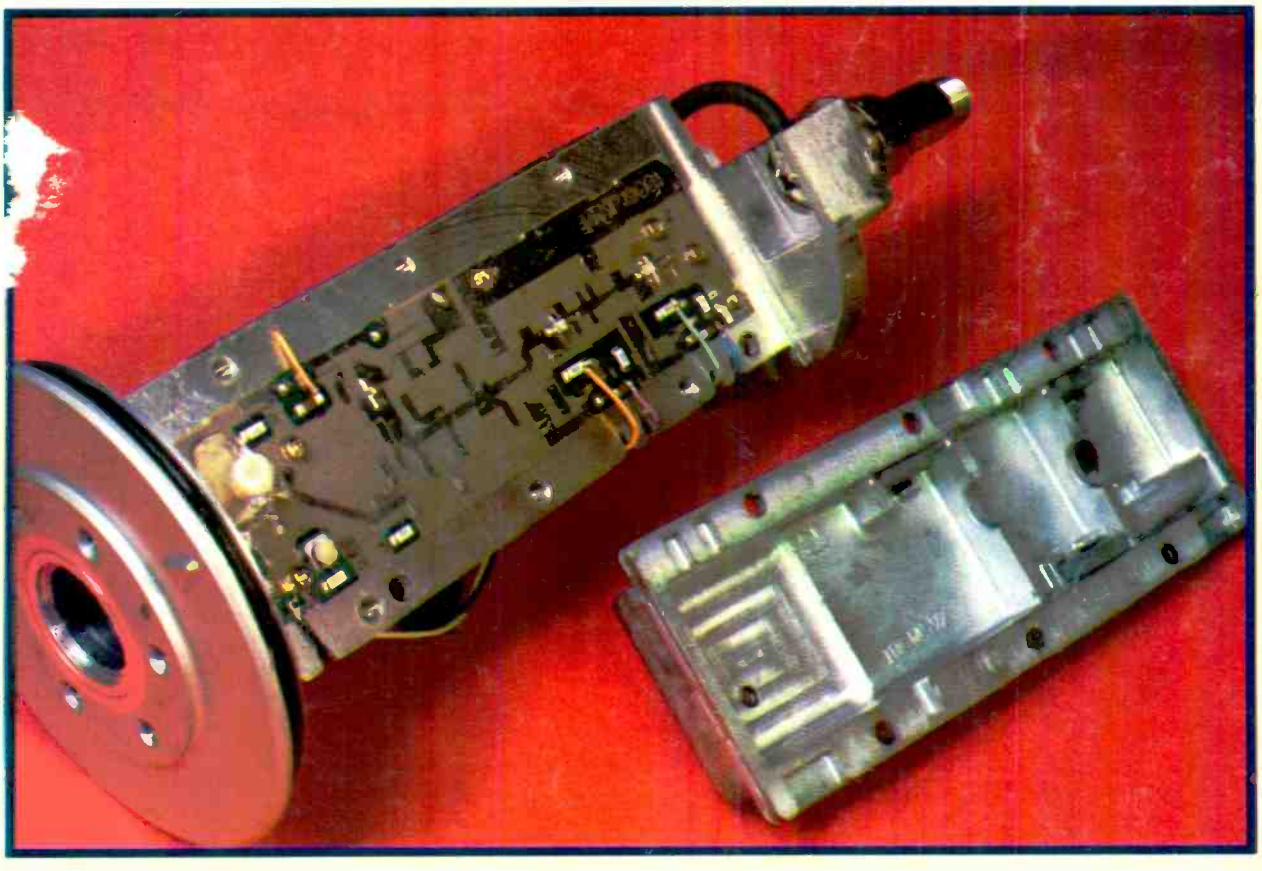
MAY 1985

Australia $1·60, New Zealand $2·20, Malaysia $5

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

★ EXTRA PAGES THIS MONTH ★



Colour Capable Video Fader Unit
Clearing Teletext Interference
Renovating the Philips G8
Spectrum Test Pattern • DX-TV
Chips for Tomorrow's Sets
VCR Clinic • TV Fault Finding

MANOR SUPPLIES

MKV PAL COLOUR
TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE

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

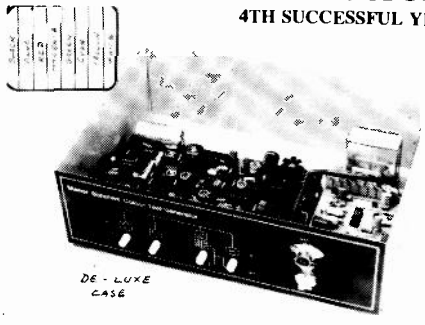
Price of Kit	**£70.00**
De Luxe Case (10″×6″×2¼″)	**£7.40**
Optional Sound Module (6MHz or 5.5MHz)	**£3.90**
Built & Tested in De Luxe Case including Sound Module	**£105.00**

SPECIAL TEST REPORT 'TELEVISION' DEC. 1982

Post/Packing £2.50
Add VAT 15% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)

4TH SUCCESSFUL YEAR



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

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £30.00. DELUXE CASE £7.40. BATT HOLDERS £2.80. MAINS SUPPLY KIT £4.20 (Combined P&P £2.20).
MK 4 DE LUXE (BATTERY) BUILT & TESTED £58.00 + £2.20 P & P.
MK 4 DE LUXE (MAINS) BUILT & TESTED £68.00 + £2.20 P & P.
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £5.75.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

GEC TELETEXT EXTERNAL ADAPTOR UNIT
Complete & ready for use. Infra-red remote control **£130.00** p.p. £3.00
TELETEXT EXTERNAL ADAPTOR KIT (Less case)
with cable remote control **£120.00** p.p. £3.00
THORN TX10, teletext
Mullard Decorder panel + Interface **£35.00** p.p. £1.80
THORN TX10, PHILIPS G11 PRESTEL
Mullard Units VM 6230, 6330 plus Line Coupler & Interface **£60.00** p.p. £2.50
Goods available if in stock immediately over shop counter (Mail order between 3 days and 1 week from receipt of order). ADD VAT 15%

TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

LOPTs, TRIPLERS, PANELS, TUNERS, SELECTORS ETC.

SPECIAL OFFER PHILIPS, PYE KT3 SERIES INFRA RED REMOTE CONTROL HANDSETS EX RENTAL (UNTESTED) TELETEXT OR NORMAL VERSIONS AVAILABLE **£2.50** p.p. 80p **(5 for £10** p.p. £1.50).
THORN 9000 Fault Finding Guide **£1.00** p.p. 30p.
SPECIAL OFFER NEW VALVES
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THORN TX10 Facia Control Panel incl. Infra Red Remote Control receiver **£7.50** p.p. £1.50.
THORN TX10 Series Facia Control Panel with 8 position Channel Selector **£5.00** p.p. £1.50.
PHILIPS UHF Modulator (Audio & Video Input) **£15.00** p.p. £1.00.
SAW FILTER IF AMPLIFIER PLUS TUNER complete and tested for T.V. Sound & Vision. **£28.50** p.p. £1.20.
THORN TX9, TX10 Saw Filter IF Panel. **£7.50** p.p. 80p.
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.
TELETEXT DECODERS New & Tested Mullard VM 6101 **£30.00,** Texas XM11 **£40.00** p.p. £1.60
TELETEXT 23 Button De-Luxe Handset with 5 yds Cable. **£2.50** p.p. £1.20.
5V Stab. Power Supply **£3.80** p.p. £1.20.
CROSS HATCH UNIT KIT, Aerial Input type, incl. T.V. sync. and UHF Modulator, Battery Operated, also gives Peak White & Black Levels, can be used for any set. **£12.00** p.p. 80p. (Alum. Case **£2.55,** De Luxe Case **£6.80** p.p. £1.40.) **ADDITIONAL GREY SCALE** Kit **£2.90** p.p. 45p.
UHF SIGNAL STRENGTH METER KIT £22.00 (VHF version **£24.00**). Alum. Case **£2.55.** De Luxe Case **£7.40** p.p. £1.80.
CRT TESTER & REACTIVATOR KIT For Colour & Mono Meter Indicator **£28.60** p.p. £2.80.
BUSH A823 Convergence, Time Base Panels **£5.00** each. p.p. £1.80.
BUSH Z718 BC6100 series IF Panel **£5.00** p.p. 90p.
BUSH A316 IF Panel (Surplus) **£1.65** p.p. 90p.
DECCA 80 Series IF. Frame, T.B. **£5.00** p.p. £1.40.
GEC 2040 Convergence Panels, Decoder Panels, **£1.50** p.p. £1.80.
GEC 2110 PANELS Frame **£8.50,** Preset (Tune) Control **£5.00** p.p. £1.40.
PYE 691-7 CDA Panels. Makers tested stock. **£6.00** p.p. £1.45.
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THORN TX9 Panels salvaged ex factory for spares incl. LOPT & Mains Transformers. **£10.00** p.p. £2.80.
THORN TX9 Panels ex factory salvaged complete cond. **£20.00** p.p. £2.80.
THORN TX10 T.B. Panels salvaged ex factory. **£15.00** p.p. £3.00.
THORN TX10 IF/Decoder Panels salvaged ex factory. **£15.00** p.p. £2.00.
THORN 3000/3500 Power supply P.C.B. **£3.50** p.p. £1.00.
THORN 8000/8500 IF/Decoder Panels salvaged **£3.20** p.p. £1.80.
THORN 9000 IF/Decoder Panels Salvaged. **£5.00** p.p. £1.60.
THORN 9000 Series. Long panel facia unit incl. 6 Position Channel Selector & Loudspeaker **£6.00** p.p. £2.00.
PHILIPS G8/G9 IF/Decoder Panels for small spares incl ICs **£2.50** p.p. £1.60.
G11 PANELS, Ex Rental SCAN (incl LOPT) **£28.00** p.p. £2.50.
G11 PANELS, Power, Frame, IF, Decoder, **£18.00** each. p.p. £2.00.
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VARICAP. ELC1043/5 **£7.80** p.p. 80p. Makers Varicap Controls PYE CT200 4PSN **£7.50,** BUSH 4PSN **£4.80,** DECCA 4PSN **£5.80,** 6PSN **£6.80** p.p. 80p. etc.
BUSH "TOUCH TUNE" Varicap Control Z179, Z718 types **£3.80** p.p. 95p.
VARICAP UHF-VHF ELC2000S **£9.80,** BUSH **£7.80** p.p. 90p.
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UHF/625 TUNERS, many different types in stock. DECCA Bradford 5 position, MULLARD 4 position **£2.50,** JAP Rotary **£4.80** p.p. £1.80.
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LOPTS New and guar. P/P Mono **£1.35,** Colour **£1.50,** Bobbins **80p.**

BUSH 161 to 186 (twin panel)	**£5.90**	**R.B.M.** A823	**£4.90**
BUSH, MURPHY 774 series	**£8.50**	**R.B.M.** Z179	**£9.80**
BUSH, MURPHY A816 series	**£9.80**	**R.B.M.** T20, T22	**£9.80**
FERG., HMV, MARCONI, ULTRA 1400, 1500, 1590, 1591	**£5.90**	**R.B.M.** T20, T22 Bobbin	**£5.60**
THORN 1600, 1615, 1690, 1691	**£9.15**	**DECCA** Bradford (state Mod No)	**£8.80**
GEC 2000 to 2038 series	**£6.80**	**DECCA** 80, 100	**£8.80**
GEC series 1 & 2	**£8.00**	**FIDELITY** 2000, 3000	**£14.50**
INDESIT 20/24EGB	**£7.65**	**GEC** 2028, 2040, 2100	**£5.80**
ITT/KB VC200, 300	**£7.65**	**GEC** 2110 series	**£10.60**
MURPHY 1910 to 2414 (twin panel)	**£5.90**	**ITT** CVC5 to 9, CVC20	**£9.80**
PHILIPS 170, 210, 300 series	**£7.65**	**ITT** CVC25, CVC30 series	**£8.80**
PYE, INVICTA, EKCO, FERR. 368, 169, 569, 769 series	**£7.65**	**PYE** 691-697 (state model no.)	**£10.00**
SPECIAL OFFER		**PYE** 713, 715	**£6.80**
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		THORN 3000/3500 SCAN, EHT	**£6.90**
		THORN 9000 to 9600	**£12.90**

OTHERS AVAILABLE, PRICES ON REQUEST. ALSO LOPTS.
TRIPLERS Full range available. Mono & Colour.
Special Offer: Thorn 8000 (2 lead) EHT Tray **£2.80** p.p. 80p.
TRANSDUCTORS suitable for G8, A823, Bradford etc. **£1.50** p.p. 60p.
6·3V CRT Boost Transformers for Colour & Mono **£5.40** p.p. £1.20.
THORN TX10 focus control **£8.80** p.p. 80p.
THORN 8000 mains input choke **£6.80** p.p. £1.40.

CALLERS WELCOME AT SHOP PREMISES
THOUSANDS OF ADDITIONAL ITEMS, ENQUIRIES INVITED
LARGE SELECTION TESTED COLOUR PANELS POPULAR MODELS
TELEVISION MAGAZINE PROJECT PARTS & REPLACEMENTS STILL AVAILABLE
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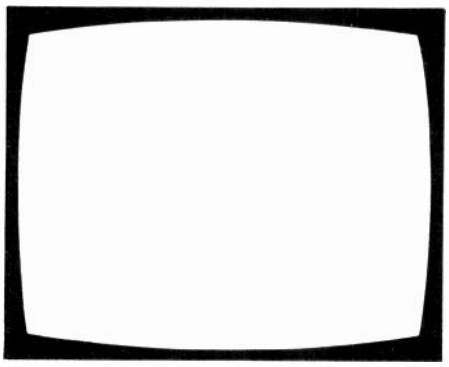
Mail Order: 64 GOLDERS MANOR DRIVE, LONDON N.W.11.
PLEASE ADD VAT 15% TO ALL PRICES



TELEVISION

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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.

SUBSCRIPTIONS
An annual subscription costs £11 in the UK, £12 overseas (by surface mail). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

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Binders (£4·50) and Indexes (45p) can be supplied by the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF. Prices include postage and VAT. In the case of overseas orders, add 60p.

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QUERIES
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Requests for advice on dealing with servicing problems should be directed to our Queries Service. For details see our regular feature "Service Bureau". Send to the address given above (see "correspondence").

this month

OUR NEXT ISSUE DATED JUNE WILL BE PUBLISHED ON MAY 15

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TRADE COUNTER OPEN MON-FRI 9 a.m.–5 p.m. SAT 9.30 a.m.–5 p.m. TRADE COUNTER CLOSED WEDNESDAY p.m.

VARICAP TUNERS

ELC1043-05	8.40
ELC1043-06	8.40
ELC2003	16.50
Philips G8/G9	10.50
Philips G11 (U321)	8.50
U322	7.20
U341	9.50
Rank T20	13.00

PUSH BUTTON ASS.

Decca 4 way	6.88
6 way	7.50
GEC 2110 6 way	7.98
GEC Slim 6 way	6.50
GEC/ITT/PYE 7 way	14.50
Pye 4 way (713/15)	9.00
Pye 6 way (207/715)	16.00
Pye 697 repair kit	9.00
Pye 725-735	11.00
Pye 725-735 with tuning head	14.60
Philips G8 (early)	15.50
Philips G8 (late)	13.90
Rank A823	10.75
Rank T20A	9.75
Hitachi 4 way	10.75
Philips G11 unit	26.50
Philips KT3	14.50
Philips KT30	10.30
ITT CVC 8/9 (mod)	12.00
ITT 6 way with VCR	8.90
Thorn 9000 switchback	5.30
Decca 7 way piano key replacement kit	19.50

SERVICE AIDS

SERVISOL Freeze-It	1.14
SUPER SERVISOL	98
SERVISOL Foam Cleanser	96
SERVISOL Plastics Seal	1.08
SERVISOL Silicone Grease	1.20
SERVISOL Tubes Silicone Grease	1.64
SERVISOL Aero Klene	90
SERVISOL Aero Duster	1.20
SERVISOL Excel Polish	92
SERVISOL Video Head Cleanser	86
Super 40	1.62
Fire Extinguisher 640G	2.86
Heat Sink Compound 25G	1.08
Silicone Rubber Tube 110G	2.98
Solda Mop standard reel	74

ELECTROLUBE PRODUCTS

Electrolube Adhesive	62
Electro-Mech lubricant	1.49
Elect. cleaning solvent	1.62
Freezer	1.49
Foam cleanser	1.12
Heat transfer compound	1.14
Silicone compound	1.94
Special contact fluid (Snorkell)	3.20
Permagard	1.52
Elec. mech. lubricant pen	74

VIDEO

Video care kits	3.50
VHS E30 video tape	3.06
VHS E60 video tape	4.00
Scotch E120 video tape	5.00
E180 video tape	4.50
Beta L500 video tape	4.90
Beta L750 video tape	5.80
Philips VCC 240	6.20
Philips VCC 360	8.30
Philips VCC 480	10.21
Philips LVC 1700 1200	15.10

VIDEO HEADS

3HSS VHS	32.50
4HSS VHS	32.80
PS38 Beta/Sony	42.00

VIDEO RECORDER HEADS

Philips V2000	57.00
Philips 1700	57.00
Video lamps	1.30
Video lamp holders	3.30

VIDEO DRIVE BELT KITS

JVC HR3330/3600	4.50
JVC HR3360/3660	4.50
Panasonic NV/300	4.50
Panasonic NV/7000	4.50
Sony SLC7/SLJ7	4.50
Sony SL8000/8080	4.50
Toshiba V7540	4.50
Ferguson HR3330/3600	4.50
Video head cleaner	86

AUDIO HEADS AND MOTORS

Mono record/playback	4.32
Stereo playback	4.79
Stereo record/playback	4.99
Stereo record/playback (Dolby)	6.90
Mono/stereo erase	2.25
Electronic/rotation clockwise motors	
6V MD6515	4.95
9V MD9516	4.95
12V MD12517	4.95

SWITCHES & ACCESS.

On/off gen. purpose 4A	75
G8 on/off	1.38
G11 on/off	1.58
G11 on/off remote	1.58
Gen. purpose rotary	66
Thorn Tx 9/10	1.06
GEC 2040	98
Thorn 1591 push on/off	2.90
Rank tuner buttons 1½"×½", 2"×½", 2"×⅜"	35
Rank drive cams	15
GEC 2110 tuner neons	20
Thorn 3500 A1 beam	70
GEC 2110 A1 cont. R/B/G	58
ITT CVC5 on/off	1.24
ITT mains switch + solenoid	4.50
Rank mains switch + solenoid	4.50

EAGLE MULTIMETERS

KEW 7N	6.75	
KEW 14	9.00	
KEW 20	14.50	
EM5	11.95	
EM20A	15.95	
EM10	13.95	
MM50	31.25	Bench
MM100	44.50	Meters
MMT20	21.50	
MM150	75.00	
T1206 intercom	8.50	
MMC100	21.95	Case
TS350	21.95	

ANTEX SOLDERING EQUIPMENT

C15W Iron 240V	4.41
C240 Element	1.80
Bits 102	90
106	90
820	90
821	90
CS17W Iron 240V	4.41
CS240 Element	2.25
Bits 1100	90
1101	90
1106	90
XS25W Iron 240V	4.59
XS240 Element	2.25
Bits 50	90
51	90
Temp. Controlled	
30W Iron CSTC	10.50
40W Iron XSTC	10.50
Unit for above TCSU1	32.64
Stand	2.00
MLXS Auto Repair Kit	6.30

WELLER

Heat gun	12.00
Heat gun tips (pair)	57
3/16" Iron tips 25W (MT5)	57

LABGEAR

CM7261 Power Unit 12V	11.24
CM7262 Reg. Power Unit 12V	12.25
CM7060 MHA 10db 12V W/B	9.86
CM7065 VHF/UHF MHA W/B 12V	14.34
CM7067 UHF 12V MHA (Specify A-B or C/D)	10.72
CM7068 UHF 12V MHA High Gain (Specify A-B or C/D)	15.95
CM7053 Behind Set UHF Amp. (Mains)	13.01
CM7054 Behind Set UHF Amp. (Battery e.g. Caravans)	10.42
CM7043 Second Set Amp. UHF	12.12
CM7093 Behind Set UHF Amp. 3 Sets	15.27
CM7063 Dist. Amp. VHF/UHF 17db/output 12V	22.17
CM7108 VHF/UHF 8+1 Dist. Amp.	43.26
CM9700 27mhz CB Suppress.	4.05
CM6011 Outdoor Splitter (2 way) W/B	7.63
CM9003 Flush Single Outlet	1.47
CM9010 Flush Twin Outlet	1.95
CM9034 UHF Group Filters with DC Through Pass (state A/B/CD)	7.69
CM6006 6 Way Passive Splitter	10.97
CM7042 TV Games Combin.	2.95
CM9009 Flush TV/FM Outlet	3.05
CM7091 Col. Bar Gen.	121.80

STATIONERY

Service Call Pad (100)	1.20
Repair Ticket (100)	3.90
Job Card (100)	2.50
Rental Payment Card (50)	3.50
Rental Agreements (100)	3.50
H.P. Agreements (100)	3.50
Maintenance Agreement (100)	3.50

DID YOU KNOW WE'VE GOT LOTS OF NEW THINGS!

