addition, declination offset has to be taken into account. This is usually measured between the back of the dish (on a flat spot) and a section of the mount such as the axis bar. In the southern UK the declination angle is 7·3°. The declination adjustment lowers the dish sight on to the satellite arc. Elevation is adjusted to the site latitude.

Thus the polar axis angle (local latitude) is first set, followed by the declination offset. Appropriate screw/bolt adjustments are provided at the rear of the dish. The dish assembly on its stand is then aligned on a north/south line, so that the axis of the polar mount is correct. For this adjustment, refer to a flat plane on the dish and use this for sighting. Once as nearly correct as possible N/S alignment has been achieved an additional offset angle is added. This is for magnetic declination and adds a further 7° adjustment to the west. Most dish stands have appropriate locking bolts and swivel action for this. All this sounds rather complicated!

Preferred Method

My own method is to set the declination offset (polar axis) using a made-up aluminium angle. The dish is then set on an approximate N/S line and the magnetic offset is added. The Intelsat bird at 1°W is used as a signal source. After setting the dish to the approximately correct angle for 1°W the signals will soon be found. The dish is then swung between 27°W and 13°E where other satellites provide signals. With these three satellites used to provide reference signals I find that only azimuth correction is required. This is done simply via the swivel system, which locks to the stand base and is usually a large bolt. By checking the alignment at 27°W and 13°E — gently pushing or pulling the lower rim of the dish and noting the rise/fall of the signals, making adjustment as necessary — you can gradually set the tracking arc of the dish mounting so that it coincides with the equatorial arc, thus obtaining optimum signals. This is simpler than it sounds, though effort is needed. Once you've got the tracking right efficient reception will be attained.

Head End

The feed tube/horn which is connected to the LNB (low-noise block down-converter) is fitted at the focal point of the dish. The tube conveys the signal at the focal point to the LNB's pickup probe. It's often fitted with a scalar ring assembly which is used for fine tuning, maximising pickup of the wanted signal while minimising pickup of unwanted signals/noise from the sides. The ring assembly peaks quite positively, giving a further 0·5dB or so of gain.

The signals in the 10·9-11·7GHz band used by the low-power satellites and the medium-power Astra satellite are plane polarised, i.e. they are either vertically or horizontally polarised. To change from reception of a vertically polarised to a horizontally polarised signal the LNB can be rotated through 90°, thus rotating the pickup probe, or a polarotor can be fitted. The standard polarotor has a movable metal pickup probe within a waveguide feed tube, driven by a small motor. This is an effective way of changing the reception polarisation but introduces an insertion loss of around 2-3dB. A more recent device is the ferrite-based polarotor, e.g. the IRTE Paris. This has no moving parts and contributes an insertion loss of just 0·2-0·3dB. It costs about twice as much as a traditional mechanical polarotor however. The polarotor fits between the feed tube and the LNB.

LNBs are available at a wide variety of prices depending mainly on the noise figure. Thus an LNB with a noise figure of 2dB, typically with a gallium arsenide f.e.t. front end, costs in the region of £65 trade while an LNB with a noise figure of 1·3dB, using hemt devices, will cost perhaps £140 trade. Very recently an LNB with a noise figure of 0·6dB has been introduced — the catalogue says price on application! The gain provided by a domestic type Ku-band LNB is around 50-60dB.

Apart from remote switching for vertical or horizontal polarisation there are generally no controls for the head electronics either outdoors or indoors. Associated with the polarisation switching there may be an indoor skew control to give variable control.

Feeder

The LNB provides a wideband output of 950-1,750MHz via either a standard US domestic F connector socket or a

Table 1: Typical dish gain at 12GHz

Diameter	*60 per cent efficiency*	*70 per cent efficiency*	*80 per cent efficiency*
0.5m	33.75dB	34.41dB	34.99dB
1m	39.77dB	40.40dB	41.02dB
1.5m	42.91dB	43.29dB	44.54dB
2m	45.79dB	46.46dB	47.04dB

Prime-focus dishes of good quality have efficiencies up to 70 per cent. The efficiency of offset parabolic dishes can exceed 80 per cent.

Beamwidths (at the −3dB points) of prime-focus dishes at 12GHz are: 0.5m 3.43°; 1m 1.72°; 1.5m 1.14°; 2m 0.86°.

We are indebted to the Echosphere Corporation for the above information.

professional N socket — the F connector is more usual. It's possible to connect low-loss coaxial cable such as RF125 to an F connector by carefully soldering the screen braid to the outside ring of an F plug with the inner conductor serving as the connection to the LNB's signal path. RF125 has the same loss figure as UR67 but is somewhat cheaper — and is vastly cheaper than most of the "correct" coaxial cable sold for this purpose. Since my own cable run is only 60ft the loss can be tolerated — inexpensive line amplifiers with a gain of typically 10dB are available to overcome losses and maintain optimum noise performance.

Receivers

The receiver/tuner market is vast. You can pay several hundred pounds for the best all-singing, all-dancing remote-control receivers. I'm still using a basic knob and switches receiver: the tuning is by means of a large knob calibrated 1-24! I've added variable bandwidth switching via an outboard unit connected to an i.f. loop with access at the rear of the receiver.

In Conclusion

The dish I now use tracks accurately using the cheapest Drake controller and actuator arm. It was collected from a nearby company (Metspin) where you can actually see the things being made. Perhaps I was fortunate: Metspin has manufactured dishes for Marconi and for military use for some years and the domestic market represents a natural spinoff — many of the tight government specifications are retained (there are not many domestic spun dishes that have a minimum 2mm thickness).

In closing this short guide to practical satellite TV reception I'd like to mention several companies that have provided help. North East Satellite Systems provided a great deal of help but now supply only professional users. Micro-X has a vast range of equipment and supplies have been very prompt. Alston-Barry provided the Drake equipment: they were similarly prompt in supplying equipment and in sorting out a small problem. I would recommend the *Echosphere Dealer Handbook* which covers the theory and provides practical guidance on installation, with lots of illustrations. I got my copy from North East Satellite Systems: it's expensive but perhaps the best. For what's in the sky the *World Satellite Almanac 1988* is excellent but costs £30.

One thing I've not mentioned so far is flat aerials. Although much work is being done in this field most of those shown so far have been dummies. The main problem appears to be that of achieving quantity production at a competitive price.

Addresses

Addresses of the firms mentioned in this article are as follows:

Alston-Barry International, Units 4/5, Winborn Building, Convent Drive, Waterbeach, Cambridge CB5 9PB (trade only).

Metspin Ltd., 94b New Brighton Road, Emsworth, Hants PO10 7QS.

Micro-X, Unit 2, Drury Way Industrial Estate, Lacton Close, Neasden, London NW10 0TG (trade only).

North East Satellite Systems, Cropton, Pickering, North Yorkshire YO18 8HL.

Servicing the Ferguson TX10 Chassis

K. Rutherford

The Ferguson TX10 was the first large-screen chassis in the TX series. Some radical ideas were incorporated in its design, mainly in deriving the e.h.t. from the chopper transformer but also in the design of the chopper circuit itself. Mounting the RGB output stages on the c.r.t. base panel is nowadays commonplace, but the TX10 was amongst the first to have them there.

Helped by its 65W power consumption, which keeps the temperature inside the cabinet at a very reasonable level, the TX10 is an inherently reliable chassis. The picture quality is such that the chassis has been approved for monitor use in broadcasting studios, though not for quality assessment – it has found use as a monitor by outside broadcast commentators, and was to be seen in numbers serving guests at the wedding of The Prince and Princess of Wales. Its reasonable pedigree would suggest long and dedicated service, which is certainly true of this chassis. Commonly-found faults are very few: more often the faults encountered tend to be obscure and baffling. After power supply faults, remote-control system troubles are the next most common ones.

The Power Supply

The TX10 has a synchronous chopper power supply that converts the 360V from the mains bridge rectifier to e.h.t. at 25kV (the focus voltage is derived from this), 205V for the RGB output stages, 26V for the field timebase chip, 22V for the audio output stage(s) and an input to the 12V regulator which supplies the low-power stages of the receiver, the supply for the c.r.t.'s heaters, and the 150V supply for the line output stage. The latter is the one that's monitored by the TDA2582 chopper control chip.

In the Mk III version of the chassis, which has the PC1560 main panel with plastic mounting frame as distinct from the earlier versions with a metal frame, R813 is a troublesome component. It forms part of the potential divider that monitors the 150V line, supplying an error voltage to pin 8 of the TDA2582 chip. In every case of field roll and intermittent tripping, check the 150V rail. If the voltage is high, suspect R813. It's a critical component which should be replaced with the recommended type from Ferguson or one of the official stockists. A convenient pin at which to monitor the 150V rail is on the signals panel, between the tuner and the large plug at the left-hand end of the board. A reading of 75V at the 150V test pin generally indicates that R813 has gone open-circuit or at least very high in value.

I find an analogue meter to be best for measuring voltages in TV receivers because it's relatively unaffected by the large quantities of line-frequency garbage sometimes present. One digital meter I tried was accurate to the nth degree but gave a reading that varied considerably depending on the proximity of the meter to the chassis. This applied not just with the TX10 but also with other manufacturer's models. You can't beat the good old industry standard Avo 8, but whatever you use should have a sensitivity of 20kΩ/V or better.

Power supply tripping is fairly common with the TX10. It can be produced by a number of causes. The trip inputs sense excessive chopper transistor current, excessive beam current and excessive back-e.m.f. voltage. If the receiver trips at switch-on the cause is almost certainly excess chopper transistor current. Check the various supply rails for a short-circuit, using the ohms range of your meter. If the trip occurs after a very brief delay you can add excessive flyback voltage to the list of possibilities.

Reduce the setting of the "set-h.t." potentiometer RV801 in an attempt to stop the tripping. If the receiver operates but the 150V rail is low, check the capacitors in the chopper transistor's emitter circuit – C711 and C712. Should the tripping occur after the c.r.t. has warmed up, obvious things to check are the c.r.t. supplies and the beam limiting system. In my experience however the main cause of tripping is the focus control assembly. An improved type is used in later models. This is distinguishable by its tall thin shape in contrast with the somewhat squat, rectangular shape of the earlier type. The new control requires adaptation to fit the chassis – a kit is normally supplied with the replacement unit.

Other causes of tripping can include a faulty insulator on the line output transistor TR831, i.e. a puncture caused by a flashover or minute particles of metal or even grit. The connection to the c.r.t. Aquadag is also important. Check it right through to the chassis. Short-circuit turns in the line output transformer can result in tripping. Older models can exhibit a tendency to trip randomly, particularly after fitting a replacement c.r.t. In this event check whether R706 is fitted (between the junction of T703/D727/D733 and chassis) and its value – it needs to be 22kΩ.

Failure of the earlier focus control was the result of its insulation breaking down, allowing the focus voltage to flash over to the chassis metalwork – or your hand when you attempt to adjust it! Focus control arcing can also cause spurious channel changing etc., see later.

If the power supply doesn't come on, check that 22V is present at the cathodes of D721 and D722, check for 11·5V at the emitter of the 12V regulator transistor TR801 and for 6·2V at the cathode of zener diode D801. If pin 5 of IC801 is at 5·5V the receiver has fast tripped and something is seriously wrong in the set, e.g. the line output transistor is short-circuit or one of the rectifier diodes connected to the secondary windings on the chopper transformer is dud. Take care when attempting to measure IC801's pin voltages – a mere slip of the probe can cause a lot of extra work! Pins 6 and 8 are particularly sensitive. The power supply will trip when a meter probe touches pin 6. When pin 8 is touched with the probe the set may not trip but hand capacitance to the meter probe introduces hum into the power supply. Hum is deliberately introduced via R819 (2·2MΩ) to cancel ripple on the 360V rectified mains supply. A faulty 12V regulator circuit (TR801, D802) can be the cause of the set switching off after a few seconds.

An oscilloscope is a great help when fault-finding in this area, but when looking at the drive waveform at the base of TR701 remember that you are on the live side of the mains isolation barrier, so the earth lead must not be connected to the isolated side of the chassis. Make sure that your scope is not earthed, and if you have to delve

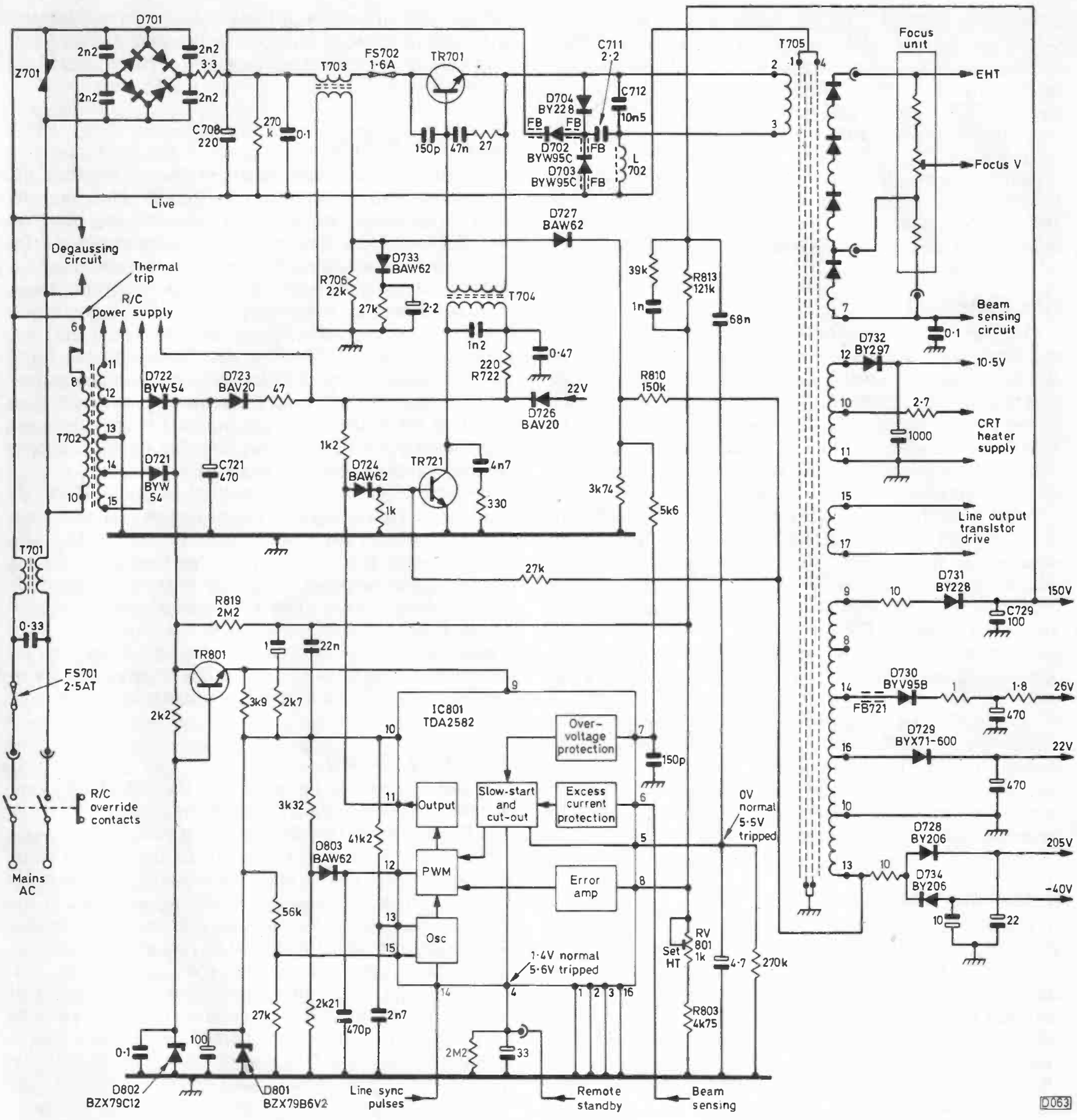


Fig. 1: The chopper power supply circuit used in the Ferguson TX10 chassis. The chopper transistor TR701 is type BU208B or S518T with panels PC1500 and PC1550 (due to shortages other types were used) and type BU508A with panel PC1560. On all panels the driver transistor TR721 is type BC639 and the 12V regulator transistor TR801 is type BC547. Surplus energy in the chopper's output circuit is returned to the mains bridge rectifier's reservoir capacitor C708 via D702, increasing the circuit efficiency. T703 senses the chopper current. The e.h.t. is monitored at the anode of D728, via R810. Beam current is monitored at the earthy end of the chopper transformer's diode split winding. D701 type SKB2/08/L5A or 4 × BY133GP.

into the non-isolated part of the chassis use an isolating transformer. Isolated chassis are all very well, but they can give you a false sense of security – constant care must be exercised. If your workshop's bench mains supply is not isolated, get it done!

The line-frequency output from IC801 to the chopper driver transistor TR721 is at pin 11. If a trip condition has removed the drive from IC801 pin 11 will go low, holding TR721 cut off. If pin 11 is high and the driver transistor is on, with R722 getting hot, IC801 has passed away.

Typical d.c. resistance readings for the four main supply rails derived from the chopper transformer, taken with the Avo meter's negative (red) lead connected to chassis, are as follows: 205V rail 30kΩ, 150V rail 30kΩ, 26V rail 4·5kΩ, 22V rail 17kΩ.

The most frequent problem on the primary side of the chopper transformer is instant destruction of the chopper transistor TR701. D704 can be the cause of this, as can C711 being open-circuit or C712 being dry-jointed. On the subject of dry-joints, it's wise to resolder the pins of the chopper transformer T705 whenever a TX10 enters the workshop – it could save you a callback. Don't forget that one of the pins is hidden beneath the chassis brace. Dry-joints on the primary winding pins 2 and 3 can cause intermittent failure of TR701. Dry-joints on the heater supply pins can give intermittent loss of picture. Tripping and intermittent spurious control action, such as switching to standby, are other effects produced by dry-joints around T705. Arcs around ferrite bead FB721 can cause very intermittent field roll and tripping on/off – resolder it clear of the PCB.

Before leaving the power supply, problems with the thermistor in the degaussing circuit can cause fuse blowing and impurity. This occurs with the round, white thermistor. Use the black type with rounded-off corners.

Line Deflection

The line output transistor TR831 is a BU208B. Protection diode D831 in its base circuit has given trouble. It has also been indirectly responsible for a loud line whistle – to stop this, glue the ferrite beads on its leads firmly in place. In the PC1560 series version the line output transistor is TR821, type BU508A, while its protection diode is D743 – this can also produce the line whistle problem, so have a go with glue here as well.

Apart from the line output transistor and its protection diode the only troublesome component in the line output stage is the transformer T721. Symptoms of its failure include tripping, a non-linear scan, line tearing and screeching from the scan coils, and instant destruction of TR831. Sometimes T721 burns out because D831 has gone leaky – check it by substitution. When D831 goes open-circuit severe line ringing will be noticed, the picture width will decrease and eventually the receiver will go into the trip mode. Don't run the set for longer than necessary in the condition before the trip operates as this will damage TR831. The remainder of the circuit, including the first anode supply and the EW raster correction system, has proved to be reliable. Sometimes the width control RV851 changes value to give reduced width.

Field Deflection

Troubles in the field deflection circuit have been few. In the earlier sets with PC1500 and PC1550 main panels a TDA1044 field timebase chip is used in conjunction with a two-transistor output stage. In cases of insufficient height and slow flyback, take a look at C781 (100μF) and TR771 (ZTX450K). Various stages in the decline of C781 will result in varying degrees of field foldover. With the PC1560 series panel a TDA3652 chip is used as field driver and output stage.

The Sync Processor Chip

Three different types of sync processor/line timebase generator chip have been used, the TDA2576 (IC791) in earlier versions of the PC1500 panel, the TDA2576A (IC741) in later versions of the PC1500 panel and the PC1550 panel, and the TDA2578A (IC742) in the PC1560 panel. The TDA2576A has an improved sandcastle pulse generator plus 50/60Hz switching while the TDA2578A also incorporates the field generator. Occasionally a later type signals panel may be paired with a main panel that has a TDA2576 chip. This will give rise to flickering colour due to the value of R627, which should be 15kΩ with the TDA2576A and TDA2578A and 820Ω with the TDA2576.

Some problems arose with the TDA2578A chip. To overcome line tearing with some VCRs, R756 was changed to 6·8kΩ. For bent verticals at high contrast settings, add an underboard link between the earthy ends of C742 and C745. If line lock is disrupted at switch on, especially in cold weather, exchange C742 (220μF) and C745 (100-μF).

Tuner and IF Strip

To improve reliability many engineers replaced the Ferguson SC4 tuner with an ELC1043/05. Now that the latter is no longer available the situation has been reversed. It's obvious that the SC4 has been modified – far fewer fail than was the case a year or two ago. The r.f. amplifier stage appears to be the most vulnerable stage, and thunderstorms can wreak havoc. The tuner is followed by an eight-pin Plessey SL1430 or SL1432 i.f. preamplifier chip, IC50. This can be responsible for a peculiar fault: the signal fades into severe noise patterning. Where an SL1430 is used this must be replaced. If an SL1432 is fitted, try connecting a 220kΩ resistor from pin 1 to chassis before condemning the chip. Note that these two chips are not interchangeable.

The rest of the i.f. strip is centred around a TDA2540 chip, IC51. This is highly reliable, though lightning damage can include this device. Less reliable is the 12V regulator chip IC621. Lack-lustre performance, shifting grey scale and weak sound are the symptoms during this device's dying throes. The replacement should be well supplied with heatsink compound. As previously mentioned, picture fade out can be caused by a dry-joint on the chopper transformer's c.r.t. heater supply pins. We've had fade out followed after a few seconds by fade in.

Checks by Muting

A trouble-shooting tip relating to the TDA3560 colour decoder chip IC601 requires the use of a small 1·5V torch cell. If you suspect that the cause of a picture disturbance is in the pre-RGB output stage areas, the internal RGB switches in IC601 can be operated by applying 1·5V at pin 5 of plug 18 on the rear edge of the signals panel. If the resultant blank raster is undisturbed (wind up the brightness a little) it's likely that the RGB output stages are o.k. This method does not kill the sync input to the sync processor chip, so the timebases remain synchronised. It can also be used to mute the sound i.f. (but not to disable the demodulator, the volume control or the audio output stage(s)) by applying 1·5V to point C (point W with the PC1551 and PC1561 signals panels) and also to mute the vision i.f. by applying 1·5V to point K. The ability to isolate trouble by using this simple switching technique can be a real time-saver.

RGB Output Stages

The major source of trouble on the c.r.t. base panel has always been the tendency of the BF460 RGB output transistors TR654/5/6 to go short-circuit base-to-emitter. The effect of this on the receiver's performance is not immediately apparent, though it does cause a very slight shift in the grey-scale, the direction depending on which of the transistors has failed. It also causes vision buzz on sound by putting video on the 12V line. The long term effect however is that the RGB output stages' green LED biasing diode D657 will be slowly destroyed. This results in a rise in the voltage across D657, with a corresponding decrease in brightness until the tube is eventually cut off. Replacing D657 will restore the vision but not cure the fault. Measuring the current flowing through D657 will produce a reading of 90mA instead of the correct 25-30mA. Finding which transistor of the three is faulty is a simple ohmmeter job. The normal voltage across D657 is 2·1V.

Failure of one of the driver transistors TR651/2/3 will flood the relevant gun, i.e. failure of TR651 will produce a blue flood etc.

Sound Problems

Sound problems with the TX10 are very few. L531 (later L561) occasionally requires a tweak to stop slight intercarrier buzz and you get the odd rattling loudspeaker, but generally the audio section is trouble free.

Remote Control

Problems with the remote control system, where fitted, can produce the occasional complaint that the normalised volume setting steadily rises. The answer to this is to change D101 to a silicon type – Ferguson's widely used PH425 is ideal. Spurious remote-control system operation is another problem that's given the writer more than a few headaches over the years. Sudden unwanted changes of volume, contrast, saturation, brightness or channel, or equally mysterious dropping into the standby mode, are symptoms of impulsive interference getting into the remote control processing circuitry and being interpreted as commands. Internal sparking in the receiver can do this – due to a defective focus unit for example, or imperfect Aquadag contact – but the interference can also come from the mains. Ferguson's answer to this is to add a link beneath board PC1515 from pin 12 of IC101 (SAA5012) to the earthy end of C106. This diminishes the amount of transient pickup in the earth tracks and prevents interference clocking itself into the SAA5012.

In receivers that use the PC1548 remote control receiver board striations can occur due to inadequate decoupling – change C915 to 10μF. The SAA5012's clock oscillator on panel PC1536 can sometimes fail to start – it often does so when the set has aged. The result is loss of text. Changing R1131 to 47kΩ will restore the vital signals. Another peculiar fault in some sets equipped with teletext is loss of sync due to poor contact at pin 3 of SK19A, as a result of which the looped through sync signal on the text panel is lost.

Tuning Drift

Finally, tuning drift with eight-channel remote-control TX10s can sometimes be baffling, all channels but one showing the fault. The cause of this is a leaky diode that couples the voltage from the slider of a tuning potentiometer to the tuning line. It doesn't matter when the leaky diode is the one in use, but when another channel is selected the diode will affect the turning voltage, causing random drift as its reverse leakage current varies.

The Tube

There must be many TX10s that have been put aside due to failing tubes and/or obscure faults. The 30AX tubes used in this chassis are expensive to replace but give an impressive performance when new, especially with teletext. Retubing a TX10 is a good proposition when the replacement tube is not too expensive and performs to the original standard – sadly very few of them do.

At the Japan Electronics Show

George Cole

Japanese consumers were faced with a plethora of television sets and broadcast systems, not to mention other domestic electronics equipment, at this year's Electronics Show, held at Tokyo's Harumi fairground.

HDTV

Many companies, including JVC, Sony, Hitachi, Panasonic, Mitsubishi, Sharp, Toshiba and NEC, held demonstrations of the Japanese 1,125-line/60-field HDTV system, now commonly referred to as Muse (multiple subnyquist encoding) after the technique used for bandwidth compression. Although Europe and America seem to have abandoned the idea of adopting Muse, the system is being heavily promoted in Japan where it's being sold under the banner "Hi-Vision", which certainly sounds more consumer-friendly!

I managed to take a look at the HDTV demonstrations provided by all the above companies and also one put on by the EIJA (Electronic Industries Association of Japan). My general impression is that Muse is very good under certain conditions but under others its defects are all too apparent. The first Muse demonstrations some time back used 30in. c.r.t.s: the pictures were sharp, detailed and clear, with the improvement over NTSC (and indeed PAL) clearly visible. This time companies also held "AV theatres" where Muse was shown on 120in. screens using back-projection systems. These were held in the dark, presumably to emulate a cinema atmosphere. The problem was that one couldn't avoid the comparison between Muse and 35mm film.

One of the biggest surprises was the huge variation in picture quality. Some companies, notably Sony, JVC and Sanyo, produced fairly impressive large-screen demonstrations. NEC's pictures were marred by noise, low contrast and poor colour however.

The large-screen demonstrations tended to suffer from three faults. First there was an increase in grain, which was clearly visible from a distance. Secondly colour shimmering was evident. With some material this was very distracting. The third problem occurred whenever a camera panned across a scene. In the Hitachi demonstration for example the camera followed a woman as she walked across a room. As the camera moved the woman went out of focus, and when she stopped there was a slight pause before the camera locked in focus. I managed to talk to several Japanese TV engineers about this focusing problem. They readily acknowledged that it was a Muse defect. Apparently the problem is worse with cameras that have a pickup tube, since tubes are more prone to image lag: the new-style CCD Muse cameras (see below) claim to improve if not cure this condition.