Decca speaker 16R	4.50
8R	3.75

B+K tube bases Dynascan

No. 3	9.50	No. 13	11.11
No. 6	11.08	No. 14	16.78
No. 8	10.08	No. 23	13.86

L5 7"×3⅝" speaker	4.25
C12 computer cass.	30
C18 computer cass.	33
5¼" floppy disc s/s s/d	1.61
15R fused res. G9	55
G11 line lin coil	2.95
G11 pot G2 R.G.B.	5.30
G11 line scan panel	54.00
G11 power panel	37.50
G11 timebase panel	37.50
G11 bridge trans.	97
G11 EW correc. coil	1.95
G11 final anode lead	1.50
G11 focus unit	5.80
G11 39R 3W resistor	60
G11 RGB 10G diodes	50
Televerta up converta	37.20

SUNDRY EQUIPMENT

Test Lead Set	4.20
Degaussing Coil Stick	17.00
Signal Injector	4.00
Elect. Circuit Tester	1.50
5A Choc Bloc (12)	40
Fuse Wire 5A, 15A, 30A	05
4-way 13A Mains Conn.	5.80
Safe Block (mains)	7.00
13A Plug Top (box 10)	4.80
Probes (x10)	10.90
Probes (x1)	10.90
Bell Wire (100m)	5.00
Mains Cable (circular 100m)	
(2 core)	10.75
(3 core)	13.25
Factory recon. Avo meters	119.00
Avo Batteries	2.95
Vero Board	2.59
Isolating trans. 500vA 240V	40.00
Solder 500g	7.00
D.I.Y. Solder	45
Solder Sucker	6.50
Nozzles	81
Trim Tools	
Plastic	16
Metal End	30

PHILIPS KT3 SPECIFICS

KT3 posistor	1.50
Mains electrolytic 225/25 380V	2.50
Selector unit Mod. 933	13.42
On/off switch Mod. 933	3.20
Tripler	10.65
Luminance chroma panel	24.00
2003 IF module	14.95
U321 IF module	13.50
R.G.B. panel	10.30
Sound panel	8.50
Power panel	10.60
Mains input panel	14.30
Line sync panel	10.20
Mark II chroma panel	16.50
Sound module	8.50
LOPT	9.70
Focus unit	3.50

K30 SPECIFICS

K30 LOPT	17.50
K30 focus unit	2.90
K30 EHT lead	8.30
Selector unit 1002 (early)	11.20
TMS 1000 panel 1234	13.00
Euro decoder panel 1234	46.00
Power supply 1234	23.50
A1 gun switches	70
On/off switch	2.60
Selector unit 1002 (late)	9.90
Hand set 1201	16.00
Hand set 1234	16.00
Diode ZTX 33B	90
DL 20 delay line	2.20

Solda Mop Stnd.	74
Sidecutters sm.	1.20
Long Nose Pliers	1.20
SM Torch	42
Quick Set Adhesive	75
Sm. Neon Screwdriver	40
Lg. Neon Screwdriver	65
Min. Screwdrivers	15
Antistatic Foam (12" sheet)	95
I.C. Inserters	1.18

DATA BOOKS (Zero VAT)

TVT 80 2N-2S only	4.00
LIN IC Books (data only not equiv.) LIN1	5.95
2M Fly Lead	70
4M Fly Lead	1.20
10M Fly Lead	1.90
Figure 8 Mains Lead	62
Computer to TV	97
7 pin din to 5 pin din	98
5 pin din to 5 pin din	98
IC equivalent booklet £2.25 and transistor equivalent booklet £2.25	

SPECIFIC COMPONENTS

Philips G8 knobs sm/lg	50
90° transductor	2.60
Thorn 1591 speakers sm	6.20
lg	6.20
Thorn 1500 controls	59
390K frame 470K line contrast 1k5	each
Focus control Thorn/GEC	1.83
Thorn 9000 focus unit	5.95
Thorn 8500 focus unit	4.75
Thorn Tx10 focus cont.	9.00
Decca bridge trans.	1.97
Decca 30 width cont.	50
Decca 2M2 HT cont.	25
Rank T20 focus cont.	2.20
Pye 731 HF choke	6.50
Delay lines DL20, DL60, DL700, DL50	2.20
CRT tube base	1.40
EHT final anode cap	53
6.3V CRT boost trans.	5.80
Focus rod	1.25
Focus holder	2.00
AFC unit G8	8.82
IF gain module	9.00
C.D.A. panel	20.00
G8 rear conv. panel	23.00

PLUGS

Phono Plugs	12
DIN Plugs 3 pin	22
4 pin	22p
180° 5 pin	20p
stnd 5 pin	20
Car Aerial Plug	18
2.5mm Jack Plug	14
3.5mm Jack Plug	14
Stand Jack Plug	20
Stereo Jack Plug	36
Coax Plugs	each 18
	ten 1.80
PL259	40
Reducers for PL259	16
Line Connectors	16
BNC Plugs	1.15

CASSETTE DRIVE BELTS

35m	35	46mm	37	57m	37
66m	39	71m	43	76m	43
90m	43	110m	59		

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SB11 Splitter	1.91
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CS200 Combiner/Splitter	3.03
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PU1240 Power Unit	11.00
UP1300 MHA	8.25
XS2U Xtraboost	11.63
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SHEILA'S SURPRISES

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VC8300
VC220/381/383/388/9100/9300/9500
VC3300/9700

SANYO VIDEO HEADS £53
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VTC 5300/5000
VTC 5350
VTC 5500
VTC 9350

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Grundig Telepilot 8 Series Infra Red	£25.10
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Grundig Telepilot 300 Infra Red	£18.87
Philips KT3/K30 Infra Red Non Teletext	£18.87
Philips G11 Ultra Sonic Non Teletext	£22.00
Philips G11 8 Way Infra Red Teletext	£23.80
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Philips G11 Ultra Sonic 2 function	£21.00
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74LS03	58	74LS40	35	74LS107	80	74LS162	4.04	74LS253	95
74LS04	58	74LS42	80	74LS109	58	74LS163	85	74LS257	1.20
74LS05	58	74LS47	85	74LS112	50	74LS164	85	74LS258	95
74LS08	58	74LS48	83	74LS113	44	74LS165	1.50	74LS259	1.70
74LS09	58	74LS49	33	74LS114	70	74LS173	1.32	74LS273	1.90
74LS10	58	74LS51	33	74LS123	80	74LS174	85	74LS283	1.30
74LS11	58	74LS54	43	74LS125	85	74LS175	85	74LS293	1.20
74LS13	37	74LS55	60	74LS126	60	74LS191	1.02	74LS352	1.40
74LS14	46	74LS73	60	74LS132	63	74LS192	1.30	74LS353	1.40
74LS15	33	74LS74	65	74LS138	83	74LS193	1.30	74LS365	75
74LS20	35	74LS75	65	74LS139	65	74LS194A	75	74LS366	82
74LS21	35	74LS76	65	74LS151	85	74LS197	95	74LS367	1.65
74LS22	35	74LS78	65	74LS153	85	74LS240	2.20	74LS368	65
74LS26	44	74LS83A	89	74LS155	65	74LS241	2.20	74LS373	1.40
74LS27	35	74LS86	39	74LS156	1.02	74LS242	2.20	74LS374	1.55
74LS30	35	74LS85	98	74LS157	78	74LS243	2.20	74LS393	1.20
74LS32	90	74LS90	1.22	74LS158	65	74LS244	2.20	74LS670	1.78

VOLTAGE REG.

7805	78
7806	78
7808	78
7812	78
7815	78
7818	78
7824	78
78L05	68
78L08	68
78L12	68
78L24	68
7905	98
7906	98
7908	98
7912	98
7915	98
7918	98
7924	98
79L05	72
79L12	72
79L15	72
79L24	72

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		4029B	90	4071B	22	4513B	1.68	4543B	1.12
4001B	21	4032B	1.04	4072B	22	4514B	1.88	4551B	96
4002B	21	4035B	80	4073B	22	4515B	1.88	4553B	2.40
4008B	72	4038B	99	4075B	22	4516B	76	4554B	1.20
4011B	31	4040B	72	4076B	80	4518B	76	4556B	48
4012B	21	4042B	58	4077B	22	4519B	64	4560B	1.76
4013B	30	4043B	71	4078B	22	4520B	76	4561B	74
4014B	74	4044B	71	4081B	22	4521B	1.68	4566B	1.20
4015B	76	4046B	96	4093B	43	4522B	88	4580B	3.60
4016B	42	4047B	70	4094B	1.56	4526B	88	4581B	1.84
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4020B	76	4051B	72	4161B	72	4529B	1.04	4584B	40
4021B	70	4052B	72	4162B	72	4530B	62	4585B	88
4022B	70	4053B	72	4163B	72	4531B	72	4597B	1.84
4023B	21	4060B	96	4502B	72	4532B	1.00	4598B	2.40
4024B	50	4066B	43	4505B	1.88	4536B	2.64	4599B	2.00
4025B	21	4068B	22	4510B	76	4538B	1.04		

I.C. SOCKETS

DIL to DIL	
8 way	22
14 way	29
16 way	32
18 way	32
20 way	32
22 way	32
24 way	34
28 way	45
40 way	64

DIL to QUIL	
14 way	32
16 way	34
18 way	37

QUIL to QUIL	
14 way	32
16 way	36

MAINS DROPPERS

DECCA 20	2.48
DECCA 27R/47R	1.40
DECCA 56R/6R8	1.40
R.B.M. A823 56R/68R	94
R.B.M. 161	82
GEC 2000/2018	70
GEC 27840	64
PYE 713/15 3R5/15/45R	1.80
PYE 725/31 3R0/56R/27R	1.84
PYE 725 56R/27R	1.04
PHILIPS 210/5050 30R/125R/2k85	1.75
PHILIPS 210/5051 -/118R/148R	93
PHILIPS G8/5081 47R Section	50
PHILIPS G8/5083 2R2/68R	95
THORN 1400	1.20
THORN 1500	1.38
THORN 1600	1.77
THORN 3500	94
THORN 8000	1.24
THORN 8500	1.36
THORN 9800	1.30
DECCA 2R5	96
DECCA 3R9 Modulohm	60

CRYSTALS & FILTERS

6Mhz	74
5.5Mhz	74
4.3Mhz	1.30
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30FL2	1.70	EF183	99	PCF200	1.35	PL504	1.65		
DY802	98	EF184	1.09	PCF800	1.38	PL508	2.90		
DY86/7	66	EH90	1.02	PCF801	1.13	PL509/19	5.30		
ECC81	1.08	EL34	3.50	PCF802	1.12	PL802			
ECC82	98	EL84	1.05	PCF805	1.80	Glass	5.50		
ECC83	1.07	EY86/7	68	PCF806	1.30	PY88	81		
ECC84	80	EY500A	2.25	PCF808	1.63	PY500A	2.30		
ECC85	98	EZ80/1	56	PCH200	1.45	PY800/1	69		
ECC88	1.35	GY501	1.45	PCL82	1.20	UCH81	2.25		
ECF80	80	GZ34	3.50	PCL84	1.20	UCL83	1.82		
ECF82	88	KT66	8.50	PCL86	92	UY85	1.35		
ECH81	1.60	KT77	8.50	PCL805	1.09	PL802T	4.00		
ECH84	1.66	KT88	12.00	PD500	2.93	40KD6	5.30		
ECL80	84	PC92	3.00	PFL200	1.86	21LU8	3.00		
ECL82	1.30	PC97	1.65	PL36	1.87	17DW4A	1.60		
ECL86	1.99	PCC85	85	PL81	94	3AT2B	5.00		
EF80	95	PCC805	1.40	PL83	1.43	12BY7A	3.75		
EF86	1.96	PCF80	1.00	PL84	84	12HG7	3.20		

THERMISTORS

VA1104	75
VA1040	75
VA8650	55
VA1039	35
GEC Dual Posistor 2040 (CK1)	1.68 GEC Dual 1.98

THERMAL CUT OUT

THORN 3000 2A Metal	2.20
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MULTITURN POTS

100K	55
GEC TCE	55
PHILIPS G8	
DECCA, RANK	55

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L.E.D's

5mm Red, Green, Yellow	14
T1 ¾ Amber	22
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Flashing Red CQX21	62
CQX22	66
Panel Clips 3mm	4
5mm	4

DISC CERAMIC CAPS

8kV (12kV)
39pF, 200pF, 150pF, 220pF, 180pF, 250pF — 40p

63V/100V
A range of pref. values 22pF-4700pF — 12p

POLYESTER CAPS

250V 0.01mF, 0.1mF, 0.22mF — 12p

400V 0.01mF, 0.1mF, 0.22mF — 12p

TANTALUM CAPACITORS

6.3V	47mF	42
	100mF	90
16V	10mF	22
	22mF	28
	47mF	1.03
25V	22mF	46
35V	0.1mF	13
	0.22mF	13
	0.47mF	13
	1mF	13
	2.2mF	17
	4.7mF	26
	10mF	57

CONVERGENCE POTS

3W/5R-6RB-10R-15R-20R
50R-100R-200R-500R — 60

METRIC CONVERGENCE POTS

PHILIPS G8
5R-10R-15R-20R-50R — 60

LINE OUTPUT TRANS.

R.B.M. T20A	13.95
R.B.M. A774 Mono	11.74
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R.B.M. Z718 22"	19.50
PHILIPS 320	8.70
PHILIPS 210/300 Mono	10.00
PHILIPS G8	8.75
PHILIPS G9	7.75
PHILIPS G11	13.50
PYE 697 (Printed)	14.50
PYE 713/731	10.00
PYE 725 90°	10.50
PYE 169	10.00
DECCA 80/100	8.58
DECCA 1700	9.00
DECCA 1730	8.58
DECCA 2230	8.58
GEC 2110	16.75
GEC 2040	9.50
ITT CVC 1-9	10.85
ITT CVC 25/30/32	8.65
ITT CVC 20	8.60
THORN 3000 EHT	9.95
THORN 3000 SCAN	7.95
THORN 8000	11.33
THORN 8500	11.33
THORN 9000	14.00
THORN 3000/3500 Mains	10.00
THORN 1591	8.68
THORN 1691	9.68
THORN TX10	15.00
THORN 1615	9.75
PHILIPS KT3	9.70
RANK BUSHRANGER	£10.00
PYE 741	8.20
B+O (2000, 3000)	12.70
B+O (3000 EHT)	18.90

RECTIFIER TRAYS

THORN 950 Mk II	4.25
THORN 1400 3 Stick	5.20
THORN 1500 3 Stick	5.20
THORN 1500 5 Stick	5.29
THORN 1600	4.95
THORN 3000/3500	7.98
THORN 8000	5.28
THORN 8500/8800	7.15
THORN 9000	7.93
DECCA 1730/1830	4.48
DECCA 30	6.76
DECCA 80	6.60
DECCA 100	7.50
UNIVERSAL ITT or REMO	6.00
GEC 2100	7.40
GEC 2200 (20AX)	6.50
GEC 2040/2028	6.60
GEC 2110 Pre Jan '77	7.00
GEC 2110 Post Jan '77	7.00
PHILIPS G8 Short Focus Lead	6.75
PHILIPS G8 Long Focus 550	6.75
PHILIPS G9	6.37
Pye/Philips K3 Tripler	10.65
PYE 691/3	6.58
PYE 713/4 Lead	8.79
PYE 713 Doubler 5 Lead	8.79
PYE 731/725	7.60
R.B.M. A823 (plug in) AV	7.60
KORTING (similar to Siemens TVK1)	7.32
ITT KB CVC5/9	6.90
ITT KB CVC20/25/30 (Mullard)	6.65
RRI T20	6.80

RECTIFIER STICKS

TV11	90	TV18	1.10
TV13	93	TV20	1.23

REPLACEMENT ELECTROLYTICS

PYE 169 (200/200/100/32)	3.74
PHILIPS 320 (400/400/200V)	3.02
DECCA 30 (400/400/350V)	3.74
DECCA 80 (400/350V)	4.37
DECCA 100 (800/250V)	
DECCA 1700 (200/200/400/350V)	5.32
PHILIPS G8 (600/300V)	2.53
PHILIPS G9 (600/300V)	2.44
PHILIPS G11 (470/250V)	3.19
PYE 691/7 (200/300/350V)	2.97
PYE 731 (600/300V)	2.55
RBM A823 (2500/2500/30V)	1.83
RBM A823 (600/300V)	3.12
RBM Z146 (300/300/350V)	3.91
RR1 T20A (220/400V)	2.20
ITT CVC5/9 (200/200/75/25)	3.28
ITT CVC 20 (220/400V)	2.20
GEC 2110 (600/250V)	2.14
GEC 2040 (1000/2000/35V)	1.31
GEC 2040 (300/300/150/100/50)	4.51
THORN 3500 (400/40V)	33
THORN 950 (100/300/100/16/275V)	2.02
THORN 1400 (150/100/100/100/150/320V)	3.07
THORN 1500 (150/150/100/300V)	2.42
THORN 1500 (12/300V)	35
THORN 3500 (175/100/100/400/350V)	3.06
THORN 3500 (1000/63V)	95
THORN 3500 (1000/70V)	95
THORN 8000/8500 (2500/2500/63V)	3.72
THORN 8000/8500 (700/250V)	2.55
THORN 8000/8500 (400/350V)	2.82
THORN 9000 (400/400V)	3.61
GEC (200/200/150/50)	2.91
PHILIPS 69 2200/63V	1.38
THORN 4700 P/C 25V	1.32
THORN 1591/1691 4700/25V	1.32

CAPACITORS AXIAL

Volts	Mfd	Price	63V		
6V3	33	9		1	12
10V	22	10		2.2	12
	47	10		4.7	12
	100	10		10	11
	220	10		15	12
	470	15		22	13
	470	20		47	19
16V	33	11		100	23
	68	11		220	37
	220	16		470	49
	1000	27		1000	85
	3300	53		2200	1.10
25V	10	11	*100V*	10	13
	22	13		22	15
	47	15		47	20
	100	15		100	36
	220	29		220	70
	470	30	*450*	1	33
	1000	55		4.7	30
	2200	51		10	30
	4700	98		22	65
40V	10	10		33	75
	22	10	*500*	10	32
	400	48	*600*	0.1	41

MIXED DIELECTRIC CAPS

Volts D.C.

250V	0.91mF	1.15	*1250V*	0.1mF	59
400V	0.22mF	29	*1500V*	0.0047mF	32
600V	0.1mF	38		0.022mF	30
1000V	0.01mF	24		0.033mF	62
	0.047mF	46		0.005mF	65
	0.033mF	33	*2000V*	0.0052mF	1.20
	0.1mF	35	*2500V*	0.0022mF	50
	0.22mF	66			
	0.47mF	98			

FUSES

	Per type	Pack of 10
1¼" QUICK BLOW		
100ma		73
250ma-500ma-750ma-1A		60
1.5A-2A-2.5A-3A-5A		60
1¼" ANTISURGE		
250ma, 500ma, 600ma, 630ma, 750ma, 850ma, 1A, 1.25A, 1.5A, 2A		1.70
2.5A, 3A, 5A		2.70
20mm ANTISURGE		
80ma		4.80
100ma		2.50
160ma, 200ma		2.20
315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A		1.30
2.5A, 3.15A, 4A, 400ma, 5A		1.90
20mm QUICK BLOW		
100ma, 250ma, 500ma, 630ma, 800ma		90
1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A		60
1" MAINS		
2A, 3A, 5A, 10A, 13A		1.00

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MULL. A31/510 110° 12"	18.50
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A50/120WR 110° 20"	18.50
A61/120WR 110° 24"	20.50
VEGA 12" 90° (Jap Types)	15.00

MULLARD COLOUREX*

18" A47/343X	59.00
19" A49/120X	53.00
20" A51/110X	53.00
22" A56/120X	46.00
25" A63/200X	55.00
26" A66/120X	65.00
26" A67/120X	65.00
22" A56/500X	60.00
A51 570X	72.00
A56 510	67.00
A66 510	92.00

WHILE STOCKS LAST

NEW TUBES

ATX 56-001	95.00
ATX 51-00X	95.00
A56/610	95.00

REBUILT COLOUR TUBES

ALL AVAILABLE EX-STOCK ON GLASS FOR GLASS EXCHANGE FROM TRADE COUNTER. SOME TYPES AVAILABLE WITHOUT EXCHANGE FOR SMALL GLASS CHARGE

17" A44/271X	32.00
18" A47/342X (Low Focus)	32.00
18" A47/343X (Stnd Focus)	32.00
20" A51/110X	30.00
19" A49/120X	30.00
22" A56/120X	30.00
22" A55/14X	30.00
25" A63/200X	34.00
26" A66/120X	34.00
26" A67/120X	34.00
22" A56/140X (410X) 110°	36.00
26" A66/140X (410X) 110°	36.00
20" A51/161X	60.00
22" A56/510X	50.00
A56 540X	89.00
A66 540X	75.00
A66 500X	64.00

P.I.L. TUBES – we can rebuild your own glass – please ring for quotes.
Carriage cost on tubes £10 + VAT

SLIDER POTENT

Lin or Log
470R-1K-2K2-4K7
10K-47K-470K — 65

SKELETON PRE-SET POTS

Standard or miniature Horizontal or Vertical
100R-2M2 — 16p

MIDGET CONTROLS

Insulated Spindle Length 44mm
Log or Lin Without Switch
5K-10K-25K-50K-100K-250K-500K-1M — 54p
With D.P.S.T. Switch
Log: 5K-10K-25K-50K-100K — 97p
250K, 500K, 1M, 2M
Dual gang Controls — 1.25
16mm Rotary Controls 10K, 22K, 100K, 1M, 10K — 39p

THICK FILM RESISTOR NETWORK

THORN 3500 (5 pin connection)	1.98
PYE 731 (6 pin connection)	2.20
THORN 9000 (Circuit Ref. R704/7)	1.98

WIREWOUND RESISTORS*

4W 1R-10K	24p
7W 1R-22K	26p
11W 1R-22K	29p
17W 1R22K	32p

(Preferred values)*

EVER READY BATTERIES

HP2	26	PP6	82
HP7	12	PP7	82
HP11	24	PP9	84
HP16	13	R6PP	17
PP3	42	R14PP	26
PP3-C	53	1289	45

CARBON RESISTORS*

¼W 3R3-8M2	20
½W 3R3-8M2	20
1W 10R-10M	36
2W 10R-10M	62

Sold in packs of 10 per type i.e. per value

RECHARGEABLES

EVER READY

RX6 (HP7)	1.10
RX14 (HP11)	1.95
RX20 (HP2)	2.15
RX22 (PP3)	3.75
Universal Charger	7.50

STOP PRESS

Special Prices
5¼" Floppy Disc

	1-10	10-40	50-90	100+
SS/SD	1.61	1.17	1.12	1.05
SS/DD	1.70	1.23	1.17	1.10
DS/DD	2.00	1.44	1.37	1.29

SERVICE MANUALS (Zero VAT)

THORN 1590/1	4.00	VIDEO 3V00	24.00	110	3.90
1615	2.95	3V22	24.00	PHILIPS G9	4.20
1640/1	5.00	3V29/30	33.00	G11	3.90
9000	8.20	DECCA 30	4.75	K30	3.90
9800	6.80	80	5.35	KT3	3.90
Tx9	16.50	70/90	3.90		
Tx10	19.20	100	4.80		

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PLEASE NOTE OUR NEW ADDRESS – COME AND SEE US

104 ABBEY STREET, ACCRINGTON, LANCS BB5 1EE.

Tel: 0254 36521/32611 Telex: 635562 Griffin G (For P.V.)

HOW TO ORDER

ADD 75p per order P+P (U.K.). Heavier parcels e.g. cable, service aids, degaus. coils please allow £1.30 P+P (U.K.). Export orders charged at cost. First Class Mail is used whenever possible. Add 15% VAT to total except where it states zero rate.

Goods are despatched on the day we receive your order. If for any reason we are out of stock we will try to inform you as quickly as possible. We try our best to give a speedy, fair and efficient service. V.A.T. invoice on 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.

SEMICONDUCTORS

AC107	35
AC126	30
AC127	32
AC128	32
AC128K	40
AC141K	39
AC142K	38
AC176	35
AC176K	35
AC186	41
AC187	38
AC187K	38
AC188	35
AC188K	39
AD143	82
AD161	54
AD162	54
AD161/62 MP	1.15
AF106	49
AF114	89
AF118	1.20
AF121	75
AF124	48
AF125	46
AF126	46
AF127	38
AF139	58
AF178	1.54
AF239	60
AL102	4.90
AU106	2.50
AU113	5.20
BC107	20
BC108	20
BC109	20
BC114	12
BC115	17
BC116A	16
BC117	30
BC118	24
BC119	36
BC139	28
BC140	32
BC141	26
BC142	30
BC143	31
BC147	13
BC148	9
BC149	12
BC157	16
BC158	16
BC159	15
BC160	52
BC161	28
BC170B	15
BC171	15
BC172	15
BC173	12
BC174	10
BC177	27
BC178	26
BC182L	9
BC183L	12
BC184L	14
BC186	35
BC187	25
BC204	10
BC208	13
BC209	10
BC212	9
BC212L	13
BC213	13
BC214	10
BC237	14
BC238	14
BC251A	18
BC252	12
BC261	18
BC262	18
BC300	50
BC301	53
BC303	33
BC307	20
BC308	25
BC323	99
BC327	18
BC328	18
BC337	18
BC338	18
BC461	30
BC547	13
BC548	13
BCX32 = BC637	39
BC549	8
BC550	7
BC557	8
BC558	9
BCY72	13
BD115	45
BD116A	65
BD124P	79
BD131	50
BD132	49
BD133	60
BD135	38
BD136	38
BD137	38
BD138	35
BD139	35
BD140	44
BD144	1.70
BD150	60
BD159	65
BD166	52
BD179	70
BD182	1.20
BD183	75
BD201	85
BD202	91
BD203	80
BD204	99
BD222	46
BD223	56
BD225	47
BD232	68
BD233	60
BD234	63
BD235	60
BD236	65
BD237	57
BD238	65
BD243	85
BD244	85
BD410	79
BD434	74
BD437	86
BD438	94
BD507	52
BD508	55
BD509	56
BD510	60
BD278A	81
BD517	60
BD520	75
BD535	82
BD536	91
BD696A	1.49
BD697	1.24
BD695	1.39
BD698	1.50
BD707	95
BDX32	2.10
BF115	38
BF117	36
BF125	26
BF127	47
BF154	23
BF158	18
BF160	27
BF167	24
BF173	22
BF177	52
BF178	46
BF179	28
BF180	39
BF181	39
BF182	36
BF183	29
BF184	36
BF185	36
BF194/394	16
BF195	16
BF196	16
BF197	16
BF198	18
BF199	21
BF200	35
BF224	25
BF225	20
BF241	25
BF256	55
BF257	28
BF258	25
BF259	35
BF262	84
BF263	75
BF271	24
BF273	24
BF274	24
BF336	36
BF337	41
BF338	41
BF355	56
BF362	68
BF363	72
BF371	30
BF392	35
BF422	34
BF423	46
BF435	35
BF457	35
BF458	43
BF459	43
BF460 = BF462	86
BF469	46
BF470	66
BF597	10
BF757	54
BF758	54
BFR39	27
BFR40	30
BFR79	85
BFR90	1.74
BFT42	39
BFT43	39
BFW10	60
BFX29	40
BFX84	42
BFX85	30
BFX86	30
BFX88	46
BFY50	30
BFY51	30
BFY52	24
BFY90	95
BR100	34
BR101	45
BR103	83
BR303	1.46
BRC4443	94
BRC4444	98
BRY39	56
BRY55	45
BRY56	57
BSR59	1.80
BSV57B	89
BT100	1.65
BT101	1.20
BT102/500	1.20
BT106	1.60
BT108	1.69
BT109	99
BT116	1.21
BT119	3.66
BT120	3.66
BT151/800	1.20
BU104	2.00
BU105	1.58
BU108	1.80
BU124	1.90
BU126	1.75
BU204	1.50
BU205	1.42
BU206	1.80
BU208	1.60
BU208A	1.65
BU208D	2.20
=BU800	
BU208/02	2.10
BU326A	1.75
BU407	1.70
BU426	3.07
BU500	2.30
BU526	2.46
BU508	3.20
BU806	1.40
BU807	2.94
BUW84	1.45
BUW91A	3.84
BUX84	1.50
E1222	40
MCR101	45
MCR220	1.50
MED411	20
MJE340	68
MJE520	50
MJ3000	1.98
MPSA92	35
MR814	45
MR854	55
MR475	2.46
MR479	2.60
ON447	99
ON448	99
OT112	1.91
OT121	1.91
R2008B	1.90
R2010B	1.92
R2265	1.50
R2322	62
R2323	67
R2461	1.50
R2540	2.80
RC4558	2.20
RCA16334	90
RCA16029	99
RCA16039	99
RCA16092	99
RCA16040	96
RCA16041	84
RCA16334	90
RCA16335	90
RCA16957	2.88
TIC45	90
TIC46	60
TIL32	65
TIL78	48
TIP29C	43
TIP30A	47
TIP30C	43
TIP31C	55
TIP32C	42
TIP33B	75
TIP34B	1.06
TIP41C	47
TIP42C	50
TIP47	70
TIP120	65
TIP2955	90
TIP3055	63
TIS91	21
TU106/02	1.80
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3054	60
2N3055	60
2N3702	11
2N3703	10
2N3705	10
2N3706	10
2N3708	17
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.50
2SC1096	1.72
2SC1172Y	2.20
2SC1173Y	1.68
2SC1306	2.73
2SC1307	3.00
2SC1449	1.67
2SC1520	68
2SC1678	2.67
2SC1909	2.90
2SC1953	1.44
2SC2028	1.82
2SC2029	2.60
2SC2078	2.90
2SC2091	1.34
2SC2166	2.73
DEC1	2.20
DEC2	2.20
THY15/80	2.20
THY15/85	2.20
BUW81A	3.84
T6006V	1.50
T6021V	90
T6022V	1.80
T6026V	90
T6027V	63
T6028V	66
T6029V	2.50
T6034V	81
T6036V	90
T9002V	1.12
T9003V	60
Transistor mounting kit TO66, TO3, TO220AB	30

INTEGRATED CIRCUITS

AN2140	3.91
AN240	3.84
AN318	3.98
AN262	2.45
AN301	5.15
AN715Q	3.97
AN6340	7.85
AN6341N	5.10
AN6344	7.85
BA521	2.80
BA536	3.00
CA555	46
CA556	84
CA741	25
CA748	45
CA3065	1.80
HA1151	3.89
HA1322	2.65
HA1342	2.49
HA1306N	2.60
HA1366WR	2.80
HA1392	3.95
HA11219	2.49
HA11244	1.98
LA4031P	3.21
LA4032P	2.90
LA4102	3.37
LA4400	3.05
LA4422	3.28
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1011	3.25
LM1340T	75
LM1303N	2.63
MB3712	1.95
MC1307	1.99
MC1310P	1.60
MC1327	1.70
MC1351P	2.93
MC1349	1.99
MC1350	1.50
MC1352	1.75
MC1358P	1.50
MC1495L	3.00
MC13002	3.90
MC14011BCP	66
MC14049UB	43
MC7742	1.35
MC7812	1.35
ML231	2.20
ETTR6016	
ML232	2.20
ML236	5.35
ML237	2.50
ML238	6.00
ML239	2.50
ML920	4.12
ML922	3.29
ML928	2.18
MM5387ANN	4.15
MRF475	2.50
MRF477	10.00
MSN5807	7.87
MS1513L	2.80
MS1515L	3.28
SAA1025	4.40
SAA1124	2.50
SAA1250	3.94
SAA1251	4.90
SAA5000	4.39
SAA5010	6.30
SAA5012	6.50
SAA5020	5.90
SAA5030	8.25
SAA5050	8.50
SAA3210	2.93
SAS560S	1.89
SAS570S	1.89
SAS660	3.25
SAS670	3.25
SAS580	2.90
SAS590	2.90
SL901B	5.50
SL917B	6.50
SL1310	1.80
SL1327Q	1.20
SL1430	1.25
SL1432	3.36
SL76544	2.05
SN76003N	2.49
=SN76013N	
SN76023N	2.00
SN76110N	1.15
SN76115N	2.27
SN76131N	2.00
SN76226DN	2.00
SN76227N	1.18
SN76533N	1.70
SN76033N	2.49
SN76544N	2.35
SN76650N	1.05
SN76660N	80
SN76666N	80
SN76530A	1.47
STK015	6.25
STK032	=
STK078	13.25
STK043	11.05
STK433	5.65
STK435	9.06
STK436	5.50
STK437	7.85
STK439	6.62
STK459	8.20
STK441	8.10
STK461=465	9.60
STK463	14.30
SW153	2.74
TA7050P	95
TA7051P	95
TA7063P	2.20
TA7074P	1.00
TA7108P	3.43
TA7120P	2.43
TA7129AP	3.76
TA7130P	1.93
TA7146P	4.67
TA7193P	5.67
TA7171P	1.85
TA7172P	1.85
TA7173P	1.85
TA7176P	2.50
TA7202P	4.27
TA7204P	3.77
TA7205AP	3.72
TA7208P	3.40
TA7210P	6.60
TA7222	2.42
TA7223P	3.74
TA7227P	5.98
TA7228P	5.98
TA7310P	2.78
TA7609P	4.39
TA7611AP	2.92
TAA300	58
TAA310	2.83
TAA320	2.00
TAA550	55
TAA630	3.90
TAA8400S1	1.96
TAA661B	1.20
TBA120A	80
(A),(S),(AS),(SA).	
TBA120B	1.30
TBA120SB	1.37
TBA120T	95
TBA120U	1.10
TBA395	1.20
TBA396	80
TBA440N	2.75
(TBA1441)	
TBA440P	2.50
TBA480Q	1.50
TBA510	3.00
TBA520(Q)	1.68
TBA530(Q)	1.38
TBA540	1.68
TBA550(Q)	1.58
TBA560Q	1.59
TBA570	1.79
TBA690	1.58
TBA641BX1	3.58
TBA673	2.45
TBA700	2.12
TBA720	2.64
TBA750	2.98
TBA800	1.62
TBA810AS	1.10
TBA820	1.70
TBA820M	1.25
TBA890	3.94
TBA920(Q)	3.00
TBA950(2X)	3.05
TBA970	4.09
TBA990	1.90
TBA14406	2.44
TCA160	2.50
TCA760	2.30
TCA270SQ	2.50
TCA800	4.50
TCA830	3.44
TCA900	2.20
TCA910	2.20
TCA940	1.95
TDA440	2.20
TDA1002	1.95
TDA1003A	5.50
TDA1004A	3.35
TDA1006A	2.50
TDA1005	3.60
TDA1010	1.54
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
TDA1062	1.56
TDA1083	1.68
TDA1170S	3.00
TDA1190	3.50
TDA1180	2.91
TDA1200	2.95
TDA1220A	2.12
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	1.20
TDA1415	1.40
TDA1470	4.67
TDA1770	5.60
TDA2002	2.80
TDA2003	1.20
TDA2004	2.52
TDA2006	1.78
TDA2010	2.00
TDA2140	5.95
TDA2150	2.22
TDA2020	4.66
TDA2030	2.80
TDA2521	4.17
TDA2522	2.40
TDA2523	3.40
TDA2524	2.25
TDA2525	4.00
TDA2530	2.70
TDA2532	2.56
TDA2540	3.84
TDA2541	3.84
TDA2560	3.50
TDA2571	2.56
TDA2576	3.75
TDA2576A	3.75
TDA2577	4.50
TDA2581	3.30
TDA2582	2.60
TDA2590	3.25
TDA2591	2.95
TDA2593	2.95
TDA2600	5.30
TDA2610	3.20
TDA2611A	1.95
TDA2640	2.92
TDA2652	7.31
TDA2653	5.90
TDA2680	3.40
TDA2690	1.35
TDA3190	2.00
TDA3500	6.90
TDA3560	6.00
TDA3561	6.50
TDA3571	3.75
TDA3651A	4.50
TDA3950	3.50
TDA4420	4.22
TDA4600	2.95
TDA9503	2.50
TEA1002	3.50
TEA1009	1.37
UPC554	1.34
UPC566H	2.95
UPC575C2	3.40
UPC576H	1.90
UPC587C2	1.60
UPC1025H	2.95
UPC1028H	2.52
UPC1032H	64
UPC1042C	1.56
UPC1156H	4.26
UPC1158H	78
UPC1163H	98
UPC1167C2	94
UPC1168C	1.28
UPC1176C	1.46
UPC1177H	1.56
UPC1178C	1.28
UPC1180C	1.84
UPC1181H	1.62
UPC1182H	2.95
UPC1183H	1.38
UPC1185H	3.66
UPC1188H	2.20
UPC1190G	1.20
UPC1197C	1.06
UPC1198C	84
UPC1200V	1.18
UPC1211V	2.70
UPC1212V	1.34
UPC1215V	1.66
UPC1216V	1.20
UPC1217G	1.13
UPC1218H	1.80
UPC1223C	2.20
UPC1225H	2.00
UPC1226C	1.50
UPC1227V	1.20
UPC1228H	54
UPC1230H	3.95
UPC1238V	1.16
UPC1245V	1.35
UPC1350C	4.15
UPC1353C	1.92
UPC1365C	6.38
UPC1356C2	2.08
UPC1367	2.08
UPC1378H	2.70
UPC1358H	1.88
UPC1360C	2.20
UPC1363C	2.16
UPC1366C	1.84
UPC1368H2	2.15
UPC1370C2	2.58
UPC1382C	1.08
UPC1384	3.78
UPC1447H	58
UPC41C	2.80
UPC5743	38
UPC577H	2.46
UPC585C	1.28
TDA 1011	4.00
11A 4112	75
TAA570	3.98

while stocks last

COMPUTER SPARES

PLEASE ASK FOR ITEMS WHICH ARE NOT LISTED

2764	7.50
4116-2	3.40
4532	3.00
Z80 CPU	2.43
ZTX 213	13
ZTX 313	13
LM1889	84

ALSO SEE 74LS RANGE

We will try to supply the original part when we can. Under certain circumstances we may have to supply an equivalent.

DIODES

AA119	9
BA102	17
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA317	26
BAX13	4
BAX16	8
BB105B	30
BB105G	30
BY126	12
BY127	11
BY133	15
BY164	45
BY176	85
BY179	63
BY182	87
BY184	55
BY199	28
BY206	14
BY210/600	28
BY210/800	33
BY223	90
BY227	28
BY298	22
BY299	22
BYX10	20
BYX36/10	30
BYX55/600	30
BYX71/600	90
DY224	2.00
OA47	9
OA90	10
OA91	10
OA95	6
OA202	11
IN914	4
IN4001	4
IN4002	4
IN4003	4
IN4004	5
IN4005	5
IN4006	10
IN4007	10
IN4148	5
IN4448	10
IN5401	12
IN5402	14
IN5403	12
IN5404	12
IN5405	13
IN5406	16
IN5407	16
IN5408	20
ITT2002 = BAX16	
Y969 – Disc.	
REP BZX85 30V	

SPECIAL DIODES

SKE 4F	£1.09
SKE 5F	£1.19
Y723	£1.30
Y827	£1.42

ZENER DIODES

BZX61 130V	28
BZX61 Range (1.3W)	20
BZY79 Range (400mV)	10
BZY88 Range (400mV)	10
BZY93, 90 (18V)	1.18

CHRISTINE REQUESTS THAT **ALL** ENQUIRIES MUST BE ACCOMPANIED BY SAE, PARTICULARLY ENQUIRIES FROM OVERSEAS.

SPECIAL OFFER FROM OUR COMPUTER DEPT.

HIGH RES. GREEN SCREEN MONITORS £69.95 + CARRIAGE £5.95

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WHILE STOCKS LAST

STOP PRESS!

NEW PRODUCTS

PHILIPS G11 CAPACITOR 7N5 1500V	£1.40
G11 ULTRASONIC REMOTE CONTROL (31 BUTTONS)	£27
SPECIAL OFFER 3 ONLY DYNASCAN	£398
DECCA 7 WAY PIANO KEY REPLACEMENT KIT	£19.50

P.V.

104 Abbey St., Accrington, Lancs.

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CHEAPEST TV WHOLESALER IN U.K.
STAR BUY PHILIPS G11 660 from £35 LATEST T.V. NOW IN STOCK

G.11 REMOTE CONTROL TELETEXT, ITT REMOTE CONTROL AND TELETEXT THORN 9600, 9800, BUSH T20/T22/T26, DECCA 80/100, G.E.C. IN LINE

WORKING TV.
SPECIAL OFFER FOR THIS MONTH ONLY

G8 26" **£12**
G8 520 22" **£15**
G8 22" 550 ..... **£20**
ABOVE PRICES ON QUANTITY

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G8 26" **£5**
G8 520 22" **£9**
G8 550 22" **£11.50**

VHS VIDEOS – 100's IN STOCK WORKING

BRAND NEW 14" AND 16" PORTABLES

BRAND NEW PYE 20", 22", 26" WITH STEREO – TEXT – REMOTES

MANY MORE BARGAINS IN STOCK – PHONE AND HAVE ***YOUR*** ORDER READY FOR COLLECTION
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01-884 1314
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ELEY ESTATE, EDMONTON, LONDON

HOT LINE SOUTH WALES
0291-271000
UNIT 4,
BULWARK INDUSTRIAL ESTATE,
CHEPSTOW, GWENT

CHEPSTOW TRITEL WAREHOUSE REOPENING. SPECIAL OFFER TVs AT VERY VERY LOW PRICES

TELE-PART

Telegen-1

PRICE £17.20 (Inc. VAT)
* *EXCEPTIONALLY LIGHT AND DURABLE*
* *POCKET SIZE FOR OUTSIDE SERVICE*
* *PP3 BATTERY POWER SOURCE*
* *FIVE DIFFERENT TEST PATTERNS FOR COLOUR & MONO TV*
* *CROSSHATCH GRID * DOT MATRIX*
* *WHITE RASTER*
* *HORIZONTALS * VERTICLES*
* *3.5mm JACK SOCKET FOR OPTIONAL P.S.U.*

A lightweight, extremely portable and versatile pattern generator for black/white and colour T.V. alignment and service at the customer's home. At the turn of a switch, the generator can provide five essential test patterns for correct installation, fast checks and repairs. Pattern stability is first class and compares favourably with other more costly bulky generators only suitable for bench work. The generator is pocket size measuring 10 × 7.5 × 4 cm and weighs only 190 grams. Switched 3.5 mm jack socket allows use of external power supply with battery in situ.

Telegen-2

PRICE £34.45 (Inc. VAT)
* *EXCEPTIONALLY LIGHT & DURABLE*
* *COMPACT 10 × 12 × 4.5 cms*
* *RED RASTER * GREEN RASTER*
* *BLUE RASTER*
* *COLOUR BARS*
* *3.5 mm JACK SOCKET FOR P.S.U.*
* *PROVIDES UHF SIGNAL APPROX. CHANNEL 35*

Telegen 2 is a colour bar generator at a very modest price and yet is extremely effective, stable and durable. It is the perfect compliment to Telegen 1, giving colour bars arranged in the following sequence: white, yellow, cyan, green, magenta, red, blue and black. The unit provides a signal in the UHF band approx. Channel 35 and requires a supply of 14 to 18 volts D.C.

Power Supply

A switchable power supply ideally suited to both Telegen 1 and Telegen 2.
PRICE £4.55 (Inc. VAT)
POST AND PACKING £1.44 (Inc. VAT)
All goods should be delivered within 4 working days.

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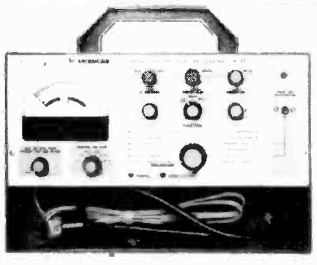

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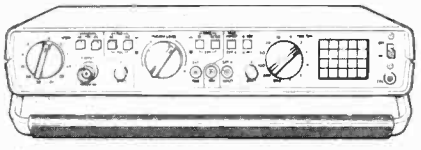

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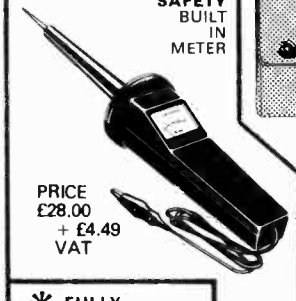

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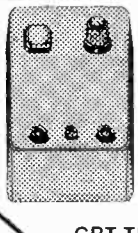

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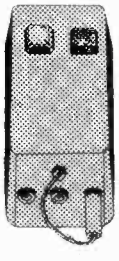

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K181 24 2k2 0.1W H presets
K182 15 PN72 plastic BCY72 T092 case
K183 14 PN71 plastic BCY71 T092 case
K184 14 PN70 plastic BCY70 T092 case
K185 200 1R ½W CF R's preformed for horiz mntg
K193 25 6V8 400mW zeners, preformed for horiz mounting
K194 30 22V 400mW zeners, preformed for horiz. mounting
K195 100 IN914 silicon diodes preformed for horiz. mounting
K196 100 IN4148 silicon diodes preformed for horiz. mounting
K197 50 AA139 diodes preformed for horiz. mntg
K201 25 100µF 6.3V PC mntg electrolytics
K202 25 330µF 10V PC mntg electrolytics
K203 20 22µF 50V radial lead electrolytics
K204 16 47µF 50V radial lead electrolytics
K205 40 0.33µF 50V radial lead electrolytics
K206 40 0.47µF 50V radial lead electrolytics
K207 15 in-line 1¼in fuseholders for cars, etc.
K208 10 SGS27212 NPN T05 transistors hfe75 VCE 50V
K209 11 SGS26907 NPN T05 transistors hfe75 VCE 40V
K210 13 ED1802 PNP T092 transistors hfe200 VCE 50V
K211 16 ED1502B T0106 NPN Si 80v switching
K212 20 TJ525 T092 NPN Si 60V
K213 25 FW5247 T105 NPN Si
K214 100 Silicon signal Diode, like IN4148
K215 25 E5444 T092 NPN Si 30V
K216 10 22-6025 T05 PNP Si 80V hfe50
K217 12 7-4659C T018 NPN Si hfe100, 40V sim BC107
K218 2 648005 T03 Ge. hi-gain 30V
K172 Do it yourself neon kit! Neon and resistor for mains operation with red bezel incorporating clip to mount neon, then this assembly clips into panel hole 10x5mm. 8 sets of parts £1.00

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	1500	150+150+100/300V 1.50
	3000	1000/63V 0.56
	3500	175/400V+100+100/350V 1.70
	8000	400/350V 2.10
	8000/8500	2500+2500/63V 1.35
	8000	700/250V 2.10
		1000/70V 0.58
	9000	400/400V 2.25
Timer Amp		4700/25V 0.70
DECCA 10/30		400+400/350V 2.45
	1700	200+200+400/350V 3.52
GEC	2047	2048 2083 2084 2104
		200+200+150+50/300V 2.32
		600/250V 1.50
ITT/KB		200+200+75+25/350V 2.15
		220/100V 1.95
PHILIPS	G8	600/300V 1.70
	G8 G9	600/300V 1.50
	G11	470/250V 1.50
	G9	2200/63V 1.25
EKCO	TH48	125+200+100+32/275V 2.65
	691 Series	200+300/350V 2.15
		600/300V 1.80
RANK		300+300/300V 2.05
	A823	2500+2500/30V 0.98
		220/400V 1.75
		600/300V 1.78

VDRs, etc.