Japanese electronics and broadcasting companies are gearing up for Muse and have embarked on a number of Hi-Vision/Muse promotional activities, including a Hi-Vision week that started on November 25th (11/25, get it?!) The first full-scale Muse broadcasts from the BS3 DBS satellite are planned for 1990.

There is still some work to be done to develop l.s.i. chips for Muse signal processing. The current Muse decoders are larger than the 30in. receivers and, while wandering around the back of one Muse demonstration, I came across a mass of electronics watched over by an army of technicians!

Most of the Muse pictures were sourced from one-inch VTRs, though there is now a standard for half-inch Muse VCRs. These recorders use helical scanning and employ newly developed video heads. The cassette dimensions are 205 × 121 × 25mm (slightly larger than for VHS), the tape being of the metal particle type. Playing time is an hour. The recording system uses analogue base-band f.m. for the video signal, with a luminance bandwidth of 20MHz and a chrominance bandwidth of 7MHz. The audio is PCM digital, with a 48kHz sampling frequency and 16-bit quantisation. Up to four audio channels can be recorded.

Sanyo displayed a Muse video disc player which plays 30cm discs made from plastics or glass. It measured 440 × 515 × 182mm and weighed 22kg. The disc's CLV playing time is an hour per side. Sanyo also showed a Muse/NTSC decoder which can be used to convert Muse into a standard NTSC signal. It was a massive 480 × 600 × 384mm, weighing 66kg! After much miniaturisation Sanyo expect to have such decoders for sale at around £45.

Companies are working on Muse still picture systems. JVC has developed one that stores HDTV pictures digitally on an AHD (audio high density) disc. Fuji uses a WORM (write once read many times) optical disc to hold 500 fields of Muse video images. Sanyo displayed its HDV1100 videograph at the show.

One of the problems with Muse cameras is their insensitivity at low light levels. NHK (the Japanese Broadcasting Corporation) has however developed a HARP ⅔in. CCD imager that improves the sensitivity by a factor of ten. HARP? — high-gain, avalanche-rushing, amorphous photoconductor!

EDTV and IDTV

Regular Muse transmissions may still be a couple of years away, but Japanese consumers can already buy TV sets that improve the quality of standard NTSC. These are for use with EDTV (extended definition TV), a broadcast system in which a high-frequency signal is multiplexed on to the standard luminance signal to give improved resolution. The chrominance bandwidth is also extended with EDTV. Unlike Muse, EDTV (called "Clear Vision") is compatible with standard NTSC equipment. Another system is the receiver-based IDTV (improved definition TV).

Both systems employ 3D filtering and sequential scanning to improve the vertical resolution and reduce cross-colour and dot interference, but I can't say that I was overly impressed with what I saw. The pictures looked cleaner, and there was a slight improvement in definition, but neither system was a great advance on standard NTSC.

LCD Screens

At the other end of the market there were numerous pocket-sized TV sets using LCD screens. Many companies had two- and three-inch models. Toshiba showed four and 6.5in. screens. The smaller screens looked sharper.

Sharp showed its 14in. LCD panel (see Teletopics, October 1988) which pushes current LCD screen technology to the limit — and shows it.

Some companies, such as Sharp and Toshiba, have turned the concept of large, flat LCD screens on its head and produced LCD projectors. Sharp's 100in. LCD projection TV uses three 3in. LCD RGB panels as the picture source, four dichroic mirrors, three condenser lenses plus a mirror and a projection lens. The LCD panels are insulated against heat and light. They use cyclohexane high-purity liquid-crystal material and amorphous silicon thin-film transistors.

Portable AV Equipment

LCD screens are also being used in portable video equipment, including Sony's GV-8 "Videowalkman" (see Teletopics August and October 1988). The Walkman has a smaller head drum than the standard 8mm type, 20mm instead of 40mm, with an extended tape wrap and faster drum speed (3,000 r.p.m. for PAL). Sony's Betamovie system with miniature drum used a single head with time compression to increase the scanning rate: the cost was loss of in-camera playback. The Walkman has two heads placed on the same side of the drum and dispenses with fast scanning to allow normal playback. Sony is also pushing 8mm software — over 400 titles are available in Japan. For Europe, Sony has reached licensing deals with Warner, CBS-Fox and CIC.

Casio showed a portable VHS "TVCR", Model VF3000, which has an LCD screen, a TV tuner and plays full-size VHS tapes. It sells for the equivalent of about £560 and weighs 2kg.

Panasonic's NV-1 Videowalkman uses Super VHS-C cassettes and has nine heads, a 3in. colour LCD TV, hi-fi sound, twin speeds, a TV/radio tuner and speaker. It sells for the equivalent of about £840 and weighs 1·5kg. The NV-1 is a very impressive machine, hampered only by its short playing time of just one hour in the LP mode. JVC and Matsushita are working on thinner S-VHS-C and VHS-C tape to increase the playing time to two hours in the LP mode.

S-VHS

Second generation S-VHS machines were in evidence. JVC's HR-S10000, selling at the equivalent of around £1,340, features a number of improvements to the S-VHS system. These include a new Y/C processor chip, a colour response improvement circuit to reduce colour edging, a twin skew corrector circuit with separate wideband CCDs for the luminance and chrominance signals, a dynamic colour level control circuit, a new noise-reduction circuit, a linear phase aperture correction chip, a new tape guide-roller, a tape stabilising head drum, impedance rollers for smoother tape running and a newly-developed tape guide roller supported by a ball bearing for the supply reel. Hi-fi sound quality has been improved by a new head switching noise-reduction circuit, gold-plated connectors, a PCB exclusively for audio processing and new audio capacitors. The HR-S10000 also includes a new editing feature called VOS — video-on-sound recording. This allows hi-fi VCRs to record linear and hi-fi sound tracks independently of the video signal, which can be dubbed on top after the sound tracks have been recorded.

JVC also demonstrated a VHS editing deck, the RV-1000, which includes insert edit, assembly edit, audio dub and VOS for the equivalent of about £180.

The Panasonic NV-1 Videowalkman, with headband camera.

Panasonic's NV-M50 at around £930 is an S-VHS-C camcorder with hi-fi sound, nine heads, the VISS index system, a three-speed fast shutter, ×6 zoom and a stereo microphone.

8mm Video

Sony's Video 8 EVC-X10 at an equivalent price of around £1,473 has a C-mount exchange lens. The CCD-V88 at around £959 has a miniature transport system (one third the standard size) that enables Sony to produce a lightweight (0·9kg) camcorder with full features.

Fuji has announced the first high-grade 8mm tape. It uses super fine metal particles and the same coating as professional M11 tape. The cost is £7 for two hours and £3 for fifteen minutes.

Sony is rumoured to have available the first Super 8mm camcorders but instead opted to display Super hi-band and hi-band Beta equipment. These systems lie midway between the standard Super Beta with 270 lines resolution and ED Beta (extended definition) with 500 lines resolution. SHB Beta has a carrier deviation of 4·8-6MHz with a resolution of 300 lines. The HB resolution is 288 lines. Sony says that both systems are strictly for NTSC markets.

Other Equipment and Systems

Sony also showed four own-made VHS recorders, all with hi-fi sound. Top of the range was Model SLV-7 at the equivalent of about £625 while for the equivalent of about £290 you could get the SLV-P3 video player.

Compact disc video (CDV) was widely represented, all the major companies (apart from JVC who stuck with its VHD system) showing players. There are no less than ten CDV players in the Sony range.

Satellite TV is being pushed in Japan, particularly the forthcoming Muse transmissions. In addition to set-top tuners many companies offered VCRs and TV sets with integrated satellite TV tuners. Sony, Hitachi and Panasonic also displayed flat-panel satellite TV aerials.

Still video cameras were in abundance. Prices showed great variation, ranging from £311 for Sony's MAVICA to £1,116 for Panasonic's AG-ES10. Picture quality was quite good, though still not as good as 35mm film.

The latest video craze in Japan is the videophone. Most units cost around £250 and produce a coarse black-and-white still picture, though Sharp had a model with colour pictures.

So it looks as though several new items will eventually be joining the TV sets, VCRs, camcorders and CD players on the service bench!

VCR Clinic

Reports from Eugene Trundle, Nick Beer, Philip Blundell, Eng. Tech., Chris Plaice, Ian Bowden, Alfred Damp and Joe Cieszynski

Panasonic NV-M5

We couldn't believe that this fault could happen! After the machine had been running for a while the pictures it recorded (displayed in the viewfinder) rolled sideways in a "loss of line lock" condition rarely seen nowadays. Some of the electronics in this machine must have been designed with genlock in mind since the CCD H drive chip has its own VCO, phase-locked to the camera's SSG output. This phase-locked loop was going out of sync — blowing warm air into the region of the CCD drive chip would cause loss of line lock while a blast of cold air would restore it. Normal operation at all times and temperatures was restored when the PLL trimmer on the image-sensor panel had been adjusted. This job requires much dismantling and — in theory anyway! — a set of board extension leads. **E.T.**

Sanyo VHR1100

An intermittent fault on this machine took some time to trace and cure. The machine would sometimes thread up then immediately unthread again, with the head drum turning too slowly. Sometimes during play the drum and capstan would both slow down dramatically to give a screen full of noise and very slurred sound. Any attempt at diagnosis would restore normal operation. We finally found that the cause of the trouble was loss of the subcarrier reference feed at pin 42 of the servo jungle chip IC4001. The feed capacitor C1102 was going open-circuit intermittently. **E.T.**

B and O VHS82·2

The complaint with this new stock machine was no E-E sound and distorted linear (longitudinal) sound playback. The loss of E-E sound was simply due to the fact that the record-level slider controls were set to minimum. Playback from the linear (lo-fi) sound track was weak and unstable, with a background whistle and hum. The problem lay in the audio head record/playback electronic switch, which was failing to earth the top of the head winding during playback. Under subpanel P550 (top of deck, adjacent to the audio head assembly) there are several surface-mounted components. The collector of T7003, which is amongst these, was not soldered to the print. **E.T.**

Sony CCD-F330

The customer brought this machine back the following day, complaining that the autofocus didn't work. Sure enough it didn't — not pilot error as had been suspected. As it's a brand new model (replacing the CCD-V50) the manual hadn't arrived. Nevertheless the autofocus board (AF prefix) was soon found, the fault being traced to a dry-joint on the AF motor connection plug. The number of screening cans in camera heads seems to be increasing: to get to the AF board you have to remove the bottom one, under the lens, and remove the PCB inside to gain access to the screw that holds the bottom half of the can to the frame. With this removed you can get to the AF PCB.

The complaint with another of these machines was of no colour in the E-E and playback modes and, you've guessed it, no autofocusing. We dismantled the camera head and found two joints that had never been soldered on the large FPC: there was also a connector that had not been fitted correctly, half in and half out, between the camera and recorder sections. Having restored colour I delved into the AF PCB and found that the trouble here was a break in FPC135 as a result of which there was no AF on to the PCB. The break had occurred because the FPC had been bent at an adverse angle during assembly and when tightened up it had cracked. Meanwhile the manual had arrived, enabling us to order the part by number — getting it by description could have been tricky.

Less than a week later another of these machines came into the workshop. It was the shop's demonstration model and the complaint was of a ticking noise when the unit was on. It occurred whenever there was drum rotation, as a loom was mislocated and was catching on the bottom of the DD unit. A fair amount of dismantling was again required, just to fit a bit of Himelon which should have been done at the factory! While running the camera on test the picture disappeared. A sharp tap on the side brought it back. Another dry-joint, on the wide FPC. After reassembling it the camera wouldn't switch on due to a moulding fault in the camera standby switching assembly. **N.B.**

Panasonic G Deck

Since my article on the G deck appeared in the September 1988 issue we've had several of the new range of G deck machines (Models NV-G40/G45/G48) with high back-tension. In each case the error has been corrected by replacing the back-tension arm spring with a new one from the Panasonic spares department. The new springs are a different colour, duller and not as silvery in appearance, and are minutely shorter. Only a small number of machines in this range seem to be affected. Note that the back-tension specification has been altered. Measure it with a tentelometer at the beginning of a three-hour cassette: the reading should be between 22·5-27·5g. This applies only to the G mechanism. **N.B.**

Ferguson FV20

These new machines are very popular and have excellent reliability. The fault with this one was no sound. In fact there was just a buzz in the E-E and playback modes but when going through the scart socket into my monitor the sound was o.k. A new r.f. converter put matters right. **N.B.**

Panasonic NV-M7

The drum would sometimes judder and stop while running and intermittently wouldn't start. The drives didn't disappear so it seemed that the DD unit itself was at fault. Fitting a replacement restored correct operation. **N.B.**

Grundig VS180

The fault reported on one of these machines was "spots on play". The spots were confined to the centre of the screen and gave the impression of a tape path fault. When the off-tape f.m. waveform was scoped however it showed that this was not the case. Adjusting the tracking had no effect of course, so I suspected a faulty drum motor. When the motor baseplate was removed the cause of the trouble could be seen — grease had built up on the brushes. When this was cleaned off the spots had gone.

A note in the March 1988 issue reported that leaky capacitors in positions C301 or C305 would result in the reel motors running all the time. In the case I had the capacitor was very slightly leaky and the reel motor rotated only when the on/off switch at the front of the machine was in the off position! **P.B.**

Philips VR6561/6362/6468

Most Philips dealers will by now be dab hands at replacing the rack slider on the current models. It looks a daunting task, but is quite straightforward if you follow the guidelines in the manual. The only tips I would add are as follows. With the deck removed from the machine, use a 9V battery on the control motor to get the mechanism to the position for dismantling. And check that you've got it assembled correctly afterwards! When refitting the top plate I put the pinch roller metal crank into position first then fit the plate, finally using a wire hook to get the belt over the control motor pulley. **P.B.**

Hitachi VT8500

Tape stops while playing is a common fault with these machines. Often it's because the ring magnet that operates the reel rotation sensor is loose or metal debris have stuck to the magnet causing it to jam. **P.B.**

Philips VR6561

If it's powered up without a cassette this machine usually moves the tray in and then out again. With this one the tray moved in and after a few seconds the machine switched off. No, it wasn't a mechanical fault this time: the control motor drive chip IC7251 (L293b) was faulty. **P.B.**

Recent Ferguson VCRs

Here are a few problems we've had with late-model Ferguson VCRs.

Model FV11: Intermittent playback picture — L15 faulty (off pin 13 of IC101). Poor or intermittent tracking — IC2 (VC2023A) faulty. Low gain on high channels — try repositioning the aerial lead that connects the tuner to the aerial splitter.

Model FV12: No functions — ICP1 open-circuit.

Model FV14: No E-E sound — ICP2 on the demodulator panel open-circuit.

Model FV21: Note that early machines have no cover over the mains fuse which is always live. **C.P.**

Ferguson 3V55/3V57

When this machine was plugged into the mains the capstan motor would immediately start up and run for approximately one second. There was no clock display. The on/off LED went on and off correctly when the power button was pressed. If a tape was inserted it would be taken in and down by the carriage, but would then be sent straight out again. Also in the E-E mode all that could be seen on the monitor was hum.

The loss of clock display was due to lack of a reset pulse for the clock/display chip IC202. If this was provided manually, by momentarily shorting across C207, the display would appear correctly. Then in the E-E mode a distorted, low-contrast picture with hum across it would be seen.

All these faults were caused by an open-circuit — not blown — fuse (F2) in the unregulated 18V power supply. When the fuse is open it disconnects one end of the transformer's centre-tapped secondary winding but the bridge rectifier still provides nearly the correct voltage from the other end. In fact with the fuse open-circuit the 18V supply is approximately 16V in standby and 13·5V in the on condition. **I.B.**

Sanyo VTC5600

The capstan motor slowed. We found that there was no pulse input at pin 19 of the CX143 capstan servo chip Q413. This was in turn due to the CX186 drum servo chip Q401 being faulty. **A.D.**

Ferguson 3V29

Uncontrollable and overloaded E-E video and no playback video were caused by a fault in the playback equalising filter EQ201. **A.D.**

Pye DV468/Philips VR6862

This VCR would accept a tape then immediately eject it. The cause of the fault was traced to point 9B3 not being grounded by switch COD3. The switch itself was in order, the trouble being a broken lead at the deck terminal connection. **A.D.**

Sony SLC6

The complaint with this machine was of intermittent noisy rewind — it made a sound like tape chewing. We found that the large fast-forward pulley (item 424) had moved sideways, twisting the fast-forward belt, because of wear in the fast-forward arm assembly. Replacing the arm assembly (item 421) cured the trouble. **A.D.**

Ferguson 3V36/JVC HRD225

This machine functioned correctly apart from the fact that when unthreading the supply spool wasn't driven in order to pull in the tape as the loading arms retract. Now although this model has a reel idler to drive the spools it doesn't have a reel motor. Instead the idler is driven by a pulley which in turn is driven by a belt from the capstan. Whilst unthreading the capstan motor wasn't being driven and we found that in this mode the drive transistor Q206 was without base bias, though the 5·7V bias was present in the play and fast wind modes. A study of the circuit diagram showed that in play the capstan drive comes from the servo chip, in fast wind it comes from the CPU chip IC201 and during unthreading it's switched by the expander chip IC202 (pin 38). This pin was found to be permanently low, all the other ports relating to capstan motor operation being correct. So, having encountered a number of faulty expander chips in this model, I replaced the i.c. This made no difference! Further checks revealed that R272 (10kΩ), a bias resistor in the drive transistor's base circuit, was open-circuit. **J.C.**

ECONOMIC DEVICES PO BOX 15, WOLVERHAMPTON, WV2 4AZ

15/80H	3.30
15/85R	3.30
17052	5.61
17053	5.61
17074	9.30
17089	3.45
17127	2.50
17376	1.58
1N4001	0.04
1N4002	0.06
1N4003	0.06
1N4004	0.05
1N4005	0.05
1N4006	0.08
1N4007	0.07
1N4148	0.03
1N4448	0.05
1N5401	0.14
1N5402	0.15
1N5403	0.16
1N5404	0.15
1N5408	0.35
1N914	0.04
1S1555	0.31
1S44	0.10
1S921	0.10
2N2219A	0.33
2N3053	0.35
2N3054	0.99
2N3055	0.61
2N3442	1.56
2N3702	0.14
2N3703	0.18
2N3705	0.16
2N3706	0.14
2N3707	0.16
2N3711	0.13
2N3771	0.70
2N3772	1.71
2N3773	2.00
2N3819	0.54
2N3823	1.17
2N3904	0.62
2N3908	0.62
2N4101	1.73
2N4240	3.30
2N4444	0.99
2N5293	0.50
2N5294	0.50
2N5296	0.49
2N5297	0.50
2N5298	0.61
2N6109	1.58
2N6130	0.80
2N6133	1.25
2N6180	0.95
2N6292	1.65
2SA1006	1.50
2SA1011	1.65
2SA1015	0.49
2SA1012	1.25
2SA1020Y	0.89
2SA1027R	0.45
2SA473	0.75
2SA766S	4.95
2SC1173Y	1.25
2SC1474	1.25
2SC1509	1.25
2SA1095	3.00
2SA1103	6.55
2SA329	0.40
2SA489	1.17
2SA490	2.25
2SA493	2.25
2SA562	0.57
2SA564	0.75
2SA614	4.88
2SA628	1.14
2SA639S	1.75
2SA659	0.49
2SA673	1.50
2SA684	1.61
2SA697	1.05
2SA699	1.75
2SA715	0.95
2SA748	1.95
2SA817	0.65
2SA835	2.50
2SA836	0.89
2SA844	0.65
2SA872	0.80
2SA884	2.15
2SA937R	0.97
2SA940	1.32
2SA940-2	2.14
2SA950	0.72
2SA951	1.75
2SA966-Y	1.16
2SA999	1.36
2SB774	1.15
2SB185	1.13
2SB375	3.87
2SB400	0.40
2SB405	1.03
2SB511	2.50
2SB54	1.39
2SB546	0.56
2SB56	2.80
2SB618A	2.22
2SB631	1.45
2SB643	0.50
2SB669	3.67
2SB681	3.96
2SB695	1.98
2SB774	0.65
2SB819	1.13
2SC1096	1.16
2SC1104	3.98
2SC1106	4.54
2SC1114	3.25
2SC1116	4.95
2SC1124	1.28
2SC1129	1.65
2SC1131	0.64
2SC1158	3.33
2SC1162	0.55
2SC1172	2.22
2SC1195	3.26
2SC1213	0.89
2SC1226	1.46
2SC1293	0.90
2SC1306	1.98
2SC1317	0.50
2SC1364	0.49
2SC1383	1.20
2SC1391	2.45
2SC1398	0.75
2SC1413A	3.05
2SC1446	1.25
2SC1447	2.07
2SC1475	0.80
2SC1505	1.30
2SC1514	1.69
2SC1573Q	1.25
2SC1583	0.50
2SC1617	3.89
2SC1678	1.98
2SC1741	1.25
2SC1810	1.70
2SC1815	0.45

2SC1826	0.67
2SC1829	2.22
2SC1875	4.50
2SC1893	3.02
2SC1906	0.98
2SC1921	1.37
2SC1923	0.30
2SC1929	2.25
2SC1942	1.65
2SC1959	0.26
2SC1957	1.09
2SC1953	1.93
2SC1962	1.93
2SC1969	2.04
2SC1983	2.21
2SC1985	1.55
2SC2009	0.34
2SC2029	2.33
2SC2028	2.11
2SC2063	0.99
2SC2078	3.11
2SC2073	2.25
2SC2085-Q	1.65
2SC2091	1.30
2SC2141	2.44
2SC2166	1.98
2SC2216	0.69
2SC2233	1.80
2SC2236	1.65
2SC2278	1.69
2SC2314	2.17
2SC2335 + Kit	12.95
2SC2551	1.26
2SC2565	3.92
2SC2570	2.88
2SC2577	1.60
2SC2578	6.75
2SC2671	1.99
2SC288A	1.85
2SC3153	6.84
2SC372	1.40
2SC373	1.16
2SC383	1.33
2SC388	0.50
2SC394V	0.81
2SC403C	0.60
2SC458	0.15
2SC495	0.92
2SC515A	2.85
2SC535	0.79
2SC536	0.45
2SC537	0.54
2SC605L	1.16
2SC620	0.95
2SC643A	1.54
2SC668	0.67
2SC681	4.40
2SC682	1.88
2SC684	1.65
2SC693	0.63
2SC710	0.69
2SC711A	0.50
2SC717	1.28
2SC734	1.43
2SC761-Y	0.95
2SC783	3.98
2SC790Y	1.25
2SC828	0.28
2SC867A	3.84
2SC876	0.96
2SC930	0.54
2SC935	4.13
2SC940	4.68
2SD1128	2.90
2SD1138	0.94
2SD1273	1.56
2SD1453	1.40
2SD152K	2.64
2SD198	4.20
2SD234	0.49
2SD235	0.60
2SD24	2.29
2SD257	1.98
2SD292	2.59
2SD313	2.65
2SD325D	2.26
2SD350	5.20
2SD353	7.50
2SD389	2.41
2SD401	1.40
2SD414	1.98
2SD471	2.13
2SD560	2.95
2SD600	2.98
2SD601R	0.65
2SD613	1.03
2SD636	0.55
2SD639-R	0.72
2SD655	0.98
2SD657	3.50
2SD681A	0.80
2SD731	1.05
2SD773	0.60
2SD811	3.30
2SD823	1.98
2SD837	1.56
2SD841	2.60
2SD856	1.25
2SD857Q	1.84
2SD882	1.15
2SD894	1.75
2SD898	1.85
2SK105H	2.15
7805-T022	0.63
7806	0.85
7812-T022	0.35
7815	0.64
7905	0.80
AC133	0.12
AC127	0.27
AC128	0.34
AC138	0.24
AC141	0.29
AC142K	0.35
AC176	0.30
AC179	0.28
AC183	0.72
AC187	0.39
AC188	0.37
AC188K	0.43
AD140	1.06
AD143	1.93
AD145	1.60
AD161	0.30
AD162	0.30
AF114	2.47
AF115	0.79
AF118	1.20
AF127	0.79
AF139	0.40
AF178	1.45
AF179	0.55
AF180	0.55
AF181	0.53
AF186	0.53
AF239	0.43
AF279	0.88
AN115	3.98
AN155	1.89

AN206	2.58
AN208	3.55
AN210	2.28
AN211	3.25
AN214Q	2.40
AN234	5.92
AN236	3.78
AN240P	1.25
AN241	1.71
AN245	4.50
AN253	1.80
AN260	3.85
AN272	8.25
AN295	5.52
AN301	2.00
AN302	1.93
AN305	3.20
AN315	1.29
AN316	3.50
AN318	4.41
AN320	5.47
AN321	2.25
AN322	5.85
AN331	5.37
AN340P	1.17
AN355	5.98
AN362	1.32
AN370	3.95
AN5111	3.43
AN5120N	4.50
AN5132	5.39
AN5250	4.40
AN5610	5.50
AN5612	2.30
AN5613	4.20
AN5630	3.95
AN5701N	1.66
AN6250	0.33
AN6300	4.40
AN6310	4.54
AN6340	10.14
AN6341	1.43
AN6363	16.00
AN6531	1.95
AN6551	1.35
AN6552	0.68
AN6610	2.40
AN7111	1.25
AN7115	3.38
AN7145	1.68
AN7146	2.05
AN7151	2.37
AN7156	2.85
AN7158	2.34
AN7218	1.64
AN7223	4.25
AU107	3.50
AU110	2.25
AU113	6.40
AY105K	2.08
AY106	1.09
BA524	8.21
BA310	0.14
BA1310	1.98
BA1320	1.38
BA1322	3.95
BA1330	2.75
BA145	0.19
BA148	0.25
BA154	0.40
BA155	0.12
BA156	0.05
BA159	0.08
BA182	0.24
BA222	1.66
BA302	1.24
BA311	1.32
BA312	1.45
BA313	0.76
BA317	0.08
BA318	0.02
BA328	1.65
BA333	1.37
BA335	6.27
BA5102A	2.86
BA511	1.95
BA514	2.20
BA521	2.52
BA524	8.94
BA526	7.98
BA527	2.98
BA532	1.50
BA536	2.05
BA6209	4.55
BA656	1.00
BA7100	11.35
BA841A	28.98
BA843	3.96
BA854	5.76
BAV18	0.21
BAV19	0.11
BAV20	0.35
BAV21	0.12
BAW62	0.11
BAX12	0.48
BAX13	0.11
BAX16	0.11
BC107B	0.18
BC108	0.15
BC109B	0.15
BC113	0.14
BC119	0.36
BC126	0.23
BC132	0.14
BC135	0.14
BC137	0.18
BC138	0.34
BC139	0.20
BC140	0.45
BC141	0.34
BC142	0.23
BC143	0.19
BC147	0.13
BC148B	0.13
BC148C	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC159	0.36
BC160	0.40
BC161	0.28
BC168	0.36
BC169C	0.16
BC170	0.16
BC171	0.11
BC172B	0.27
BC173	0.17
BC174B	0.27
BC177	0.35
BC178	0.26
BC179	0.26
BC182	0.05
BC182LB	0.07
BC183LB	0.26
BC184	0.13
BC184LB	0.25
BC186	0.25
BC187	0.28
BC204	0.16