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02/	0.28
E298CD /A258	0.25
E298ED /A258	0.22
/A260	0.22
/A262	0.22
/A265	0.22
/P268	0.22
E299DD/P116-P354	all 0.23
E299DH /P230	0.72
VA1015	0.92
VA1033/34/38/40/53	39/ all 0.20
VA1055s/56s/66s/67s	all 0.23
VA1074	0.20
VA1077	0.31
VA1091	0.29
VA1096/97/98	all 0.20
VA1103	0.32
VA1104	0.72
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Circuit Freezer	1.14		
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1.3W Plastic 3V–200V **15p each. 10/£1.40**
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2.5W Plastic 7.5–75V **64p each**

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Type	Price (£)
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DY86/87	0.75
ECC81	0.95
ECC82	0.65
ECC83	1.10
ECC84	0.65
ECC85	0.90
ECC88	0.95
ECF80	0.95
ECH81	0.75
ECH84	0.75
ECL82	0.75
ECL86	0.98
EF80	0.65
EF86	1.60
EF183	0.75
EF184	0.75
EH90	0.94
EL34	3.25
EL84	0.69
EL509	7.85
EM87	2.55
EY86/87	0.67
EY500A	1.65
PCC84	0.50
PCC85	1.36
PCC89	0.74
PCC189	0.85
PCF80	0.75
PCF86	1.25
PCF200	1.95
PCF801	1.45
PCF802	1.00
PCF806	1.20
PCL82	0.90
PCL83	2.50
PCL84	1.30
PCL86	1.15
PCL805/85	1.35
PD500	3.75
PFL200	1.35
PL33	1.50
PL36	1.45
PL81	0.85
PL82	0.75
PL83	0.65
PL84	0.75
PL95	2.00
PL504	2.20
PL508	2.40
PL509/519	5.95
PY88	1.80
PY500A	2.40
U26	1.90
UCH81	0.90
UCL82	1.70
6J5GT	1.75
6SJ7	2.20
30FL12	1.60

TRANSISTORS + DIODES

Type	Price (£)
AC127	0.30
AC128	0.30
AC128K	0.34
AC132	0.55
AC141	0.26
AC141K	0.40
AC142	0.26
AC142K	0.48
AC151	0.45
AC152	0.45
AC176	0.28
AC176K	0.46
AC187	0.42
AC187K	0.48
AC188	0.44
AC188K	0.50
ACY40	0.88
AD142	1.10
AD143	1.10
AD149	0.96
AD161	0.42
AD162	0.42
AD161/AD162	0.98
AF106	0.48
AF114	2.10
AF115	2.10
AF116	2.10
AF117	2.10
AF118	0.85
AF121	0.62
AF124	0.48
AF125	0.48
AF126	0.48
AF127	0.48
AF139	0.68
AF178	0.68
AF239	0.68
AF279S	0.75
AL100	2.50
AL102	5.90
AL113	2.20
ASY80	1.75
AU110	1.40
AY102	4.32
BA102	0.34
BA110	0.67
BA121	0.40
BA129	0.38
BA148	0.16
BA154	0.08
BA155	0.10
BA156	0.08
BA157	0.28
BA164	0.14
BB104B	0.52
BB105B	0.30
BB105G	0.48
BB110B	0.42
BC107	0.10
A or B	0.12
BC108	0.10
A,B or C	0.12
BC113	0.14
BC114	0.12
BC115	0.12
BC116	0.15
BC117	0.22
BC118	0.17
BC119	0.30
BC125	0.12
BC140	0.28
BC141	0.42
BC142	0.30
BC143	0.30
BC147	0.08
A or B	0.10
BC148	0.08
BC550C	0.18
BC557	0.12
BC558	0.12
BCX34	0.27
BCY70	0.15
BCY71	0.17
BCY72	0.18
BCZ10	1.68
BCZ11	1.45
BD124P	0.80
BD130Y	0.68
BD131	0.34
BD132	0.34
BD131/BD132	0.95
BD135	0.32
BD136	0.36
BD137	0.36
BD138	0.38
BD139	0.38
BD140	0.38
BD144	1.60
BD145	1.82
BD150A	0.51
BD159	0.65
BD160	1.65
BD165	0.45
BD175	0.60
BD182	1.00
BD183	1.10
BD184	1.20
BD201	0.72
BD202	0.87
BD204	0.80
BD222	0.80
BD225	0.86
BD232	0.45
BD233	0.60
BD234	0.62
BD235	0.63
BD236	0.63
BD237	0.65
BD238	0.56
BD241	0.60
BD243A	0.80
BC300	0.32
BC303	0.32
BC307	0.10
BC308A	0.10
BC323	0.99
BC327	0.14
BC328	0.14
BC337	0.12
BC338	0.12
BC350	0.14
BC440	0.30
BC441	0.32
BC461	0.32
BC547	0.12
BC548	0.12
BC549	0.12
BC550	0.18
BDX32	2.10
BF115	0.32
BF117	0.54
BF119	0.82
BF120	0.38
BF123	0.40
BF125	0.42
BF127	0.38
BF152	0.16
BF154	0.23
BF157	0.40
BF158	0.22
BF159	0.24
BF160	0.23
BF167	0.30
BF173	0.25
BF177	0.42
BF178	0.30
BF179	0.32
BF180	0.35
BF181	0.35
BF182	0.32
BF183	0.32
BF184	0.32
BF185	0.32
BF194	0.08
BF195	0.10
BF196	0.10
BF197	0.10
BF198	0.14
BF199	0.16
BF200	0.26
BF222	0.48
BF224	0.20
BF224J	0.16
BF240	0.20
BF241	0.20
BF244	0.26
BF244A	0.28
BF244C	0.24
BF245A	0.28
BF254	0.15
BF256	0.40
BF257	0.32
BD244A	0.65
BD375	0.32
BD410	0.76
BD434	0.68
BD436	0.68
BD437	0.76
BD438	0.75
BD439	0.68
BD507	0.48
BD508	0.53
BD509	0.54
BD510	0.48
BD517	0.56
BD520	0.66
BD699	1.25
BD707	0.88
BDX18	2.35
BF422	0.38
BF450	0.38
BF457	0.33
BF458	0.36
BF459	0.44
BFR39	0.22
BFR40	0.22
BFR41	0.22
BFR51	0.30
BFR61	0.32
BFR62	0.28
BFR88	0.34
BFR90	1.72
BFT41	0.38
BFT43	0.38
BFW10	0.79
BFW44	0.76
BFX29	0.28
BFX30	0.30
BFX80	3.56
BFX84	0.24
BFX85	0.26
BFX86	0.26
BFX87	0.26
BFX89	0.65
BFY50	0.21
BFY51	0.21
BFY52	0.21
BFY57	0.40
BFY90	0.90
BFY90S	1.34
BR100	0.20
BR101	0.44
BR103	0.58
BRC4443	1.76
BRY39	0.38
BRY56	0.42
BRY61	0.86
BSS17	0.56
BSS27	0.92
BSX19	0.34
BSX20	0.34
BSX59	0.62
BSX76	0.29
BT100A/02	0.94
BT101/300	1.15
BT101/500	1.25
BT102/300	1.35
BT102/500	1.65
BT106	1.50
BT108	1.30
BT109	1.18
BT116	1.25
BT119	3.62
BT120	3.60
BT121	3.02
BT138/600	1.30
BT151/560R	0.90
BT151/300R	1.15
BTY79/400R	2.80
BU100A	2.30
BU104	2.00
BU105	1.20
BU105/02	1.56
BU108	1.80
BU124	1.75
BU126	1.25
BU133	1.80
BU204	1.35
BU205	1.30
BU206	1.70
BU208	1.55
BU208A	1.63
BU208/02	2.05
BU326S	1.75
BU407	1.65
BU407D	1.80
BUX80	3.70
BUY20	1.75
BUY69A	2.60
BUY69B	1.98
BY101	0.48
BY118	1.10
BY122	0.68
BY126	0.12
BY127	0.10
BY133	0.16
BY135	0.25
BY164	0.44
BY179	0.66
BY182	0.87
BY184	0.40
BY187	0.72
BY189	4.75
BY198	0.44
BY199	0.47
BY206	0.24
BY207	0.24
BY210/400	0.25
BY210/600	0.26
BY210/800	0.30
BY223	1.20
BY227	0.26
BY229	0.30
BY238	0.68
BYX10	0.24
BYX36/150	0.22
BYX36/600	0.28
BYX48/300	0.72
BYX49/300	0.47
BYX55/350	0.29
BYX55/600	0.33
BYX71/600	1.18
BYZ12	0.42
C106D	0.80
E1222	0.40
E5024	0.30
GET872	0.48
ITT44	0.04
ITT2002	0.11
ME0402	0.20
ME0404/2	0.24
MEU21	0.60
MJ400	1.25
MJ2955	0.90
MJ3000	1.98
MJE240	0.60
MJE340	0.54
MJE370	0.88
MJE520	0.48
MJE2955	0.99
MJE3055	0.70
MPSLO1	0.28
MRF475	2.50
MRF479	5.20
MRP477	10.00
OA47	0.10
OA90	0.08
OA91	0.09
OA95	0.18
OA200	0.06
OA202	0.15
OC25	2.10
OC26	1.70
OC28	1.50
OC29	2.47
OC35	1.75
OC36	1.75
OC42	0.72
OC42K	1.40
OC44	0.72
OC45	0.58
OC71	0.50
OC72	0.52
OC81	0.68
OC200	2.46
OC202	2.20
ORP12	0.85
R2008B	1.50
R2010B	1.52
SHG1.5	0.40
TAG1/100	1.40
TAG3/400	1.78
TIC44	0.40
TIC45	0.45
TIC46	0.48
TIC47	0.70
TIC106A	0.70
TIP30A	0.46
TIP31C	0.54
TIP32	0.40
TIP32C	0.60
TIP33A	0.63
TIP34A	0.72
TIP41C	0.46
TIP42A	0.52
TIP47	0.60
TIP110	0.88
TIP2955	0.60
TIP3055	0.60
TIS43	0.32
TIS88	0.40
TIS90	0.25
TIS91	0.28
ZTX108	0.12
ZTX109	0.12
ZTX212	0.28
IN4001	0.05
IN4003	0.05
IN4004	0.06
IN4006	0.07
IN4007	0.07
IN4148	0.05
IN5400	0.12
IN5402	0.15
IN5405	0.16
IN5406	0.18
IN5408	0.20
IS920	0.08
2N697	0.55
2N706A	0.33
2N2904	0.28
2N2906	0.24
2N2926G	0.10
2N3053	0.40
2N3054	0.56
2N3055	0.45
2N3702	0.10
2N3704	0.10
2N3708	0.10
2N3772	1.90
2N3773	2.70
2N3904	0.16
2N3906	0.16
2N5294	0.48
2N6107	0.71
2N6126	0.68
2SB337	1.60
2SC495	0.65
2SC1172Y	2.90
2SC1173Y	0.82
2SC1302	1.40
2SC1226	0.84
2SC1279	0.50
2SC1306	0.92
2SC1307	1.40
2SC1413A	2.70
2SC1444	1.45
2AC1449	0.63
2SC1507	0.63
2SC1678	1.06
2SC1758	0.68
2SC1909	1.20
2SC1923	0.30
2SC1945	2.88
2SC1953	0.74
2SC1957	0.76
2SC1969	2.88
2SC2028	0.73
2SC2029	2.10
2SC2078	1.05
2SC2091	0.73
2SC2098	2.90
2SC2122A	3.20
2SC2166	1.20
2SC2314	0.80
2SC2335	1.50
2SC2371	0.90
2SC2749	2.70
2SC2752	0.60
2SD234	0.64
2SD348	3.30
2SD986	0.62
2SJ50	5.20
2SK134	3.80
2SK135	4.60
3N126	1.90
3N211	2.52
3SK45	0.76
3SK88	0.66
3SK135	5.20

I.C. SOCKETS

Dil to Dil

8 pin	0.08 0.70/10
14 pin	0.10 0.95/10
16 pin	0.11 1.00/10
22 pin	0.21 1.95/10
28 pin	0.30 2.75/10
40 pin	0.34 3.10/10

CAPACITORS

Metallised Paper

2n2F 600V AC 24p
10nF 1000V DC 22p
10nF 500V AC 80p
15nF 300V AC 30p
22nF 300V AC 32p
100nF 1000V DC 46p
470nF 1000V DC 60p

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8kV 10, 47, 56, 82, 100, 120, 150, 180, 200, 220pF 30p
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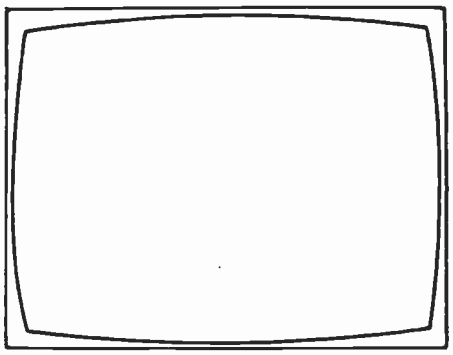

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COVER PHOTO

Our cover photo this month shows the world's first low-noise downconverter for satellite TV reception to go into large-scale production. The converter is manufacturered by General Instruments for the American Market.

CORRECTIONS

The power of the Danish local TV transmitter at Syd should have been given as 200W, not 200kW (page 332 last month). A confusing misprint occurred on page 306 last month (The Lid off Microcomputers): the fourth line of the second column should read "care of by a large i.c. called a ULA . . .". Two letters this month (page 370) comment on the Oric test pattern programme published last month.

HELD OVER

Part 2 of Hugh Cocks' article on receiving satellite TV will appear next month.

Revenue for the BBC

So the BBC got an increase in its CTV licence fee from £46 to £58 instead of the £65 for which it had asked (the monochrome licence fee went up from £15 to £18). There is also to be an inquiry under Professor Alan Peacock into the methods of providing revenue for the BBC. One wonders why this should be necessary. After all, the BBC has only just emerged from a detailed inquiry, carried out by management consultants Peat, Marwick and Mitchell, into its internal financial arrangements, an inquiry which by and large established that the BBC gives good value for the money it gets and spends. There seem to be all too many who will not let the BBC alone despite the fact that it provides a service recognised worldwide for its quality and impartiality.

The Corporation can't complain – and in fact has "welcomed" the decision to set up an inquiry – since it relies on money provided by the public. You have to pay whether you watch/listen to BBC programmes or prefer to stay tuned to the alternative services. It's a touchy problem that will not go away. But do we have to keep fretting over it every three years or so? One could say that the present time, when numerous changes in the broadcasting field are in the offing for technical reasons, is an appropriate one at which to set about reconsidering the position of the BBC in the media world. There is, we are assured, no intention to jeopardise the BBC in any way, merely to review the way in which it is financed – in particular to assess the effects of advertising or sponsorship on the BBC's services, either as an alternative or a supplement to the income at present provided by the licence fee. But the fact remains that any government wishing to make life difficult for the Corporation or exercise tighter control over it has the power to do so – by cutting the funds available.

The situation is a difficult one. The ideal of an independent, impartial broadcasting organisation that is not beholden to the government of the day or to political or commercial interests is worth a great deal. But at the same time the organisation has to get its income from somewhere and must be answerable to the public in some way. It's quite a conundrum. That said however it would appear that the present arrangements have more or less got it right. There is little one can justifiably object to about the way in which the BBC goes about its tasks. So why do we have to go through all this heart-searching every three or so years? Provided the BBC maintains its independent stance, which is pretty well guaranteed by its organisational structure, and provides services that the public find acceptable, as can be ascertained by listening/viewing figures, isn't it best to let the BBC get on with it? One can of course argue that the BBC must justify itself from time to time, and that the appropriate time for this is when it asks for more money. But to do this with the present frequency simply gives an opportunity to those with some sort of sense of grievance to get plenty of publicity for their views.

Public discussion this time round has concentrated largely on the subject of advertising – and we shall doubtless hear a lot more about this when the Peacock Committee reports next year. Chas E. Miller touches on this subject on a later page in the course of looking back at the start of commercial/independent TV in the UK. He mentions the fact that magazines/newspapers carry a far higher proportion of advertising matter than any broadcasting network could ever hope to get away with. True enough, but the two are not strictly comparable. With printed matter you can choose whether or not to look at the ads. You can ignore them almost completely if you want to. This is not so with the serial presentation of broadcast material. When the ads come up, everything else comes to a halt. The proportion of advertising matter may not be so great as with the printed page, but it's far more intrusive and to many of us objectionable. Quite apart from this, could there ever be enough advertising revenue to finance four or more TV channels plus radio services? The ITV companies are rightly concerned here: any shift of advertising revenue to the BBC would be to their loss. We could end up with four inadequately funded channels turning out cheap pap.

There's been a certain amount of speculation about the interests of various media companies (all right, press barons!) who have managed to get a foothold in the TV field via cable and satellite TV operations. This speculation has been coupled with concern over growing concentration in the publishing field. Some of this concern seems to this observer to be misplaced. Publishing is a highly competitive business where it's as easy to loose a packet as to make a fortune. The BBC does of course have valuable assets in the form of its channel allocations. It's not surprising that commercial organisations should find these attractive and feel that they could be put to good use to earn a profit. But this brings us back to the limitation imposed by finite advertising revenue. The danger is that if the bingo merchants ever did get their hand's on the BBC's airwaves the result would be ruthless competition and a totally emaciated service. It's not very likely to happen.

The present broadcasting set up services us well. You don't have to take anyone's word for this, merely to look at what's provided in other countries. The way in which it's funded is indeed a rather curious compromise. But then so is much else that works well in practice. There are plenty of guarantees built into the present system to ensure fairness and value for money. We shall have to await the results of the Peacock Committee's deliberations now, and indeed it might come up with some worthwhile alternative methods of providing broadcasting revenue, but one feels that the Committee's inquiry should be the last for a good few years to come.

Teletopics

DBS – THE CONTINUING SAGA

Last month's leader commented on the progress – or lack of it – in getting a UK DBS service started. During the intervening month the saga has continued on its dismal course: the DBS consortium appears to have come to the conclusion that the cost of a Unisat provided and operated satellite transmission system would be prohibitive; the Satellite Broadcasting Board (which has yet to be formally set up) has asked the Home Secretary for permission to negotiate directly with British Aerospace for the supply of satellites; while the Home Office minister responsible for broadcasting, Giles Shaw, told the *Financial Times* Cable Television and Satellite Broadcasting Conference that the government might ask the IBA to set up a new DBS consortium if the present one pulls out. Mr. Shaw is reported as saying that "there are alternative options for creating a DBS service in the UK". The reason for the present consortium's request to deal with British Aerospace instead of Unisat (of which British Aerospace is a member) is its view that it might be cheaper to buy the satellites and operate the system itself.

A great deal of effort is clearly going into seeking ways and means of reducing the cost of providing a DBS service for the UK. As Lord Thomson of Monifieth, chairman of the Satellite Broadcasting Board and of the IBA, told the *Financial Times* conference: "The UK is the only country in Europe seeking to develop DBS services on a commercial basis with no subsidy from public funds either direct or hidden. There are enormous risks involved. If the project is to break even, some £900 million will have to be paid by the consumer in subscriptions to receive the service over the first six years in addition to the cost to the consumer of buying or renting the equipment necessary to enable television sets to receive DBS signals. Even assuming that this money is forthcoming, the investors in the DBS joint venture will have had to face considerable financial exposure – perhaps as much as £400 million when interest rates are taken into full account."

Elsewhere in the local satellite TV scene, the ITV companies are giving consideration to setting up a live 18-hours daily "Super Channel" which would supply European cable networks with a programme based on ITV and Channel 4 material; British Telecom has announced plans to take a stake in the Life Style channel (see Teletopics March); ITT has announced plans to market an add-on satellite receiver system in Europe, starting next year; Egypt has applied to Eutelsat for permission to link the Cairo earth station to the Eurovision network; and Thorn EMI has announced its intention to enter the satellite master antenna television (SMATV) market as soon as the legalities of satellite reception have been cleared up. Thorn believe that the SMATV market could be worth some £50 million annually by 1987 and propose to set up a national network of franchised satellite TV installation and servicing companies.

HITACHI TO PRODUCE VCRs IN UK

Hitachi, which has already invested heavily in updating the CTV production lines at its Hirwaun, S. Wales plant, is now adding a VCR production line which will assemble machines from Japanese supplied kits. Production is due to start in July at a rate of 5,000 a month and will be increased to a rate of 10,000 a month by December. Production at Hitachi's W. German plant is being increased to 30,000 a month, which will give Hitachi a European-based production capacity of 480,000 machines a year, estimated as being about a tenth of the W. European market. Present CTV production capacity at Hirwaun is 25,000 sets a month. The start of VCR production at Hirwaun will coincide with the introduction of a new range of Hitachi VCRs.

SONY'S EUROPEAN 8mm VIDEO LAUNCH

Sony has acted quickly in launching the Video 8 camcorder on the European market. The machine was launched in Japan only last January and is now available, for about £1,100, in W. Germany, Belgium, France and the UK. A tuner/timer unit can be added for some £200.

An interesting feature of the Video 8 is the use of a CCD solid-state image sensor instead of a tube. The cassettes, loaded with metal tape, sell for around £7 and have a playing time of thirty minutes – cassettes giving up to ninety minutes' playing time are to follow. The Video 8 will record at half speed for tape economy.

ELECTRONIC RENTALS ACQUIRES CAROUSEL COLOURHIRE

Dixons, who took over Currys last December, has sold the Currys' Carousel Colourhire business to Electronic Rentals (Visionhire) for £28 million. The deal includes 210,000 CTV and VCR rental contracts and thirteen shops. Dixons made it clear after taking over Currys that it did not wish to become involved in the rental business. The deal leaves Visionhire in third position in the rental market, with 17·5 per cent, after Thorn/Radio Rentals (40 per cent) and Granada/Rediffusion (28 per cent). Visionhire at present has 419 outlets and expects turnover per shop to increase after the merger. Philips Electronics has a 25 per cent interest in Electronic Rentals.

CANAL PLUS DÉBÂCLE

TV service changes suggested by the French government – the aim is to introduce commercial TV – have lead to a sharp fall in subscriptions to the Canal Plus off-air pay-TV system which was set up only last November. The first year's operations are expected to result in a heavy loss: government assistance is being sought while right-wing press owner Robert Hersant has put in a takeover offer.

PHILIPS' CHINESE SUCCESSES

Philips has announced substantial orders for CTV sets, LaserVision equipment and assembly plant from the People's Republic of China. A CTV plant with a production capacity of 200,000 sets a year is to be supplied. The LaserVision order is for 20,000 machines plus kits for 200,000 machines to be assembled during 1985-87. The Chinese CTV market is growing rapidly: sales increased fourfold to 2·8 million in 1984 and are expected to rise to 6·5 million this year.

NEW FROM FERGUSON

Two further versions of the Ferguson monochrome monitor, which was described in this column last month, have been released. The MM07 incorporates a c.r.t. with a P39 green (shifted towards yellow) phosphor screen. This is preferred to the green P31 phosphor by some computer users as the longer persistence reduces screen flicker.

Model MM08 is fitted with a monochrome c.r.t. for black and white picture or text displays, making this version ideal for use with security systems. The complete range, Models MM02, MM06, MM07 and MM08, is in production at the company's Gosport plant.

A new 14in. monochrome portable, Model 38050, has been introduced to replace the 38710. It's fitted with the 1790 series chassis and has monitor-look styling to appeal to the increasing market for portable sets for use with home computers and video games.

The Ferguson MA20 interface unit has been designed for use with the Sinclair ZX range of microcomputers, enabling them to be linked to the MC01 colour monitor or the MM02 range of monochrome monitors. The MA20 converts YUV outputs to RGB signals, takes audio signals from the Spectrum and feeds them through the MC01's output stages to give enhanced sound performance, has the ability to produce a switchable "green screen" effect on the MC01, and incorporates a separate socket for feeding signals to the monochrome monitors. The MA20 also features a duplicated Spectrum interface edge connector so that the user can continue to take advantage of the Sinclair range of peripherals.

Ferguson's new FST CTV sets were mentioned last month: details of the latest additions to the VCR range are given elsewhere in this column.

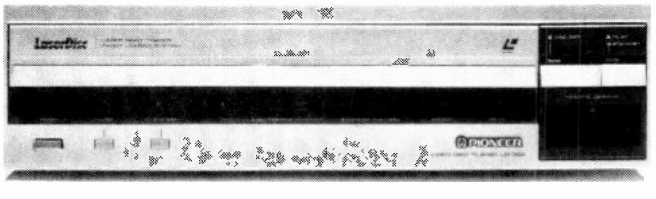
NEW COAXIAL PLUGS

A new range of coaxial plugs for the aerial and cable TV industry has been introduced by Advid Electronics (17a, Mill Lane, Welwyn, Herts AL6 9EU). The plugs are of one piece design giving neat appearance and ease of fitting without the need to use special tools – after cutting back and preparing the braid the cable is simply screwed into the plug. The S6 plug conforms to BS3041:1958 and comes in two versions, with either a polished aluminium or nickel-plated brass body.

SECOND-GENERATION LASERVISION PLAYER

A second-generation LaserVision disc player, Model LD700, has been introduced by Pioneer. The most striking features of the player are the greatly reduced size – now only 420mm in width, matching Pioneer's hi-fi component range – the front-loading which enables it to be stacked, and the use of a solid-state gallium arsenide laser. A completely redesigned servo mechanism gives quieter and more accurate operation: other points of interest include automatic CX noise reduction and an infra-red remote control system that gives a wider range of trick features than with the LD1100. The new LD700 will interface directly with Pioneer's MSX personal computer, which is planned for introduction next summer. The LD700 is expected to sell at around £500.

Pioneer have also announced a new top-of-the-range component TV system designated SD26. This consists of a 26in. colour monitor, an on-board amplifier which can be switched to drive either built-in or external stereo speakers, and an integral surround-sound processor which can be connected to a separate amplifier and a second set of speakers to create a concert hall or theatre effect. The unit has ports for inserting optional tuner and teletext packs and comes with infra-red remote control.



The Pioneer LD700 LaserVision disc player.

MICROCOMPUTER SERVICING

Newnes Technical Books (Borough Green, Sevenoaks, Kent TN15 8PH) have published what appears to be the first book on microcomputer servicing to appear in the UK, "Servicing Personal Computers" by Mike Tooley. The book has 272 pages and is priced at £17·95. We hope to publish a review in a couple of months' time.

COMPUTER SOFTWARE FOR TV SALES/ SERVICING

Telepack, the television sales and service system designed by New Miracle Software Ltd., is now available from Tatung (UK) Ltd. for use with the Einstein colour microcomputer. Telepack is programmed in Cobol for use with two diskette drives. Reports on customer records, product sales, servicing etc. are produced in a standard 80-column format on the Tatung dot-matrix printer. The system can handle approximately 1,500 customer records and 1,500 product records on a single disk drive or some 7,000 customers and products with a hard disk drive.

TV SYNC SEPARATOR UNIT

Video Techniques (101 Derby Street, Bolton, Lancashire BL3 6HH) have introduced a new, improved version of their TV sync separator unit which enables an oscilloscope to be triggered from composite video waveforms. The SS1 Mk 2 has been completely redesigned and is priced at £33·50 (postage included) plus VAT at 15 per cent. The unit is simple to operate – just one switch – and can be used with X1/X10 scope probes. It gives mixed sync or field only trigger pulse outputs. Power is provided by a PP3 battery.