BC207	0.14
BC212B	0.26
BC213L	0.10
BC214	0.10
BC225	0.40
BC237	0.10
BC238	0.10
BC238B	0.10
BC239B	0.25
BC251A	0.31
BC294	0.50
BC300	0.35
BC301	0.45
BC302	0.53
BC303	1.04
BC307A	0.08
BC308A	0.11
BC309	0.17
BC317A	0.13
BC327	0.15
BC328	0.10
BC337	0.09
BC338	0.10
BC368	0.24
BC440	0.69
BC441	0.44
BC454	0.36
BC460	0.42
BC461	0.35
BC462	1.15
BC463	0.64
BC478	0.22
BC479	0.41
BC532	0.28
BC546	0.08
BC547	0.10
BC548	0.12
BC549	0.10
BC550	0.10
BC556	0.10
BC557	0.10
BC558	0.10
BC559	0.10
BC560C	0.14
BC635	0.36
BC636	0.28
BC637	0.24
BC639	0.20
BC640	0.24
BCX34	0.18
BD115	0.34
BD116	0.70
BD124	1.31
BD131	0.57
BD132	0.20
BD133	0.53
BD135	0.28
BD136	0.26
BD137	0.26
BD138	0.33
BD139	0.28
BD140	0.29
BD144	1.70
BD150	1.25
BD157	0.67
BD160	1.60
BD163	0.71
BD166	0.42
BD175	0.25
BD179	0.45
BD181	0.99
BD182	0.99
BD183	0.99
BD184	1.21
BD187	0.55
BD189	0.69
BD190	0.72
BD201	0.65
BD202	0.60
BD203	1.38
BD204	0.41
BD207	1.79
BD208	0.34
BD222	0.50
BD225	0.48
BD228	0.63
BD229	1.05
BD232	0.50
BD234	0.42
BD237	0.47
BD238	0.39
BD239	0.45
BD240	0.57
BD241	0.39
BD242	0.39
BD243A	0.35
BD243C	0.29
BD244	0.45
BD244C	0.79
BD245C	0.99
BD246C	0.79
BD253	1.05
BD278A	0.60
BD317	2.60
BD318	2.00
BD375	0.42
BD380	0.76
BD410	0.52
BD433	0.47
BD434	0.52
BD435	0.49
BD436	0.80
BD437	0.49
BD438	0.40
BD441	1.42
BD442	1.41
BD509	1.65
BD510	0.62
BD519	0.98
BD529	0.80
BD530	1.18
BD533	0.67
BD534	0.52
BD535	0.45
BD536	0.61
BD537	0.80
BD538	0.80
BD544B	0.83
BD677	0.64
BD679	0.57
BD680	0.76
BD681	1.48
BD696	2.47
BD699	3.49
BD700	3.70
BD707	0.89
BD709	1.05
BD710	0.70
BD809	0.73
BD810	0.69
BD879	0.74
BD895	2.31
BD901	0.99
BD902	0.84
BDW83C	1.45
BDX32	1.75
BDX53A	1.25
BDX53B	1.85

BDX54B	2.16
BDX62A	2.15
BDX63A	1.96
BDY20	1.21
BDY81	1.05
BF115	0.40
BF117	0.66
BF118	0.67
BF121	0.25
BF123	0.21
BF127	0.13
BF137	0.29
BF153	0.58
BF154	0.26
BF157	0.33
BF158	0.18
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.34
BF177	0.35
BF178	0.40
BF179	0.36
BF180	0.36
BF181	0.32
BF182	0.34
BF183	0.39
BF184	0.40
BF185	0.39
BF194	0.14
BF195	0.14
BF196	0.17
BF197	0.18
BF198	0.17
BF199	0.17
BF200	0.37
BF218	0.36
BF224	0.17
BF237	0.65
BF240	0.17
BF241	0.15
BF245	0.50
BF245B	0.49
BF246A	2.52
BF255	0.20
BF256	0.38
BF257	0.34
BF258	0.36
BF259	0.34
BF262	*0.28
BF263	0.57
BF271	0.34
BF273	0.20
BF274	0.20
BF324	0.35
BF336	0.33
BF337	0.45
BF338	0.36
BF355	0.49
BF362	0.62
BF363	0.50
BF371	0.50
BF391	0.25
BF417	0.84
BF418	1.87
BF422	0.30
BF423	0.27
BF450	0.35
BF451	0.29
BF457	0.41
BF458	0.33
BF459	0.52
BF460	1.45
BF469	0.22
BF470	0.55
BF471	0.33
BF472	0.33
BF479	0.35
BF480	1.38
BF491	2.20
BF506	0.43
BF532	0.45
BF596	0.18
BF597	0.27
BF694	0.22
BF757	0.59
BF759	0.47
BF761	1.05
BF762	0.50
BF869	0.47
BF870	0.30
BF959	0.42
BF960	0.57
BF970	0.39
BFR39	0.44
BFR61	0.92
BFR62	0.50
BFR79	0.29
BFR81	1.65
BFR86	1.08
BFR88	0.77
BFR90A	1.05
BFX29	0.34
BFX84	0.37
BFX85	0.41
BFX86	0.36
BFX87	0.56
BFX88	0.34
BFX89	1.15
BFY50	0.30
BFY51	0.25
BFY52	0.27
BFY79	0.49
BFY90	0.61
BLY49	2.20
BR100	0.29
BR101	0.65
BR103	0.55
BR303	1.15
BRC84	2.08
BRX44	0.60
BRX49	0.67
BRY39	0.69
BSS38	0.87
BSTB0140G	5.25
BSTC0246	6.99
BSTC0233	7.25
BSTCC0143	3.07
BSTD1043	2.85
BSV57B	3.49
BSW68	0.60
BSX19	1.29
BSX20	0.30
BSY52	0.50
BSY79	0.51
BT108	1.45
BT119	1.76
BT120	2.17
BT121	2.48
BT123	1.98
BT151-800R	0.89
BTT6018	2.42
BU106	2.48
BU108	1.50
BU109	2.65
BU110	5.69
BU125	2.48
BU126	1.45
BU137	6.53

BU205	1.15
BU206	1.27
BU207	1.65
BU208	1.20
BU208/02	1.97
BU208A	1.12
BU208D	1.95
BU209	1.50
BU226	2.45
BU326	2.00
BU326A	2.20
BU406	1.49
BU406D	1.79
BU407	0.82
BU412	5.29
BU426A	1.13
BU500	1.45
BU508A	1.25
BU536	1.65
BU608	1.80
BU705	2.95
BU806	1.79
BU807	0.80
BU825A	1.95
BUW84	1.39
BUX84	1.00
BUX85	1.10
BY126	0.13
BY127	0.08
BY133	0.12
BY164	0.44
BY176	0.52
BY179	1.08
BY182	0.95
BY187	0.77
BY189	1.79
BY198	1.62
BY207	0.22
BY208	0.46
BY210-400	0.19
BY210-600	0.27
BY210-800	0.30
BY218	1.64
BY223	1.23
BY224-600	1.88
BY226	0.25
BY227	0.20
BY228	0.60
BY229-1000	1.12
BY229-600	0.92
BY255	0.66
BY295-600	1.03
BY298	0.36
BY299	0.45
BY407	0.90
BY409	1.49
BY448	1.35
BY713	0.65
BYW56	0.14
BYX55-600	0.23
BYX71-600	0.85
BYX71-350	0.72
BYY56	1.20
BZY93C30	1.86
BZY88 RANGE	0.10
BZX61 RANGE	0.18
BZX79 RANGE	0.10
C106D	0.46
C106M	0.76
CA3046	1.55
CA3089	0.83
CA3090AQ	3.25
CA3094	2.20
CA3131EM	2.95
CD4001	0.34
CD4002	0.27
CD4008	1.35
CD4011	0.29
CD4012	0.24
CD4013	0.33
CD4016	0.46
CD4017	0.82
CD4020	1.23
CD4021	0.39
CD4023	0.28
CD4025	0.64
CD4028	0.84
CD4040B	0.85
CD4047	1.06
CD4049	0.24
CD4052	0.75
CD4066	0.29
CD4069	0.29
CD4070	0.26
CD4081	0.35
CD4093	0.72
CD4511	1.10
CD4528	2.04
CD4556	1.47
CR02AM-8	1.70
CV12E	4.08
CX0950	3.14
CX104	9.64
CX108	12.48
CX109	7.86
CX130	8.76
CX134	12.32
CX136	11.49
CX139	11.83
CX157	5.52
CX158	5.50
CX177	6.46
CX187	6.84
CX755	12.95
CX885A	6.85
E1222	0.40
E5024	0.28
E5386	0.25
GD243	4.34
GF758	0.84
HA11215	1.75
HA11211	2.53
HA11225	1.12
HA11229	1.96
HA11235	1.47
HA11124	5.25
HA1125	1.17
HA1137W	1.26
HA1138	5.03
HA11414	5.65
HA1156	0.80
HA1160	4.78
HA1166X	6.43
HA1167	6.45
HA11706	3.61
HA11705	5.00
HA11703	3.84
HA11701	2.98
HA11710	3.13
HA11713	9.75
HA11711	7.50
HA11715	3.25
HA11714	9.75
HA11716	13.10
HA11725	18.26
HA11725MP	16.00
HA117555P	6.23
HA11781	19.90
HA1180	5.15

HA1196	7.43
HA13001	1.73
HA1306	2.26
HA13402	7.87
HA13342	2.65
HA13365	4.02
HA1366WR	1.51
HA1367	2.75
HA1368R	2.45
HA1368	1.76
HA1370	3.30
HA1374	4.80
AA117	9
HA1377	1.75
HA1389R	2.05
HA1389	2.39
HA1392	2.17
HA1394	1.95
HA1397	2.17
HA1398	2.29
HA1406	1.30
HA1452	0.85
HD14538	2.07
HD38702-A2	7.95
HD38750A53	10.44
HD38750A-7	7.25
HD38800A50	14.09
HD44801A05	19.98
HISH1010	8.59
HISH1004	6.00
HISH1002	9.50
HM6231	9.81
HM6232	5.25
HM6251	5.25
HM7103	4.85
HM9032	9.98
HM9012	3.22
HM9015	3.24
HT4207	17.16
HT4208	20.65
KA2101	2.92
KC581C	7.60
KC582C	3.97
L200CV	1.69
LA1201	0.75
LA1210	1.33
LA1230	1.05
LA1320	2.87
LA1357N	11.07
LA1363	1.05
LA1364	3.02
LA1365J	2.08
LA1385	1.53
LA1387	5.95
LA3350	1.00
LA3361	0.91
LA3390	5.52
LA4032P	1.40
LA4100	0.87
LA4101	0.94
LA4102	0.75
LA4112	0.56
LA4125	1.88
LA4138	4.55
LA4140	0.70
LA4192	1.55
LA4220	1.04
LA4420	1.35
LA4422	1.72
LA4430	1.29
LA4440	1.81
LA4445	3.95
LA4460	1.47
LA4461	2.95
LA5112N	1.16
LA7020	13.86
LA7025	11.97
LA7027	10.92
LA7040	9.20
LA7042	3.90
LA7800	1.00
LA7801	1.30
LB1274	3.61
LC7800	9.20
LD3120	1.13
LD3150	2.75
LM1017N	1.75
LM1877	13.43
LM2808	6.25
LM2877	7.45
LM317CKC	1.08
LM324N	0.98
LM339N	0.35
LM340K	11.85
LM348N	2.15
LM380N	2.80
LM384N01	3.25
LM567CN	1.71
LM6402/011	10.23
LM6402A093	10.15
LM748	0.69
LM8360	3.87
LM8361	3.57
LR3419	9.37
LR3471	9.37
LU1141	7.27
LU52012	5.95
LU52011	14.95
LU03112	12.37
M193	6.83
M21C	1.13
M23C	1.98
M293	6.95
M51102L	1.86
M5115P	5.24
M51203L	3.15
M51231P	0.95
M5134-9341	4.13
M51353P	5.25
M51381P	5.45
M51393AP	9.35
M51394P	14.05
M5142P	6.85
M5144P	2.97
M51513L	1.56
M51515BL	2.15
M51517L	1.61
M5192	2.20
M5194AP	5.74
M5231L	1.95
M53274P	1.33
M54532P	1.88
M54544L	3.45
M58478P	8.77
M58485P	14.25
MA06	1.07
MA8001	0.82
MA8003	1.16
MB3705	1.44
MB3712	1.00
MB3713	1.69
MB3730	2.09
MC13002	3.60
MC1310P	0.58
MC1327P	0.40
MC1330P	1.91
MC1350P	1.66

MC1351P	2.96
MC1352P	2.50
MC1357P	2.15
MC1358P	1.35
MC14001	2.40
MC14013	0.41
MC14493P	7.65
MC14494P	2.15
MC14497	3.46
MC14510BAL	3.75
MC14511BCP	1.10
MC14528BCP	2.15
MC1712	3.88
MC5192	19.50
MC7724CP	3.49
MC7818C	2.18
MCR106-5/6	0.95
MCR220/7	2.28
ME0411	0.28
ME6002	0.26
ME6102	0.28
ME8001	0.34
ME0411	0.75
MJ2501	3.30
MJ3001	1.76
MJ481	1.53
MJ802	4.90
MJE2955	1.89
MJE3055	1.25
MJE340	0.49
MJE520	0.49
ML231	3.33
ML232B	3.01
ML237B	2.51
ML238	5.77
ML923	3.00
ML926	3.98
MM5314N	8.99
MM5316N	9.16
MM5318N	3.11
MM5369N	2.01
MM5387AA/N	6.20
MM5841N	6.64
MN1400VL	13.65
MN1405	12.50
MN1435VX	12.40
MP1192	5.07
MP2794	4.00
MP2812	5.07
MP8512	1.57
MPC596	2.13
MPF256C	0.60
MPS6570	0.48
MPSA42	0.65
MPSA56	0.27
MPSA92	0.72
MPSU05	0.86
MPSU10	1.45
MPSU56	0.78
MPSU60	1.98
MR818	0.33
MR854	0.85
MR914	1.20
MSM5816RS	17.35
MSM5840H	15.15
MVS460-02	0.61
NE542	2.65
NE555	0.16
NE556	0.65
NP1106	7.25
OA202	0.11
OA47	0.16
OA91	0.14
OA95	0.13
OC28	2.95
OC29	2.15
OC36	1.28
OC44	0.35
OC45	0.18
OC72	0.44
OC75	0.44
ON236	1.06
ON782	1.98
OT121	1.45
PT6042	2.45
PT8504	4.98
R1038	2.19
R1039	2.19
R2008B	1.33
R2009	1.98
R2010B	1.33
R2029	1.33
R2030	1.33
R2257	3.71
R2265	1.49
R2305	1.18
R2322	0.59
R2323	0.76
R2354A	2.01
R2354B	2.01
R2443	0.88
R2461	1.50
R2540	1.91
R2540X	3.30
R2615	0.67
RCA2060	2.00
RGP01-15	1.65
RGP10	0.30
RGP30M	0.28
RT402	1.58
RT905A	2.38
S1299	5.34
S2800D	5.54
S2802	3.47
S2818	0.85
S3702S	6.15
S40W	18.64
S6080B	8.80
SA8063	5.17
SAA1006	1.85
SAA1020	4.76
SAA1025	4.40
SAA1024	2.81
SAA1075	4.25
SAA1121	7.44
SAA1124	3.30
SAA1130	4.99
SAA1174	7.77
SAA1250	4.15
SAA1251	3.20
SAA1351	8.11
SAA3027P	2.55
SAA5000	2.50
SAA5010	4.40
SAA5012	5.50
SAA5020	5.78
SAA5030	8.25
SAA5050	7.74
SAB1009B	5.98
SAB3011	7.34
SAB3013	3.76
SAB3021	7.98
SAB3024	6.36
SAB3209	5.82
SAB3210	3.10
SAF1032P	3.58
SAF1039	2.95
SAS5010	8.39
SAS560S	1.86

SAS560T	5.42
SAS570T	5.42
SAS570S	2.61
SAS580	2.25
SAS6600	1.33
SAS660	2.97
SAS6700	1.33
SAS670	3.96
SAS6710	2.21
SBA750	1.61
SC84203	19.35
SC9504P	1.46
SDA2006	17.95
SDA2112/2	12.85
SG264A	6.45
SG613	10.75
SG629	8.27
SG6533	11.96
SI1125H	7.50
SI1225HD	18.35
SI1630HD	20.50
SKE2F1/04	1.39
SKE2G3/04	0.85
SKE4F1/06	0.35
SKE4F2/08	1.07
SKE4F2/08	0.44
SKE4F2/10	1.24
SKE4G2/02	0.96
SKE5F3/10	1.60
SKS1/10	2.15
SL1310	3.14
SL1430T	0.89
SL414	3.69
SL432A	3.44
SL439	2.48
SL471	2.50
SL480	3.98
SL490	1.25
SL901B	6.95
SL918A	9.07
SN16861ANO	1.95
SN16862AN	2.98
SN16966N	10.25
SN29717N	7.19
SN29716N	3.66
SN29715N	6.04
SN29722	11.95
SN29723AN	8.77
SN29764AN	1.65
SN29767	4.90
SN29770BN	1.95
SN29772BN	4.91
SN29771BN	1.65
SN29791	2.98
SN29798N	5.56
SN2709	0.44
SN7400N	0.34
SN7401N	1.45
SN7402N	0.65
SN7404N	0.52
SN7408N	0.27
SN7410N	0.27
SN74121	1.60
SN7413N	0.74
SN74141N	2.65
SN74151AN	1.51
SN74154N	1.27
SN74190	1.35
SN7420N	0.55
SN7430	0.49
SN7440N	0.27
SN7472	1.54
SN7474N	0.44
SN7490AN	0.93
SN74LS26N	1.45
SN76001N	1.65
SN76013ND	3.50
SN76023N	2.75
SN76023ND	3.96
SN76033N	3.65
SN76110N	1.13
SN76115AN	1.61
SN76131	1.92
SN76227N	0.85
SN76226DN	2.00
SN76228N	3.27
SN76242	8.95
SN76243	8.50
SN76396	2.90
SN76533N	2.47
SN76532N	0.95
SN76545	1.95
SN76546N	3.30
SN76549	2.59
SN76570	3.08
SN76611	2.59
SN76620	2.59
SN76660N	2.48
SN76666N	1.20
SN76708	4.86
SN76709N	3.38
SN76707N	5.11
SN76705N	6.00
SN76730	6.00
SN76810N	0.60
SN76832N	1.35
SN94041	5.54
SN94042	5.54
SP8385	8.45
SPS5384	1.98
ST1702L	0.99
STA401	6.76
STA441C	3.00
STA471C	7.95
STK0029	3.33
STK0050	5.63
STK016	8.45
STK022	5.25
STK031	12.95
STK040	13.34
STK054	7.13
STK058	27.50
STK077	5.96
STK1039	5.10
STK2110	7.33
STK2145	16.95
STK2240	16.65
STK2250	18.95
STK3042	4.95
STK3044	5.75
STK4019	4.50
STK433	6.25
STK4332	4.30
STK435	4.93
STK4352	1.95
STK436	3.95
STK437	5.62
STK4372	11.15
STK460	7.02
STK466	11.77
STK4833	10.95
STK501	5.28
STK502	7.25
STK5314	12.40
STK5730	2.99
STK7216	14.50
STK772	6.95
STR1096	4.98
STR4090	10.55

STR440	4.78
STR451	5.36
STR453	8.16
STR454	4.95
STR6020	5.25
T6029V	5.75
T6035V	0.73
T6036	0.67
T6037	2.11
T6044V	0.97
T6045	1.20
T6049	1.45
T6052V	0.87
T6058	3.08
T6059	2.77
T9003V	1.25
T9005V	2.38
T9011V	1.40
T9013V	4.95
T9014V	2.42
T9016	1.02
T9019W	1.98
T9034V	1.45
T9035V	1.95
T9051	6.95
T9054V	5.34
T9057V	0.70
T9062V	0.49
T9064	1.25
TA7027	4.80
TA7050	1.74
TA7051	1.74
TA7054	0.80
TA7060AP	0.71
TA7061AP	1.27
TA7069	3.13
TA7070P	1.83
TA7072P	2.57
TA7074P	1.98
TA7076P	7.80
TA7089P	2.82
TA7092P	8.65
TA7093P	3.99
TA7102P	5.88
TA7108P	1.61
TA7109	3.71
TA7122B/P	0.92
TA7124P	2.34
TA7129P	1.50
TA7130P	0.63
TA7136AP	1.89
TA7137P	0.73
TA7141AP	3.87
TA7146	2.50
TA7146P	4.23
TA7148P	1.67
TA7149P	3.26
TA7152P	2.72
TA7161P	4.50
TA7162P	3.61
TA7172P	1.41
TA7176P	1.54
TA7193P	3.84
TA7204P	2.16
TA7206P	12.49
TA7207P	2.34
TA7208P	1.12
TA7210P	1.45
TA7214P	3.63
TA7215P	2.07
TA7217AP	1.45
TA7222	1.12
TA7226	3.57
TA7229P	2.13
TA7230P	1.30
TA7233P	1.67
TA7240AP	3.55
TA7245P	3.55
TA7310P	0.94
TA7313AP	1.36
TA7314	1.90
TA7323P	3.15
TA7325P	0.61
TA7339P	1.85
TA7340P	5.95
TA7607AP	2.10
TA7609	2.65
TA7611AP	2.32
TA7616P	5.25
TA7622AP	8.94
TA7628P	2.50
TA7629P	7.50
TA7630P	0.95
TA7640AP	1.08
TA7672P	2.55
TA7676P	2.81
TA7726P	12.50
TAA320A	1.27
TAA350A	6.45
TAA570	1.85
TAA621AX1	4.85
TAA621A12	2.14
TAA661B	2.62
TAA691	8.58
TAA700	2.3T
TAA930	4.87
TAA970	2.83
TAG625-600	1.20
TBA120AS	0.69
TBA120SB	1.05
TBA120T	0.97
TBA120U	0.62
TBA120A	1.05
TBA1440	1.78
TBA1441	1.62
TBA240A	2.65
TBA395	1.10
TBA395Q	1.10
TBA396	1.20
TBA400	2.39
TBA440C	2.34
TBA480Q	1.30
TBA510	2.11
TBA520	1.15
TBA520Q	1.68
TBA530	1.30
TBA530	1.30
TBA540	1.15
TBA540Q	1.15
TBA560C	1.40
TBA560CQ	1.60
TBA570Q	1.35
TBA570A	1.71
TBA651	0.87
TBA673	2.60
TBA700	1.85
TBA720	3.50
TBA730	3.55
TBA750Q	2.90
TBA760	1.71
TBA800	0.92
TBA810S	1.61
TBA810T	1.50
TBA810AS	1.00
TBA820	1.52
TBA820M	0.82
TBA890	2.50
TBA920	1.53
TBA920Q	2.31

TBA940	1.87
TBA950	1.84
TBA970	3.56
TBA990	1.98
TBA990Q	1.68
TCA270Q	1.86
TCA270S	0.95
TCA270SQ	1.05
TCA290A	2.39
TCA420A	2.16
TCA440	2.25
TCA530	2.24
TCA640	2.25
TCA650	3.05
TCA660B	2.60
TCA730	3.81
TCA750	2.25
TCA800Q	6.95
TCA830S	2.38
TCA890	5.44
TCA900	2.04
TCA910	2.04
TCA940	2.47
TCA940E	2.93
TD3F800R	3.66
TD3F900H	4.16
TD62706P	4.50
TDA1001B	2.31
TDA1003A	2.25
TDA1005A	2.38
TDA1006A	2.11
TDA1010AF	4.25
TDA1011	0.95
TDA1010	1.28
TDA1011A	1.03
TDA1028	2.45
TDA1034B	2.42
TDA1035S	2.95
TDA1035T	1.85
TDA1037	1.95
TDA1037D	2.05
TDA1044	1.95
TDA1047	3.25
TDA1059B	0.98
TDA1054M	1.35
TDA1060	2.60
TDA1082	3.25
TDA1151	1.22
TDA1190	2.11
TDA1190Z	3.96
TDA1200	1.51
TDA1235	3.88
TDA1236	4.30
TDA1270	3.55
TDA1327A	1.33
TDA1412	0.92
TDA1420	2.55
TDA1440	3.45
TDA1470	2.90
TDA1470P	4.25
TDA1506	7.85
TDA1510	4.60
TDA1512	3.69
TDA1515	2.60
TDA1559	3.15
TDA1670	4.48
TDA1770	6.85
TDA1905	1.27
TDA1908	2.98
TDA1940	1.95
TDA1950	2.95
TDA2005	1.45
TDA2006	1.32
TDA2004	1.48
TDA2002	0.69
TDA2003	1.00
TDA2030	1.45
TDA2140	1.68
TDA2150	6.20
TDA2151	2.07
TDA2160	4.01
TDA2161	1.85
TDA2170	2.88
TDA2270	2.25
TDA2520	2.37
TDA2522	3.46
TDA2524	4.50
TDA2521	3.71
TDA2525	3.80
TDA2532	0.82
TDA2530	2.55
TDA2541	1.88
TDA2540	0.66
TDA2545Q	5.94
TDA2560	0.76
TDA2575A	0.50
TDA2578A	2.57
TDA2576A + Kit	12.35
TDA2581	1.60
TDA2582	1.80
TDA2591	2.50
TDA2594	3.40
TDA2593	2.47
TDA2595	1.69
TDA2600	5.60
TDA2611AQ	2.98
TDA2612Q	4.68
TDA2611A	1.05
TDA2610	3.08
TDA2620	2.15
TDA2630	1.96
TDA2631	2.73
TDA2640	2.95
TDA2652	13.45
TDA2653	2.95
TDA2654	6.18
TDA2670	2.54
TDA2680	3.20
TDA2740	6.00
TDA2780AQ	5.14
TDA2795	2.78
TDA2791	2.5
TDA2910	13.25
TDA3300B	6.98
TDA3330	2.95
TDA3506	4.40
TDA3501	7.25
TDA3500	4.25
TDA3510	5.95
TDA3520	9.71
TDA3540	6.99
TDA3541	2.22
TDA3560	4.25
TDA3571Q	2.83
TDA3576	7.48
TDA3590	5.79
TDA3591	6.45
TDA3650	5.90
TDA3652	2.60
TDA3651AQ	3.95
TDA3651	2.95
TDA3651A	2.96
TDA3950	4.50
TDA4050B	3.95
TDA4280	5.95
TDA4290	4.47
TDA4400	2.27
TDA4420	2.55
TDA4422	3.65
TDA4427S	9.00