NEW VCRs

JVC's latest VCR, Model HRD455, is a two-speed machine with two audio channels and switchable Dolby noise reduction. It replaces the HR7655 and has a suggested price of about £630. ITT's recently introduced VR3986 has similar features. The VR3995 is ITT's first machine with hi-fi sound: it's a two-speed model to sell at about £700. Two new machines have been added to the Ferguson range. The 3V49 is a budget-priced model expected to sell for around £430. The 3V52 "component VCR" is similar to the JVC HRS10/TUS10 mentioned last month, comprising a portable VCR and linked tuner/mains adaptor. A price of around £650 is suggested.

TV TRANSMITTERS

Some unusual products – TV transmitters for restricted use – have been demonstrated by Waveview Holdings, the firm that briefly operated a pirate TV transmitter in the London area late last year to get publicity for the "suitcase" TV transmitter it was developing at the time. The new products include a low-power (4mW) transmitter with an output on approximately ch. 36 intended for domestic use to link a TV camera or VCR to a TV set without the need for cabling and, even more adventurously, a microwave transmitter for communal signal distribution to avoid the need for street cabling. Government approval for the latter system is being sought.

Driven to Drink

Les Lawry-Johns

A smart grey Honda pulled up outside. A rather flash female jumped out and pranced into the shop, immediately filling it with French perfume or something.

Mrs Upyew

"Oh darling, will you be a pet and get my box out of the car for me?"

I went and dragged the ITT CVC32 out of the car. I then brought it in and put it on the bench while she prattled away.

"I'm going into town for an hour, so I'll collect it on the way back if it's done by then. I don't mind spending a fiver on it if necessary."

I picked the set off the bench and started to put it back in the car.

"Oh darling, I was only joking. I'll pay whatever it costs of course, but fuses don't cost all that much do they?"

I continued to plonk the set on the back seat.

"Oh you are an old grumpy today aren't you? Please do it for me, I'll be so grateful – you'll see."

So I got it out again and started to prepare the sheet.

"What name is it please, madam?"

"Upyew darling."

So I wrote Up You Darling. She screamed with laughter. "No no you naughty boy, the name is Upyew, the darling was meant for you sweatheart."

To shorten the story a bit she then pranced off to her car which refused to start. So I had to push it after telling her to put it in gear and keep her foot on the clutch until we picked up a bit of speed. Then off she went and I returned to the CVC32.

The Nightmare

It was tripping. Going hump, hump. So I switched off and disconnected the tripler. I then checked the line output transistor which was short-circuit. With this replaced and the tripler still disconnected I switched on again. The set still tripped and this time there was a whisp of smoke from the lower part where the BSX21 chopper driver transistor lives. The set became silent and I found the BSX21 short-circuit. With this replaced the set remained silent and I had to replace the TDA2640 chopper control i.c. As a precaution, the h.t. feed to the line output stage was disconnected before switching on again. When I did switch on the set didn't trip and some pretty red LEDs lit up to show that the set was happy enough without the load presented by the line output stage.

The items connected to the line output transformer's primary and secondary windings were checked and found to be in order. So a new transformer was fitted and, fool that I am, I reconnected the tripler before switching on. When I did this the set continued to trip and then gave up – the BU126 chopper transistor was short-circuit. With a heavy heart and gloom all round I replaced the transistor and this time disconnected the tripler before switching on again. Everything was just fine, i.e. no tripping and the LEDs glowing merrily. A new tripler was fitted and I now had a picture – with severe EW distortion. The BD238 diode modulator driver transistor was short-circuit. By now I was in a filthy temper but to complete the job I replaced the BD238. This enabled me to adjust the presets and a really good picture was obtained. I wrote out the report and bill.

When Mrs Upyew returned she pranced in as usual.

"Set ready darling? I hope it didn't cause you too much trouble."

I gave her the bill and the smile faded. She paid by cheque and I put the set in the car for her and not a word was said. Fortunately the car started first time and off she sped, a very unhappy woman. So much for her fuse. Oh yes I forgot to tell you, I removed the small panel over the scan coils and found the usual dry-joints there.

Elephants

A well known component firm has for its trademark a small elephant leading a large one, the latter's trunk holding the tail of the small one. I've often wondered about the origin of this and when Stan Westover called last week I asked him about it.

Apparently the firm's two founders started it by combining their separate firms – South East Electronics and Midland Electronics. Naturally they decided to call the firm South East and Midland Electronics. When they came to register the name they were sternly told that this could not be done as there was already such a firm. So they said they'd just use the initials, SEME. No they were told. SEME stands for South East and Midland Electronics which is already registered. "Oh no it doesn't" they replied, "it stands for Small Elephants and Mammoth Elephants." So now you know . . . I think. And I'd always thought it was to do with See Me.

Fooled

This one made me blush. A chap I know quite well – he works on the river – brought this small ITT (STC) portable in. It was a VC11 with valves and things like that in it. I had quite a tussle, restoring full width and height, repairing the i.f. stages, etc. The aerial was then connected to the u.h.f. socket and the set switched to 625. I next discovered that it didn't have a u.h.f. tuner. So I switched back to 405, plugged in the v.h.f. aerial and tried to tune in Channel 1 or 9. I spent some time on the tuner before realisation dawned on me that it had all been in vain. The signals weren't there any more.

When he came back to collect the set he told me it had been out of commission for a few weeks. It had gone wrong just before the shut down.

Confusion

I've been in a state of confusion for some time now. I fear it's getting worse, and anyone who brings anything to me expecting to find efficiency must be living in cloud-cuckoo-land. It took me hours last weekend to prepare a car radio (Radiomobile 80) for positive earth use just because the polarity turn key was missing and it had been wired for negative earth and the AD149 output transistor had gone short-circuit and blown its emitter resistor. You see, Dave collects vintage cars and everything has to be right. Not Dave from the pub, Dave from the garage down the road. He often sends me car radios to fix. Some keep their dial lights on when they are switched off – anything to worry me . . .

Thorn 10Ω 20W (3500) R751 Safety Resistor	75p
Pye 713 Speaker 9" × 3" 70Ω	1.00
Pye 713 Complete Tube Base Panel with Focus Slider & Leads	2.75
Pye 713 Control Knobs	4 for 50p
Tube Base Socket ITT CVC32	65p
Tube Base Socket Thorn 3000/8000 etc	50p
IC Inserter 16 Pin	50p
Large IC Extractor	50p
Crystal 4.43MHz	65p
EHT Lead & Cap for Split Diode Lopt	90p
Anode Cap	47p
Sanyo Anode Cap Assy + Lead. 12TCD-CT-1G	65p
Degause Thermistors. PT37P. ITT/GEC	35p
Degause VDR E299D/HP230 3000/8000	25p
Casters Set of 4	1.90
Double Fuse Holder on Small Pax Board 20mm type	10p
Single Fuse Holder on Small Pax Board 20mm type	5p
Direct Panel Mounting 20mm Fuse Clips (pair)	15p
Single Fuse Holder on Small Pax Board. As per early 3000 mains input	6p
EHT Cable Metre	25p
13A Plugs 12 for	4.80
BF259 with Heatsink	14p
TIP110 with Heatsink	40p
L129/130/131 Coil	10p
6MHz Ceramic Filter	25p
DL700 (Philips) Chroma Delay Line	1.00
DL50 Chroma Delay Line	1.00
T9006A Lum Delay Line	1.00
8K5/9K Lum. Delay Line	65p
Plastic Cover for 3K5 SP8385	5p
TX9 Back Ground Control 10K	15p
TX9 Gain Control 100R	15p
1500 Metal Chassis Supports Pair	40p
Thorn 8K5 Focus Pot	2.40
Thorn 4000 Focus Pot	2.75
Thorn 18Ω 9W (3K5) R752	30p

SERVICE AIDS

Ambersil MS4 Silicone Grease	12oz	2.15
Ambersil Freezer	12oz	1.99
Ambersil Amberlube	6oz	1.89
Ambersil Ambertron	16oz	1.95
Ambersil Anti-Static Screen Cleaner	7oz	1.95
Ambersil 40+ Protective Lubricant	14.1oz	2.15
Ambersil Amberclens Foaming Cleaner	13oz	1.26
Ambersil Circuit Lacquer	14oz	2.15

THICK FILM RESISTOR UNITS

3500 Thorn (5 Pin Connection) video	1.70
4000 Thorn (4 Pin Connection)	1.90
725/731 Pye (6 Pin Connection)	2.20
713 Pye (6 Pin Connection)	2.20

FUSES

20mm			1¼"	
50MA	10 for 70p	250MA	10 for	65p
315MA A/S	10 for 50p	750MA	10 for	65p
500MA	10 for 50p	7A	10 for	50p
1A	10 for 50p	10A	10 for	50p
2.5A	10 for 1.00	20A	10 for	50p
3.15A	10 for 1.00	50A	10 for	50p

Thorn Mains TX 3000/3500	7.50
Thorn Mains TX 8000/8500	10.00
Thorn S.O.P.T 8000/8500	3.50
Thorn Scan TX 3000/3500	6.00
Thorn EHT TX 3000/3500	6.00
Thorn LOPT 9600	12.00
Thorn LOPT 1615	7.25
Thorn LOPT 1590/91	7.25
Thorn LOPT 1690/91	7.25
Thorn LOPT 8000	9.80
Thorn LOPT 8500	9.80
Thorn LOPT TX9	9.85
Pye LOPT 713	10.00
Pye LOPT 725	9.85
Pye LOPT 731	10.18
Philips LOPT G9	8.80
Philips LOPT G11	13.75
GEC LOPT 3113	7.40
Diode Split LOPT AT2076/35	14.75
Sanyo LOPT AM-WM-21	6.75
Sanyo LOPT AM-WM-4	7.30
Philips LOPT G8	7.80
Sanyo LOPT (CW21) 4-2751-44700	5.00
ITT LOPT CVC5-9	9.60
ITT LOPT CVC30	8.75
ITT LOPT CVC45	9.75
Baird 8750	10.25
Baird 8752	10.25
Korting AZ9100	10.25
Korting B92-170	10.25
Korting AZ2101	10.25
Korting AZ2103	10.25
Korting ZTR1001	10.25
Siemens V1155	11.75
Siemens V1823	11.75
Zanussi BS2222	10.25
Zanussi BS2223	10.25
Salora FR0057	10.25
Salora FR0029	10.25

300 Mixed Resistors	1.50
300 Mixed Capacitors	1.50
150 Mixed Electrolytics	2.00
100 W/W Resistors	1.00
20 Mixed Conv Pots	1.00
40 Mixed Pots	1.50
20 Mixed Sliders	1.00
40 Mixed Presets	60p
20 Mixed VDR & Thermistors	1.00
20 Mixed Ferrite Cores	50p
100 Mixed Ceramic Discs	1.00
20 Mixed Valve Bases	1.00
10 Spark Gaps	1.00
10–16 pin Quil IC Socket	90p
20 Assorted TV Knobs	1.00
10–16 pin Quil to Dil IC Socket	90p
100 Mixed Diodes	1.00
50 Mixed Mica Washers	65p
300 Mixed Resistors & Capacitors	1.50
10–16 pin Dil to Dil IC Socket	1.00
50 Electrolytics & 50 Capacitors	1.00
50 Mixed Poly Capacitors	1.00
30 Mixed Neons & Bulbs	1.00

AC128	39	BC172	9	BC559	8	BF167	24	BFR62	28	NKT276	20
AC131	40	BC174B	23	BC595	8	BF173	29	BFR81	29	NKT453	1.65
AC138	40	BC177	24	BCX33	22	BF179	32	BFR87	25	OT112	1.92
AC141K	39	BC182LB	12	BCX34	11	BF180	30	BFR90	1.74	OT121	2.00
AC142K	38	BC183L	12	BD115	49	BF181	30	BFR91	2.08	R1038	80
AC153	39	BC184L	13	BD131	30	BF184	30	BFT42	30	R1039	80
AC176	33	BC187	24	BD132	46	BF185	30	BFT43	30	R2088B	1.40
AC176K/		BC204	15	BD133	59	BF194	16	BFX38	40	R2010B	1.10
AC128K	93	BC208	9	BD139	38	BF195	16	BFY50	30	R2030	70
AC188	38	BC212L	9	BD140	38	BF196	16	BFY51	34	R2265	1.30
AD142	1.18	BC213L	12	BD144	1.70	BF197	15	BFY52	34	R2305	80
AD143	1.08	BC237	12	BD150	50	BF199	19	BRC116	1.50	R2322	50
AD149	98	BC238B	8	BD163	98	BF223	18	BRC1693	1.43	R2443	25
AD161	32	BC238L	8	BD201	74	BF224	19	BU105	1.00	RCA16446	30
AD162	32	BC250A	15	BD203	78	BF238	20	BU126	1.10	RCA16599	1.25
AD263	1.05	BC251	8	BD204	99	BF240	9	BU207	1.05	RCA16600	1.40
AF127	45	BC252A	20	BD222	48	BF241	21	BU208A	1.15	RCA16799	1.13
AF139	38	BC294	37	BD225	52	BF256	10	BU208	1.15	RCA16800	1.42
AF239	41	BC301	32	BD232	50	BF256S	20	BU326A	1.30	RCA16802	1.38
BC107	15	BC303	31	BD233	80	BF257	20	BU407	1.70	S1299	2.25
BC108	15	BC307	10	BD234	60	BF259	28	BU408	2.76	S2B000	1.25
BC109	15	BC308	8	BD237	55	BF271	28	BU500	2.30	S6C80A/B	3.50
BC115	16	BC309	14	BD238	65	BF274	25	BU526	2.46	T6050V	1.30
BC117	21	BC327	18	BD241	59	BF337	11	BU807	2.94	T6052V	1.30
BC125	26	BC328	18	BD244	85	BF338	34	C1129	9	T9003V	1.25
BC126	23	BC337	17	BD278A	81	BF355	40	C1172B	9	T9C10V	1.45
BC139	27	BC338	17	BD386	68	BF362	50	E5386	54	T9053V	1.30
BC141	34	BC347	8	BD433	71	BF391	21	E9003	28	T9054V	1.80
BC142	30	BC394	8	BD437	83	BF394	16	E9005	25	T9C39V	1.10
BC143	31	BC454	8	BD592	1.20	BF422	47	ME0404	10	TIC45X	50
BC147	12	BC455	8	BD589	1.20	BF423	53	ME0412	10	TIC46	48
BC148	12	BC456	10	BD677G	1.35	BF450	43	ME6002	10	TIC106C	40
BC149	12	BC460	40	BD707	95	BF453	53	MJ2501	2.36	TIP29	42
BC153	16	BC463	22	BD708	95	BF458	37	MJ3001	2.21	TIP30	42
BC1540R	16	BC546	8	BDX10	93	BF459	48	MJE182	47	TIP31	35
BC154YL	16	BC547	12	BDY20	1.09	BF461	59	MJE340	50	TIP32	43
BC157	12	BC548	12	BDY82	99	BF556B	35	MJE520	50	TIP33	61
BC158	12	BC549	8	BF137	20	BF596	15	MJE2955	1.40	TIP41	42
BC159	15	BC557	10	BF153	20	BF694	16	MJE3055	1.50	TIP42	45
BC171	9	BC558	10	BF154	25	BF757	62	NKT241W	8	TIP110	61
						BFR52	31	NKT241G	8	TIS91	25
								NKT241Y	8	ZTK550	30

INTEGRATED CIRCUITS

BRC1330	1.40	SN76013ND	1.80	TBA530	1.26	TDA2002	2.80
BRC3064	1.00	SN76023N	1.80	TBA540	1.00	TDA2030	2.10
BRC/M/200	1.00	SN76033N	2.00	TBA550Q	1.82	TDA2522	2.10
BRC/M/300	1.00	SN76115	2.00	TBA560C	1.50	TDA2530	2.61
CA3060	1.58	SN76131N	1.58	TBA641	2.05	TDA2540	3.50
LM1303P	1.48	SN76226N	1.25	TBA651	2.50	TDA2560	3.50
ML231B	2.20	SN76227N	1.00	TBA720A	2.49	TDA2581	3.00
ML237B	2.00	SN76530P	1.30	TBA750	2.28	TDA2591	1.96
ML239B	2.86	SN76622N	1.00	TBA800	1.82	TDA2611A	1.95
MC1327AP	1.25	SN76660N	80p	TBA810S	1.00	TDA2640	2.90
MC1358P	1.30	SN76666N	75p	TBA810AS	1.00	TDA2690A	1.50
MC1455P	18p	SN76744	1.92	TBA920	1.00	TDA3560	6.00
MC14516BCP	60p	TA7117P	1.00	TBA950	1.95	TDA9503	2.90
SAA1025	7.20	TA7109AP	2.80	TBA1440	1.92	TCEP100	3.48
SAA1124	4.50	TAA611	1.40	TCA270SA	1.05	TEA1009	1.95
SAA5010	6.00	TBA120B	1.20	TCA270C	1.05	MC14428P	4.80
SL432A	1.80	TBA120C	1.20	TCA270CQ	1.05	MC14429P	4.50
SL1430	2.50	TBA120CQ	70p	TDA1004A	4.00	MC14514	5.00
SN15846N	60p	TBA120S	70p	TDA1035T	3.50	UA758PC	2.50
SN74123N	65p	TBA120U	1.00	TDA1037	2.72	UA1008A	2.86
SN74154N	1.40	TBA395	1.00	TDA11705	1.50	ULN2165	1.30
SN76001N	1.40	TBA480Q	1.40	TDA1200	2.42	ULN2216A	1.25
SN76110N	1.14	TBA510	1.90	TDA1270	2.76	UPC1365C	5.75
				TDA1327	2.53	SC9488P	1.40
						SC9511P	1.40
						SW153	2.50

Thorn 8/8K5 ex equip panels untested

PSU	2.88
FTB	3.75
Decoder	4.00

Thorn 9K ex equip panels untested

PSU	12.00
Decoder	5.00

Thorn 9K6 ex equip panel untested

Decoder	5.75

Thorn 3/3K5 ex equip panels untested

PSU	3.75
LTB	3.75
Video	2.50
Chroma	2.00
FTB	2.75
IF	1.75
Conv. 3K	3.00
Conv. 3K5	3.75
Autovox Decoder FG/01 boxed	new 5.00
Thorn 4000 Convergence panel ex-factory	3.75

Thorn 4000 PSU panel ex-factory	2.50
Thorn 3K5 beam limiter board new	1.75
Thorn 3K5 PSU bottom board PC206 new	2.75
Thorn 3K5 IF panel new	3.00
Thorn 3/3K5. EHT & scan TX + R2008B on alum chassis ex-equip	1.80
Thorn 8/8K5 damaged FTB for spares	1.25
Thorn 8/8K5 damaged decoder for spares	2.25

UHF TV Aerial for portable Indoor Aerial Parabolic Type Reflector to Help Combat Ghosting Problems Line Connectors **50p**

Coax Plugs	10 for 1.65
Band Change Switch Assy, Pye 725	40p
Flush Mounting TV/FM Diplexer	1.00
Switched Flush Fitting Aerial Outlet	1.00

Pye 78+161	50p
Pye 147+260	50p
Thorn 56+1K+47+12	1.24
Thorn 50+40+1K5	60p
Thorn 128+16+1K7+ 116+462+126	50p
Thorn 120+72+300	50p
RBM 250+14+58 (TV161)	63p
Pye 3R5+15+45 (713)	90p
Philips 2R2+682	90p
Philips 47R	52p
Thorn 350+20+148+ 1K5+317	1.40
Thorn 6+1+100	92p
Thorn 3000 Metal	1.45
Thorn 8/8500 Plastic	1.45

EHT TRAYS

Thorn 3000	5.50
Thorn 8000	3.50
Thorn 8500	6.00
Thorn 9000	7.90
Thorn 9600	6.00
Thorn 900/950	1.50
Pye 713 4 lead	5.83
Pye 713 5 lead	5.97
Pye 725	6.35
Decca Bradford	5.00
Baird 8750	7.10
Korting AZ9100	7.10
Philips G8 (520)	6.50
Philips G8 (550)	6.50
Universal	5.00

MULTISECTION CAPACITORS

100+150+150	350V	50p	200+200+100 350V 55p
220+47	350V	65p	200+200+75+25 350V 80p
200+150+50	350V	60p	50+50+8 300V 55p
200+200+100	325V	54p	100+50+100 350V 55p
32+32+16	275V	52p	100+150+50 350V 55p
200+200+100+32	350V	70p	2500+2500 (Thorn 8K) 63V 1.20
100+50+150	350V	58p	150+150+100 300V 1.80
400+400	200V	72p	200+47 250V 65p
32+32+16	350V	52p	500+500 175V Thorn TX9 1.00
200+32+300+100	350V	70p	175+100+100 350V Thorn 3K5 2.25
225+25	350V	50p	400 400V Thorn 9K 2.50
200+200+100	350V	70p	470 250V Philips G11 1.50
200+100	325V	65p	
200+100+100+50	350V	60p	

CAN TYPES

0.2MF	250V	50p	1250MF	40V	50p
2MF	250V	50p	1250MF	50V	50p
22MF	275V	50p	1500MF	70V Thorn 3K	1.00
50MF	275V	50p	1500MF	100V	1.05
100MF	150V	65p	2000MF	30V	50p
100MF	250V	70p	2200MF	40V Thorn 4K	95p
100MF	450V	75p	2200MF	63V Philips G9	1.25
220MF	400V Thorn 9K	1.30	2500MF	35V	65p
220MF	450V Thorn 4K	1.30	2500MF	40V	65p
400MF	350V Thorn 8K	1.00	3000MF	30V	65p
800MF	250V Print type	80p	3300MF	16V	50p
800MF	250V	70p	3300MF	25V	80p
			4700MF	16V	72p
			4700MF	40V	75p

Thorn/Decca/GEC On/Off Switch. Push to make	75p
Philips G11 On/Off Switch. Push to make	75p
ITT CVC8 On/Off Switch	65p
ITT CVC9 On/Off Switch + Relay	90p
Philips G8 On/Off Switch	75p
Thorn 3/3500 A1 Switch	50p
Thorn 4000 A1 Switch	50p
Korting Shift Pot 50Ω	65p
2.5A Push to make on/off switch	15p

DIODES

AA112	8p	IN4003	4p
AA119	8p	IN4004	5p
AA143	8p	IN4005	5p
BA115	8p	IN4006	5p
BA154	8p	IN4007	6p
BB103	8p	IN4148	2p
BB105B	30	IN4149	6p
BR103	52p	IN4742A	8p
BR303	46p	IN5254B	8p
BT106	1.50	IN5349	14p
BT116	1.00	IN5400	12p
BT119	2.56	IN5401	12p
BT120	2.82	IN5402	14p
BT151 650	1.00	IN5404	12p
BY127	12p	IN5406	16p
BY188	16p	IN5408	16p
BY204	26p	IS025	8p
BY206	16p	IS131	8p
BY207	16p	IS1858	8p
BY208/800	38p	MR854	35p
BY223	95p	SKE1/02	20p
BY225	1.20	MCR106/1	1.00
BY227	28p	MCR406	35p
BY298	22p	2N4444	1.50
BYX22/400	30p	Y827	80p
BYX55/600	30p	Y969	75p
BYX71/350	80p	ZX150	12p
BZV15 C12R	1.16	OA91	5p
BZV15 C24R	1.16	MCR106/7	1.00
IN80	8p	MCR106/8	1.50
IN2070	8p	TD3F800H	2.80
IN4001	4p	TD3F800R	3.00
IN4002	4p	BY255	30p

Letters

TV LICENCE PROBLEMS

I read in the *Financial Times*, February 27th, that the BBC is considering a licence fee per television receiver rather than per household. Whoever put forward this idea can't possibly appreciate the problems that this would cause for the setmaking and retail industries.

Many of the solid-state colour receivers made ten years ago are still working today. They are sold at around ten pounds each from ex-rental warehouses, a mere fraction of the licence fee. Often, sales of new receivers are made where the old receiver is not scrapped but is moved to another room.

At £10 each you don't have to be rich to own several receivers. In this context the comparison that has been made between a millionaire and the unemployed steelworker is ridiculous. If the BBC should want to charge according to the ability to pay, why not scrap the licence altogether and provide funding through taxes? The BBC could for example be paid a sum which is a percentage of the viewer's tax bill: television ownership would be declared on the income tax return and the sum collected by the inland revenue.