TDA4431	2.27
TDA4440	3.26
TDA4442	4.15
TDA4500	4.75
TDA4600-2	2.10
TDA4610	6.88
TDA4620	4.78
TDA5500	6.20
TDA5700	2.75
TDA7270S	2.25
TDA8190	2.75
TDA9403	3.15
TDA9503	1.95
TDA9513	3.15
TDB1033	2.68
TDE1081	7.05
TEA1002	2.30
TEA1009	1.50
TEA1014	2.50
TEA1020SP	8.21
TIC106C	0.61
TIC106M	0.77
TIC44	0.72
TIC45	0.50
TIC47	0.35
TIP120	1.06
TIP110	0.45
TIP112	0.54
TIP117	0.50
TIP121	0.50
TIP126	0.73
TIP132	0.99
TIP137	1.50
TIP29	0.84
TIP2955	0.95
TIP29A	0.46
TIP29B	0.63
TIP29C	0.40
TIP29D	0.75
TIP3055	0.75
TIP30A	0.41
TIP30C	0.16
TIP31A	0.34
TIP31B	0.38
TIP31C	0.50
TIP32A	0.35
TIP32B	0.69
TIP32C	0.40
TIP33	0.85
TIP33A	1.05
TIP33C	0.80
TIP34	0.50
TIP41A	0.49
TIP41B	0.65
TIP41C	0.25
TIP42A	0.49
TIP42B	0.53
TIP42C	0.25
TIP47	0.37
TIS43	1.43
TIS90	0.28
TL011CP	0.95
TL494CN	8.95
TLD72CP	2.55
TMP4320	15.00
TMS1024NLL	13.75
TMS1025N	16.95
TMS3720ANS	5.25
TMS3748NS	14.95
TMS3755	13.65
TMS3894NL	19.25
TMS5102NLL	6.25
TUA2000	8.98
TY6010B	2.97
ULN2204	8.50
UPA53C	4.94
UPC1003	5.95
UPC1009C	8.95
UPC1025H	2.20
UPC1028H	0.86
UPC1032H	0.62
UPC1042C	8.95
UPC1156H	1.45
UPC1161C	4.98
UPC1182H	1.50
UPC1186H	0.79
UPC1181H	1.03
UPC1185H	2.10
UPC1188	7.40
UPC1212C	1.72
UPC1225H	3.25
UPC1230	1.78
UPC1238	1.15
UPC1278H	2.15
UPC1351C	1.81
UPC1350C	1.00
UPC1353	1.40
UPC1355C	2.13
UPC1363	1.00
UPC1362	2.64
UPC1365C	1.65
UPC1366	2.25
UPC1360C	4.51
UPC1378H	1.25
UPC141C	4.95
UPC1458	3.34
UPC151C	2.95
UPC2002	1.48
UPC30C	2.51
UPC324C	4.17
UPC32C	5.25
UPC339C	4.35
UPC41C	4.10
UPC4558C	2.15
UPC474	5.11
UPC554C	1.21
UPC575C2	0.77
UPC580C	2.85
UPC587C2	1.34
UPC592H	2.15
UPC595	1.15
UPC596	1.80
UPD1514C	4.76
UPD2819C	4.98
UPD4013B	4.00
UPD4066B	4.95
UPD553-164	19.52
UPD8049C-1	11.50
X0022CE	5.75
X0029CE	7.09
X0031CE	4.95
X0035TA	5.98
X0040TA	4.50
X0042CE	4.35
X0043CE	2.75
X0056CE	6.25
X0057GE	6.00
X0062CE	8.35
X0065CE	4.60
X0074GE	10.00
X0077GE	15.96
X0079CE	4.95
X0092CE	4.95
X0096CE	5.95
X0109CE	11.25
X0113CE	2.07
X0195CE	7.50
X0204CE	8.74
X0261CE	8.75
ZPY120	3.25

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★ HIGH QUALITY VIDEO SPARES ★
(FAST EX-STOCK)

Make / Part Nos.	Head
AKAI	
Machine Nos.: VP77 VP88 VP7100 VP7200 VS1 VS2 VS3 VS5 VS10 VS9300 VS9500 VS9700 VS-P1 VS-P5	VHS P
AMSTRAD	
Machine Nos.: VCR4500 VCR5200	VHS T
Machine Nos.: VCR7000	VHS R
VCR4600 VCR9000	VHS T
FERGUSON/JVC	
Machine Nos.: 3292 8903 3V00 3V01 3V06 3V16 3V22 3V23 3V24 3V29 3V30 3V31 3V35 3V36 3V38 3V39 3V49	VHS A
FISHER	
Machine Nos.: FVH — D520 D530 D620 D720 P420 P510 P520 P530 P615 P620 P622 P710 P720 P721 P722	VHS U
GEC	
Head Part Nos.: 5458161 5458165 Machine Nos.: 4000H 4001H 4002H	VHS I
Head Part Nos.: 5458282 5458413 5458415 5458992 Machine Nos.: 4001H 4004H	VHS K
HITACHI	
Machine Nos.: VT3000	VHS A
Head Part Nos.: 5458104 Machine Nos.: VT4000 VT4200 VT5000 VT5500	VHS H
Head Part Nos.: 5458161 5458165 Machine Nos.: VT6500 VT7000 VT8000 VT8040 VT8100 VT8500 VT8700 VT9000 VT9300 VT9500 VT9700 VT9900	VHS I
Head Part Nos.: 5458282 5458413 5458415 5458992 Machine Nos.: VT11 V14 VT33 VT34 VT330 VT340 VT5030 VTP10 VTP30	VHS K
ITT	
Machine Nos.: VR3605 VR3033 VR3905 VR3913 VR3914 VR3935 VR3943 VR3963 VR3993 VR3975 VR3985 VR3986 VR3833	VHS A
JVC (see also Ferguson)	
Machine Nos.: HP4000 HR2200 HR3300 HR3320 HR3330 HR3350 HR3360 HR3660 HR3750 HR3860 HR4100 HR7200 HR7600 HR7610 HRD110 HRD111 HRD120 HRD121 HRD140 HRD150 HRD220 HRD225	VHS A
MITSUBISHI	
Machine No.: HS200	VHS A
HS7008	VH700
NATIONAL PANASONIC	
Head Part Nos.: VEH0099 0103 0115 0121 0131 Machine Nos.: NV300 NV322 NV332 NV333 NV340 NV390 NV2000 NV3000 NV7000 NV7200 NV7500 NV7800 NV7850 NV8170 NV8200 NV8400 NV8600 NV8610 NV8620	VHS B
Head Part Nos.: VEH0171 VEH0218 Machine No.: NV370 NV3708	VHS M
Head Part Nos.: VEH0171 Machine No.: NV330 NV777	VHS N
Head Part Nos.: VEH0286 Machine No.: NV430	VHS W
Head Part Nos.: VEH0174 Machine No.: NV366	VHS X
SHARP	
Head Part Nos.: DDRMU 0002 HE17/21/27 Machine No.: VC581/2/3 651 681/2/3/5 659 699	VHS S
Head Part Nos.: DDRMU 0001 HE00 0002 HE02 04 05 06 Machine No.: 2C9 VC110 VC200 VC220 VC300 VC381 VC384 VC386 VC387 VC388 VC477 VC481 VC482 VC930 VC970 VC3300 VC9100 VC9300 VC9400 VC9500 VC9600 VC9700	VHS C
Head Part Nos.: DDRMU 0001 HE09 Machine No.: VC7300 VC7700 VC7750	VHS D
Head Part Nos.: DDRMU 0001 HE10 Machine No.: VC6300	VHS E
Head Part Nos.: DDRMU 0001 HE12 Machine No.: VC8300	VHS L
Head Part Nos.: DDRMU 0001 HE14 Machine No.: VC2300	VHS F
SANYO	
Head Part Nos.: 1430242 T01700 1430242 T22300 Machine No.: VTC5000 VTC5150 VTC5300 VTC5400	BETA D
Head Part Nos.: 1430242 T02200 Machine No.: VTC5350 VTC5500	BETA D
Head Part Nos.: 1430762 T02000 Machine No.: VTC9300 VTC9455 VTC9500	BETA X
Head Part Nos.: 143072 T02100 Machine No.: VTC9300PS VTC9350	BETA X
SONY	
Head Part Nos.: A6762 044A, 044B, 054A, 147A Machine No.: SL3000, 8000, 8080, SLT 6Me, 7, 7E, 7ME	BETA A
Head Part Nos.: A6762 012A, 038A, 055A, 129A Machine No.: SL5W, 5000 5100 SLC5, C6, C7	BETA B
Head Part Nos.: A6762 072A, 122A, 136A, 139A, 213A Machine No.: SLC20, C30, C33, C40, C44 SLF1, F30, HF72, HF100, T20, T30	BETA W

HEADS

Head Part No.	Price 1 +
BETA A	£24.50
BETA B	£22.50
BETA D	£39.50
BETA E	£42.95
BETA T	£30.85
BETA W	£28.99
BETA X	£39.50
VHS VIDEO	
VHS A	£21.50
VHS B	£21.50
VHS C	£26.95
VHS D	£83.00
VHS E	£76.38
VHS F	£83.10
VHS H	£25.99
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VHS L	£82.95
VHS M	£25.99
VHS N	£35.99
VHS P	£25.99
VHS R	£26.95
VHS S	£26.95
VHS T	£25.99
VHS U	£26.95
VHS V	£35.99
VHS W	£28.25
VHS X	£42.35
ORIGINAL FERGUSON	
01X0 003 222	£31.35
01X0 027 085	£46.02
01X0 033 825	£47.05
01X0 040 002	£48.32
01X0 056 013	£61.55
01X0 057 002	£31.36
01X0 082 001	£46.02
01X0 083 063	£66.03
PHILIPS	
310 274 44	POA
691 200 54	£49.68
691 200 98	£62.02
691 201 12	£61.66
691 201 66	£61.93
691 201 78	£49.96
691 202 87	£55.37

FERGUSON/JVC			
VID1	01X0-003-381	Tension band T3292/PU545904A	2.55
VID2	01X0-018-024	Take up idler T3292/PU47752	5.00
VID3	01X0-018-025	Rewind idler assembly T3V16/PU49282	6.20
VID4	01X0-018-729	Take up idler T3V00/PU49280	6.95
VID5	01X0-040-006	Loading belt T3V29/30/PU48941-2	0.50
VID6	01X0-033-454	Roller Assy. (cass. Housing) T3V23/PU49042	4.50
VID7	01X0-040-007	Take up idler 3V29/30/PU48967B	2.90
VID8	01X0-040-017	Reel motor assembly 3V29/30/PU51381V	27.95
VID9	01X0-065-009	Capston motor 3V35/36/38/39/PU55371V	27.00
VID10	01X0-065-016	Cass. housing Assy. 3V35/36/38/39/PU29825	27.00
GEC/HITACHI			
VID11	V5577355	GEC 4100/Hitachi VT11E capston motor	21.90
VID12	V6413663	GEC 4000/Hitachi VT33 f/f rewind arm	2.10
VID13	V6861471	GEC 4001/2/Hitachi 93/9500 f/f rewind arm	1.70
VID14	V6861482	GEC 4001/2/Hitachi 93/9500 play idler assy.	4.75
VID15	V6886971	GEC 4004/Hitachi VT33 f/f rewind arm	1.80
VID16	V2423461	ET541 Tuner Unit	21.90
NATIONAL PANASONIC			
VID17	VXP0329	Fast forward idler NV2000	0.85
VID18	VXP0344	Idler NV7000/7200	0.85
VID19	VXZ0078	Tension Band NV7000	2.95
VID20	VXP0521	Idler NV370	2.50
VID21	VXP0463	Reel Idler NV777	3.25
VID22	VXP0432	Pinch Roller NV333	8.50
VID23	VXP0401	Idler wheel NV333	0.90
SANYO/FISHER			
VID24	4529V10800	Reel motor VTC5000/5150	8.00
VID25	1430662T01201	Reel drive pulley	5.00
VID26	PR2758	Pinch roller VTC5000/5150	3.85
VID27	1430490400900	Gear idler Fisher FVH-P615	6.50
VID28	1430420400300	Heart idler Fisher FVH-P615	6.05
SHARP			
VID29	RMOTP1029	Capston motor 73/9300	33.55
VID30	RMOTV1008	Reel motor VC9700	16.85
VID31	NIDL0006	Idler VC387H etc	1.95
VID32	NIDL0005	Reel idler VC9300 etc	1.85
VID33	NIDL0004	Idler wheel VC2300	1.60
VIDEO LAMPS/BULBS			
VID34	LA9292	Universal lamp without socket 290mm	0.45
VID35	LA9210S	Universal lamp with socket 310mm	0.75
VID36	NAT/PAN.	P.C. MTG. leadless lamp	0.50
VID37	SHARP 9300	Etc. lamp plus plastic shroud.	2.53

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DRIVE BELTS

AKAI		
VP 77	2 DBK135	£0.95
VP 68	2 DBK135	£0.95
VP 7100	1 DBK103	£1.95
VS 1	2 DBK134	£1.20
VS 2 EG	5 DBK101	£1.95
VS 3	2 DBK134	£1.20
VS 5 EG	6 DBK101	£1.95
VS 10	2 DBK136	£0.75
VS 9300	7 DBK103	£1.95
VS 9500	7 DBK103	£1.95
VS 9700	6 DBK102	£2.20
VS 9800	7 DBK103	£1.95
FERGUSON		
3292	7 DBK103	£1.95
3 V 00	7 DBK103	£1.95
3 V 01	7 DBK103	£1.95
3 V 16	7 DBK103	£1.95
3 V 22	7 DBK103	£1.95
3 V 23	3 DBK106	£1.95
3 V 24	2 DBK137	£0.75
FISHER		
VBS 7000	4 DBK146	£2.95
VBS 7600	5 DBK105	£2.60
VBS 7000	6 DBK105	£2.60
VBS 9000	3 DBK108	£1.95
GEC		
V 4000 H	3 DBK129	£0.75
V 4001 H	3 DBK129	£0.75
V 4002 H	3 DBK129	£0.75
V 4100 H	5 DBK125	£1.80
HITACHI		
VT 11	5 DBK126	£1.50
VT 3000	7 DBK103	£1.95
VT 6000	7 DBK126	£2.60
VT 6500	4 DBK142	£0.75
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TV Fault Finding

Reports from Philip Blundell, Eng. Tech., Mick Dutton, B. Ross, Bob McClenning, John Coombes, J.S. Ruwala, J.L. Howard, Ray Vesey and David Botto, J. Olijynyk and Nick Beer

Philips G11 Chassis

Hum ripple on the 153V h.t. supply is a common fault on these sets. If it occurs after the BU208A line output transistor has gone short-circuit either the BD201 active filter transistor is leaky or one of the safety resistors in this circuit is open-circuit. Otherwise C4040 (40μF) or maybe C4029 (470μF) has dried up. Scope checks are helpful here: look for 12V of 100Hz ripple across C4029 and 1V of 100Hz ripple (with minimal line ripple) across C4040. **P.B.**

Grundig GSC100 Chassis

There was foldover at the bottom of the screen and cramping at the top. The +D supply to the field timebase module was slightly low at 17V instead of 18·5V. This is derived from the line output transformer, so I checked the e.h.t. by measuring the voltage at pin C of the transformer. This was also low and adjustment of the width control HS had no effect. The width control is mounted on the e.h.t. control module and checks here revealed that R2522 (2·2kΩ) which is in series with the control had gone high in value. **P.B.**

Luxor SX9 Chassis

This set wouldn't give a real-time clock display on ITV. We scratched our heads over this one, as did Luxor's UK technical department. The Swedish head office knew the answer right away however. The customer had programmed an unused page number into the text memory. The number was used on each channel except ITV, which meant that the text decoder was searching for something that didn't exist. This was confusing to the clock. **M.D.**

Ferguson TX90 Chassis

The complaint with this set was tripping. We'd not previously had this problem with the TX90, but when we checked the power supply we found that the h.t. was high. A resistor that had gone high in value, causing poor regulation, was suspected. We were surprised to find that R225 (33kΩ) and R222 (10kΩ) were both open-circuit. **M.D.**

Philips 14TX3504 (TX3 Chassis)

This set suffered from field collapse. We found that the field driver transistor's load resistor R423 (33kΩ), which is fed from the 110V rail, had gone open-circuit. **M.D.**

Philips 10CK1120

These sets are proving to be very reliable. We've sold about 120 of them and the only fault we've had was when T9629 (BUZ71) in the battery converter unit went short-circuit due to dry-joints around the line output stage. **M.D.**

ITT CVC1150 Chassis

There was a dark screen though the sound was o.k. Checks around the colour decoder chip showed that the amplitude of the sandcastle pulse was low at 8V. When we lifted the field blanking at pin 18 of the TDA1940 chip a picture with flyback lines appeared. Clamping diode D402 (1N4148) had gone leaky. **M.D.**

Philips KT3 Chassis

The picture would occasionally oscillate in size. It was a very intermittent fault and quite a time was required to prove that the tripler was the cause. **M.D.**

Philips G8 Chassis (550 Series)

The fault report on this set was "loses brightness during the evening: a tap on the cabinet four inches from the left-hand side used to provide a cure but no longer does". The set was found to be working normally and thoughts turned to the 12V zener diode in the beam limiter circuit. Poor connections on plug J to the line scan unit were the cause of the trouble however. **B.R.**

Some Mitsubishis

Mitsubishi Model CP1424B: The trouble with this set was vertical ringing at the left-hand side of the screen. The cause was a poor earth connection to C905 (33μF) in the power supply section, close to the line driver.

Mitsubishi CT186: There was no luminance though the chroma was all right and the contrast control had some effect. The voltage at pins 16/17/18 of IC101 should be 11·8V but was found to be about 15V and varying. The cause of the fault was the 2SC2236 12V regulator transistor Q231.

Mitsubishi CT2101: For poor remote control operation check first that the infra-red window is of the modified, slightly larger type. Then if necessary replace the line filter coil L992 in the power input circuit with the modified type.

Mitsubishi CT2227BM: For no sound or raster first check the mains input circuitry. If this is in order check the l.t. supply at the remote control panel – the safety resistor R7A0 (1·2Ω) tends to go open-circuit.

Mitsubishi CT2027TX: In the event of no sound or intermittent sound check for a high-resistance connection at pin 4 of IC351 (μPC2002) – preferably replace the chip as a precaution. No colour or intermittent loss of colour can be due to the RGB demodulator but the usual cause is a leaky blanking diode, D209 (1S2076) – check by replacement. **J.C.**

Sony KV2752 (RX Chassis)

I've had a very interesting fault on these sets on three occasions during the past year. Customers complain of no remote control operation and no teletext. The clue to what's wrong is that the 6V supply is slightly low at 5V. When I first encountered the problem I suspected the teletext board and found that the remote control system worked when the board was unplugged – the 6V supply returned to normal. A new teletext panel made no difference however. To cut a long story short the culprit turned out to be C655 (220μF) on the power board.

Replacing it cleared the faults. On one occasion the same capacitor blanked out the picture, leaving just a vertical moving line down the centre of the screen. **J.S.R.**

Sony RM Chassis

This set would work for five minutes after which the picture disappeared. Voltage checks revealed that in the fault condition the $-30V$ supply was missing. The cause was that coil L810 went open-circuit when the set warmed up. **J.S.R.**

Beovision 33XX Chassis

Here are a few faults we've had with these sets:
(1) Grey-scale tracking variations were caused by 4R18 ($1{\cdot}8M\Omega$) which had gone high in value. It's mounted on the c.r.t. base panel.
(2) The remote control handset volume button worked correctly but sound mute didn't. Replacing diode 1D4 on the tuner/i.f. panel cured the trouble.
(3) Pulsing on and off was traced to loose screws on the chopper transistor 6TR1.
(4) No luminance can be caused by high-resistance contacts on the tuner/i.f. contact strip or the same item in the decoder. It can also, often intermittently, be caused by dry-joints on the inductors that form the luminance delay line.
(5) An insensitive remote control handset was due to one of the LEDs being open-circuit. **J.L.H.**

Tandberg CTV3 Chassis

Pumping on this chassis can be caused by failure of any one of a dozen components on the line output panel. High on the list of items to check for this condition is diode CR738 on the power supply panel. An RS BYW56 is a satisfactory replacement for the BY127 used in this position. **J.L.H.**

Salora Models 1F3K and 1F0

When the memory crashes with remote control versions of these sets the result is a picture that lacks punch – for want of a better word. The adjustments can be restored as follows:
(1) Set the customer controls to mid-position.
(2) Adjust the brightness, contrast, colour and sound to the required levels using the remote control handset.
(3) Press the front button on the μP board.
(4) Press the normal button on the remote control handset.
(5) Press the store button on the TV set *twice*. **J.L.H.**

Panasonic TC2213

Difficulty in selecting a channel using either the channel change button or the remote control handset, coupled with difficulty in storing a station, was corrected by replacing the TMS3452N2L chip. Remember to take anti-static precautions when changing it. **J.L.H.**

Sony KV2752

A new and rather nasty fault on one of these sets puzzled us recently for quite a few hours. It occurred on the RX chassis but the effect is the same with the PE version. The symptoms were a blank raster with sound present. Extensive checks were made around the TDA3562A colour decoder chip IC301 but nothing amiss was found. The correct signals were entering the chip and the sandcastle pulse at pin 7 was of exactly the correct shape. Feeling that IC301 just had to be faulty we decided to change it, but this made no difference. Eventually we decided to replace IC551 (TDA2578A) which contains the sandcastle pulse generator circuit. The pulse now looked exactly the same but was of greater amplitude. To our relief this restored the picture. Another example of an easy fault – once you know what it is! **R.V. and D.B.**

Philips/Pye KT3/30/35 Chassis

One of these sets suddenly refused to produce a picture, leaving just a smear of chroma. The trouble was that all voltages and waveforms seemed to be in order and panel swapping made no difference. There was a strange waveform on the $-20V$ line at C464 ($100\mu F$) however. The $-20V$ supply reservoir capacitor C586 ($100\mu F$) was the cause of the trouble – it had gone open-circuit. **B.McC.**

Some Quickies

Thorn 9600 Chassis: This set came in dead. We found that one of the rectifiers (W518, type SKE2G2/02) fed from the chopper transformer was badly leaky – almost short-circuit in fact.
Thorn 1694 Chassis: This monochrome portable had lost its picture. The e.h.t. overwinding was getting warm because the e.h.t. rectifier, which is built into it, was short-circuit. A new overwinding put the set right.
GEC PIL Chassis: Another dead set – this time the line output transistor was short-circuit. **J.O.**

Sony KX20PS1 Monitor

This set had an overbright picture with flyback lines. R638 ($270k\Omega$) in the first anode network on the tube base was open-circuit. **N.B.**

Sony KX27PS1 Monitor

When a signal was fed in via the BNC video input socket there was no display. The sound was o.k. and a raster was present. Going out to the job I had visions of faulty leads/plugs etc. but everything appeared to be in order. Buffer transistor Q352 turned out to be short-circuit. **N.B.**

Panasonic TC2205 (U2 Chassis)

Panasonic manuals can cause almost as much trouble as a faulty set. In this case the c.r.t. was cut off and we eventually traced the cause to the diodes in the 12V regulator transistor's base circuit – they were both leaky. This is in fact a not uncommon problem with these sets. But the circuit diagram in the manual shows both these diodes as ordinary types, the parts list says they are both zener diodes (no voltage given) while the board layout diagram shows one as being a zener diode and the other not. In fact they are both 6V zener diodes and the blanking circuit is fussy about this – the correct types should be fitted. I proved the point by using two 6·2V zener diodes. **N.B.**

Sony KX20PS1 Monitor

Intermittent chroma dropout was corrected by adjusting the PAL delay potentiometer RV308. **N.B.**

Test Report: Grundig Oscilloscopes

Steve Beeching, T.Eng.

I have recently had for evaluation two of the oscilloscopes, Models M022 and M053, in the current range of Grundig test equipment. On unpacking them the first impression was of the very attractive and well laid out control panels. The colour can only be described as fawn with a hint of green, the lettering being white. This proved to be very easy on the eye. The M022 has a bandwidth of 20MHz while the more comprehensive M053 has a bandwidth of 50MHz. We'll deal with the M022 first.

Model M022

During the time I spent using this oscilloscope I was impressed by the ease with which I could glance up from a circuit test point and locate a control or a switch to change ranges. The controls are very easy to read and adjust and avoid the confusion that is so often present with a clutter of controls, symbols, etc. I suppose the term "user friendly" would sum up the familiarity I felt after just a few minutes' use.

The M022's control panel is divided horizontally into upper and lower sections, the lower section for vertical controls being subdivided into three sections while the upper section for the timebase controls is subdivided into four sections. The tube controls are at the lower left – focus, intensity, trace rotation (preset), push-button on/off plus a calibration test point. Two further sections cater for the ch. 1 and ch. 2 inputs for the dual traces. These inputs are identical except for an additional earthing point on ch. 1. Each input consists of a standard BNC plug, the impedance being 1MΩ shunted by 25pF. Maximum input is 400V, including any d.c. There's a slide switch for a.c., O and a.c./d.c.: the a.c. setting blocks the d.c. component, O is an open input internally clamped to ground via 68Ω while a.c./d.c. is a straight input.

The input sensitivity selector ranges are from 5mV/cm to 20V/cm in 1, 2, 5 steps, i.e. 0·5V, 1V, 2V, 5V, 10V etc. In addition to vertical shift and variable/calibrate controls there's an inverter push-button. Vertical shift ranges from well below the screen to well above, quoted as +6cm to −6cm from the mid-point, the screen being calibrated to + or −4cm. The rotary calibrate control varies from a fixed position fully anticlockwise to up to 2·5 times the selected V/cm setting.

Triggering Facilities

A four-position lever switch for the triggering mode gives "automatic", "normal" (with an additional variable level control), "TV vertical" and "TV horizontal", with a push-button to select triggering on the positive- or negative-going slope of transition edges. The push-button is not marked: it's in for negative and out for positive, with indication by positive and negative "S" curves. Above the variable trigger level control there's a green LED which lights when the scope triggers from a signal, as an aid to setting the trigger level for repetitive triggering.

A second four-way lever switch selects a.c., d.c., l.f. or h.f. triggering – l.f. is for frequencies below 8kHz and h.f. for frequencies above 10kHz. A third four-way switch selects the trigger source, ch. 1, ch. 2, the 50Hz mains ("line") or external. These three switches, mounted together, give a wide range of trigger sources and types covering most TV and video needs plus general-purpose inputs, as follows:

(1) ch. 1/ch. 2/line/ext
(2) auto/normal/TV field/TV line
(3) a.c./d.c./l.f./h.f.

This indicates the trigger options, first the source on switch (1), then the type on switch (2) and lastly the signal parameter on switch (3). Note that these switches have no function when the source is TV sync pulses.

The Traces

In the centre of the panel there's a trace selector switch for ch. 1, ch. 2 or both, i.e. dual traces. "Both" is written in darker green, indicating that it refers to the switch to the right giving chopped or alternate traces or ch. 1/ch. 2 addition.

Each of the ch. 1 and ch. 2 inputs has an invert option. Thus when used in conjunction with the add setting ch. 1 can be subtracted from ch. 2 or vice versa. This is useful for setting up camera tubes.

A second timebase, referred to as "B", has two lever switches for trigger and display selection, a rotary control covering 0·5μsec/cm to 2msec/cm and a delay control. The first lever switch has three positions, A, "B INT D" and B. Position A displays the A timebase while the unusual "B INT D" position displays the A trace with a brightened portion which is the delayed B timebase section. The timebase range selector expands the brightened portion to cover more of the A trace, while the delay control moves it sideways through the A display. The third position of the switch changes the display to the brightened portion and expands it to fill the time scale. Thus at the flip of a switch you can display A, A brightened by B, or B only. The main purpose of this delayed timebase arrangement is to enable a portion of the A trace to be selected and expanded for closer study.

The second lever switch selects timebase B's trigger mode – free run, A or not A. In the free-run mode the B timebase starts after the delay period has elapsed, i.e. at the start of the brightened portion. In the A position it starts after the next positive or negative trigger slope – determined by the position of the A slope polarity control. In the not A position the B timebase starts at the inverse of the next slope selected by the A setting.

Auto-ranging Timebase

Without doubt the best feature of the oscilloscope is the auto-ranging timebase, which selects the best time scale from 0·5μsec/cm to 200msec/cm in eighteen ranges. The signal has between two and a half and five and a half cycles displayed on the screen, depending on the time scale used, the latter being indicated by one of nine green LEDs in a horizontal row – calibrated 0·5, 1, 2, 5, 10, 20, 50, 100, 200 similarly to the vertical calibration. Two more LEDs light to indicate whether the row is μsec/cm or msec/cm, giving the total of eighteen scales in the range.

There are two further controls, a fine control that provides up to 2·5 times the indicated display, with a central detent position for the calibrated display, and a manual range control. The latter has an auto-ranging position when fully counter clockwise: when turned each green LED lights up in turn to indicate the scale. The operation of this control seems at first strange as it's linear instead of being a stepped switch, but it's pleasant when you get used to it – and not hard on the wrist!

In addition to the horizontal shift control there's a hold-off control whose function is to provide a "pause" between the completion of a trace sweep and the next trigger point to start the following sweep. It's variable and enables complex waveforms to give a stable display. An example is the display of TV lines that have shadowing in the background due to the half-line offset – this can be cleared with the hold-off control. Also, asynchronous digital signals such as bursts of serial data can be more clearly displayed by preventing unwanted sweeps that mix up the display by overlaying unwanted pulses.

Performance

I could quote the various tolerance figures for d.c. drift etc., but they are so low as to be unnoticeable in normal use. For measurement purposes the timebase is accurate to ±3 per cent while the vertical calibration is accurate to ±3 per cent with a 0-20MHz bandwidth (−3dB).

The main question of course is what is the scope like to use? I put it through its paces for a week or so on VCRs, camcorders and compact disc players in order to be able to compare its capabilities with my Philips oscilloscopes.

There were no problems at all when searching through servos or signal paths, and I was able to set up the "eye" patterns on JVC CD players easily. At times the auto-ranging timebase got in the way and I went to manual but at other times it was a blessing. The timebase triggering is excellent – it never missed a beat. For signal checks around colour processing circuits where it's difficult to trigger from a signal I locked the second channel to a suitable video signal point and traced around with ch. 1. To set shading characteristics with cameras it's very useful to be able to subtract ch. 2 from ch. 1: the M022 is very good in this respect.

VCR Head Switching Adjustment

The worst and most frequent use with a VCR is to set the video head switching points. For this, ch. 2 is triggered by the head switching signal and ch. 1 monitors the video signal. The timebase is then expanded to view the field sync pulses, so that the switching point can be set to 6·5 lines before the start of the field sync period. As the trace is fully expanded, the brightness decreases and the focus gets worse – stretching the tube to its fullest. The reason I've used Philips oscilloscopes is the 10kV post-deflection acceleration operation of the tube, which keeps the beam stable when fully expanded. The M022 has only 2kV and I expected it to fail in this task, but not so. While the brightness falls off, the trace is viewable except when too much ambient light falls on the screen. Focus is maintained as a result of the "automatic focus" achieved by high-voltage regulation. In addition, I understand that a hood is available as an optional extra.

Model M053

The M053 is a higher grade version. It has an 11kV tube acceleration voltage and 50MHz bandwidth and is better able to cope with the problem of setting video head switching. The layout is similar to that of the M022 but is not so attractive. Being more comprehensive, it takes a bit more driving. In fact it comes within the category of professional equipment.

The vertical range is from 2mV/cm to 10V/cm and the inputs are positioned in the same part of the front panel as with the M022, i.e. the lower half. Each range switch has an outer knob for selection and an inner knob for variable sensitivity – it pulls out for amplifier invert. With the inputs are the vertical trace selectors ch. 1/both/ch. 2 and alt/chop/add and the vertical shift and a.c./d.c. input selection controls, also a single alternate sweep separator which really belongs with the timebase controls above.

The main tube controls are on the lower left: dual-purpose rotary on/off with intensity, single-button beam finder, trace rotation and calibration test point. The focus and tube graticule illumination controls are together, rotary for focus and pull out for illumination. Unlike the M022, I sometimes found that I sat waiting for the trace to appear after switching on because I'd not rotated the control sufficiently to brighten it.

The main timebase A has auto/normal/TV/×1 trigger modes. A reset button allows ×1 to provide a one-shot sweep. A separate switch selects V1/V2/Horiz which apply only in the TV mode: V1 triggers twenty lines before field sync in field one and V2 at the same point in field two, the Horiz position being for TV line sync. There's also a d.c./a.c./l.f./h.f. selector as in the M022. Trigger slope is also selected by a single in/out push-button but with green LEDs to indicate the trigger slope. This is mounted next to the variable trigger sensitivity control along with a green LED to indicate triggering.

Two switches act together for trigger source ch. 1/both/ch. 2 and internal/line/external/external ÷ 10. Both are similar to those described for the M022 except for the external ÷ 10, which gives an extra factor of trigger level from an external source, and "both" – if two signals on ch. 1 and ch. 2 are without interrelated timing (non-synchronous) they can both be displayed as stable signals by alternately triggering from each (this is not effective in the chop mode).

Delayed timebase B has a ten-turn precision potentiometer for the delay time and a single-turn control for trigger level with a free-running position fully anticlockwise. The slope is always the same polarity as selected for A. The display facilities are much more comprehensive however, via the timebase selector switch positions.

The A/alt/B/X, Y switch operates as follows. In the A position there's normal display of ch. 1/ch. 2, alternate or chopped. The alt position gives display of Ach. 1, Ach. 2, Bch. 1 and Bch. 2, i.e. four traces, two main and two delayed, with the main traces carrying a bright-up portion representing the section that's displayed by the delayed traces. This is where the alternate sweep separator comes into its own, adjusting the vertical separation of the four traces. The third switch position B gives a display of the delayed traces only, and finally the X, Y position puts ch. 2 into operation as an X amplifier with limited bandwidth (about 1MHz).

As with the M022, the M053 has an auto-ranging main timebase with optional manual control, this time in 21 ranges from 0·1μsec/cm to 500msec/cm with the 1, 2, 5 scales previously mentioned. A comprehensive digital display shows the time/cm, with an indicator on the left showing A or B timebase and indicators on the right showing nsec/cm, μsec/cm and msec/cm. Two push-buttons step through the range manually, one for up and one for down, with a single button for auto/manual and a red

LED to indicate manual.

Finally there are along the upper part of the control panel a ×10 timebase expansion button with a red LED, a variable time-scale control with a calibrate detent, a hold-off control as described for the M022 and a horizontal shift control.

Conclusion

The M053 is a much more comprehensive oscilloscope than the M022, with better display facilities and a complexity designed to suit the proficient engineer. It can be recommended as a main, wideband workshop oscilloscope for the serious user. The crunch is that you will have to pay something like £950 for the M053 while the M022 costs around £500, which without doubt makes it excellent value for money – what more can I say than that an M022 now graces my camera setting bench, along with a broadcast standard vectorscope and a Grundig VG1000 broadcast standard pattern generator. The equipment is available to Grundig dealers via their local Technical Liaison Officer. In case of difficulty, these items can be obtained from Newark Video Services, Grove Farm Estate, Barnby-in-the-Willows, Newark, Notts NG24 2SG.

Long-distance Television

Roger Bunney

There was a lot of DX-TV propagation during October, via Sporadic E, auroras, F2/TE, the troposphere and the daily meteor scatter. It looks as though things are getting better, especially with F2 as a result of the increasing sunspot count — hopefully we'll be experiencing a productive winter. The general SpE log for the month is as follows:

4/10/88	TVE (Spain) chs. E2, 3; +PTT (Switzerland) ch. E3.
5/10/88	TVE E3.
7/10/88	NRK (Norway) E2; DR (Denmark) E3, 4.
10/10/88	TVE E2.
11/10/88	+PTT E3.
12/10/88	TVP (Poland) R1; TVE E2, 3.
14/10/88	TVE E2, 3, 4.
17/10/88	TVE E3.
21/10/88	TSS (USSR) R2.
22/10/88	TVE E2, 3, 4; TDF/C+ (Canal Plus — France) L3.
25/10/88	RTP (Portugal) E2.
26/10/88	TVE E2, 3, 4.
27/10/88	TVE E2.
28/10/88	TVE E2.

Auroral reception was reported by Iain Menzies (Aberdeen) as follows: NRK/TSS Band I signals on the 6th leading to RUV (Iceland) ch. E3 early on the 7th; NRK on the 9th; NRK/TSS on the 11th; NRK again on the 18th.

A stable high-pressure system over the UK from the middle through to the end of the month gave enhanced tropospheric propagation in Band III and at u.h.f., with particularly spectacular signals over the 15th-17th. On the 15th Band III/u.h.f. signals from West Germany plus the more usual French/Benelux stations were received in south/central UK. The 16th was the most significant day, with reception over most of the UK from West/East Germany, Scandinavia (Norway chs. E5-9, Sweden chs. E8, 9 and 30), the Benelux countries, France and RTE (Ireland). DFF (East Germany) was received in N.W. Wales on chs. E5, 6, 11, 12 and 34 while u.h.f. signals from the expanding French fifth and sixth networks were received in the north Midlands. Many enthusiasts reported reception of RTL+ (Luxembourg) ch. E7 and AFRB (American Forces) ch. A80. Conditions declined on the 17th, though many West German Band III/u.h.f. signals were received along the south/east coasts.

Undoubtedly the most interesting point however is that the increasing m.u.f. has resulted in the first F2/TE reception of the present solar cycle in the UK. Roger Fussel (Torpoint) received TE signals from NTA (Nigeria) on the 9th, from 1650-1720: first a grey-scale test pattern, then programme material with music. The signals suffered from severe fading and smearing, a characteristic of this mode of propagation. On the 25th, 27th, 29th and 30th Garry Smith (Derby) logged early morning F2 signals on chs. R1 and E2 at varying times between 0750-0912. The signals were strong at times though with smeary video — the R1 signals were from the USSR with the E2 signals on the 30th thought to be of Arabic origin. On the 31st Cyril Willis (Kings Lynn) received very strong ch. R1 signals from the USSR, first the test card, then programmes from 1115 with ch. E2 vision buzz (no pictures could be locked), followed by a locked line sawtooth on ch. E2 at 1245 and then captions and football, fading out at 1300. It all looks good!

With an increasing number of European countries allowing Amateur Radio operation in the 50MHz band we should be getting a closer insight into the possibilities of DX propagation at these frequencies. Contacts have already been made between the UK and the USA, also South Africa. Those with equipment tunable over 30-50MHz may, under suitable conditions, hear interesting communications signals from various parts of the world, e.g. rural US highway patrols, fire brigades, Middle Eastern communications, etc.

Meanwhile Anthony Mann in Perth, W. Australia reports a remarkable F2/TE opening on the 29th, with reception from China on channels up to C4 (77·25MHz vision). During most of the evening the signals were at very high levels, particularly on ch. C2. There was a general fade-out at 2400, after some four hours of reception. Other TV channels received were on frequencies 48·25MHz, 49·75MHz, 55·25MHz (E3 and A2), 56·25MHz, 59·75MHz, 61·25MHz and 62·25MHz. It seems that some of the signals were given an SpE boost over their final path to Perth. SpE reception had been prevalent during the day, with the 50MHz amateur band open to Hawaii. On the 15th a mid-afternoon SpE opening produced signals at up to 56·25MHz. In eastern Australia Robert Copeman and Todd Emslie report enhanced F2/TE conditions, with China ch. C1 received in Sydney on three occasions early in the month and many low-band v.h.f. communications signals received from the USA, Mexico and China, also the Korean Broadcasting System f.m. links at 30·4MHz. Incidentally Robert reports that TVQ has moved from ch. 0 to Band III while DDQ on Darling Downs has moved from ch. 10 to ch. 0 — one to look out for if the F2 conditions improve considerably. I recall one day during the last sunspot cycle when three ch. 0 signals were present floating over each other — it does happen!

Hugh Cocks reports from the Algarve, Portugal, that TE conditions were excellent during September and early October, with ZTV (Zimbabwe) ch. E2 being received on most evenings from 1600-2000 BST, Nigeria/Ghana ch. E2/3/4 signals often being present and on good days ch. A2 signals from Brazil. Picture quality appalling of course, with multiple imaging and smearing.

We hear that during the excellent tropospheric opening on September 9/10th two DXers in Holland received TVE-2 signals on chs. E37 and E42. The same opening produced really intense ducting farther to the south, with amateur radio contacts between the Canaries and the UK in the 144MHz band, reaching also (just) to the Norwegian coast. According to a report in the RSGB's *VHF/UHF Newsletter* a Leicester amateur (G4GLT) noted regular reception of Zimbabwe TV at 48·258MHz via TE during a twelve-day period in September, at various times from 1640-2100 but mainly between 1800-1930. I assume that this reception was at scanner level within a narrow a.m. bandwidth rather than the 2-3MHz bandwidth that TV-DXers would use in order to be able to lock the video signal. It's common here at Romsey to hear a low-level video buzz from the south within a 5kHz bandwidth at times appropriate for TE reception of ZTV, though with the signal well below the noise threshold even using a 1·5MHz TV bandwidth.

An active and interesting month then. My thanks to the following for sending in reception reports: Roger Fussell (Torpoint), Garry Smith (Derby), Hugh Cocks (Portugal), Simon Hamer (Powys), David Oliver (Birmingham), Peter Schubert (Rainham), Tim Anderson (St. Leonards), Bill Cotterill (Tipton), Anthony Mann (Perth), Cyril Willis (Kings Lynn) and Iain Menzies (Aberdeen).

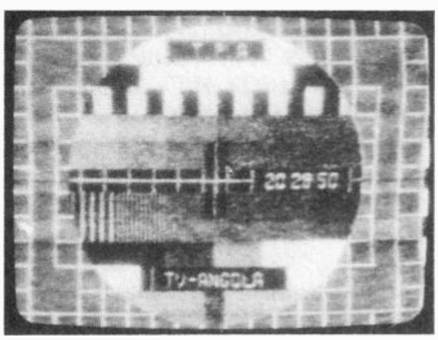
News Items

Belgium: A local TV station, TeleBruxelles, opened in early October on ch. 36 with horizontal polarisation. The 10m high transmitter mast is atop an eight-storey building with the main beam apparently to the N/NW. A half hour local news/magazine programme is repeated from 1800-2400 weekdays with an omnibus edition at weekends from 1200.

France: The BDXC has kindly sent us a list of Canal Plus transmitters in Band I. Note that some of these stations are relays. Ch. L2 Drap H, L'Arbresle H, Amiens H, Bastia V, Chartres V, Nemours V; Ch. L3 Le Plessis H, Carcassonne V, Besancon V; Ch. L4 Mont Vial H, Mont Brian H, Ussel H, Quimperles H, La Roche/Yon H, Etempes H, Rennes V, Orange V. H = horizontal, V = vertical polarisation.

We regret having to report the death of Michel Dubernat, a well-known and very active TV-DX enthusiast over many years.

Teletext adaptor: A French firm is producing a teletext adaptor whose output plugs into a TV set's scart connector. It's a dual-standard decoder able to handle both UK and French teletext. The cost is 2,200 French francs, but French VAT may be deductable at 18·6 per cent. Enquiries, with return postage, can be sent to Societe Reinau Audio Visual, 1 bis rue Pernoux, 92160 Antony,



Yes, Angola does use the PM5544 test pattern! Seen here via a Gorizont (14°W) Band C downlink on its global beam. Photo of reception by Ian Waller, Lincoln.

Paris, France. An r.f. output version is under development.

Meteor Shower Dates for 1989

Our grateful thanks to George Spalding of the Meteor Section, the British Astronomical Association, for providing us with meteor shower information for the coming year as follows:

Quadrantids January 1-6th peaking on the 3rd at 1500 ± 3 hours.
Lyrids April 19-25th peaking on the 22nd.
May Aquarids April 24th-May 20th peaking on May 5th.
Delta Aquarids July 15th-August 20th peaking over July 28-30th.
Perseids July 23rd-August 20th peaking on August 12th at 1400 ± 12 hours.
Orionids October 16-27th with a flat peak over the 20-23rd.
Taurids October 20th-November 30th with a flat peak over November 1-8th.
Leonids November 15-20th peaking on the 17th.
Geminids December 7-16th peaking on the 13th at 2100 ± 6 hours.
Ursids December 17-25th peaking on the 22nd.

New EBU Listings

Station	*Service*	*Channel*	*Output*
France			
Toulouse/Pic du Midi	TDF-5	E29	80kWH
Clermont Ferrand	TDF-5	E30	100kWH
Laval/Mont Rochard	TDF-6	E30	20kWH
Marseilles Grand Etoile	TDF-5	E32	150kWH
Clermont Ferrand	TDF-6	E33	100kWH
Laval/Mont Rochard	TDF-5	E33	20kWH
Brest	TDF-5	E34	100kWH
Le Mans Mayet	TDF-6	E35	150kWH
Orleans	TDF-6	E36	20kWH
Marseille Grand Etiole	TDF-6	E38	100kWH
Toulouse/Pic du Midi	TDF-6	E38	80kWH
Villiers	TDF-5	E39	25kWV
Mezieres	TDF-6	E41	5kWH
Bourges	FR3	E43	30kWH
Chartres	TDF-6	E44	50kWH
Sens	TDF-6	E44	40kWH
Mezieres	TDF-5	E44	5kWH
Bayonne	TDF-6	E45	40kWH
Chartres	TDF-5	E47	50kWH
Sens	TDF-5	E47	40kWH
Tours-Chissay	TDF-6	E54	80kWH
Bourges	TDF-6	E56	130kWH
Le Havre	TDF-6	E56	20kWH
Villers-Cotterets	TDF-6	E57	25kWV
Lyon Mont-Pilat	TDF-5	E59	250kWH
Brest	TDF-6	E60	100kWH
West Germany:			
Wesel	Ind.	E52	200kWH

H = horizontal, V = vertical polarisation.

Satellite TV

The first high-power European TV satellite, the French TDF1 at 18°W, is now in orbit and testing — I received it here on November 15th. The D2-MAC transmissions included colour slides and an identification with date. With a 1·5m dish the 62dBW signals were extremely strong. They are right-hand circular, a linear LNB showing no signal variation when switched between vertical and horizontal polarisation. Reception was at 11·727GHz, the extreme h.f. end of the European DBS band. During the previous week I received the PanAm satellite at 45°W with coverage of the US elections — this despite the fact that a neighbouring house almost obscured the dish. Test patterns and programmes from this satellite have been noted at 11·515 and 11·479GHz. When Ian Waller contacted the uplink site in the USA he was told that CNN is considering a business video channel but that apart from this the main TV transmissions are at present to South America, in Band C.

MTV is using an Intelsat transponder at 27·5°W, with both vertical and horizontal polarisation. Radio Nova is carried on a subcarrier with vertical polarisation, its previous "home" on a subcarrier of the now deceased Canal 10 being vacant. Universa, a Spanish-language service from the USA, may be downlinked via ECS4 at 13°E from early 1989. Scansat/TV3 is to launch a second channel to compete with TV2 — the latter started on October 1st for the Danish market. The new link will be via Astra. Gorizont at 14°W has been testing a new scrambling system on its Band C spot beam — there's little sign of any video transmissions from this craft's 11GHz transponder.

A new, easy to use satellite guide listing programmes, satellite downlinks and languages is available from Tele-Audiovision Medien GmbH, PO Box 801965, D-8000 Munich 80, West Germany for only one IRC. The information includes the latest Eutelsat changes, Astra, etc. Ask for *Europas Satelliten Ubersichtstabelle.* Highly recommended, and a very generous offer!

Thanks to Ian Waller of Lincoln for reporting on various satellite news items.

Maplin Electronic Supplies can supply F plugs, sockets, female in-line barrels and F male to BNC female adaptors at lowish cost for anyone using TVRO equipment with American F outputs/inputs. I was able to connect low-loss coaxial cable directly to an F plug by soldering the screen to the plug body (after pretinning the body). Two layers of heatshrink covering were then applied to provide physical support. With care an efficient termination can be made, giving a low insertion loss compared to the use of adaptors.

The British Amateur Television Club recently published material from US amateur Henry B. Ruh of Des Plaines, Illinois, in which he discusses the possibility of amateur TV operation on future space missions. The suggestion is to use fast-scan TV with reduced bandwidth and f.m. video at 434MHz or say 439·25MHz (the latter suggested by Motorola). The Americans are seeking comments from interested parties in the amateur field and a working committee of experienced ATV operators is being formed to give the matter futher consideration and make recommendations to NASA.

Miscellany

It's to the bottom of the class for me. Two readers who have purchased my TV-DX book have pointed out that the photograph showing double-hop multipath SpE reception on page 12 is from Jordan TV, not Syria.

A reader in Portland is seeking a photocopy of the circuit for a Bush Model R130 valve radio. Can anyone help?

Service Bureau

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

PHILIPS G11 WITH TELETEXT

This set works fine for about twenty minutes then the brightness starts to decrease and the teletext starts to play up. Eventually the picture loses colour lock and goes into bars. I've tried replacing the teletext panel, the chroma/luminance can and the colour decoder chips without success. The colour finally disappears altogether, though not on all channels. On text all I get when the fault is present is a vertical row of P100s down the left-hand side.

The teletext decoder will function correctly only when it sees valid data, so the problem that upsets the brightness etc. is also degrading the received vision signal. This suggests that the voltage on the LT2 line is varying. First check that the LT1 line (17·5V) is present and correct when the fault is present. If not, suspect C3150 (150μF) and possibly C5067 (10μF). If the LT1 voltage is correct, suspect the 12V stabiliser chip IC5073 (TDA1412).

GRUNDIG CUC720 CHASSIS

There appears to be an a.g.c. fault on this set. The picture is good for most of the time but when there's a bright object, e.g. captions or something bright in the scene, the rest of the picture goes very dark and no amount of contrast control adjustment will make it any better. The fault is also intermittent: it's sometimes there when the set is switched on while at other times it appears only after the set has been working for a time. The voltages around the TDA5500 i.f. chip have been checked and seem to be within 1V or so of those shown on the circuit diagram.

First check the a.g.c. decoupler C2216 (1μF, 63V). If it's o.k. you will need to hook a d.c.-coupled scope to pin 21 of the tuner/i.f. module to check for correct signal level and video/sync ratio (should be 7:3). If this check shows wrong levels for waveform five (should be 2·2V peak-peak) replace the TDA5500 or fit an exchange module. If the waveform is o.k. when the fault is present the cause of the problem could be loss of clamping/black level in the decoder module. The Y signal is a.c.-coupled to pin 10 of IC2515 and is internally clamped by the pulse that enters at pin 8. Check C2541 (2·2μF, 50V) etc.

PANASONIC NV370

When a tape is loaded and play is selected, instead of normal forward tape movement the tape usually runs at the correct speed but in reverse, thus looping and chewing the tape. This fault is intermittent – sometimes playback is normal, but going into reverse is more common. Also when play is selected the machine goes into pause/still picture – there seems to be no set sequence to it. The digital readout on the display/counter sometimes runs backwards when playing or recording. When the tape is loaded and rewind/forward is pressed the readout will show correctly but nothing happens. Then after about four seconds the machine goes into the stop mode. When rewind/forward is again pressed the machine works correctly.

For the play backwards fault, check whether pin 39 of IC6001 rises above 1V. If it does, IC6001 is suspect, though IC2002 could be responsible – isolate the appropriate pins to prove which chip is causing the trouble. The other faults will probably be cured by fitting a new mode select switch (VES0246) and idler arm unit (VXP0521).

FERGUSON TX9 (PANEL PC1040)

The colour is normal when the set is first switched on but after about half an hour it disappears. Freezing the 4·43MHz crystal restores the colour, but changing the crystal, the decoder chip and adjusting the oscillator has failed to cure the fault.

We've encountered this puzzling fault on more than one occasion. In each case the cause has been that the direct-path gain control RV67 in the chroma delay line circuit has a high-resistance or open-circuit track.

GEC C1402H

This set worked well for six years then started to take some time to come on. Eventually it failed altogether. Some defective components were found in the switch-mode power supply: when these were replaced power was restored but only a poor monochrome picture was obtained, with perfect sound but no operation of the contrast, brightness and colour controls. Eventually the power seemed to fade away and the sandcastle pulse feed transistor T873 (BC238B) on the decoder panel blew.

First check the 12·6V line at C706. You'll probably find it high – if so replace the 7812 12V regulator chip IC700 in the power supply. If the fault remains, note that T873 is an emitter-follower feeding pulses to IC800 (TDA2151) and IC870 (TDA2140), both of which represent emitter loads. One or other of these is likely to be defective – check by substitution.

SHARP VC8300

The loading motor goes backwards. Sometimes the recorder will load, but it then unlaces before the take-up spool has rotated by more than a quarter of a turn. The cassette lamp lights up, the head drum rotates and all the sensors seem to be all right. The head switching pulse is not being fed into the microcomputer chip, i.e. there's no 30Hz rectangular waveform at pin 58 of I801. The play, record and fast forward lamps light up but the mechanism doesn't respond.

The pulse waveform at pin 58 of I801 should in fact be 25Hz. It comes via I808 pin 10, I802 pin 5, I701 pin 20 (TP708), Q702, connectors AB1 and K11 on the drum

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motor. Check this path. Reversed operation of the loading motor could be due to faulty loading switches or failure of I805.

FERGUSON 3787

When this set is switched on there's no sound or raster, the c.r.t.'s heaters don't glow and the fusible resistor RU05 gets excessively hot.

The usual cause of RU05 overheating is a short-circuit or leakage across the U1 (290V) rail. Check this with an ohmmeter – the flyback thyristor DA12, which incorporates a reverse diode, is in particular suspect. Another possibility is that conduction via the start-up diode DR03 is being sustained because thyristor DU04 doesn't come on – check DU04, TU07 etc.

TEST CASE

313

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

The repairs inwards bench can sometimes be a depressing sight. Take the other Monday morning: a Bang and Olufsen with intermittent pumping ("seen by engineer, customer very angry"); a Decca "not right since last repair, free of charge please"; a rental Mitsubishi, repossessed due to arrears, about fit for the scrap heap; a Ferguson TX model reeking of cat's pee, "estimate for insurance"; and so on. Amongst this lot there was a little Pye 14in. colour set with the simple comment "low height" on its job card. We pounced on it!

Its Model number was 37KT2060/05W and it was fitted with the CTX chassis – the CTX-S version. Tuned in to a test card the set displayed a picture that was centred but decidedly lacking in height – say 60 per cent of full height. The width was correct and the field linearity fine. Our first action was obviously to wind up the preset height control to see what it would do. The height could certainly be turned up, but the potentiometer had to be at nearly maximum before the picture reached the top and bottom of the screen, and at this point the sides of the raster bowed out. So we restored the height control to its original setting and consulted the manual.

The field amplifier and output stages are within a TDA3651 chip, IC7400: tests commenced here. IC7400's supply voltage comes from the line output stage. It measured correctly – 26V at the anode of D6400. The field oscillator is in another chip, a TDA2577, which also contains the sync separator and line generator stages. The voltages at the pins relevant to the field timebase were found to be reasonably close to those quoted in the manual. Out with the scope! The sawtooth provided by the output stage, at pin 5 of IC7400, was way down in amplitude compared to the waveform shown on the circuit diagram. Our next check was at IC7400's input, pin 3, where the waveform did not resemble that shown in the manual. We proved that it was low in amplitude by whipping the back off our VCR monitor, which has a similar chassis.

Resisting the temptation to continue swapping notes between the two sets, we pressed on with our diagnosis. Negative feedback from the output stage is fed back to the sawtooth generator in the TDA2577 chip, and we suspected trouble here. Accordingly the series resistors R3404 and R3409 were checked. They were o.k. At this point we discovered the fault-finding tree on page 18 of the manual. Was there any effect on the raster sides it asked us? Yes, the bowed-out sides moved when the height control was adjusted. Check the height control and the field output chip said the tree. We checked the height control, which was o.k., but baulked at chip replacement at this stage.

Time for coffee. As is so often the case, when we returned to the job fresh after our break we had a new insight into the problem, which was solved almost at once. Thinking about all the symptoms together led us to the answer: low height with excessive EW pincushion distortion correction; both chips apparently working correctly; a height control which forms part of a negative feedback loop. One small component was fetched from the stores and dabbed across two points in the CTX circuit. When this was done the height shot up beyond normal. What was the component? For the answer, see next month's issue.