The sets being made today are orders of magnitude more reliable than those of ten years ago. Apart from newly established households, it would seem that industry turnover can be maintained only if people put more and more sets into their homes. But an annual licence fee of six and a half times the cost of an ex-rental receiver or a third of the cost of a new one would soon put an end to that.

The suggestion of licensing each set could destroy the setmaking and retailing industries, and the resulting unemployment and knock-on effects would not be insignificant.

John de Rivaz, B.Sc. (Eng.),
Truro, Cornwall.

THE SCART CONNECTOR

Harold Peters' article in the March issue aired some relevant points concerning the Peritel system. In the interests of accuracy I'd like to correct some minor errors and amplify some points left unclear.

First his drawing of the SCART connector is only one pattern. Other varieties have a screw to stop the two halves coming asunder plus location for the restraining clip he misses. My example also has the cable entry at the top centre, designed for the flat ribbon cable some French manufacturers favour: this is unlikely to force the plug to pull out.

Secondly the table. Pin 6 should be specified as audio in, mono or left-hand channel. Where "varies" is printed this indicates that the specification allows some latitude within defined limits. Pin 8, source switching, is actually off-air/direct input switching, 0-2V off-air or 10-12V for monitor use, into 12kΩ. The term fast blanking (pin 16) has caused some head scratching. This pin should be referred to as off-air/RGB input switching, 0-0·4V off-air or 1-3V for RGB inputs to the set. To use the TV set as an RGB monitor pins 8 and 16 must thus both go high. Pin 16 can go high and low during a single active TV line, e.g. for teletext display, which is why it's called *fast* blanking! – I'm grateful to Steve Beeching for pointing this out. The so-called intercom or domestic data bus lines, pins 10 and 12, are in fact for remote control. They can be used to switch a VCR via the set's remote control system. Pin 10 is for inverted control or clock pulses. Pin 20 is also used for sync pulses in the RGB input mode.

Incidentally CVBS does not stand for composite video, blanking and sync. This is VBS. The extra C stands for colour. It's a Philipsism, from a translation of the German FBAS which means the same thing.

Andy Emmerson, G8PTH,
Northampton.

TELETEXT LINES

Since the number of lines used for teletext has been increased, sets fitted with the Rank A823 series chassis have been prone to displaying these lines at the top of the picture due to the inherently slow field flyback. Apart from a suggestion by one of your readers to readjust the midpoint balance and linearity controls to minimise the effect, no remedy has previously been suggested in your pages.

It seemed to me that the trouble is basically due to the field output stage being operated with an inadequate supply. This is supposed to be about 40V, but with the h.t. and width correctly set the voltage is usually somewhat below this figure. If one reduces the width tapping and increases the h.t. to compensate, the supply to the field timebase is increased and the picture can be set up correctly. The trouble is that the e.h.t. also rises. With the set I tried this out on, with only one step reduction in width the h.t. had to be increased to 210V and the e.h.t. rose to 28kV.

There is however a simple way to increase the 40V supply with correct operation of the set. This is to add more turns to winding 6L17 on the line output transformer. To do this, unsolder the connection to pin 6 on the upper base of the transformer, take about two feet of enamelled copper wire, connect one end to the now vacant pin and wind on six or seven turns in an anticlockwise direction looking towards the base of the transformer, then remake the connection to the rectifier(s) and secure with tape. This increases the field timebase supply to at least 40V and enables the picture to be set up correctly with no teletext lines showing.

M. Catchpole, Broughton Radio (Worthing),
West Worthing, Sussex.

LASERVISION TELETEXT CHECK

It may be worth mentioning that anyone who owns a LaserVision video disc player can use it for checking or testing the teletext option on TV sets by using the BBC disc "BBC Videobook of British Garden Birds". This has a teletext signal recorded on it throughout the whole disc: the pages include a test page and a clock-cracker page.

M.F., Coventry.

LINE DRIFT – TX9 AND TX10 CHASSIS

Line drift with versions of the TX9 chassis incorporating the U725 remote control system has been mentioned in your TV Fault Finding feature twice recently, the cause in both cases being a leaky diode (D916) on the remote control receiver panel (PC1528 or PC1548). This has also

been mentioned in *Ferguson Feedback*. The important point to note however is that the replacement diode should be a BAW62 (to specification T0184W) which is available under part no. 03V4-110-200 or 03V4-168. The same comment applies to versions of the TX10 chassis using the U725 remote control system, also to D117 on panel PC1515 and D1120 on panel PC1536.
Frank Pack, Editor
Ferguson Feedback.

SILENT TAPES

Beware when using blank Scotch L250 cassettes – the one we have had the oxide wound outside in! The silence it gives matches what you'll get from the makers if you ask for compensation for lost time.
Brian Henniker,
Henniker and Kerr, Edinburgh.

SONY GCS CONVERSION

I too had a Sony KV1810UB that was shelved due to the ridiculous price of the GCSs and their unreliability. I've now carried out the modifications suggested in the December 1984 issue and the set is back in working order – a few other faults needed correction and were due to the original GCS failure. Two points cropped up however.

First, the layout of the line driver transformer was not as shown – the tags were differently arranged. As the variac was wound up, the timebase board current was found to be too high. Reversing the line driver transformer's secondary lead connections cured this. The current should be around 630mA at full mains voltage. If it goes over 700mA as the output from the variac is increased, try reversing these leads.

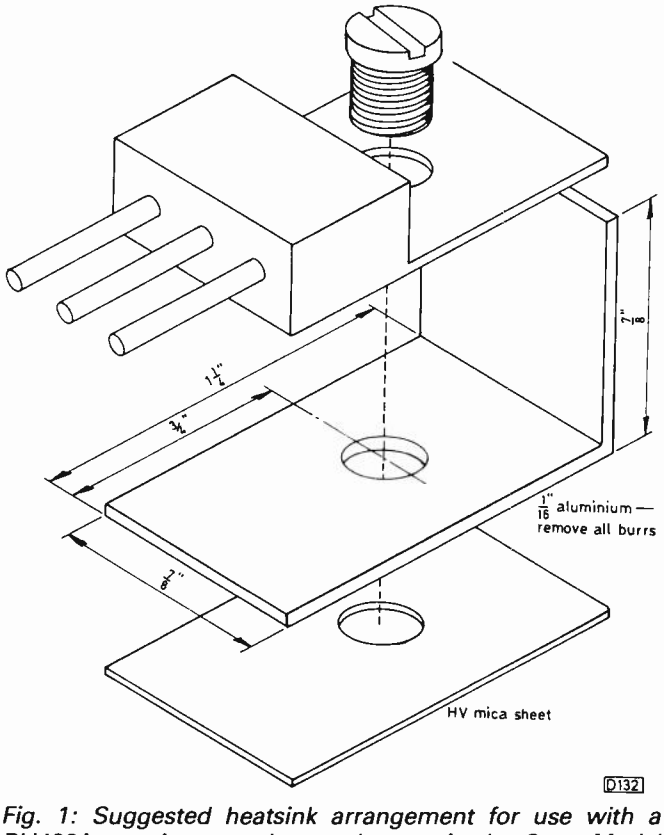


Fig. 1: Suggested heatsink arrangement for use with a BU426A transistor used as a chopper in the Sony Model KV1810UB. Use bush from the original GCS.

Secondly, although the set worked it blew the 2·5A mains fuse after running for several hours. I had doubts about the BU426A's heatsinking. The small tab and high-voltage washer reduce its effectiveness considerably, even with heatsink compound applied. So I added extra heatsinking as shown in Fig. 1 to give more immediate heat transfer and a much larger area through the insulator. This cured the problem and the set now works satisfactorily.
L.F. Sinfield, T. Eng.,
Luton, Beds.

STREAMLINED SERVICING

Further to my letter in the March issue, I've given some very serious thought to the matter of streamlined servicing and would like to ask readers for their reaction to the following proposals. If there's a large enough response I'll make a start on putting the system together. I'll itemise the proposals briefly.
(1) The service would be by telephone enquiry, using same day return, with an answering machine for out-of-hours use.
(2) Subscribers would be asked to pay £12 per year, i.e. £1 a month, and £1 per enquiry. All information relevant to the set etc. would be supplied, together with details of local parts suppliers and reference to circuits in technical books plus any other material to hand if possible with, again if possible, a photostat of the circuit diagram.
(3) Possible modem use for direct access including out of hours and weekends.
(4) Non-subscribers could obtain information at £2 per call though the service would be slower and cash up front.
(5) Credit would be allowed for usable information. Anyone supplying information on a regular basis for the benefit of all could use the service free.
(6) The information provided would be that available at the time of posting and could not be guaranteed to cover the fault concerned. It would nevertheless save hours of searching through material in different places and should thus pay for itself over and over.
(7) The response would have to be big enough as I'm at present employed full time with prospects and would have to drop everything to give it a try.
Robert Easton, 131 Rose Avenue,
Upton, Nr. Pontefract, W. Yorks WF9 1DS.

DEPRESSED INDUSTRY

May I comment on Mr. Lockitt's letter (A Demanding Job, March)? It seems to me that the root of the problem is that the servicing trade, like many other labour-intensive operations, is rapidly becoming a depressed industry, mainly because of the relatively low first cost of mass-produced entertainment equipment (John de Rivaz's letter in the same issue touches on this), the continually rising cost of labour and overheads, and the difficulty of *rapid* fault diagnosis with complex equipment. Such factors as five-year guarantees, diversification of product (Mr. Lockitt's first paragraph) and intrinsic reliability also come into the equation. It might be a sobering experience for your correspondent to inspect his employer's books!

Most employers in this industry today are finding it increasingly difficult to make ends meet in their service departments. Many have gone to the wall during the last decade, even without providing day-release facilities for engineers or participating in the crazy manufacturer-

sponsored extended guarantee schemes currently being operated and discussed.

Regarding college courses, my own experience is that the local college is ready, willing and able to arrange technical courses at any level in any subject required. All their efforts founder on the rock of apathy: without a student quorum of twelve or twenty or whatever, no course can be economic or justifiable. Many a worthwhile project has been nipped in the bud for this reason.

Eugene Trundle,
Hastings, East Sussex.

GOING YOUR OWN WAY

In reply to Mr. Lockitt's letter, I feel I must take him to task on a few of the points he raises. Of course the job of a TV engineer is a demanding one – I should know, I've been at it far longer than he has! But the job has evolved at only the same rate as the technology itself, and is now in some ways a lot simpler than it was twenty years ago. Remember "Comet" Murphys and English Electric P40s? A call to a TX10 or a KT3 is far simpler, quicker and more lucrative. As to microcomputers and VCRs, what do you find when you open one up? Wonder of wonders – resistors, inductors, capacitors, transistors and integrated circuits! Maybe Mr. Lockitt should stick to glass rattling and leave the clever stuff to L.L.-J. and me!

The "political" aspects worry me more. Some years ago I was employed by one of the major national rental companies and was very happy – well paid, well looked after and with a high degree of job satisfaction. Then one of my colleagues got the union bug. We ended up with a closed shop and overnight the good relations between employers and employees and the job satisfaction at all levels evaporated. Overall efficiency suffered and the eventual result was mass redundancies.

As to gaining qualifications, these are obtained for one's own benefit to enable the job, for which one is paid, to be completed more easily.

It's a fact that unions cannot be effective in this trade due to the nature of the job, with every engineer working alone in the field, regulating the style and rate of his work and its quality. Mr. Lockitt could always start his own business. He would have to work longer hours for less, but would be compensated for this by 100 per cent job satisfaction. I tried it and found that one has to be not only an ace technician but also a businessman, accountant, diplomat, salesman and tea boy. It's not only a case of being all these things but being good at all of them!

David Swann, Managing Director, Accountant,
Senior Engineer, Toilet Cleaner, Tea Boy and
General Factotum, Peakview TV, Buxton, Derbyshire.

A DYING TRADE?

William Lockitt's letter on status and the demands of the job and Les Lawry-Johns' comments the previous month on a procession of idiots encourage me to put pen to paper on the state of the electronics service industry, particularly with respect to domestic TV and video equipment.

For many reasons, we appear to be mixed up in a dying industry. The cost of new equipment, especially TV sets, has not kept up with inflation. Virtually everything else has kept pace with or gone ahead of inflation. For example the motor industry has kept its prices up and, more importantly and relevantly to our industry, its servicing labour costs. This is much easier to do if the cost of servicing something, be it a car or a TV set, is a small percentage of the cost of a new item. Who can blame anybody for not wanting to pay £12 to have a monochrome portable repaired when this represents 25 per cent of the cost of a new one? It's fine if you're in the retail trade as well. Sell 'em a new one – if they don't suspect that the repair estimate is a con.

On to the idiots. People still ask for the picture valves to be replaced in their two-year old sets and cannot begin to understand why it should take more than ten minutes to find the cause of such a small thing as intermittent line sync – after all the picture's still there, so it can't be anything serious. They'd do it themselves but just don't have the time. Some do have a go and I suppose we've all seen the results at some time or another. If you hand it back unrepaired they think you're no good at mending "these things".

The general reliability of most equipment nowadays may not be such a good thing, as people are getting used to not having their TV sets and VCRs repaired. In the majority of cases when a VCR comes in for the first time it will require a new head drum in addition to anything else that might be wrong with it. I estimate that 80 per cent of customers are not prepared to accept the cost and go away to try to find someone who'll do it more cheaply. Maybe they do – there's always one of the rental boys who want a bit on the side and can get the parts from their firm for nothing. It happens in my area all the time.

Modern TV sets are very reliable, but what about the tubes? Modern c.r.t. manufacture seems to involve built-in obsolescence. Nothing lasted longer than a good old 56-120 shadowmask tube, and when it did go it didn't cost an arm and a leg. Now when a quote is given for replacing the prematurely worn out tube in a two and a half year old set the customer rushes off to the nearest Comet or wherever for a new one.

My advice to anyone thinking of joining this service industry is don't. It can't have more than a few years left to support the present number of people in it. Yes, there is a lot of new technology on the horizon, and there will always be the need for retail and someone to resolder the odd wire that falls off, but before long it's likely to be a case of "if it goes wrong, buy a new one". If you're already in the industry, it's an idea to get a job in a non-related field but continue as a "private engineer, will call", charging realistically for a decent, reliable repair.

R.M.D., Sidcup, Kent.

ANOTHER PUZZLER

I would like to offer my theory as to why terminal screws in plugs become loose. Whenever copper is put under a localized stress, such as by the point of a terminal screw, the metal will tend to "flow" away from the stress. Thus the screw appears to have become loose though in fact the copper has moved away from it.

Another mystery I'd like to put before your readers concerns the lead-acid battery as used in a car. When topping up cells with distilled water I've noticed that the one which always requires more water in relation to the rest is the one nearest the negative terminal. In most cars this is the chassis connection.

In connection with microcomputer colour bar programs, has anyone devised one for the Commodore 64?

R. Horton,
Melton Mowbray, Leics.

ORIC TEST PROGRAM

When I tried the Oric-1 test pattern program (April, page 329) I couldn't get the circle to work. On checking, a mistake was found in the program: line 690 should read ". . . . CHR$(99)THEN 690", i.e. not "CHR$(67)". Earlier the program told the computer to be in the small letter mode but in line 690 it says look for capital C (CHR$(67)).

P. Marston,
Somerton, Somerset.

I entered the Oric-1 program into my Oric Atmos and found that I couldn't get a circle when pressing key C. A small change is needed to the program. First "CHR$(67) in line 690 should be changed to CHR$(99). Secondly, line 650 should have an addition so that it reads "PRINT CHR$(20): TEXT:CLS:END".

I think this change to the program will also be needed with the Oric-1 microcomputer.

The reason for all this is that caps lock is switched off in line 40. Thus when line 680 asks you if you want a circle drawn by pressing C, if C is pressed code 99 is placed in 2S. Code 99 is for lower case C – with the Oric in the caps mode 67 would be correct.

Dave Garrett,
Calne, Wiltshire.

Dealing with Teletext Interference

Eugene Trundle

The first experimental teletext-type transmissions were carried out by the BBC in the summer of 1973, outside normal broadcasting hours. These trials used two lines during the field flyback blanking period for simulated data-pulse transmission – lines 13 and 14 in the even fields and the corresponding lines 326 and 327 during the odd fields. At that time lines 17 and 18 (plus 330 and 331) were allocated to the international insertion test signal (ITS) and were not freely available for data signals.

Results of the Tests

The effects of these data transmissions were monitored by viewer-participants who completed questionnaires. On analysis, these showed that up to seven per cent of observers saw data lines of twinkling dots superimposed on their pictures. Most of the receivers then in use have long since been scrapped, and on the basis of a BREMA recommendation of 1973 most new receiver designs took into account the need to suppress the effects of data pulses in the field blanking interval – even though teletext decoders were not in general production at that time.

Number of Lines in Use

When the UK teletext service began in 1975 the ITS signals were moved to lines 19/20/332/333 and lines 17/18/330/331 were used for the text signals – see Fig. 1. In late 1981 the number of text lines per field was increased to four (15/16/17/18 and 328/329/330/331). The first half of 1984 saw a further increase to six lines per field, with lines 13, 14, 326 and 327 being added for text use. As an experiment, in late 1984 the IBA inserted further "dummy" lines of data type pulses in the ITV-1 transmissions from certain stations to test for interference effects on picture and sound. The transmitters chosen for this experiment were Crystal Palace, Rowridge, Hannington and Midhurst, all in the south east. From October 1st to 4th twelve lines of data were broadcast, reaching down to lines 7 and 320. This was followed by several weeks of eight-line data. In November there were two weeks of nine-line tests, followed by a period with eight lines. It seems that the twelve-line tests gave considerable problems with older receivers though eight-line data was very much less troublesome. My own experience (I'm unfortunately outside the range of the transmitters used for these tests) is that certain sets are prone to displaying twinkling data lines superimposed on the upper quarter of the display even with the current six-line transmissions – more on this later.

There's little doubt that in the fullness of time the "spare" lines available in the field blanking period will be put to good use – the teletext specification allows for the use of up to sixteen lines per field for text. We can't encroach on lines 6 and 318, the first "clear" lines following the post field sync equalising pulse train, while at the other end of the blanking "window" picture information starts coming through on lines 23 and 336. Lines 19, 20, 332 and 333 are currently used for the ITS. Lines 21, 22, 334 and 335 are reserved, with 21 and 334 being used as network status/switching control lines.

The steady increase in the number of lines used for teletext has obvious advantages for viewers with text decoders – faster access time, a greater number of pages of information, or a combination of these. Certainly I've noticed the improvement since six-line text was introduced, though in the various tests of up to twelve lines the additional ones used carried dummy data rather than actual magazine data. For those without text decoders however this flood of coded information can be something of an embarrassment, particularly where older TV sets are being used.

Nature of the Problem

The problem is mainly with sets designed before the advent of teletext. In some cases the combination of a relatively slow field flyback with less than adequate beam blanking gives rise to interference with the reception of the basic broadcast pictures. This interference takes the form of lines of twinkling dots across the upper part of the picture or, a more subtle condition in some more modern sets, a reflection effect – the symptom is a white haze at the top of the picture, most visible on dark scenes and in low ambient lighting conditions. This effect is caused by secondary emission from the shadowmask frame in certain makes and types of tube when bright data lines are present above the picture display area.

The field flyback waveform in a typical older colour chassis, the Thorn 3000, is shown in Fig. 2. The luminance

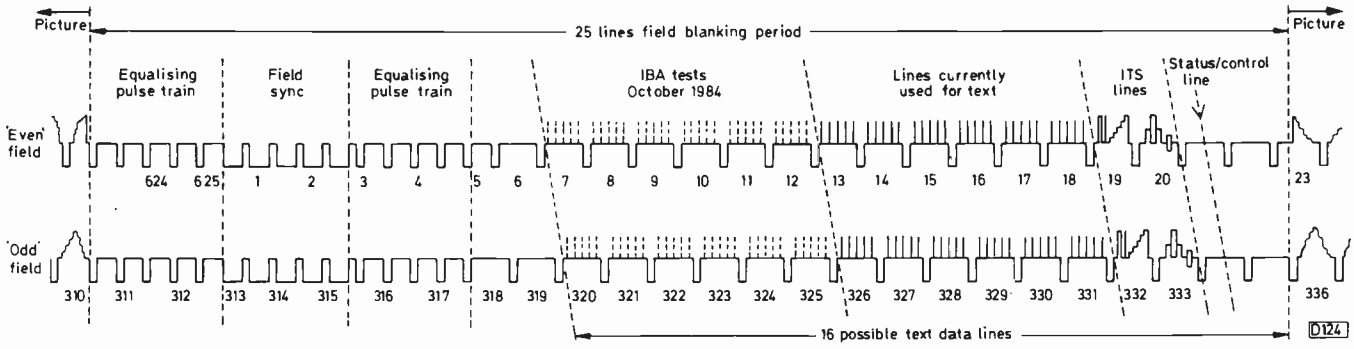


Fig. 1: The field blanking interval in the 625-line system, showing the sync pulses, text, control and ITS lines.

information shown below the sawtooth brings out the potential for data lines being displayed on the picture, since by line 13 the beam's flyback has reached only about seven-eighths of the way to the top of the screen. In any set, the slower the flyback the farther down the screen the data lines will appear.

Provided the field flyback blanking arrangement used in the set is adequate, the beam will be fully extinguished during the flyback and nothing will be introduced on the screen. Thus slow flyback will not necessarily cause problems – unless it's so slow that the next field of video information arrives before the flyback has been completed, in which case the result will be top foldover. Many modern sets have a field flyback of around 800-1,000μsec (12-16 lines) and a very effective blanking pulse generator which is timed so that the blanking ends 22 lines (1,400μsec) after the start of the field flyback.

Modifying a Set

Some modifications to remove teletext interference involve speeding up the flyback. This is not recommended however unless approved by the setmaker – a faster flyback generates a higher peak voltage across the inductance of the field scan coils, and this voltage spike can have dire effects in older sets, for example punching through the junctions of field output transistors and breaking down the insulation of field output transformers. A faster flyback will also do nothing for the reflection problem. Thus modifications to remove teletext effects on the picture are in most cases best confined to the blanking circuit.

Shortcomings with field flyback blanking performance fall into two categories, which can be crudely defined as "depth" and "width". Depth problems are caused by

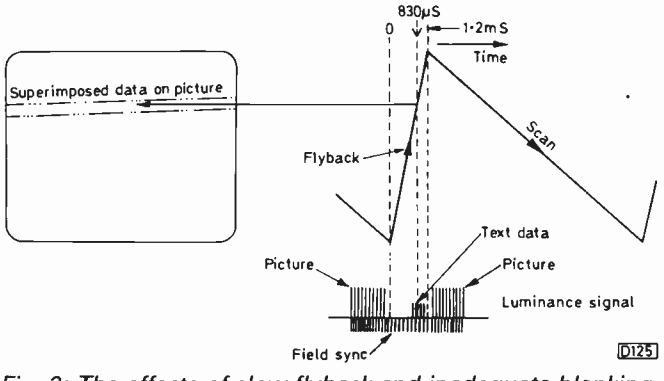


Fig. 2: The effects of slow flyback and inadequate blanking. Text pulses will be displayed on the screen if the beam is not fully extinguished during the flyback.

inability to suppress completely the high brightness (66 per cent of peak white level) data pulses – the blanking system is probably adequate for dealing with only the much lower level "flyback lines" originally transmitted at black level. What's required in this case is to increase the amplitude of the field flyback blanking pulse to the point where it fully extinguishes the luminance signal during the flyback. Far more common however are pulse width problems, where the duration of the blanking pulse is insufficient to cover all the text lines – ideally beam blanking should continue until the beginning of the first active picture lines, 23 and 336. Most of the modifications given at the end of this article are designed to lengthen the blanking pulse so that it reaches this point – and this approach is the only way of eliminating the effects of internal reflections and secondary emission in picture tubes.

It's not difficult, with an oscilloscope (preferably a double-beam type) and a reasonable working knowledge of the circuit, to identify the cause of the trouble in an affected set. A cure can then usually be devised. Once it has been proved that defective components are not to blame, a modification can be tried, generally involving a changed time-constant in the blanking pulse generator or fitting a pulse-stretcher. The latter takes the form of a monostable multivibrator with an adjustable timing element to set the end of the blanking period so that it coincides with the start of the picture at the top of the screen.

Fault Finding

There's little point in trying a modification unless the blanking circuit is o.k. and the field timebase is in good order, properly set up and not afflicted by low-emission valves, leaky output transistors or dried-up electrolytic capacitors (particularly supply line smoothing electrolytics). Any of these things can slow down the flyback. With a discrete transistor field output stage the mid-point voltage setting is critical and has a profound effect on flyback time – this is relevant to Pye hybrid sets, Philips G8s, the Rank A823 series and similar designs. The "sit up" control in the field timebase circuit used in the Thorn 3000/3500 series chassis is also a critical adjustment. The most common offenders in blanking circuits are leaky or high-resistance diodes.

Suggested Modifications

What follows is an alphabetical list of TV sets that can be prone to the teletext intrusion problem, with details of preventive measures. Most of the information relates to

modifications, but where common faults that can give rise to data line interference are known these are briefly described. If a set is not included it's probably because no modification is necessary, any problems being likely to arise from a fault rather than a design characteristic. Some very old chassis are not included, due mainly to their rarity and a lack of recently generated information on them. For sets not mentioned, some idea of what's required and possible avenues of approach may be suggested by modifications applicable to similar chassis. My own view is that a data-twinkle problem in a set around ten years old may be taken as reason to pension it off in favour of something new – possibly one that includes teletext facilities!

Acknowledgement

Much of the modification data given in the following notes was provided by the setmakers themselves. My thanks are due to them for their patience and co-operation. I've not had the opportunity to try out all the modifications suggested: feedback from readers, particularly worthwile additions, would be welcome.

Bang and Olufsen

Problems are confined to hybrid models. For 90° types (2600, 3000 and 3200) use the circuit devised by Keith Cummins (see Letters, April 1984, pages 314-5) or use the circuit shown in Fig. 3(a). For the 110° 3400 type use the circuit shown in Fig. 3(b).

Decca

30 series hybrid chassis: A modification kit to prevent tube reflections is available, part no. 503266. The circuit is shown in Fig. 4 for those wishing to build it up themselves.

80, 88 and 100 chassis: Check by substitution D203, D204 and D205 on the decoder panel. With the 80/88 series chassis also check C332, C333 and C334 on the timebase panel.

Doric/Rediffusion

Mk I colour chassis: Change C612 to 47μF, 63V, R607 to 3·3kΩ and R443 to 12kΩ.

Mk III colour chassis: Fit improved TDA9400 chip, part no. 38326. Change 4R14 to 10kΩ and remove any 33kΩ resistor mounted on the print side of the timebase panel.

Finlandia

Model C22HZ: Change C101 to 150μF.

Grundig

Early solid-state sets (Models 5010 to 6632) used colour-difference drive, with blanking via the colour-difference output stages. Decoder panel 07247.072.00 should be replaced with type 29301.024.61 which incorporates a monostable multivibrator to stretch the field flyback blanking pulses. If the superimposed data lines are coloured, trouble in one of the CDA output stages is indicated. The voltages at the collectors of the output transistors should be 150V ±20V: if incorrect, the trouble could be due to a faulty BF459 output transistor. Correct adjustment of the first anode and SP presets is important with these sets.

Slow flyback in early models can be caused by a leaky or low-gain output transistor. Replace with type GD241

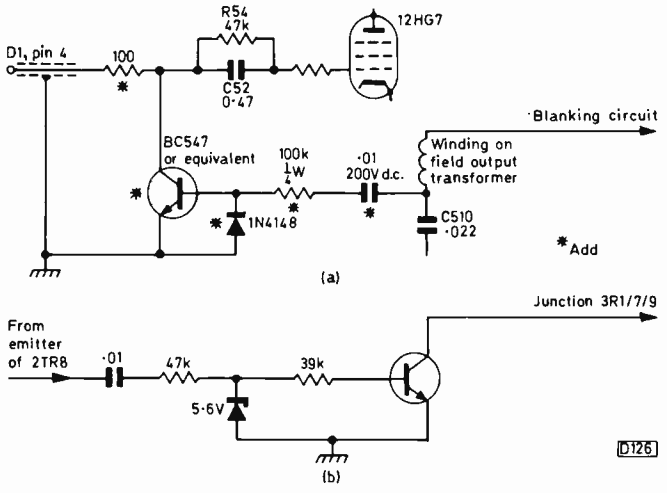


Fig. 3: Modifications for Beovision hybrid colour sets. (a) for 90° models, (b) for 110° models.

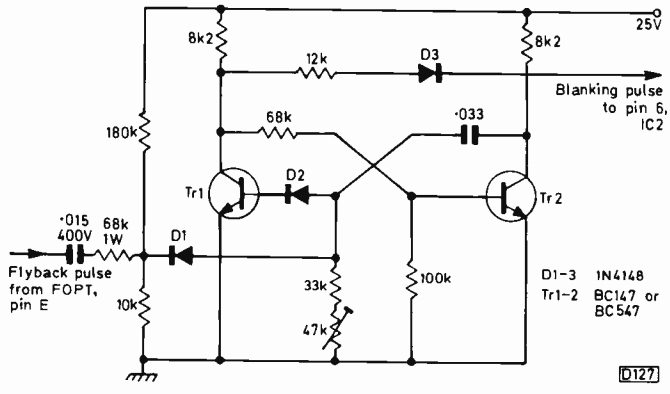


Fig. 4: Monostable multivibrator pulse-stretcher circuit for use with the Decca 30 series chassis. Adjust the preset just to clip the top of the picture.

or GD243. In early production some sets (notably Model 5010) did not have blanking components fitted to video panel 29301.005.01, though in practice their presence or absence seems to make little difference. Fig. 5 shows the blanking circuit.

Hitachi

Models CFP470 and CSP680: Renew C607. Change R619 to 120kΩ.

ITT

CVC8, CVC9 and CVC9/1 chassis: Some sets fitted with these chassis exhibit reflections at the top of the screen. An auxiliary circuit can be fitted to supplement the existing tube grid blanking circuit where necessary. It provides additional cathode blanking via the luminance section of the TDA1327 decoder chip IC2d. The subpanel is no longer available from ITT but the simple circuit is easy to make up – see Fig. 6. The pulse feed is taken from the white lead to the field scan coils. Desolder and remove the print at pin 6 of the i.c., taking care that pin 7 remains connected to the print. Remove C138d and replace it with two 22μF 10V tantalum capacitors wired in series, the negative connections together, then connect the extra circuit to pin 6 of IC2d. Adjust R1 so as just to "clip" the top line of the picture.

CVC20 etc.: No design problems, but faults can cause teletext interference. C24, C26, R56 and R57 in the field timebase are worth checking – if a tendency to top

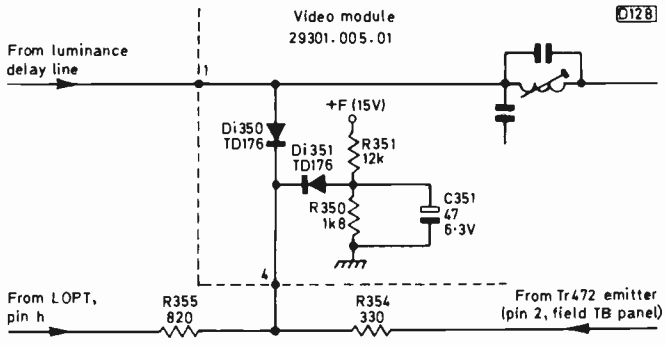


Fig. 5: Luminance blanking circuit used in Grundig sets with colour-difference tube drive. Di350, Di351, C351, R350, R351, R354 and R355 were not present in early production sets.

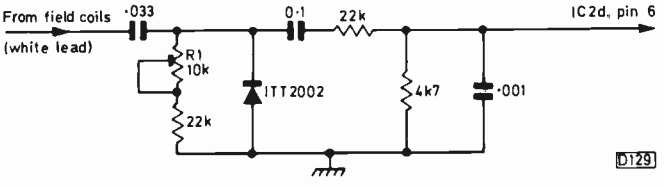


Fig. 6: Additional blanking circuit for the ITT CVC8-9 series chassis. See text for interfacing details.

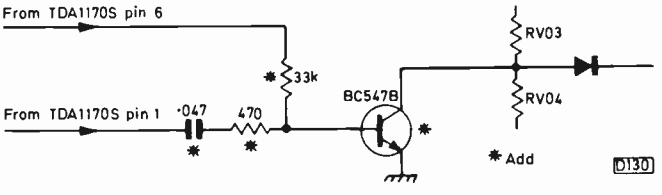


Fig. 7: Suggested modification for the Skantic BC chassis.

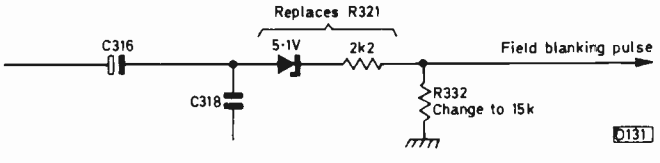


Fig. 8: Suggested modifications for the Toshiba X53 chassis.

foldover is present, C19/20/21 can be responsible or more rarely R47/48/49. If the field timebase is healthy, the cluster of diodes associated with pin 8 of IC501 on the decoder panel should be checked by substitution.

Luxor/Skantic

BC chassis (Models 5111, 5114, 5601, 5608, 6711, 6718 etc.): Check and if necessary implement the following modifications on the signal processing module: change RF92 to 120Ω, change RF77/RF84/RF91 to 1kΩ, add the components shown in Fig. 7 on the solder side of the mother board.

National Panasonic

Model TC202G: Add an 0·47μF capacitor across D603.

Philips

G8 chassis: Fit an additional resistor in series with the base of the field flyback blanking transistor T4488. For early panels its value should be 330Ω or 470Ω; for later panels with BD131 field output transistors 220Ω or 270Ω will be needed. The value of this resistor determines the width of the blanking pulse: if necessary adjust on test to prevent blanking the top of the picture.

KT4 chassis: Add a 2·7kΩ resistor and 27V zener diode in series between pin 4 of IC7110 and the junction of R3109 and pin 4 of socket L53, with the diode's cathode to pin 4 of the i.c.

K30 chassis: Early production didn't have an 0·015μF capacitor (C1530) connected across the collector and emitter of T1535. If it's absent, fit one.

Pye

Hybrid colour chassis: If R257 is 560Ω, change it to 1kΩ. Change R262 to 10Ω. Add an 0·1μF capacitor from the anode of D44 to chassis. If necessary reset RV24 to eliminate text lines and top foldover.

Rank

A823 chassis: Reduce the value of 5R40 to 18kΩ (15kΩ in obstinate cases) and reset 5RV5 as necessary.

A823A etc. chassis: As above but component reference numbers are 5R23 and 5RV4.

Sanyo

Model CPT5101: Renew R429 (410Ω). D426, D421 and D422 can also be responsible. Note that R429 is 820Ω in Model CPT5101W.

Sony

In some earlier sets (e.g. the KV1300 and KV1320 up to serial no. 100,000) an improvement can be achieved by increasing the value of C534 to 4·7μF. With Model KV2206 reflections can be overcome by increasing the value of C518 (board D) until the text lines are just blanked.

Thorn

3000/3500 chassis: Usually, changing R441 to 5·6kΩ will suffice. If necessary change R425 to 82Ω and R442 to 39Ω; use a BC107A instead of a BC107B in position VT422; if VT421 (BC115) is a Texas device replace it with one manufactured by SGS; in older models C429 may need to be changed to 10μF.

8000 series: Problems are mainly confined to reflections with certain tubes fitted to the 8800 chassis. Change C440 to 0·1μF.

TX10 chassis, panel PC1550-001: The TDA2576A i.c. used on this panel has a count-down field sync system from which the field flyback blanking pulses are derived. In the AV mode however direct field sync is used, so the field flyback blanking signal disappears. A supplementary narrow blanking pulse comes from pin 6 of the field timebase chip IC771. In a recent case I found this inadequate for suppressing data twinkle on live or taped broadcast signals via the VCR. The pulse was stretched to the extent required by adding an 0·1μF capacitor from the anode of D641 (panel PC1551-001) to chassis.

Toshiba

C2000 series: C461 (220μF, 107V line decoupler) can dry up to cause text superimposition.

X53 chassis (Models C1695/2090/2095/2290/2295): Change R332 to 15kΩ. Replace R321 with a 2·2kΩ resistor and 5·1V zener diode in series as shown in Fig. 8.

Components and Safety

Unless otherwise stated, resistors are 0·5W, capacitors are greater than 60V working and zener diodes are 400mW types. Ensure that any modifications made do not degrade the safety of the set or infringe BEAB or BS415 requirements.

Renovating the G8

Tony Thompson

Large quantities of sets fitted with the popular Philips G8 chassis have become available over the last year or so, due mainly to stock rationalisation exercises by major rental companies. This article is based on recent experience servicing a considerable number of these sets. By and large the G8 represents a worthwhile opportunity for those interested in obtaining economy TVs. There can be few of us who've not encountered this chassis, but as it's been some time since a servicing feature on it appeared in these pages I felt that it would be useful to provide a run-down on the more common faults – also a few less common ones.

Before embarking on serious work it's useful to obtain service data for the model concerned. Due to the great flexibility of the basic chassis design, with its edge connectors and multiple plug/socket configurations, many variations were produced over the years, including some complete panel redesigns. The earlier range, the 520 series, is recognisable by the six square tuner buttons and the fact that the convergence panel is accessible from the front by levering out the metal plate with the Philips logo and loosening the grill retaining plate beneath. The later 550 series has flap-type tuner buttons and a convergence panel inside – for access remove the cabinet rear cover.

Power Supply

Apart from fuses going open-circuit – the h.t. ones sometimes die and are sometimes killed by faults elsewhere in the set – the most common power supply fault seems to be failure in one way or another of the mains rectifier thyristor. You can't miss this component: it's located roughly centrally on the power supply panel and may be mounted on a heatsink or have a cooling fin in one form or another fitted. Several different types of thyristor were used, and most of the boards are designed to take differing packages. The thyristor usually goes dead short, taking the 3·15A anti-surge mains fuse with it. This latter fuse is located on the outer metalwork of the power panel, under a safety cover that's held in place by the connector for the a.c. from the on/off switch.

You may find the mains fuse blackened but be unable to find any obvious cause. Further a new fuse may well restore normal operation. One reason for this is that the power supply does not have soft-start "cushioning". At switch on there's a very low impedance which, though momentary, can weaken the fuse. Even so, the fact that the fuse is likely to be blackened internally as opposed to having failed gently suggests that there's a cause for this. It's prudent on these occasions to feel for the smoothness of the action of the switch in the set and at the wall. Also check the wall socket itself for tightness of grip on the plugtop. The connections inside the plug should also be looked at, because arcing at any of these points can blow the fuse and probably damage the thyristor too – which can itself be the cause of such baffling fuse failures even though it smiles sweetly and looks innocent.

The "dropper" resistor is inclined to go open-circuit. There are two sections, 2·2Ω (R1367) which is the surge limiter and 68Ω (R1381) which is the h.t. smoothing resistor. When R1367 goes open-circuit there's no supply at the anode of the thyristor. When R1381 goes open-circuit there's no h.t. but the h.t. reservoir capacitor receives a hefty charge – it's better to discharge it through a resistor than your hand.

The main smoothing block can give the symptoms of poor sync before much evidence of hum, in the form of a dark band moving slowly up or down the screen, becomes apparent. These electrolytics are becoming more of a problem with age and it pays to look for leakage in the form of a white encrustation at the business (tag) end of the component.

The c.r.t. heater transformer can give rise to a buzzing which the customer often mistakenly assumes comes from the loudspeaker. As this buzz often develops only some time after switching on from cold you could miss the true cause and waste time searching for a non-existent audio or sound i.f. problem. Due to the form of construction it's not feasible to tighten the core, so the only certain cure is replacement. We've had some success with slightly buzzing transformers however by applying a silicon sealant to damp the core vibrations. Note that the transformer has a built-in thermal fuse.

If the fault is poor or non-existent h.t. regulation, perhaps with excessive e.h.t., after changing the dreaded thyristor check the trigger diac D1377 (BR100). These odd little components read open-circuit both ways and are therefore confusing when checked with the multimeter. Try swapping the ends about if another one is not to hand – this could do the trick. If regulation is not restored and you're sure that the thyristor and diac are o.k. you'll have to check the regulating transistor T1374 (BC147) and its associated 7·5V zener diode D1371. These two items are best checked by replacement.

Picture flutter should lead to a check on the setting of the h.t. preset potentiometer R1370 and its condition. The problem could possibly be in the overvoltage circuit.

Timebase Panel

The bottom right-hand panel carries the field timebase plus the line oscillator. The vertical right-hand panel consists of the line output and driver stages.

Amongst the more common field timebase faults is failure of the output transistors, the symptoms being partial or complete field collapse and a variety of poor linearity effects. Replace them both I say. Check for poor connections though, especially where reliance is placed on securing bolts only. If possible hard wire as well.

Dry-joints will often be found in the vicinity of the raster distortion correction transductor, creating problems of the type where any disturbance – even walking across the floor near the set – will cause field flicker or collapse. The transductor itself is troublesome and can cause field collapse or burn-ups, sometimes of a severe nature (it can also load the line output stage). The hazard can be permanently avoided by removing the transductor completely and linking points C and D to maintain supplies. Alternatively you can simply disconnect plug H. We much prefer the former approach, on the grounds that a troublesome component, especially one that's a potential fire risk, is best removed to avoid the possibility of future inadvertent connection.

If the trouble is intermittent field collapse check the tightness of connector U on the bottom rear edge of the line timebase board before delving too deeply: this plug

and socket is the source of the field timebase's 45V supply.

Other fault symptoms can be traced to this point – field blanking pulses and the high voltage for the tube's first anode presets also travel this way from their source, the line output transformer.

Line Driver and Output Stages

The line output transformer very often fails (you don't say . . . !). This is usually evident from its burnt appearance and/or the fact that it runs very warm. Check the tripler before rushing to fit a new transformer however – a new line output transformer won't be new for many minutes if the tripler is short-circuit. Many chassis show signs of rushed and untidy line output transformer replacement. It's worth checking the soundness of the many wired connections – it's also worth doing an annotated sketch of the wiring and its colour coding before removing a defective transformer. I tend to use transformers of a modified design, Continental types with smaller overwindings: though not Philips' originals, they seem to be very reliable.

Focus faults usually turn out to be due to the series resistor on the c.r.t. baseboard. This may be 4·7MΩ, but as usual with this chassis there are other permutations.

The largish wirewound anti-breathing resistor R5535 (47Ω) mounted in brackets at the lower edge of the line timebase panel frequently goes open-circuit, giving the symptoms no results with the c.r.t. heaters lit. The reason for this is that the line output stage, from which all the low-voltage supplies are derived, is deprived of its h.t. supply. The fact that most supplies are derived from the line output transformer should be borne in mind at all times when investigating puzzling faults on this chassis: it's instructive to lift fuses, switch on, and see the fault symptoms produced.

The line output transistors can go short-circuit of course, often with very evident blown fuses. One or other of them can also quietly die, leaving the remaining one to soldier on. The symptoms may be blooming (unstable picture size, increasing with white content), a narrow, poorly linearised scan or a large, poorly focused picture. A clue is given by feeling them for equality of warmth, though this is not infallible – and don't do it with the set switched on! Remember the base balancing coil which might require adjustment. If the core is jammed, as it often is, replace the coil (L5003). Where one transistor has failed we consider it prudent to replace them both.

One set had the symptom of very slow start up when switched on from cold, two or three minutes elapsing before anything at all was heard from the loudspeaker – even then it was only a faint but gradually increasing hiss. When the screen finally lit up, some seven minutes later, there was a badly distorted picture accompanied by much tearing, distorted sound and evidence of stress from the line output transformer in the form of a loud audible twittering. Increasing the h.t. settings to well beyond normal produced a reasonable result. The power board came under suspicion of course but proved to be blameless. After a lot of effort the cause of the fault was traced to the line driver transistor T5519 (BD144). Apart from this odd fault the line driver transistor has given very little trouble. The faulty one measured o.k. and had to be replaced before its guilt could be established.

Cases of brightness variations over say an evening's viewing may be resolved by changing the 12V zener diode D5582 on boards coded BY14 and upwards. It's part of the beam limiter circuit. The two transistors in this circuit on boards with the same coding, T5581 and T5587, can also give rise to brightness fluctuations, but this is less common.

We've not had much trouble with triplers. The type used seems to be one of the more reliable ones but it's possible to use a universal component if the specified replacement is not to hand.

Signals Circuits

The video/decoder/i.f. panel arrangements vary considerably: in later chassis the original three boards are combined into one large signals panel. Unfortunately this change did little for reliability, the large panel being if anything less reliable than the ones it replaced.

As usual, one of the RGB output transistors can be responsible for excess of one colour. The TBA530Q matrixing i.c. (IC3570) in the four-chip decoder has on a few occasions given us the no video symptom with large magnitude voltage errors at the collectors of the output transistors.

Distorted or intermittent sound can usually be cured by replacing the TBA750Q intercarrier sound i.c. (IC3530). In earlier versions with a separate i.f. panel a TAA570 i.c. is used (IC002). This gives its share of sound problems and if faulty usually responds to heat/freeze treatment. A pair of BD131 transistors is used in the audio output stage: they can also be the cause of distortion. Many sound faults don't have an electronic cause however: the loudspeaker is prone to cone distortion and as its impedance is 60Ω it's important to fit the correct replacement.

Earlier i.f. units have a subpanel that supports the tuner. The two panels are linked by rigid soldered wires and cracks can occur at the joints on the lower panel. These can be difficult to cure, though a good clean up and a check on the print for cracks and lifting should put matters right. If you suspect one of these boards of being intermittent, perhaps producing low gain or snow, gentle flexing while the set is running may give observable proof. Instability or patterning is often caused by the same basic problem of dry-joints or hairline print breaks.

The tuner itself is not above suspicion of course. The tuner switchbank is troublesome but can be dismantled, cleaned and the springs retensioned. If necessary the unit can be replaced.

A 12V regulator is used for the low-voltage tuner, i.f. and decoder supplies on the combined signals panel. The series transistor T3401 (BD131) receives its 23·5V collector supply from the line output transformer. So if supply problems arise, start at the transformer and work forward.

General

When you pick up G8s through the trade a stand is rarely supplied. Somewhere in the country there must be a veritable mountain of these stands. You'll also find that the cabinets lack any kind of front feet and won't sit level, tilting forward awkwardly. One way round this is to screw small, countersunk wooden plates under the front corners, staining the wood with dark-scratch cover. These improvised feet work well provided you make sure that the screwhead is well inset and won't scratch the table top. They can easily be removed in the event of a stand being fitted.

It's as well to check sets visually for completeness: you

may find small but essential components missing, such as the R/G symmetry coil L5551 on the line timebase panel. You may also find whole panels missing!

The later type of convergence panel (550 series chassis) was a step backwards in design and may produce drift over a period, making your carefully set convergence look pretty sick. The main trouble is heat and we find that the AC128 transistors on the panel are particularly prone to thermal change. Replacing these elderly devices helps. The redesigned replacement panels available from SEME Ltd., Unit 2E/F, Saxby Road Industrial Estate, Melton Mowbray, Leics are expensive but effective.

The G8 is an accessible chassis. It has its share of problems but for the most part these can be dealt with by using logical fault-finding techniques. Replacement components are readily available from a number of suppliers in addition to Philips.

Given a good tube and cabinet, G8s usually make a worthwhile return on the investment when bought in quantity for resale or renting – or as a one-off for personal use. Remember though, buyer beware! Sets don't appear in trade disposal outlets for no reason and you may have to put a lot of work in before a set is working satisfactorily. The condition of the tube is the biggest stumbling block. While it would probably be worthwhile fitting a replacement for personal use this cannot be sensible for resale unless you can be sure of getting a good price for the set. Watch out when offering guarantees: as these sets are getting on in years they can now best be described as moderately reliable. If someone out there can design a portable, battery-operated tube checker, please let us know . . .