ANSWER TO TEST CASE 312
– page 129 last month –

Last month's fault, on a Sony KV2204UB, was a strange one. At intervals, particularly when the set had warmed up, the picture brightness would decrease while the sound level increased. There had to be a common cause, but the main factors common to the relevant circuits, such as the supply line voltages and the analogue control chip IC003, had all been eliminated by making voltage measurements.

The audio and video signal processing chips are IC203 and IC301 respectively. Each has a control pin for output level, 5 and 4 respectively. The chips were responding correctly to the control commands when the fault was present – the voltage at pin 5 of IC203 rose while that at pin 4 of IC301 fell.

The cause of the problem turned out to be in the mute circuit. When the muting transistor Q001 conducts it pulls down the cathodes of D201 and D304 to cut off both the sound and vision. What was happening here was that some strange leakage or similar effect intermittently occurred in D201. This bled some of the brightness control voltage to the audio control line, increasing the latter from its typical figure of 3·4V while simultaneously reducing the voltage at pin 4 of IC301. The fault could be made to come and go by heating and cooling D201. It was permanently cured by replacing D201 and, just in case, D304.

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BD137	20p
BD138	20p
BD139	20p
BD140	20p
BD142	45p
BD144	90p
BD150	30p
BD157	38p
BD158	38p
BD166	30p
BD175	30p

BD179	32p
BD181	45p
BD182	60p
BD184	60p
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BD538	40p
BD643	50p
BD645	50p
BD647	50p
BD649	50p
BD651	50p
BD675	40p
BD676	40p
BD677	38p
BD678	40p
BD679	40p
BD680	40p
BD681	45p
BD682	45p
BD705	50p
BD707	50p
BD709	50p
BD711	50p
BD736	50p
BD826	50p
BD828	50p
BD875	50p
BD897	50p
BD899	50p
BD901	50p
BD977	50p
BDX32	100p
BDX33	60p
BDX53	60p
BDX65	80p
BDW23	55p
BDW24	55p
BDW93	50p
BDW94	50p
BDY20	100p
BDY92	100p
BF137	35p
BF154	25p
BF167	30p
BF173	40p
BF178	30p
BF180	16p
BF181	18p
BF183	20p
BF184	20p
BF185	20p
BF194	7p
BF195	7p
BF196	8p
BF197	10p
BF198	10p
BF199	8p
BF200	16p
BF225	30p
BF240	16p
BF241	10p
BF245	20p
BF247	25p
BF254	15p
BF255	12p
BF256	18p
BF257	18p
BF258	18p
BF259	18p
BF262	25p
BF263	25p
BF270	15p
BF273	15p
BF311	21p
BF324	25p
BF336	20p
BF337	20p
BF338	20p
BF355	28p
BF362	30p
BF367	13p
BF371	17p
BF391	18p
BF392	18p
BF393	20p
BF414	18p
BF420	16p
BF421	16p
BF422	21p
BF423	25p
BF440	16p
BF450	20p
BF451	17p
BF458	19p
BF459	19p
BF461	60p
BF462	50p
BF469	30p
BF470	28p
BF471	28p
BF472	28p

BF494	16p
BF495	16p
BF506	25p
BF595	16p
BF596	16p
BF597	10p
BF615	30p
BF617	30p
BF680	30p
BF757	40p
BF758	41p
BF759	40p
BF760	40p
BF763	40p
BF869	22p
BF870	22p
BF871	22p
BF872	23p
BF960	38p
BF961	35p
BF963	40p
BF964	38p
BF966	40p
BFR34	110p
BFR36	110p
BFR40	25p
BFR51	21p
BFR62	21p
BFR79	25p
BFR90	52p
BFR91	99p
BFR94	500p
BFS22	110p
BFT37	130p
BFT42	30p
BFT43	30p
BFW84	30p
BFW92	35p
BFX29	20p
BFX84	20p
BFX85	20p
BFX87	15p
BFX88	15p
BFX89	60p
BFY17	30p
BFY18	40p
BFY41	28p
BFY50	14p
BFY51	14p
BFY52	14p
BFY56	26p
BFY57	25p
BFY64	25p
BFY90	45p
BLY48	85p
BLY49	85p
BR100	14p
BR101	43p
BR103	37p
BR303	85p
BRY39	55p
BRY49	38p
BRY56	33p
BSS74	33p
BSX20	15p
BSX26	18p
BSX29	19p
BT100A	70p
BT106	120p
BT109	90p
BT116	80p
BT119	100p
BT120	100p
BT138	60p
BT146	99p
BT151	58p
BT79	140p
BU100A	110p
BU104	100p
BU105	80p
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BU109	100p
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BU111	140p
BU124	60p
BU126	70p
BU180	150p
BU184	100p
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BU206	100p
BU208	75p
BU208A	80p
BU208D	100p
BU209	140p
BU225	190p
BU226	190p
BU312	120p
BU325	55p
BU326	85p
BU406	85p
BU406D	95p
BU407	75p
BU407D	95p
BU408	85p
BU408D	95p
BU409	95p
BU426	120p
BU500	110p
BU508A	120p
BU508D	100p
BY536	150p
BU526	80p
BU546	140p
BU608	150p
BU626	150p
BU636	150p
BU801	95p
BU806	120p
BU807	95p
BU902	130p
BU903	130p
BU920	130p
BU921	130p
BU922	130p
BU930	130p
BUX80	180p
BUX82	180p
BUX84	65p
BUX85	65p
BUY69A	200p
BUY70C	160p
C106D	28p
J174	38p
J300	50p
MCR220	120p
ME0411	38p
ME0414	125p
ME3001	12p
ME4103	12p
ME6001	12p
ME6002	15p
ME8001	15p
ME9021	12p
MJ802	350p
MJ900	200p
MJ901	200p
MJ1000	200p
MJ10012	300p
MJ15001	325p
MJ15002	300p
MJ15003	325p
MJ15004	370p
MJ15022	400p
MJ2500	100p

MJ3000	115p
MJ3001	115p
MJE29A	30p
MJE30A	30p
MJE340	25p
MJE350	80p
MJE520	30p
MJE2955K	90p
MP8111	40p
MP8112	45p
MP8113	55p
MP8512	50p
MPN3404	30p
MPS6571	20p
MPS9012	20p
MPS9013	20p
MPS9014	20p
MPS9015	20p
MPSA05	15p
MPSA06	15p
MPSA13	15p
MPSA20	15p
MPSA42	15p
MPSA43	15p
MPSA65	25p
MPSA66	25p
MPSA70	15p
MPSA92	20p
MPSA93	20p
MR510	35p
MR856	36p
MRF479	350p
MV1622	80p
MV209	48p
MV2209	48p
OC28	250p
OC29	250p
OC35	250p
OC36	250p
OC45	50p
OC71	50p
OC72	50p
OC200	180p
OT121	120p
R2008B	100p
R2010B	100p
R2030	100p
R2306	55p
S2800D	52p
S2800M	72p
T2800D	52p
T2800M	72p
TAG4442	76p
TAG4443	76p
TAG4444	76p
TIP29	11p
TIP29A	22p
TIP29C	25p
TIP30	25p
TIP30C	30p
TIP31A	24p
TIP31C	30p
TIP32	24p
TIP32A	24p
TIP32C	28p
TIP33	50p
TIP33C	60p
TIP34	60p
TIP34C	60p
TIP35C	65p
TIP36C	65p
TIP41A	22p
TIP41C	25p
TIP42A	22p
TIP42C	25p
TIP47	40p
TIP48	40p
TIP50	60p
TIP51	120p
TIP52	120p
TIP53	120p
TIP54	140p
TIP105	65p
TIP106	65p
TIP107	65p
TIP110	47p
TIP111	50p
TIP112	45p
TIP115	45p
TIP116	45p
TIP117	50p
TIP120	43p
TIP121	46p
TIP122	47p
TIP125	47p
TIP126	56p
TIP127	56p
TIP130	30p
TIP131	30p
TIP130	30p
TIP141	90p
TIP142	90p
TIP145	65p
TIP146	90p
TIP147	100p
TIP150	90p
TIP151	90p
TIP2955	42p
TIP3054	45p
TIP3055	42p
TIS43	45p
TIS44	40p
TIS61	15p
TIS88A	45p
TIS90	15p
TIS91	18p
TIS93	20p
VK1010	88p
VN.10KM	60p
VN.46AF	88p
VN.66AF	100p
VN.88AF	115p
VN.89AF	110p
Y723	75p
Y827	75p
Y860	22p
Y969	65p
ZTX107	11p
ZTX108	11p
ZTX109	12p
ZTX212	27p
ZTX300	13p
ZTX301	16p
ZTX302	24p
ZTX303	17p
ZTX304	29p
ZTX320	29p
ZTX326	29p
ZTX500	13p
ZTX501	13p
ZTX502	18p
ZTX503	18p
ZTX504	25p
ZTX550	24p
2N.696	26p
2N.697	22p
2N.698	40p
2N.699	45p
2N.706	22p
2N.708	22p
2N.914	28p
2N.918	36p
2N.930	18p
2N.1131	28p

2N.1711	24p
2N.1893	30p
2N.2102	50p
2N.2160	300p
2N.2218A	24p
2N.2219	24p
2N.2221	23p
2N.2222	23p
2N.2369	15p
2N.2484	20p
2N.2646	40p
2N.2904	20p
2N.2905	20p
2N.2906	18p
2N.2907	18p
2N.2926	8p
2N.3019	28p
2N.3053	18p
2N.3054	40p
2N.3055	38p
2N.3055H	50p
2N.3440	58p
2N.3442	85p
2N.3525	150p
2N.3583	90p
2N.3585	120p
2N.3702	9p
2N.3703	9p
2N.3704	9p
2N.3705	9p
2N.3706	9p
2N.3707	9p
2N.3708	9p
2N.3710	12p
2N.3711	12p
2N.3771	85p
2N.3772	90p
2N.3773	110p
2N.3799	18p
2N.3819	29p
2N.3866	68p
2N.3903	11p
2N.3904	11p
2N.3905	11p
2N.3906	11p
2N.4031	25p
2N.4036	25p
2N.4037	25p
2N.4058	13p
2N.4062	12p
2N.4064	100p
2N.4240	150p
2N.4248	130p
2N.4401	12p
2N.4403	12p
2N.4443	76p
2N.4444	76p
2N.4904	75p
2N.5061	20p
2N.5062	28p
2N.5088	20p
2N.5163	45p
2N.5192	50p
2N.5241	500p
2N.5245	45p
2N.5294	30p
2N.5296	30p
2N.5303	200p
2N.5320	90p
2N.5321	60p
2N.5366	25p
2N.5401	12p
2N.5448	12p
2N.5496	80p
2N.5777	40p
2N.6106	40p
2N.6107	40p
2N.6109	40p
2N.6254	110p
2N.6292	40p
2N.6384	120p
2N.6385	120p
2N.6403	160p
2N.6649	140p
3N.128	55p
3N.143	65p
DIODES	
AA119	9p
BY100	40p
BY103	32p
BY126	6p
BY127	8p
BY133	8p
BY164	40p
BY176	85p
BY179	35p
BY182	32p
BY184	32p
BY187	32p
BY196	20p
BY206	11p
BY207	11p
BY208	15p
BY210	22p
BY223	72p
BY225	120p
BY226	18p
BY227	19p
BY228	32p
BY296	20p
BY298	26p
BY299	28p
BY476	90p
BYX10	15p
BYX55/350	30p
BYX55/600	32p
BYX55/800	32p
BYX70/300	29p
BYX70/500	32p
BYX70/800	36p
BYX71/600	80p
OA47	6p
OA90	6p
OA91	8p
OA200	7p
OA202	7p
IN.914	2p
IN.4001	4p
IN.4002	4p
IN.4003	4p
IN.4004	4p
IN.4005	4p
IN.4006	4p
IN.4007	5p
IN.4148	2p
IN.5400	9p
IN.5401	10p
IN.5402	10p
IN.5403	11p
IN.5404	11p
IN.5405	12p
IN.5406	13p
IN.5407	13p
IN.5408	13p
SKE4F2/06	50p
SKE4F2/08	70p
SKE4F2/10	90p
I.C. SOCKETS	
8pin	6p
14pin	8p
16pin	9p
18pin	12p
20pin	14p
22pin	16p
24pin	16p
28pin	20p
40pin	25p

BYZ88 RANGE	
2V7 to 39V	6p
1.3W	
BZX61 RANGE	
2V7 to 39V	12p
VOLTAGE REGULATORS	
7805	35p
7806	35p
7808	35p
7812	35p
7815	35p
7818	35p
7824	35p
7905	35p
7906	40p
7908	40p
7912	40p
7915	40p
7918	40p
7924	40p
78L05	28p
78L08	28p
78L12	28p
78L15	28p
78L18	28p
78L24	28p
79L05	40p
79L08	40p
79L12	40p
79L15	40p
7818KC	100p
7824KC	100p
LM309K	100p
LM317K	220p
LM317T	180p
LM323K	420p
LM723	40p
78HGKC	570p
78HO5KC	800p
78H12KC	700p
78GU1C	190p
79GU1C	215p
79HGKC	800p
VALVES	
DAF96	60p
DF96	50p
DL92	60p
DY86	50p
DY87	60p
DY802	75p
EABC80	60p
E891	44p
EBF80	45p
EBF89	50p
ECC82	80p
ECC83	80p
ECC84	70p
ECC85	80p
ECH81	100p
ECH84	70p
ECL80	65p
ECL82	80p
ECL84	70p
ECL85	70p
ECL86	90p
EF80	65p
EF85	65p
EF89	85p
EF183	75p
EF184	85p
EL34	250p
EL36	90p
EL84	75p
EL95	85p
EL500	100p
EL504	130p
EY86	45p
EY87	45p
EY88	65p
EZ35	65p
EZ80	70p
EZ81	55p
GZ34	200p
PC97	100p
PCC85	60p
PCF80	80p
PCF200	135p
PCF801	110p
PCF802	80p
PCF806	115p
PCH200	100p
PCL81	62p
PCL82	80p
PCL84	50p
PCL85	80p
PCL86	80p
PCL805	80p
PFL200	110p
PL36	120p
PL82	60p
PL83	60p
PL84	80p
PL95	180p
PL500	110p
PL504	120p
PL508	200p
PL519	450p
PY81	90p
PY88	70p
PY500A	190p
L.E.D.'S	
LED 3MM RED	5p
YEL 3MM	10p
LED 3MM GRN	10p
LED 5MM RED	5p
LED 5MM YEL	10p
LED 5MM GRN	10p
LINEAR IC'S	
AN-124	230p
AN-127	250p
AN-136	250p
AN-203	210p
AN-210	165p
AN-214Q	170p
AN-228	280p
AN-234	450p
AN-235	450p
AN-236	235p
AN-238	400p
AN-239Q	400p
AN-240P	150p
AN-241	135p
AN-245	290p
AN-247	230p
AN-252	150p
AN-259	250p
AN-262	140p
AN-270	200p
AN-271	230p
AN-272	480p
AN-274	230p
AN-294	380p
AN-295	340p
AN-301	330p
AN-303	250p
AN-304	380p
AN-305	320p
AN-306	800p
AN-313	270p
AN-315	210p

AN-331	295p
AN-360	100p
AN-362	140p
AN-610	160p
AN-612	160p
AN-3320K	900p
AN-5151	600p
AN-5430	280p
AN-5612	400p
AN-5620	330p
AN-5712	350p
AN-5722	140p
AN-5730	160p
AN-5732	130p
AN-5753	170p
AN-6100	425p
AN-6120	400p
AN-6135	150p
AN-6300	600p
AN-6320	300p
AN-6330	380p
AN-6340	830p
AN-6341	350p
AN-6344	440p
AN-6350	610p
AN-6359	810p
AN-6360	400p
AN-6362	480p
AN-6371	510p
AN-6387	560p
AN-6430	390p
AN-6431	400p
AN-6677	550p
AN-6811	130p
AN-6876	270p
AN-6884	240p
AN-7105	210p
AN-7110	130p
AN-7114	150p
AN-7115	150p
AN-7116	130p
AN-7120	130p
AN-7130	110p
AN-7222	300p
AN-7310	90p
AN-7311	90p
AN-7410	250p
AN-7420	250p
AN-7140	450p
AN-7145	195p
AN-7146	210p
AN-7154	180p
AN-7156	240p
AN-7158	310p
AN-7168	260p
AN-7178	270p
AY3-1015	290p
AY3-1270	800p
AY3-1350	450p
AY3-8910	360p
AY3-8912	400p
AY5-3600	570p
BA-301	65p
BA-302	90p
BA-308	100p
BA-311	80p
BA-313	60p
BA-314	100p
BA-318	120p
BA-333	100p
BA-340	150p
BA-401	60p
BA-402	60p
BA-403	100p
BA-501	450p
BA-505	160p
BA-511	160p
BA-514	160p
BA-516	150p
BA-521	160p
BA-524	240p
BA-526	220p
BA-527	95p
BA-532	140p
BA-534	290p
BA-535	600p
BA-536	180p
BA-546	180p
BA-612	160p
BA-656	150p
BA-658	380p
BA-664	300p
BA-684	400p
BA-685	400p
BA-1310	160p
BA-1320	110p
BA-1330	160p
BA-1360	160p
BA-4403	220p
BA-5101	500p
BA-5102	250p
BA-5204	200p
BA-5402	250p
BA-5406	280p
BA-5408	220p
BA-6104	250p
BA-6135	250p
BA-6208	250p
BA-6209	320p
BA-6304	190p
CA-3011	110p
CA-3012	150p
CA-3014	250p
CA-3018	75p
CA-3019	75p
CA-3020	190p
CA-3023	190p
CA-3028A	95p
CA-3035	230p
CA-3036	240p
CA-3043	240p
CA-3045	80p
CA-3046	60p
CA-3048	190p
CA-3052	190p
CA-3054	95p
CA-3059	300p
CA-3060	280p
CA-3065	210p
CA-3080E	60p
CA-3085	135p
CA-3086	55p
CA-3088E	200p
CA-3089E	150p
CA-3089Q	250p
CA-3130E	80p
CA-3130S	100p
CA-3134E	280p
CA-3140E	38p
CA-3160	85p
CA-3161E	140p
CA-3162E	450p
CA-3189E	230p
CA-3193E	230p
CA-3240E	90p
CA-3260E	170p
CA-3290E	150p
CX-108	750p
CX-130	450p
CX-136	610p
CX-139A	1150p
CX-143A	580p
ER-1400	200p

HA-1144	380p
HA-1156	110p
HA-1197	150p
HA-1199	145p
HA-1306W	170p
HA-1319	240p
HA-1338	300p
HA-1339A	350p
HA-1342	350p
HA-1366WR	160p
HA-1367	300p
HA-1368	160p
HA-1371	300p
HA-1372	300p
HA-1374	230p
HA-1377	200p
HA-1388	320p
HA-1389	210p
HA-1392	230p
HA-1394	280p
HA-1397	250p
HA-1398	240p
HA-1452	120p
HA-1457	120p
HA-11219	280p
HA-11221	210p
HA-11223	340p
HA-11225	170p
HA-11226	410p
HA-11235	170p
HA-11251	240p
HA-11423	210p
HA-11701	310p
HA-11703	390p
HA-11705	620p
HA-11710	340p
HA-11714	400p
HA-11715	560p
HA-11724	800p
HA-12005	450p
HA-12017	130p
HA-13001	260p
HA-13007	400p
HA-13008	800p
HA-13432	400p
ICL-7016	650p
ICL-7017	950p
ICL-7611	90p
ICL-7660	240p
ICM-7555	130p
ICM-7556	130p
LA-1111	80p
LA-1130	240p
LA-1150	150p
LA-1185	150p
LA-1201	75p
LA-1210	140p
LA-1222	80p
LA-1230	130p
LA-1231	210p
LA-1352	120p
LA-1364	200p
LA-1365	120p
LA-1368	220p
LA-1369	260p
LA-1385	170p
LA-1460	220p
LA-2000	150p
LA-2100	260p
LA-2101	270p
LA-2200	190p
LA-3100	125p
LA-3101	160p
LA-3120	125p
LA-3155	100p
LA-3160	120p
LA-3201	80p
LA-3210	65p
LA-3220	100p
LA-3300	140p
LA-3301	110p
LA-3350	110p
LA-3361	110p
LA-3375	300p
LA-4030	180p
LA-4031	140p
LA-4032	140p
LA-4050	130p
LA-4051	160p
LA-4100	85p
LA-4101	80p
LA-4102	120p
LA-4110	120p
LA-4112	120p
LA-4120	270p
LA-4125	200p
LA-4126	240p
LA-4135	250p
LA-4137	180p
LA-4140	70p
LA-4160	220p
LA-4180	300p
LA-4182	190p
LA-4190	300p
LA-4192	180p
LA-4200	130p
LA-4201	120p
LA-4210	150p
LA-4220	170p
LA-4230	175p
LA-4250	260p
LA-4260	230p
LA-4261	300p
LA-4270	300p
LA-4400	140p
LA-4420	140p
LA-4422	130p
LA-4430	130p
LA-4440	230p
LA-4445	260p
LA-4450	150p
LA-4460	170p
LA-4461	180p
LA-4500	230p
LA-4505	260p
LA-4507	360p
LA-4508	260p
LA-4510	160p
LA-4520	230p
LA-4530	230p
LA-4540	300p
LA-4550	200p
LA-4555	220p
LA-4560	200p
LA-4570	300p
LA-5112	120p
LA-5523	150p
LA-5527	150p
LA-5700	300p
LA-6324	200p
LA-6358	100p
LA-6458	100p
LA-7000	150p
LA-7003	400p
LA-7005	350p
LA-7007	400p
LA-7009	500p
LA-7011	220p
LA-7013	300p
LA-7015	300p
LA-7017	320p
LA-7018	160p
LA-7019	160p
LA-7020	400p
LA-7025	380p

LA-7032	700p
LA-7033	400p
LA-7040	280p
LA-7042	280p
LA-7043	300p
LA-7045	300p
LA-7046	300p
LA-7048	300p
LA-7050	250p
LA-7051	300p
LA-7060	250p
LA-7061	250p
LA-7070	500p
LA-7071	300p
LA-7072	350p
LA-7090	300p
LA-7110	400p
LA-7112	300p
LA-7205	250p
LA-7210	300p
LA-7212	300p
LA-7215	300p
LA-7220	300p
LA-7224	150p
LA-7225	180p
LA-7230	500p
LA-7505	250p
LA-7506	250p
LA-7507	250p
LA-7508	250p
LA-7520	500p
LA-7590	250p
LA-7620	500p
LA-7621	300p
LA-7751	450p
LA-7755	300p
LA-7770	300p
LA-7800	180p
LA-7801	280p
LA-7802	300p
LA-7803	400p
LA-7805	400p
LA-7806	250p
LA-7808	250p
LA-7810	300p
LA-7811	300p
LA-7820	250p
LA-7822	280p
LA-7823	280p
LA-7910	150p
LA-7920	150p
LAP-512	310p
LAG-552	200p
LAG-600	200p
LAG-634D	300p
LAM-508	200p
LC-7120	280p
LC-7130	250p
LC-7131	260p
LC-7132	400p
LC-7137	450p
LF-347	110p
LF-351	45p
LF-353	48p
LF-355	60p
LF-356	60p
LF-357	70p
LF-398	300p
LM-301	26p
LM-307	42p
LM-308CN	70p
LM-310	220p
LM-311	35p
LM-318	120p
LM-319	165p
LM-324	35p
LM-325	45p
LM-334Z	115p
LM-335Z	120p
LM-336	140p
LM-337	250p
LM-339	37p
LM-348	55p
LM-358	45p
LM-377	220p
LM-380	100p
LM-381	150p
LM-382	130p
LM-383	300p
LM-384	130p
LM-386	85p
LM-387	100p
LM-389	150p
LM-391	160p
LM-392	100p
LM-393	55p
LM-394CH	370p
LM-558	160p
LM-709DIL	30p
LM-710	45p
LM-711	85p
LM-723	40p
LM-725CN	380p
LM-733	60p
LM-741DIL	18p
LM-741MET	45p
LM-747	58p
LM-748	35p
LM-1458	33p
LM-1889	400p
LM-3900	40p
LM-3909	80p
LM-3911	160p
LM-3914	250p
LM-3915	255p
LM-3916	290p
LM-8560	300p
LM-016H	3200p
M-5155	150p
M-50120	600p
M-51102	290p
M-51316B	540p
M-51513L	160p
M-51514	160p
M-51515BL	220p
M-51516	260p
M-51517L	260p
M-51518	200p
M-54836	600p
MB-3705	150p
MB-3712	140p
MB-3722	310p
MB-3730	240p
MB-3731	300p
MB-3756	230p
MB-3759	200p
MB-8719	360p
MC-1310P	150p
MC-1327	70p
MC-1413	65p
MC-1455	45p
MC-1458	33p
MC-1469	290p
MC-1488	65p
MC-1489	65p
MC-1494	670p
MC-1495	285p
MC-1496	65p
MC-1569	210p
MC-3302	70p
MC-3401	45p
MC-3403	60p
MC-3423	75p
MF-10	295p
ML-920	480p
ML-922	380p

NE-555	20p
NE-556	40p
NE-564	380p
NE-565	110p
NE-566	130p
NE-567	115p
NE-570	360p
NE-571	290p
NE-592	85p
NE-5532P	140p
NE-5533P	150p
NE-5534P	110p
SAS-560	110p
SAS-570	110p
SAA-1006	300p
SAA-1008	450p
SAA-1009B	250p
SAA-1024	250p
SAA-1016T	400p
SAA-1220	400p
SAA-1251	380p
SAA-1272C	280p
SAA-1274	280p
SAA-3004	400p
SAA-5040A	280p
SAA-5040B	400p
SI-3242P	360p
SI-7300A	1400p
SNR-20A130K	200p
STA-301A	380p
STA-312	280p
STA-401A	380p
STK-0025	420p
STK-0029	430p
STK-0030	400p
STK-0039	410p
STK-0040	560p
STK-0049	570p
STK-0050	570p
STK-0059	620p
STK-0060	900p
STK-0070	1100p
STK-0080	690p
STK-011	370p
STK-013	700p
STK-014	700p
STK-015	490p
STK-016	800p
STK-020	540p
STK-022	700p
STK-024	700p
STK-025	700p
STK-031	820p
STK-041	700p
STK-043	980p
STK-050	1450p
STK-056	820p
STK-077	600p
STK-078	620p
STK-080	710p
STK-082	720p
STK-084	740p
STK-086	910p
STK-430	500p
STK-433	490p
STK-435	510p
STK-436	490p
STK-437	600p
STK-439	550p
STK-441	740p
STK-443	740p
STK-457	580p
STK-459	610p
STK-460	720p
STK-461	720p
STK-463	780p
STK-465	800p
STK-501	580p
STK-563	480p
STK-583	600p
STK-732	850p
STK-734B	510p
STK-772B	480p
STK-1039	550p
STK-1040	700p
STK-1049	800p
STK-1050	750p
STK-1060	760p
STK-1070	1200p
STK-1080	1000p
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STK-2125	680p
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STK-3044	575p
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STK-4026	800p
STK-4036	500p
STK-4038	680p
STK-4048	1280p
STK-4060	580p
STK-4111	650p
STK-4121	800p
STK-4131	650p
STK-4141	700p
STK-4151	720p
STK-4161	820p
STK-4162	820p
STK-4171	1000p
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STK-4311	800p
STK-4332	500p
STK-4352	700p
STK-4362	625p
STK-4372	600p
STK-4392	720p
STK-4773	1000p
STK-4793	1180p
STK-4803	820p
STK-4813	950p
STK-4833	950p
STK-4843	865p
STK-4853	950p
STK-4893	1400p
STK-4913	1220p
STK-5314	625p
STK-5315	650p
STK-5322	620p
STK-5324	550p
STK-5325	650p
STK-5332	300p
STK-5372	300p
STK-5421	625p
STK-5422	600p
STK-5441	500p
STK-5471	500p
STK-5476	600p
STK-5481	520p
STK-6922	600p

STK-7216	610p
STK-7308	800p
STK-7309	650p
STK-7402	660p
STK-7404	680p
STK-7406	800p
STK-7408	880p
STK-7410	1200p
STK-7563	1000p
STK-8250	700p
STK-8050	880p
STK-4833	1200p
STR-370	650p
STR-380	580p
STR-440	520p
STR-441	480p
STR-451	500p
STR-453	700p
STR-2012	650p
STR-3115	580p
STR-3125	580p
STR-4090	650p
STR-6020	600p
T2800D	52p
TA-7054	190p
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TA-7063	70p
TA-7066	120p
TA-7072	300p
TA-7073	200p
TA-7089	300p
TA-7108	130p
TA-7109	220p
TA-7119	150p
TA-7120	55p
TA-7130	80p
TA-7137	83p
TA-7140	130p
TA-7142	220p
TA-7145	220p
TA-7146	400p
TA-7148	350p
TA-7157	140p
TA-7162	300p
TA-7169	420p
TA-7176	240p
TA-7193	400p
TA-7200	200p
TA-7201	200p
TA-7203	180p
TA-7204	140p
TA-7205	80p
TA-7207	150p
TA-7208	145p
TA-7210	200p
TA-7212	300p
TA-7213	200p
TA-7214	260p
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TA-7217	145p
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TA-7223	210p
TA-7224	270p
TA-7225	300p
TA-7226	290p
TA-7227	190p
TA-7229	300p
TA-7230	170p
TA-7232	250p
TA-7233	250p
TA-7237	400p
TA-7238	400p
TA-7240	260p
TA-7241	260p
TA-7242	290p
TA-7243	350p
TA-7245	450p
TA-7247	800p
TA-7267	290p
TA-7269	850p
TA-7270	250p
TA-7271	400p
TA-7272	260p
TA-7273	350p
TA-7274	260p
TA-7280	330p
TA-7281	270p
TA-7282	260p
TA-7283	260p
TA-7288	300p
TA-7299	400p
TA-7310	100p
TA-7312	120p
TA-7313	110p
TA-7314	210p
TA-7315	200p
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TA-7341	250p
TA-7343	250p
TA-7357	400p
TA-7358	200p
TA-7401	400p
TA-7607	270p
TA-7608	360p
TA-7609	270p
TA-7611	280p
TA-7612	360p
TA-7614	230p
TA-7616	400p
TA-7621	520p
TA-7622	420p
TA-7625	420p
TA-7628	240p
TA-7629	420p
TA-7630	300p
TA-7632	400p
TA-7640	150p
TA-7641	170p
TA-7658	130p
TA-7668	160p
TA-7680	480p
TA-7688	250p
TA-7698	720p
TA-7699	1200p
TA-7769	300p
TAA-550	20p
TAA-611B12	100p
TAA-661	100p
TBA-120S	50p
TBA-395	60p
TBA-396	70p
TBA-520	120p
TBA-540	120p
TBA-560	120p
TBA-641B11	400p
TBA-750	120p
TBA-800	40p
TBA-810AS	60p
TBA-820	65p
TBA-820M	50p
TBA-920	120p
TBA-950	120p
TBA-990	120p
TBA-1440G	120p
TC-5020	285p
TC-9109	500p
TC-9106	470p

TCA-740	130p
TCA-830	90p
TCA-940	100p
TCEP-100	200p
TDA-1001	200p
TDA-1003	150p
TDA-1029	300p
TDA-1035	120p
TDA-1044	300p
TDA-1054	200p
TDA-1083	200p
TDA-1170	100p
TDA-1180	190p
TDA-1190	100p
TDA-1200B	80p
TDA-1270	200p
TDA-1410	210p
TDA-1412	100p
TDA-1420	200p
TDA-1470	140p
TDA-1670A	300p
TDA-1770A	300p
TDA-1870A	300p
TDA-1908A	100p
TDA-1940	280p
TDA-1950	280p
TDA-2002	80p
TDA-2003	150p
TDA-2004	170p
TDA-2005	170p
TDA-2006	150p
TDA-2008	175p
TDA-2009	200p
TDA-2010	100p
TDA-2020	140p
TDA-2030	140p
TDA-2532	120p
TDA-2540	100p
TDA-2560	120p
TDA-2575A	100p
TDA-2581	180p
TDA-2590	200p
TDA-2593	150p
TDA-2600	580p
TDA-2611A	120p
TDA-2653	380p
TDA-2670	150p
TDA-2690	100p
TDA-2760	400p
TDA-3190	100p
TDA-3300B	480p
TDA-3301B	380p
TDA-3560	350p
TDA-3561	280p
TDA-3651A	290p
TDA-3652	300p
TDA-3710	320p
TDA-3800	350p
TDA-4420	180p
TDA-4600	280p
TDA-4601	250p
TDA-4950	200p
TDA-5700	200p
TDA-7040	250p
TDA-7050	200p
TDA-7211	150p
TDA-7220	150p
TDA-7270	150p
TEA-1002	650p
TL-61	40p
TLO-64	80p
TLO-71	38p
TLO-72	55p
TLO-74	92p
TLO-81	40p
TLO-82	46p
TLO-83	67p
TLO-84	80p
UCN-5801A	560p
ULN-2002	70p
ULN-2003	69p
ULN-2004	69p
ULN-2068	270p
ULN-2802	170p
ULN-2803	130p
ULN-2804	170p
UPC-16C	160p
UPC-20C	220p
UPC-30C	190p
UPC-358	150p
UPC-554	130p
UPC-555	60p
UPC-556H	80p
UPC-558	200p
UPC-566	60p
UPC-571	220p
UPC-572	200p
UPC-574	60p
UPC-575C2	90p
UPC-576	200p
UPC-577	64p
UPC-578	400p
UPC-580	300p
UPC-592	95p
UPC-595	190p
UPC-596	190p
UPC-1001	220p
UPC-1018	170p
UPC-1020	200p
UPC-1021	200p
UPC-1023	60p
UPC-1025	230p
UPC-1026	95p
UPC-1028	90p
UPC-1031H2	180p
UPC-1032	60p
UPC-1155	200p
UPC-1156	250p
UPC-1158H2	70p
UPC-1167C2	170p
UPC-1168	105p
UPC-1181	110p
UPC-1182	110p
UPC-1183	200p
UPC-1185H2	230p
UPC-1186	80p
UPC-1187	150p
UPC-1191	100p
UPC-1197	140p
UPC-1216	120p
UPC-1222	130p
UPC-1230	210p
UPC-1238	120p
UPC-1263	230p
UPC-1277	240p
UPC-1278	240p
UPC-1350	115p
UPC-1353	160p
UPC-1363	190p
UPC-1365	320p
UPC-1373	85p
UPC-1378	210p
UPC-1380	450p
UPC-1382	110p
UPC-1383	260p
UPC-1384	260p
UPC-1394	170p
UPC-1397	450p
UPC-1470	200p
ZN-423	100p
ZN-424	100p
ZN-425	320p
ZN-426	260p
ZN-427	560p

LINEAR IC'S — Cont.

ZN-428	425
ZN-429	215
ZN-435	340
ZN-448	510
ZN-459	190
ZN-1034	170
ZN-1040	640
ZNA-134H	2150
ZNA-234E	920
2SJ-48	480
2SJ-49	425
2SJ-50	425
2SJ-77	350
2SJ-122	580
2SK-15	350
2SK-19	45
2SK-49	50
2SK-55	100
2SK-68	100
2SK-133	480
2SK-134	415
2SK-135	415
2SK-147	160
2SK-176	800
2SK-191	160
2SK-192	45
2SK-195	150
2SK-197	140
2SK-210	130
2SK-211	130
2SK-217	130
2SK-291	300
2SK-294	400
2SK-312	750
2SK-322	300
2SK-323	130
2SK-555	480
2SK-557	650
3SK-88	70

JAPANESE TRANSISTORS

2SA-473	35p
2SA-483	400p
2SA-490	60p
2SA-562	57p
2SA-563	45p
2SA-571	500p
2SA-634	50p
2SA-636	50p
2SA-673	20p
2SA-684	60p
2SA-699	100p
2SA-715	90p
2SA-720	20p
2SA-733	30p
2SA-798	55p
2SA-844	30p
2SA-872	40p
2SA-872A	50p
2SA-886	90p
2SA-899	60p
2SA-907	650p
2SA-909	700p
2SA-933	40p
2SA-934	40p
2SA-935	40p
2SA-937	40p
2SA-940	70p
2SA-950	30p
2SA-952	50p
2SA-953	60p
2SA-965	60p
2SA-966	70p
2SA-970	50p
2SA-979	85p
2SA-984	50p
2SA-992	30p
2SA-1012	130p
2SA-1015	30p
2SA-1102	190p
2SA-1103	200p
2SA-1104	200p
2SA-1105	250p
2SA-1106	250p
2SB-022	80p
2SB-324	55p
2SB-370	45p
2SB-546	70p
2SB-557	225p
2SB-561	50p
2SB-566	130p
2SB-595	80p
2SB-598	60p
2SB-600	500p
2SB-600	500p
2SB-616	190p
2SB-621	85p
2SB-646A	90p
2SB-647	30p
2SB-649	40p
2SB-688	120p
2SB-703	125p
2SB-705	200p
2SB-707	200p
2SB-716	30p
2SB-727	200p
2SB-754	80p
2SB-755	310p
2SB-761	170p
2SB-764	60p
2SB-772	45p
2SB-775	160p
2SB-791	280p
2SB-792	70p
2SB-795	60p
2SB-825	135p
2SB-861	160p
2SB-882	180p
2SB-884	120p
2SB-886	225p
2SB-895	120p
2SB-950	180p
2SB-951	190p
2SB-1009	110p
2SB-1037	110p
2SB-1077	180p
2SB-1091	100p
2SC-97A	380p
2SC-454	45p
2SC-458	15p
2SC-461	30p
2SC-495	60p
2SC-536	30p
2SC-681	340p
2SC-710	50p
2SC-733	30p
2SC-790	125p
2SC-792	380p
2SC-828	25p
2SC-930	50p
2SC-943	160p
2SC-945	40p
2SC-1010	300p
2SC-1050	300p
2SC-1060	99p
2SC-1061	100p
2SC-1070	65p
2SC-1096	60p
2SC-1106	180p
2SC-1114	415p
2SC-1115	400p
2SC-1116	290p
2SC-1161	110p
2SC-1162	35p
2SC-1164	600p
2SC-1172	150p
2SC-1173	60p
2SC-1213	50p
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2SC-1306	90p
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2SC-1342	120p
2SC-1383	50p
2SC-1384	50p
2SC-1398	80p
2SC-1413	265p
2SC-1419	150p
2SC-1444	360p
2SC-1454	320p
2SC-1472	40p
2SC-1505	80p
2SC-1507	140p
2SC-1509	80p
2SC-1514	65p
2SC-1515	60p
2SC-1520	120p
2SC-1573	95p
2SC-1586	540p
2SC-1624	140p
2SC-1675	100p
2SC-1678	120p
2SC-1729	900p
2SC-1730	540p
2SC-1740	40p
2SC-1741	45p
2SC-1755	90p
2SC-1756	40p
2SC-1758	30p
2SC-1775	20p
2SC-1809	40p
2SC-1815	30p
2SC-1826	60p
2SC-1845	20p
2SC-1847	120p
2SC-1865	120p
2SC-1875	260p
2SC-1881	210p
2SC-1906	75p
2SC-1907	75p
2SC-1909	250p
2SC-1921	60p
2SC-1923	25p
2SC-1941	40p
2SC-1942	260p
2SC-1944	350p
2SC-1945	350p
2SC-1946	1500p
2SC-1947	450p
2SC-1957	70p
2SC-1969	160p
2SC-1971	400p
2SC-1972	600p
2SC-1983	130p
2SC-2001	60p
2SC-2002	40p
2SC-2003	25p
2SC-2023	180p
2SC-2026	60p
2SC-2028	75p
2SC-2029	120p
2SC-2053	120p
2SC-2060	60p
2SC-2068	90p
2SC-2073	70p
2SC-2075	80p
2SC-2078	95p
2SC-2086	60p
2SC-2098	600p
2SC-2166	90p
2SC-2228A	60p
2SC-2229	25p
2SC-2233	125p
2SC-2235	60p
2SC-2236	60p
2SC-2238	70p
2SC-2240	45p
2SC-2259	60p
2SC-2271	60p
2SC-2275	50p
2SC-2290	1800p
2SC-2314	70p
2SC-2324	120p
2SC-2329	480p
2SC-2334	240p
2SC-2335	120p
2SC-2335	120p
2SC-2369	100p
2SC-2371	45p
2SC-2373	210p
2SC-2407	110p
2SC-2408	120p
2SC-2470	65p
2SC-2482	40p
2SC-2484	240p
2SC-2509	580p
2SC-2545	55p
2SC-2547	65p
2SC-2550	70p
2SC-2551	70p
2SC-2562	90p
2SC-2564	245p
2SC-2565	280p
2SC-2570	60p
2SC-2577	125p
2SC-2578	220p
2SC-2579	200p
2SC-2580	240p
2SC-2581	290p
2SC-2608	620p
2SC-2611	40p
2SC-2611	65p
2SC-2625	380p
2SC-2681	270p
2SC-2688	70p
2SC-2695	2100p
2SC-2719	80p
2SC-2749	350p
2SC-2785	60p
2SC-2810	360p
2SC-2837	360p
2SC-2922	610p
2SC-2979	320p
2SC-2988	280p
2SC-3025	500p
2SC-3039	140p
2SC-3040	260p
2SC-3042	300p
2SC-3060	900p
2SC-3148	410p
2SC-3150	200p
2SC-3151	230p
2SC-3152	250p
2SC-3153	350p
2SC-3156	400p
2SC-3158	260p
2SC-3173	180p
2SC-3178	340p
2SC-3181	240p
2SC-3210	400p
2SC-3212	510p
2SC-3264	510p
2SC-3277	280p
2SC-3293	85p
2SC-3299	120p
2SC-3318	500p
2SC-3355	90p
2SC-3358	80p
2SC-3402	50p
2SC-3416	80p
2SC-3417	90p
2SC-3422	110p
2SC-3467	70p
2SC-3468	70p
2SC-3503	90p
2SC-3568	200p
2SC-3675	160p
2SC-3685	400p
2SC-3789	75p
2SD-024	60p
2SD-313	70p
2SD-325	60p
2SD-348	460p
2SD-371	240p
2SD-401	130p
2SD-438	100p
2SD-600	120p
2SD-613	70p
2SD-718	100p
2SD-1277	190p
2SD-1398	250p
2SD-1453	180p
2SD-1609	110p

BRIDGE RECTIFIERS

1A/50V	16p
1A/100V	18p
1A/200V	19p
1A/400V	21p
1A/600V	23p
1A/800V	28p
2A/100V	33p
2A/200V	33p
2A/400V	37p
2A/600V	43p
2A/800V	43p
3A/200V	43p
3A/400V	43p
3A/600V	44p
6A/200V	80p
6A/400V	72p
25A/100V	150p
25A/200V	165p
25A/400V	185p
25A/600V	200p
25A/800V	240p
35A/100V	185p
35A/200V	200p
35A/400V	220p
35A/600V	230p
35A/800V	260p
1.5A/100V	40p
1.5A/800V	40p

PLASTIC CASED TRIACS

4A/400V	60p
6A/400V	69p
8A/400V	68p
12A/400V	85p
16A/400V	105p
20A/400V	190p
25A/400V	205p
8A/400V	52p

THYRISTORS

0.8A/60V	20p
0.8A/100V	28p
0.8A/200V	29p
4A/400V	28p
8A/300V	59p
8A/400V	70p
8A/600V	79p
12A/400V	75p
12A/600V	90p
2N4444	76p
BR103	37p
BR303	85p
BT106	120p
BT116	80p
BT119	100p
BT120	100p
OT121	120p
TIC44	22p
TIC45	27p
TIC47	32p
17088	200p
17089	200p
17127	200p
15/80H	230p
15/85R	230p
SG613	850p
SG264A	300p

4000B SERIES CMOS IC's

4000	13p
4001	13p
4002	13p
4006	34p
4007	13p
4008	38p
4009	20p
4010	21p
4011	13p
4012	13p
4013	19p
4014	32p
4015	32p
4016	18p
4017	29p
4018	30p
4019	28p
4020	33p
4021	36p
4022	36p
4023	13p
4024	25p
4025	13p
4026	60p
4027	18p
4028	29p
4029	34p
4030	17p
4031	90p
4032	52p
4033	60p
4034	76p
4035	42p
4036	180p
4037	75p
4038	46p
4039	180p
4040	30p
4041	36p
4042	30p
4043	36p
4044	36p
4045	72p
4046	42p
4047	45p
4048	27p
4049	18p
4050	22p
4051	38p
4052	35p
4053	35p
4054	53p
4055	52p
4056	52p
4060	40p
4063	52p
4066	20p
4067	120p
4068	13p
4069	13p
4070	13p
4071	13p
4072	13p
4073	13p
4075	13p
4076	42p
4077	13p
4078	13p
4081	13p
4082	13p
4085	36p
4086	30p
4089	75p
4093	18p
4094	44p
4095	58p
4098	50p
4099	42p
4501	27p
4502	36p
4503	30p
4504	55p
4505	180p
4506	58p
4507	30p
4508	67p
4510	32p
4511	30p
4512	38p
4513	80p
4514	65p
4515	65p
4516	36p
4517	100p
4518	36p
4519	28p
4520	36p
4521	86p
4522	43p
4526	38p
4527	41p
4528	38p
4529	65p
4532	48p
4551	75p
4553	140p
4555	29p
4556	36p
4557	140p
4583	60p
4584	30p
4585	40p
40100	120p
40101	78p
40102	150p
40103	120p
40104	90p
40105	140p
40106	35p
40107	50p
40108	250p
40109	74p
40110	170p
40114	180p
40117	180p
40147	240p
40160	55p
40161	55p
40162	55p
40163	55p
40174	48p
40175	60p
40181	170p
40182	70p
40192	48p
40193	48p
40194	58p
40208	240p
40257	120p

74 SERIES

7400	20p
7401	16p
7402	18p
7403	20p
7404	35p
7405	10p
7406	40p
7407	40p
7408	25p
7409	20p
7413	35p
7414	45p
7416	40p
7417	32p
7420	22p
7421	25p
7425	15p
7430	25p
7437	28p
7438	35p
7442	45p
7447	60p
7450	22p
7451	10p
7454	25p
7470	30p
7473	30p
7474	40p
7475	25p
7481	90p
7482	70p
7485	30p
7486	28p
7489	80p
7490	35p
7492	45p
7493	35p
7495	48p
7497	80p
74107	30p
74111	52p
74116	85p
74119	85p
74122	40p
74123	20p
74125	40p
74126	45p
74132	42p
74141	55p
74145	70p
74153	45p
74155	40p
74157	45p
74160	50p
74164	45p
74167	55p
74173	50p
74174	70p
74175	65p
74176	45p
74180	50p
74182	45p
74192	40p
74196	40p
74197	45p
74393	70p

74HC SERIES HIGH SPEED CMOS

74HC00	14p
74HC02	15p
74HC03	14p
74HC04	15p
74HC08	18p
74HC10	20p
74HC11	14p
74HC14	28p
74HC20	20p
74HC21	20p
74HC27	20p
74HC30	20p
74HC32	20p
74HC42	32p
74HC51	20p
74HC73	26p
74HC74	26p
74HC75	30p
74HC76	30p
74HC77	40p
74HC85	33p
74HC86	29p
74HC93	50p
74HC107	31p
74HC109	31p
74HC112	31p
74HC113	31p
74HC123	43p
74HC125	35p
74HC126	36p
74HC131	38p
74HC132	37p
74HC133	35p
74HC137	55p
74HC138	36p
74HC139	24p
74HC147	45p
74HC148	40p
74HC151	36p
74HC153	35p
74HC154	110p
74HC155	50p
74HC157	36p
74HC158	36p
74HC160	44p
74HC161	44p
74HC162	44p
74HC163	44p
74HC164	44p
74HC165	58p
74HC166	70p
74HC173	55p
74HC174	38p
74HC175	38p
74HC181	130p
74HC182	60p
74HC190	46p
74HC191	60p
74HC192	60p
74HC193	43p
74HC194	47p
74HC195	47p
74HC221	100p
74HC237	50p
74HC238	65p
74HC240	48p
74HC241	47p
74HC242	55p
74HC243	60p
74HC244	44p
74HC245	49p
74HC251	25p
74HC253	37p
74HC257	41p
74HC258	50p
74HC259	55p
74HC273	42p
74HC279	37p
74HC280	65p
74HC283	65p
74HC297	950p
74HC298	52p
74HC299	105p
74HC354	38p
74HC356	45p
74HC365	34p
74HC366	38p
74HC367	36p
74HC368	36p
74HC373	47p
74HC374	50p
74HC375	60p
74HC377	55p
74HC386	20p
74HC390	55p
74HC393	50p
74HC423	70p
74HC533	68p
74HC534	65p
74HC540	73p
74HC541	73p
74HC563	73p
74HC564	73p
74HC573	73p
74HC574	70p
74HC583	90p
74HC595	85p
74HC597	85p
74HC620	110p
74HC623	110p
74HC640	90p
74HC643	90p
74HC646	150p
74HC648	150p
74HC651	110p
74HC652	110p
74HC670	90p
74HC688	150p
74HC690	120p
74HC691	120p
74HC4002	25p
74HC4015	85p
74HC4016	75p
74HC4017	48p
74HC4020	50p
74HC4022	40p
74HC4024	34p
74HC4028	40p
74HC4040	34p
74HC4049	50p
74HC4050	50p
74HC4051	95p
74HC4052	95p
74HC4053	95p
74HC4059	85p
74HC4050	33p
74HC4066	33p
74HC4072	33p
74HC4075	26p
74HC4078	32p
74HC4094	50p
74HC4316	100p
74HC4351	110p
74HC4352	160p
74HC4310	120p
74HC4511	85p
74HC4514	140p
74HC4515	130p
74HC4516	130p
74HC4518	70p
74HC4520	80p
74HC4538	90p
74HC4543	120p
74HC7266	75p
74HC22106	580p
74HC40104	190p
74HC40105	250p

74LS SERIES LOW POWER SCHOTTKY T.T.L.

74LS00	14p
74LS01	14p
74LS02	14p
74LS03	14p
74LS04	14p
74LS05	14p
74LS08	14p
74LS09	15p
74LS10	14p
74LS11	14p
74LS12	14p
74LS13	22p
74LS15	15p
74LS20	15p
74LS21	15p
74LS22	15p
74LS24	38p
74LS26	15p
74LS27	15p
74LS28	15p
74LS30	15p
74LS32	17p
74LS33	17p
74LS31	16p
74LS38	17p
74LS40	16p
74LS42	28p
74LS47	56p
74LS48	52p
74LS51	15p
74LS54	15p
74LS55	17p
74LS73	26p
74LS74	20p
74LS75	26p
74LS76	26p
74LS78	26p
74LS83	40p
74LS85	40p
74LS86	28p
74LS90	29p
74LS91	60p
74LS92	35p
74LS93	28p
74LS95	45p
74LS96	56p
74LS107	30p
74LS109	30p
74LS112	30p
74LS113	30p
74LS114	30p
74LS122	38p
74LS123	38p
74LS124	85p
74LS125	32p
74LS126	32p
74LS132	32p
74LS133	32p
74LS136	32p
74LS138	31p
74LS139	31p
74LS145	70p
74LS147	100p
74LS148	80p
74LS151	30p
74LS153	36p
74LS154	85p
74LS155	36p
74LS156	41p
74LS157	28p
74LS158	31p
74LS160	44p
74LS161	44p
74LS162	44p
74LS163	40p
74LS164	40p
74LS165	56p
74LS166	60p
74LS168	68p
74LS169	60p
74LS170	75p
74LS174	36p
74LS175	36p
74LS190	51p
74LS191	48p
74LS192	48p
74LS193	47p
74LS194	47p
74LS195	50p
74LS196	55p
74LS197	48p
74LS221	50p
74LS240	50p
74LS241	46p
74LS242	50p
74LS243	55p
74LS244	45p
74LS245	46p
74LS247	46p
74LS248	48p
74LS249	78p
74LS251	28p
74LS253	40p
74LS256	58p
74LS257	38p
74LS258	40p
74LS259	55p
74LS260	38p
74LS266	26p
74LS273	50p
74LS279	37p
74LS280	100p
74LS283	55p
74LS290	30p
74LS293	30p
74LS365	30p
74LS366	35p
74LS367	33p
74LS368	35p
74LS373	50p
74LS374	50p
74LS375	52p
74LS390	46p
74LS393	41p
74LS399	75p
74LS629	105p
74LS641	100p
74LS642	100p
74LS644	140p
74LS645	140p
74LS670	68p
74LS674	320p
74LS687	260p

COMPUTER IC'S

2114	200p
2532	330p
2716	200p
2732	280p
2732A	300p
2764	240p
27C64	550p
27128	350p
26256-25	400p
41256-15	450p
256DRAM	450p
4116	75p
4164	150p
6116	200p
6264-15	300p
6502	300p
6502A	400p
65C02	930p
6503	570p
6520	170p
6522	330p
6530	1050p
6532	460p
6545	880p
6551	530p
6800	210p
6802	220p
6803	800p
6808	500p
6809	600p
6810	150p
6818	380p
6820	140p
6821	140p
6840	310p
6845	620p
6850	110p
8080A	400p
8085A	300p
8155	360p
8156	360p
81LS95	120p
81LS96	130p
81LS98	130p
8224	270p
8226	270p
8228	270p
8243	250p
8250	850p
8087	11000p
8251	320p
8253	320p
8255	310p
8256	1200p
8257	350p
8259	360p
8271	3400p
8272	1200p
8279	450p
8282	300p
8283	400p
8284	440p
8287	360p
8288	650p
8748	1100p
8755	1400p
AY3-1015	290p
AY5-3600	570p
SP0256AL2	500p
Z80ACPU	180p
Z80BCPU	500p
Z80ADMA	650p
Z80AP10	230p
Z80BP10	480p
Z80ACTC	280p
Z80AS10	660p
Z80AS10-1	700p
Z80BP10-2	700p
Z80ADRT	680p
74S188	175p
74S189	210p
74S201	240p
74S287	190p
74S288	160p
74S289	180p
74S387	200p
75107	80p
75108	80p
75109	110p
75110	80p
75112	140p
75113	105p
75114	130p
75115	130p
75121	125p
75122	125p
75150	110p
75154	110p
75158	140p
75159	200p
75160	400p
75161	400p
75162	700p
75172	720p
75182	100p
75183	100p
75188	60p
75189	60p
75195	185p
75322	130p
75324	340p
75325	155p
75365	145p
75450	45p
75451	42p
75452	42p
75453	65p
75454	65p
75480	135p
75491	60p
75492	60p
8T26	95p
8T28	110p
8T31	330p
8T95	90p
8T96	110p
8T97	90p
8T98	110p

UHF TUNERS

U322LO	600p
U341	500p
U342	500p

VIDEO RUBBER BELTS

AKAI	
VS-2EG/5EG 5 belts/kit	180p
VS-9300 7 belts/kit	220p
VS-9700EG 6 belts/kit	200p
VS-9500/9800 7 belts/kit	220p
JVC	
HR-3300/3600 9 belts/kit	220p
HR-3330 7 belts/kit	200p
HR-3360/3660 7 belts/kit	190p
HR-4130 7 belts/kit	195p
HR-7200 3 belts/kit	75p
HR-7600 3 belts/kit	145p
HR-7730 3 belts/kit	77p
NATIONAL	
NV-300 5 belts/kit	160p
NV-333 5 belts/kit	135p
NV-777 4 belts/kit	130p
NV-2000 5 belts/kit	155p
NV-3000 6 belts/kit	180p
NV-7000 5 belts/kit	100p
NV-7200 5 belts/kit	90p
NV-8600 7 belts/kit	200p
SONY	
SL-C72SL-J7 6 belts/kit	140p
SL-T7ME/T7MER 6 belts/kit	170p
SL-T9/P7/J9 7 belts/kit	210p
SL-8000-8080 6 belts/kit	240p
SANYO	
VTC-5300 5 belts/kit	190p
VTC-5500 3 belts/kit	95p
VTC-9300 4 belts/kit	240p
HITACHI	
VT-5000 7 belts/kit	155p
VT-8000 3 belts/kit	110p
VT-11 5 belts/kit	190p
FISHER	
VBS-7000 6 belts/kit	245p
VBS-9000 3 belts/kit	120p
TOSHIBA	
V-5250/5280 5 belts/kit	230p
V-5480 7 belts/kit	210p
V-5475 6 belts/kit	190p
V-7540 5 belts/kit	190p
V-8600 6 belts/kit	150p
SHARP	
VC-6300 5 belts/kit	195p
VC-7300 5 belts/kit	160p
VC-8300 5 belts/kit	175p
VC-9300 5 belts/kit	155p

CASSETTE MOTOR

6V	290p
9VCW	290p
12VCCW	290p
12VCW	290p
13.2VCW	290p
13.2VCCW	290p

CASSETTE TAPE HEADS

Mono Head	90p
Stereo Head	150p
Mono Mini Head	230p
Auto Reverse Head	260p

VIDEO MOTORS

Sanyo	
Reel Motor (RM11) P/N 4-529V-10800	790p
Capstan Motor 4-527V-51000	2400p
Sony	
Capstan Motor BHF-1100D	2500p
Sharp	
Reel Motor RMOTB 1007 Gezz	1750p
Reel Motor RMOTM 1008 Gezz	1750p
Loading Motor RMOTM 1017	1000p
JVC	
Capstan Motor PU-55371V	2200p
Capstan Motor PU-45979	2250p
Drum Motor PU-46414	2250p

VIDEO PINCH ROLLERS

National	
NV-300	475p
NV-7000	475p
Sanyo	
VTC-9300	475p
VTC-5500	475p
Sony	
SL-T7	475p
SL-C7	475p
JVC	
HR-3300	500p
HR-3330	500p
HR-3360/3660	500p
HR-7200	500p
HR-3300	500p
Akai	
VS-9700EG	360p
Hitachi	
VT-5000	475p
Sharp	
VC-6300/6500	

IDLERS & PULLEYS REPLACEMENTS

Sanyo	
Reel, Pulley 143-0-662T-01201	520p
Gear Idler 143-04904-00900	450p
Take Up Idler 143-0-4204-00100	650p
Idler 143-256T-03200	450p
Sony	
Rew Pulley A-6706-348-B	400p
Rew Pulley A-6706-391-A/B	300p
Sharp	
Idler Assembley NIDL0005 Gezz	325p
Idler Assembley NIDL0006 Gezz	325p
Idler Sharp NIDL0005 Gezz	225p
Hitachi	
Idler Assembley 6886971	300p
Idler Assembley V-68661482	385p
JVC	
Idler Assembley PU-47752	480p
Take Up Idler PU-51402A	145p
Take Clutch PU-55373	225p
Idler Arm PU-55374-3-8	285p
Fast Forward Idl PU-45896C	210p
National	
Idler	300p

SERVICE AIDS

SERVISOL PRODUCTS

V. Head Cleaner	85p
Switch Cleaner	100p
Silicone Grease	115p
Freeze It	105p
Foam Cleaner	105p
Anti-Static	105p
Aerokleane	90p
Aero Duster	115p
Plastic Seal	105p

UNIVERSAL TRIPLERS 500p

SONY on/off SWITCHES 250p

VIDEO LAMPS

UNIVERSAL VIDEO LAMP 30p
12V. 60mA (300mm Wires)
RED OR BLUE
VIDEO LAMP FOR PANASONIC 60p

FLOPPY DISCS

5 1/4 inch DSDD (10 in box) Branded Name	£12.50
5 1/4 inch DSDD (bulk pack) 25	£10.00
3 1/2 inch DSDD (10 in box) Branded Name	£21.00
3 inch CF2 Branded Name	£2.40
3 inch CF2D Branded Name	£3.00

ELECTROLYTIC CAPACITORS RADIAL LEAD

10 Volts		40 Volts	
22 MF	15p	10 MF	15p
47 MF	15p	15 MF	15p
100 MF	18p	22 MF	15p
220 MF	18p	47 MF	20p
470 MF	25p	100 MF	25p
1000 MF	35p	220 MF	30p
16 Volts		470 MF	35p
10 MF	15p	1000 MF	50p
22 MF	15p	2200 MF	190p
47 MF	15p	**50 Volts**	
100 MF	18p	1 MF	15p
220 MF	18p	2.2 MF	15p
470 MF	25p	4.7 MF	15p
1000 MF	50p	10 MF	20p
2200 MF	65p	22 MF	25p
4700 MF	110p	**63 Volts**	
25 Volts		0.47 MF	15p
10 MF	15p	1.0 MF	15p
22 MF	15p	2.2 MF	15p
47 MF	15p	4.7 MF	15p
100 MF	18p	10 MF	15p
220 MF	18p	22 MF	20p
470 MF	25p	47 MF	25p
1000 MF	50p	100 MF	30p
2200 MF	70p	220 MF	40p
35 Volts		470 MF	50p
10 MF	15p	1000 MF	100p
22 MF	15p	**100 Volts**	
47 MF	15p	0.47 MF	15p
100 MF	20p	1.0 MF	15p
220 MF	25p	2.2 MF	15p
470 MF	30p	4.7 MF	15p
1000 MF	60p	10 MF	15p
2200 MF	100p		

ELECTROLYTIC CAPACITORS AXIAL LEAD

16 VOLTS		40 VOLTS	
47 MF	25p	10 MF	25p
100 MF	30p	22 MF	30p
220 MF	35p	47 MF	35p
470 MF	45p	100 MF	40p
1000 MF	60p	220 MF	50p
2200 MF	120p	470 MF	60p
4700 MF	160p	1000 MF	100p
10 VOLTS		2200 MF	160p
470 MF	40p	**63 VOLTS**	
1000 MF	50p	1.0 MF	25p
2200 MF	70p	2.2 MF	25p
25 VOLTS		4.7 MF	25p
22 MF	25p	10 MF	30p
47 MF	35p	22 MF	35p
100 MF	35p	47 MF	40p
220 MF	40p	100 MF	50p
470 MF	45p	220 MF	60p
1000 MF	70p	470 MF	100p
2200 MF	125p	1000 MF	160p
35 VOLTS		**100 VOLTS**	
10 MF	25p	1.0 MF	25p
22 MF	25p	2.2 MF	25p
47 MF	30p	4.7 MF	30p
100 MF	35p	10 MF	35p
220 MF	40p	22 MF	35p
470 MF	90p	47 MF	40p
1000 MF	110p		
2200 MF	160p		

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G.E.C. 2047 to 3135 mono	9.20
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SONY KV 1400, 1612, 2000	P.O.A.
GRUNDIG: most models in stock	
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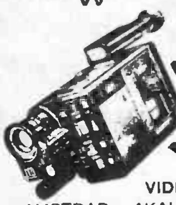

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YOU'LL HAVE TO SEE US TO BELIEVE US !!

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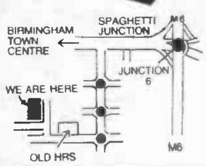

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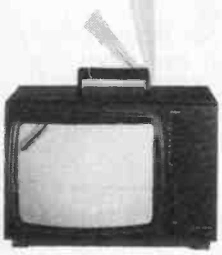

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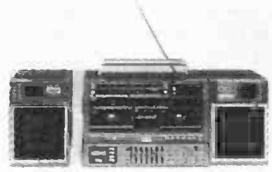

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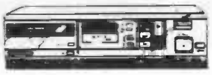

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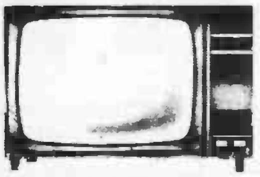

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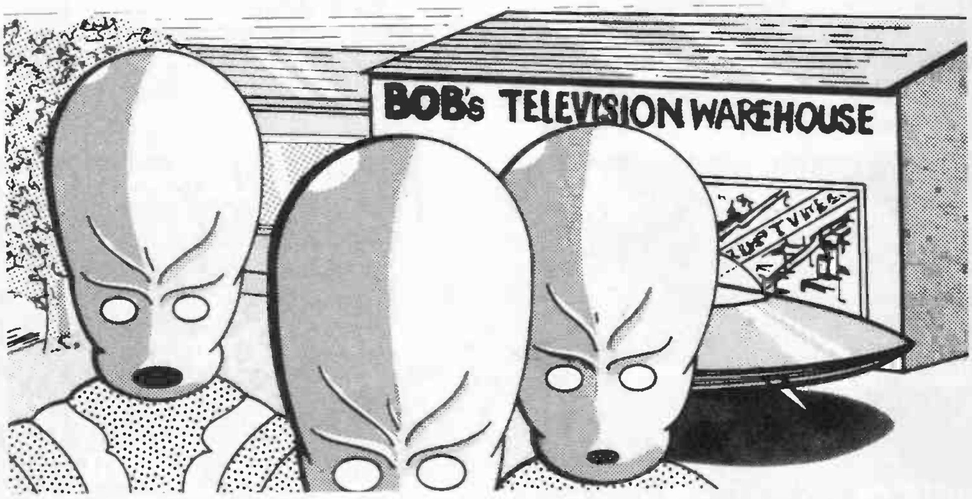
ALIENS SEEN IN BASILDON



A space ship was seen today outside a local television warehouse in Basildon.

Passers by were held spellbound by the sight of three space aliens appearing from within the store, carrying what appeared to be Television sets and video recorders.

In an exclusive interview with one of the aliens, our reporter was told that they had travelled a great distance across our galaxy to this particular T.V. store, because as they said "Bobs T.V. & Video deals cannot be beaten". They were also particularly impressed by the large selection of reconditioned sets

The Alien went on to say that as a main dealer for T.V. equipment on his own planet Trinitron, he found that the trip to earth was justified and rewarding due to the amazing deals he found at Bobs.

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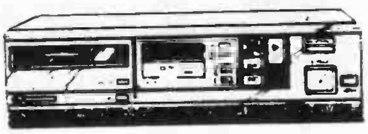
OVER 1,000 TVs & VIDEOS IN STOCK



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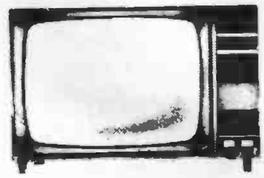

Mechanical Videos	**From £25**
Front Loading Videos	**From £50**
Text TVs	**From £45**
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☆ ***NEW STOCK WEEKLY*** ☆

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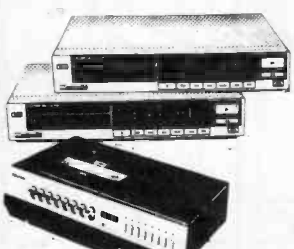

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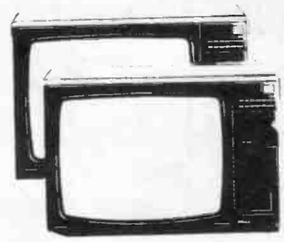

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VC 0005GEZZ	£2.50p
VC 0006GEZZ	£2.50p
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NV 333	£1.50p
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JVC LAMPS	60p
SHARP LAMP	£1.00p
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SONY ON/OFF SWITCH	£2.75p
G11 ON/OFF SWITCH WITH REMOTE	£2.00p
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6-9-12-13.2 VOLTS	£3.00p

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189 × 0.5 × 5	80p
195 × 0.5 × 5	80p
205 × 0.5 × 5	80p

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19 × 1.2	20p
to	
135 × 1.2	20p

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VS-10	95p
VS-7300	£1.40p
VS-9700	£1.65p
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VBS-7000	£2.05p
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VTC-5500	£1.00p
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VC-6000	£1.60p
VC-6100	£1.50p
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VC-7000	£1.50p
VC-8300	£1.50p
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VT-5000	£1.60p
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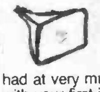

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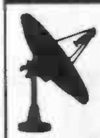

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Double 1.5 Digital Display. High brightness 20p

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BY206	25 for £1.00
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G11 touch button red	6 for £1
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K30 VHF. UHF Dawer Ass	£6.00
BY298 3 amp/fast/R	20 for £1.50
BU126	10 for £6.00
BU205	10 for £8.00
BU105	10 for £6.00
BF458	10 for £1.00
BF224	20 for £1.40
OA90	40 for £1.00
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12v DC relay 1½×1½×2 print type 10 amp D.P. change over £1

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SENDZ COMPONENTS

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Matsushita PY34220 Tuner	£7
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3500 Frame panel	£3
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6 Push button GRC	£6.00
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Hearing aid unit	£3
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with small focus pot. Green type	£7.00

20,000 Per Volt
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10 Amp AC/DC
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£15 to £35

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OF-513	correction	10p
OF-557		50p

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Rank 11TCP A823	£3.50
TU 25 30K Rank	£3.00
11 TEZ Rank	£3.00
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9000 Thorn	£7.00
9500 Thorn	£4.50
9600 Thorn	£4.00
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11THY	£4.00
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G11 E.W. Transformer	50p
G11 E.W. coils	£1.00
G11 Transient Suppressors 245V	20p
G11 Scan Coils	£5.00
G11 100K tuner pots	12 for £1
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K30 drawer unit with IC's (home)	£10
K30 drawer unit with IC's (export)	£10
KT3 AE Sockets	50p
KT3 receiver panel	£8
KT3 line driver transformer	50p
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Decca 80/100 IF panel	£5
NPN PNP 80V 6 Amp TO66 O.P. Trans.	pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
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CVC 20/25/30/35/40 decoder panel	£10
CVC 20/25/30/35/40 decoder panel (untested)	£5
CVC 40/45 IF panel	£5
40K Transducer	50p
PHILIPS NE511N	£1.20
LM337M Reg.	30p
20 GEC Black Spark Gaps	£1.00
KT3 Front Panel Control Assy.	£2.50
BTW 30/50	50p

DIODES

BY 126	10p
BY 127	10p
BY 133	10p
BY 134	10p
BY 176	25p
BY 179	40p
BY 184	25p
BY 187	10p
BY 190	40p
BY 196	30p
BY 198	10p
BY 204/4	8p
BY 206 – BY 407 Eqv.	8p
BY 208/800	8p
BY 210/400	5p
BY 210/800	10p
BY 223	60p
BY 224/600: 4.8A/600v bridge	50p
BY 226	15p
BY 227	15p
BY 228 1500v	20p
Flat BY229 black	15p
BY 299 Red	20p
BY 229/400	30p
BY 299/60p Tag	30p
BY 237	5p
BY 254	10p
BY 255	30p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 448	10p
BY 527	10p
BY 602	10p
BYV 26C	10p
F 247	10p
GP20G	5p
GRP80G (TX10)	60p
XK 3102	50p
BYV 28/200	20p
Bridge TX10 800/3 amps	30p
KBPC35-02 Bridge	£1.50
Bridge Rec. D35B10	40p

International Rectifier EHT Diodes G770/HV34 6KV	3 for 8p
6A/600V Stud Diodes	20p
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BTW 92/800R	£3
25A473 PNP C/P	10p

25% OFF ALL PANELS

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Rank T20 Z136 Panel	£6.00
NEW GEC 20AX Power Supply Switch Mode	£12.00
Field + Jungle panel for GEC 3133/3135	£1.50
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Pye/Chelsea Line op panel	£12.00
Pye 205 T/unit	£3.90
Pye 713 IF panel and tuner	£7.00
Pye 713 Chroma	£10.00
Pye/Chelsea Timebase panel with LOPTI	£10.00
Pye 731 Frame Panel	£5.00
Pye 731 Convergence Panel	£5.00
Pye 731 Chroma	£10.00
Pye 731 IF panel + tuner	£10.00
GEC portable chassis + LOPTI 2114 New	£4.00
G9 Power Panel	£6.00
Mono RANK Chassis 127A NEW	£10.00
NEW G9 Frame Panel	£4.00
NEW G11 IF Panel	£10.00

G8 Tuner Unit + Panel	£4.00
G8 IF & Chroma	£6.00
G8 Chroma	£3.00
G11 IF Detector	£3.00
G11 Selector gain module	£3
Complete CVC 825 Chassis (both panels)	£40.00
AEC V/Cap Resistor Unit UHF with IC SAS660 SAS670	£3.00
Z714 RANK IF Panels 6MHz 1 I.C. SL437F	£3.00
Z909B RANK IF Panels Export 5.5MHz 2 I.C.'s TBA1205B TCA2705Q	£2.50
K35 IF	£6.00
Z743 RANK IF Panel Export 5.5MHz 3 I.C.'s TBA750+SC9504P+SC9503P	£1.50
Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead	£5.00
Pye 6 button switch portable	£1.00
GEC V/cap VHF/UHF tuner and IF+ sound O/P PC 706B3 (Export)	£12.00
GEC Line O/P PC 659B3	£6.00
2110 GEC Power Panel	£8.00
CVC 20 Front panel with sliders + mains input panel	£4
CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots 8 button units	£9.00
CVC9 slider pots panel	50p
Universal Focus. Fits Pye, Thorn and Decca Units.	
T147 Rank tube base on panel	£1.00
Z718 Focus Unit	£1.50
T20 Focus Unit	£1.00
Large Type	75p
Decca Small	75p
KT3 Focus Unit	75p
K30 Focus Pot	75p
K30 Tube base on panel	£1.00
TX10 Focus Units	£8.50
CVC 32 Focus Unit	75p
Fedility Focus Unit 14R–14S	30p
3500 Thorn Focus Unit	£1.00
ITT Small for use with Split	
Z718 Bush Focus	£2.00
Diode	50p
Remo TV12SP	50p
1600 Thorn EHT Rec and Lead	50p
TV14	50p
TV20	£1.00
TV45	50p
Thorn 14/1500 rec stick	5p
TX10 8 Button Unit	£10.00
TX10/TX100 16 Button	£10.00
G11 drawer ASS 3 pots Mains switch and lead	£2.00
K30 Drawer Ass with pots cable forme	£1.00
TX10 Drawer with 8 way pots. ass.	£2.50
TX10 Ex. port with band switch (drawer)	£2.50
Line O/P panel GEC 2217/2218/2213/2214/2226/2227/2228	£10

PHILIPS BATTERIES (Small Types) HAND SETS

SR41	25p
SR43	25p
SR44	25p
SR54	25p
LR43	25p
LR44	25p
LR54	25p
CR2032	25p
10 500PF 2KV	20p
.22/1000	20p
.1/250AC	20p
.1/100	5p
1MFD-250AC	25p
TAA7750	£1.00
HA411485	£1.00
UPC1373	50p
M50143	£1.00
M491BB1	£1.00
M58657P	25p
M50441/550	3p
M58658P	£1.00
Delay Line TDK Small	10p

420M 400V	£1.00
470M 380V	£1.00
220/400V	£1.00
1200PF 15KV	10p
.01 2KV	10p
1+1 MFD Mains Filter ITT 3 Pin	15p
1/100 × 10	30p
22/100	10p
4.7M/100	5p
470/100	20p
4700/100	75p
47/160	10p
300 300/300V	80p
800/160	50p
.1/250 Pulse	5p
2.2 250v	10p
7N5 1500V	15p
3n3/250 A.C.	10p
.33/250V	20p
.39/250V	15p
4n7/250 tested 5KV	25p
22/250	15p
47/250	10p
100/250	20p
G11 470/250V	£1.75
GEC600/250	60p
700/250	£1
300+300 MFD 350v	£1.00
800/250	40p
32/300	20p
4/350	5p
8/350	8p
4.7M/350v	10p
33/350	20p
220/350	30p
300/350	40p
400/350	50p
22/375	15p
220/385 (ITT)	75p
330/385 CVC 820HT	60p
0.1/400	15p
KT3 E/W .39/400	15p
.56K/400v	20p
4700pf/400	10p
.22/400	10p
8/400	15p
33/400	20p
400/400	40p
394K/400V	20p
220/450	40p
.47/500	25p
0.1/600	15p
0.1/1200V wire end	20p
0.1/450 A/C wire end	20p
.22/1000	20p
.047/600	15p
0.047/1000	10p
0.01/1000	10p
0.1/1000	10p
.47/1000v	65p
.47/250V A.C.	10p
.001K/1250	10p
0.0047/1500	10p
.005/1500	10p
.0105/1500	10p
1n8/1500	15p
2n0/1500	10p
2n2/1500	15p
.01/1600	15p
G11.8200/2KV	15p
0.1/2KV	20p
3n9/2KV	15p
0.0015/2KV	10p
6n2/2KV	15p
2n0/2KV	15p
2n2/2KV	15p
470pf 4KV	10p
7500pf/2KV	10p
3000PF/3000V	10p
4n7/2KV	15p
6n2/2KV	10p
7n1/1500V	10p
8n2/1500V	10p
9n1/2000V	10p
8n2/2KV	15p
0.0082/2500	15p
150/3500	10p
1800/4KV	5p
4.7nf/5KV	10p
170/8KV	10p
180/8KV	10p
210/8KV	10p
1000/10KV	10p
.47/100V	80p
Tube Thermpath 167	£1.00
Rank Secam Decoder Panel UHF & VHF T115A	£13.00
10 off .91 CAP G11	£2.00
Philips K4 CAP 150M/385V	50p

CVC 20-25-30 Mains Switches	60p
Infra Red and Ultrasonic G11 Teletext Decoder Panel	£30
RANK & ITT Mains Remote On-Off Switch (720R)	£1.50
RANK & ITT Remote Switch 2800 ohm	£1.50
G11 Mains Switch	50p
4 amp Mains Switch	25p
GEC Mains Switch 4 amp	30p
KT3 Mainswitch	£1.00
G8 Mains Switch	75p
G11 Preh Red LED P/Button for C.H. Change	20p
RANK TOSHIBA Transductors TPC-2011	50p
Mains Switch ITT Long Type Print	75p
Mains Switch Philip Long Type TAG	75p
Mains Switch GEC Long Type TAG	75p
2000 Chassis Fidelity Mains Switch (4 TAG)	60p
250V/4A White Lorlin Mains Switch	60p
KT3-K30-K35 Full Remote Mains Switch (6 TAG)	£1
Teletext Adaptor Kit TY-500 Panasonic	£12

Multi-Caps

220 MFD Sprague 385V	50p
350V 300M + 300M	£1.00
400V 400M	60p
350V 400M	60p
Thorn 3500 175/100/100/350v	£1.00
KT3/200/25/25/385v	£1.00
KT3-K30 220+40+40	75p
200+200+75+25M 325V	£1.00
300+300+150+100+50MFD 350V	£2.00
G11 CAP 470/250	£2.50
47/220/350v	60p
150/150/100/100/100/320v	£2.00
2500/2500/63v	50p
150/200/200/300v	70p
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	£1.00
300/300/100/32/32/300v	2.00
1500/2000/30v	50p
150/150/100/100/320v	£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
Pye 725 LOPTs	£6.00
Pye 731 LOPTs	£6.00
Thorn 8500-8800 LOPTs	£5.00
CMC 301 front panel	£5.00
CMC 303 front panel	£5.00
CMC 302 Panel with TC mains switch etc	£5.00
CMD 800 Decoder	£8.00
G11 1 I.C. Receiver Panel	£1.50
3 I.C. Power Supply G11 Full Remote Receiver Panel	£3.00
PHILIPS SBC 469 Stereo Microphone	£23.00
Meters Hills 520	£17.00
Meters Hills 420	£10.00
Hills HD5000 Digital Meter 1000V DC 750AC 10 Amp 20 MRG Rangers	£28
HT100 Multimeter	£6.75
HT300 Multimeter	£7.75
HT500 Multimeter	£9.00
HT700	£15.00
HD1000 Digital	£20.00
HD3000 Digital	£25.00
HD5000 Digital	£25.00
HD5500	£29.00
HD6000 Digital	£32.00
HD8000 Digital	£37.00
HD9500 Digital with capacity Temp Trans Volts Ohms and Amps ranges	£60

Infra Red Hanset Tester

Works at 24 feet – Sound repeater. Works off 9 volt battery Fits in top pocket.	£8.00
Handset Tester with LED	£4.50

Repaired Handsets

Philips K4-K35, RC5350-RC5300, RC5370, RC5375, repaired same day	£10.00
RC4001 Full Remote KT3 K30 Teletext Handsets exchanged	£15.00
NEW Type RC4001 9 CH not 12	£6.00
GEC Full Remote Infra-red, 1983 models	£15.00
Timers, 60 mins, small	£1.00

TOSHIBA HAND SETS

24 Button CT938 Fullremote	£5.00
32 Button CT983 Videotext	£6.00

THORN

VCR Front Display Panel	£7.00
Large type ITT TV and V.C.R. Handset	£15.00
GEC Ultrasonic 8CH Full Remote	£10.00
G11 Full Remote Ultrasonic	£32.00
G11 Ultrasonic Teletext Handset	£20.00
8 C.H. Ultrasonic GEC Full Remote C2014H/C2219H	£15.00
New Replacement for G11 Ultrasonic Full Remote	£12.00
Thorn 4000 insert with 7 buttons	£5.00
Decca RC 11	£14.00
Decca RC 12	£14.00
G11 Infra-red full teletext	£20.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Hitachi infra red handset	£18.00
Philips full remote KT3, 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 1826	£12.00
G11, Full remote top button assy.	£12.00
G11, Full remote repair service (exchange unit)	£18.00
GEC infra red full remote 8 channel (I.C.SAA1250)	£14.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
Philips infra red full remote 12 channel for 60 CP2605	£12.00
K35	
KT3/K30 T/Text	£15.00
KT3/K30 Full remote	£15.00
KT3 Power supply	£4.00
GEC infra-red 2236-2026	£4.00
GEC 8 button full remote	£14.00
GEC push pad handset button blobs each	10p
Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5171-RC5177. Special Price	£13.00
RC4001 KT3 and Teletex	£14.00
IT CVC 32 handset repaired	£15.00
CVC 32 Hand Set	£15.00
CVC 45 3 and 2 Pin	
TX10 Hand Set Text	£12.50
TX9 with Text	£12.50
TX9 & TX10 button print	£2.00

ITT

T/V & Video Processor. 1200 Type	£10.00

PHILIPS

UNIVERSAL HAND SET £12.00 RC5
KT3 – K45

We have all parts for Philips Handsets

RC5353	£15.00
RC5300	£12.00
Philips RC5	£15.00

TEXT-TYPE

Replace Hand Set for Philips KT3-K30, K4 etc	£12.30

THORN HAND SETS

9000 – 9600 – TX9 – TX10 – TX100 Text and Non-Text	£10.00

PHILIPS

RC5171	£12.00

K35-K4 HAND SET

Repaired for £5.00