Video Fader Unit

Malcolm Burrell

A friend of mine built a version of the video effects generator featured in the April 1976 issue of *Television*. What he wanted was a fader, but he found that the one in the effects generator wouldn't work with colour signals. He told me that he'd also tried tapping video directly from the slider of a potentiometer. The trouble with this was picture break-up and loss of colour with the control near the minimum position. The reason of course was that to be able to fade to black the sync pulses must be preserved while to retain colour the burst must be preserved.

Despite the millions of VCRs now in use in the UK, few people make and edit their own programmes. As a result, not many faders are available. The design presented in this article is based on a number of circuits that have been found to work – it owes much to the previously mentioned effects unit. It has been found to work consistently and is relatively cheap to build.

The video input is fed to the emitter-follower Tr1 whose output is split to allow maximum video to be fed to the sync separator transistor Tr9 and slightly less to the fader circuit. This helps to overcome any jitter that might be caused by overloading due to a strong input signal. The fader circuit is almost identical to that used in the effects generator, though the component values have been changed to enable a better range to be obtained from the single rotary potentiometer used (a slider type could be used but requires a rectangular cutout in the case). It acts as a variable clamp following a.c. coupling of the video signal via C2/3. The burst signal is removed by feeding a broad line-frequency blanking pulse that coincides with the back porch period to the base of Tr4. This is done because the burst must remain of constant amplitude regardless of the position of the fader control. We therefore remove the burst and reinsert it after sync restoration

★ Components list

Resistors:

R1	100	R12	3k9	R23	1k
R2	10k	R13	1k5	R24	22k
R3	100	R14	47	R25	1M
R4	220	R15	2k7	R26	1k
R5	6k8	R16	390	R27	1k
R6	4k7	R17	100	R28	4k7
R7	10k	R18	100	R29	47k
R8	1k	R19	220	R30	1k
R9	10k	R20	1k	R31	33k
R10	10k	R21	33	R32	1k
R11	1k	R22	6k8	R33	18k
				R34	2k2

All 0·25W, 5% carbon film

VR1 4k7 rotary VR2 4k7 miniature horizontal preset

Semiconductor devices:

Tr1-8	BC184L	IC1	7400
Tr9	BF178	IC2-3	74121
Tr10	BC184L	IC4	7812
D1-6	1N4148	IC5	7805
D7	Red LED	BR1	BY179

Capacitors:

C1	100	16V radial electrolytic
C2	10	16V radial electrolytic
C3	10	16V radial electrolytic
C4	100	16V radial electrolytic
C5	150p	ceramic plate
C6	22p	ceramic plate
C7	470p	ceramic plate
C8	0·1	ceramic disc
C9	0·1	ceramic plate
C10	0·0022	ceramic plate
C11	0·047	ceramic plate
C12	0·1	ceramic plate
C13	0·1	ceramic plate
C14	1000	25V radial electrolytic
C15	0·1	ceramic disc
C16	10	16V radial electrolytic
C17	0·1	ceramic disc
C18	10	16V radial electrolytic
C19	0·1	ceramic disc

Miscellaneous

F1	1A anti-surge	Input/output sockets, PCB, heatsink for IC4
T1	240V primary, 15V 0·2A secondary	

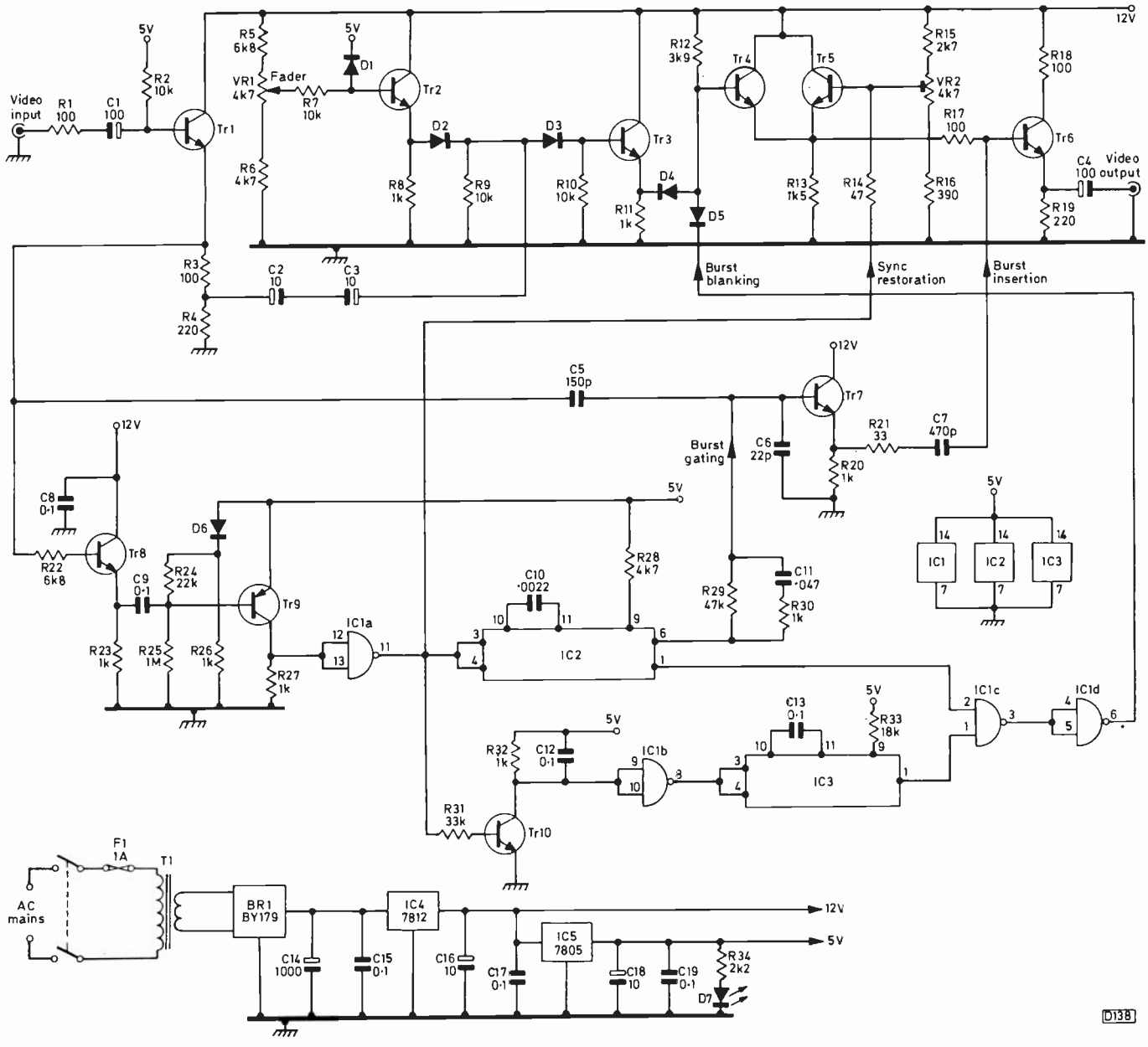


Fig. 1: Circuit diagram of the fader unit.

of the video signal.

Tr4/5 form a differential amplifier with the preset VR2 providing black level adjustment. When this control is set correctly excessive loss of the picture's darker tones is prevented. The output developed across R13 is applied to the base of the emitter-follower Tr6 which provides a nominal 75Ω output. The burst is simply coupled to the base of this transistor.

Tr9 acts as a sync separator whose output consists of inverted (i.e. positive-going) mixed line and field sync pulses which are sufficient to drive the NAND gate IC1a. At the minimum setting of the fader control there would be no sync pulses. So the inverted pulses from IC1a are fed to the base of Tr5 via R14. IC1a also drives the monostable multivibrator IC2 which provides the burst blanking pulse. It also provides a pulse, via the shaping network R29/R30/C11, to gate on Tr7. This transistor passes the colour burst present at the emitter of Tr1 to the base of Tr6 when it's gated on. Tr1's high-level output is used so that any slight loss compared with the video signal can be cancelled out.

If a line blanking signal only was used for burst blanking a slight imbalance would occur between the line and field sync pulses. Under certain conditions this could cause poor field sync. To combat this, a new field blanking pulse is produced by the monostable multivibrator IC3 which has a long time-constant and is triggered by field sync pulses derived from the integrator Tr10 and NAND gate IC1b. IC1c combines the outputs from IC2 and IC3, with IC1d providing inversion. A bonus of this arrangement is that any teletext or data signals present in the field blanking interval will be removed when the unit is used for editing off-air tapes.

The power supply required is obtained from a 200mA mains transformer which feeds a bridge rectifier. The latter is mounted on the board along with the two regulator i.c.s. The 12V regulator gets moderately hot and is best clamped to a small heatsink. The 5V regulator doesn't do a lot of work – a larger rather than a miniature one is used for reasons of cost and increased reliability. A LED fed via a series resistor is included in the 5V supply: this is purely for the convenience of having an indication that the unit is operational.

The unit can be fed with signals from almost any video

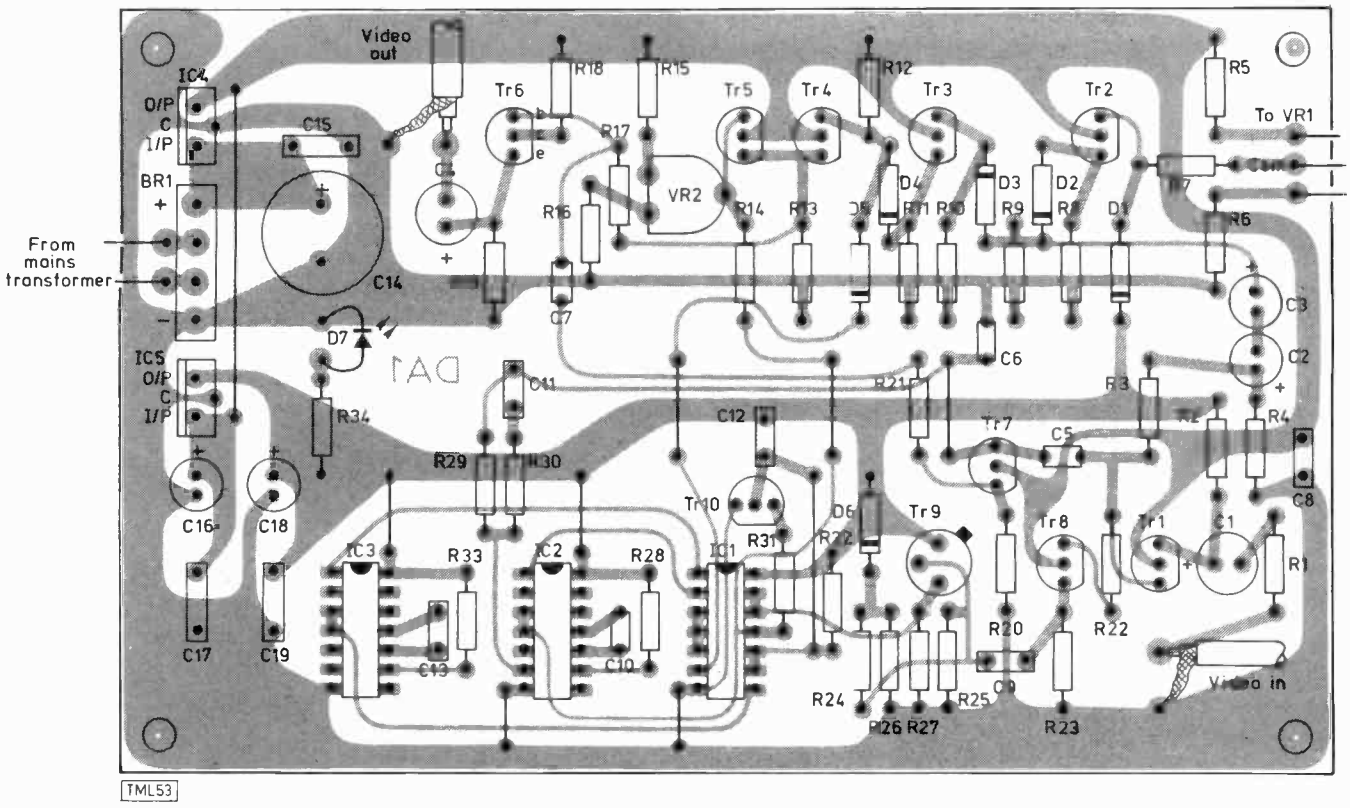


Fig. 2: Component layout on the PCB.

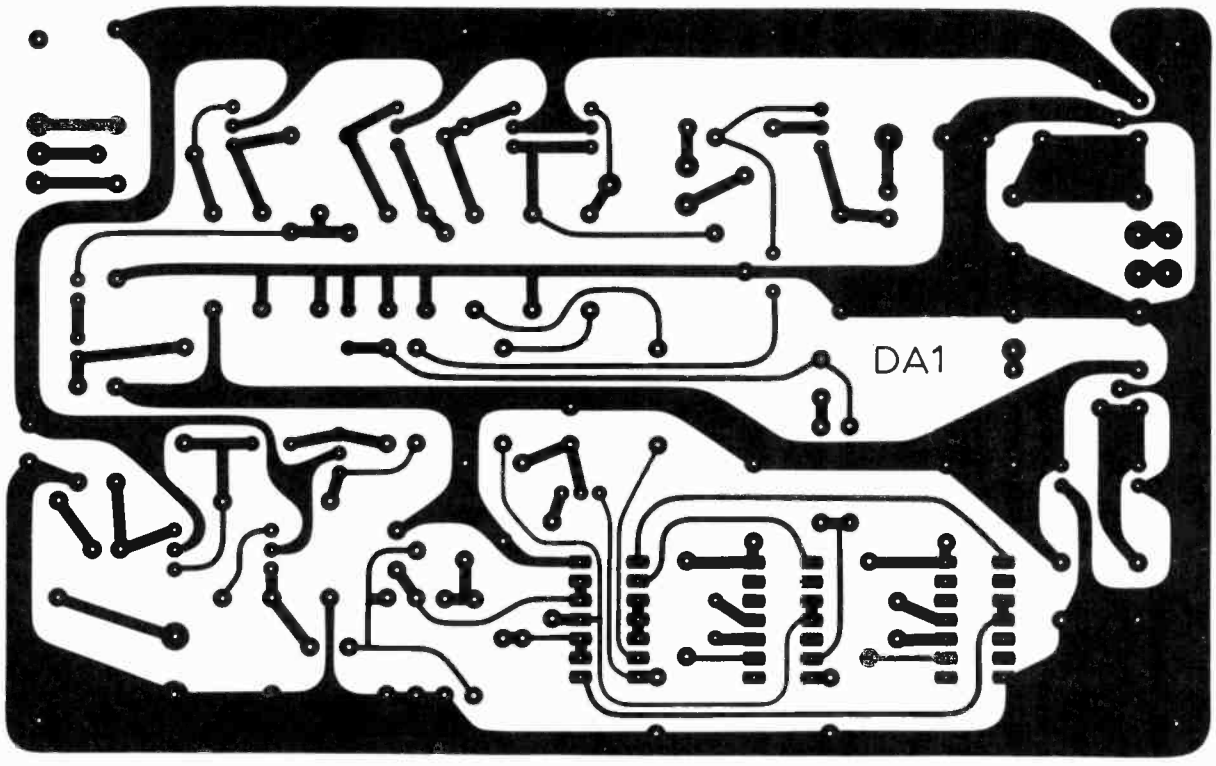


Fig. 3: PCB print pattern. Shown actual size.

source. Computer graphics could probably be fed in and fades added though this has not been tried. Provided a good quality, first generation tape is being copied there should be no problems. Some video should be present on the tape at all times so that the fader receives sync pulses: no input means no sync and thus no black-level signal. Pictures can be faded up and down at the required moment so that some form of editing is possible using even the most basic of VCRs. Use of the pause control should be done during black level when picture break-up will be minimised.

The use of poor quality or noisy tapes may result in black flashes across the picture or the accentuation of white tones used in sharp transitions such as lettering, even with the fader at minimum. The black flashes are caused by false triggering of the monostables. With a simple unit like this the aim should be to start off with the best possible picture quality.

Spectrum Test Pattern Program

John de Rivaz, B.Sc. (Eng.)

In the March issue letters page a reader requested a program for generating colour bars and a test pattern using the Sinclair Spectrum computer. A program for colour bars appears on page 109 of the Spectrum manual, in the chapter on colours. This article describes a test pattern based on the design shown on the front cover of the May 1984 issue of *Television*.

Features

The pattern has a coloured border with a similar order of colours. There are no arrows at the edges because the Spectrum doesn't display right up to the border of the screen – this is so that the computer will work with overscanned domestic TV sets. I've put the pattern inside a blue border, but altering BORDER 1 to BORDER 0 in line 100 will put the pattern in a black border if this is preferred.

The pattern itself is on a black background with a grid of white lines and has a centre circle. There are two columns of colours, approximately a quarter and three quarters of the way across. Within the circle there's a vertical white column, with the bottom half twice the brightness of the upper half, and to the right of this there's a column of frequency gratings. These gratings are somewhat larger than on conventional test patterns however due to the limitations of the Spectrum's 256 vertical line resolution. At the top centre there's a black bar on a white background while at the bottom there's a bright white rectangle with the word TELEVISION.

While the pattern is being displayed randomly composed music will play. If a sound-through-the-TV adaptor is fitted to the Spectrum the music will be reproduced by the set being tested. If you don't want the music, press any key other than ENTER on the computer and the music will cease. Press any key other than ENTER again and the music is resumed. Press ENTER to end the test pattern program.

Entering the Program

Putting the program in the computer should be straightforward. If you don't want to bother with the music, leave out lines 460 to 590 and insert PAUSE 0 as line 460. Then, pressing any key deletes the pattern and finishes the program. When you have completed the program, GOTO 9000 will save it three times on a cassette. Enter GOTO 9000 and start the tape before pressing ENTER. If any reader would like the program on a cassette, one can be provided for £2 post free by RTL, Westowan, Porthtowan, Truro TR4 8AX.

Program

```
100 LET nn=0: BORDER 1: PAPER 0: INK 7: CLS
110 REM Test card program
120 REM
130 REM by J. de Rivaz
140 REM array of colours
150 REM
160 DIM c(8): FOR n=1 to 8: READ c(n): NEXT n
170 DATA 0,2,4,6,1,3,5,7
180 REM Print borders
190 REM
200 FOR 1=1 to 2: FOR m=0 to 1: FOR n=8 to 1 STEP -1:
    PRINT#1; AT m, (8-n)*2; PAPER c(n); " ":
    PRINT#1;AT m,16+(n-1)*2; PAPER c(n); " ": NEXT
    n: NEXT m: NEXT 1
210 FOR m=0 TO 30 STEP 30: FOR n=2 TO 6 STEP 2:
    PRINT AT n*3/2-1,m; PAPER c(n); INK c(n+1); "  ";AT
    n*3/2,m;"▁▁";AT n*3/2+1,m;"■■": NEXT n: NEXT m
220 FOR m=0 TO 30 STEP 30: FOR n=2 TO 6 STEP 2:
    PRINT AT 23-(n*3/2-1),m; PAPER c(n); INK
    c(n+1);"  ";AT 23-n*3/2,m;"▔▔";AT 23-(n*3/2+1),m;
    "■■": NEXT n: NEXT m
230 REM Draw grid
240 REM
250 FOR n=16 to 144 STEP 16: PLOT 16,n: DRAW 223,0:
    NEXT n
260 FOR n=32 to 224 STEP 16: PLOT n,0: DRAW 0,160:
    NEXT n
270 PRINT PAPER 7; INK 0; BRIGHT 1;AT 20,11;"TELEVI-
    SION": CIRCLE 127, 80, 60
280 REM pulse bar
290 REM
300 FOR n=150 TO 154: PLOT 114,n: DRAW 10,0: PLOT
    126,n: DRAW 16,0: NEXT n
310 REM white block
320 REM
330 FOR n=6 TO 17: PRINT AT n,13; BRIGHT (n>11);"■■":
    NEXT n
340 REM gratings
350 REM
360 FOR n=USR "a" TO USR "1" STEP 8: READ n1: FOR
    m=0 TO 7: POKE n+m,n1: NEXT m: NEXT n
370 DATA 170,170,204,204,227,142,240,240,248,62,252,15
380 FOR n=6 TO 17 STEP 2: FOR m=0 TO 1: PRINT ;AT
    m+n,17;CHR$ (138+n); CHR$ (139+n): NEXT m:
    NEXT n
390 REM Restore centre line
400 REM
410 FOR m=104 TO 136 STEP 32: FOR n=79 TO 81 STEP 2:
    INVERSE 1: PLOT m,n: DRAW 15,0: INVERSE 0: NEXT
    n: NEXT m
420 PLOT 138,80: DRAW 16,0
430 REM colour columns at sides
440 REM
450 FOR m=5 TO 25 STEP 20: FOR n=4 TO 18 STEP 2:
    PRINT BRIGHT 1; INK c((n-4)/2+1);AT n,m;"■■";AT
    n+1,m; "■■": NEXT n: NEXT m
460 LET i$=INKEY$: IF i$="" AND nn>0 THEN GO TO 460
470 IF i$=CHR$ 13 THEN GO TO 600
480 REM MUSIC SECTION
490 REM
500 LET nn=3+INT (6*RND): DIM a(nn,2)
510 FOR n=1 TO nn: LET a(n,1)=(1+INT (RND*8))/32: LET
    a(n,2)=1+INT (12*RND)-4: NEXT n
520 FOR j=1 TO nn*(1+10*RND)
530 FOR n=1 to nn: BEEP a(n,1), a(n,2): IF INKEY$<>""
    THEN GO TO 570
540 NEXT n
550 LET n1=INT (1+nn*RND): LET a(n1,1)=(1+INT
    (RND*8))/32: LET a(n1,2)=1+INT (12*RND)-4: NEXT j
560 PAUSE 100: GO TO 500
570 LET i$=INKEY$: IF i$=CHR$ 13 THEN GO TO 600
580 IF i$<>"" THEN GO TO 570
590 GO TO 460
600 BORDER 7: PAPER 7: INK 0: CLS : STOP
9000 FOR f=1 TO 3: POKE 23736,181: SAVE "testcard":
     NEXT f
```

TV Fault Finding

Reports from Malcolm Burrell, Philip Blundell, Eng. Tech., and P. Walsh

ITT CS0614

A common fault with this set is no remote control operation. It's usually due to a faulty remote control transmitter or TEA1009 receiver i.c., but not always. In this case the data from the remote control receiver was correct but the SAA1251 decoder i.c. was taking no notice of it. Replacing the i.c. made no difference of course. The keyboard module can sometimes cause this fault if the decoder thinks a button is being pressed, but disconnecting the board didn't restore remote operation. Voltage checks were then made around the SAA1251 and pin 15 was found to be at a lower voltage than it should. Transistor T3a (BC237) was leaky. **P.B.**

Hitachi NP81CQ Chassis

Have you noticed that the stock faults dry up whenever you're busy? Take this example: the fault reported on the ticket was field collapse when cold. Normally you resolder the dry-joints on the field output thick-film module and the trouble's gone. Not this time. I was rewarded with a rolling picture that was very difficult to stop with the field hold control. So out with the scope and the manual. Things now became very puzzling: the waveforms at pins 6, 7 and 8 of the LA7801 sync/timebase generator i.c. had a negative-going hump that shouldn't have been there on them. The hump was even larger at the output from the field output module. Now the scan coupling capacitor C610 (220μF) is very close to the hot field output module heatsink, so it seemed a good idea to replace this. Bingo! **P.B.**

Decca 130 Chassis

The complaint with this stock set was "goes beserk". Sure enough when I switched it on it would go to standby, change channel etc. all by itself. The first step was to change transistor QR16 on the frequency synthesizer PCB as this has been responsible for some weird faults in the past. It wasn't guilty this time. The microcomputer i.c.'s clock signal was of the correct amplitude but its 5V supply was slightly low at 4·7V instead of 5V. A check at the 5V regulator's input revealed that this was also low at 6V: it came back to 8V when the board was flexed. We eventually found that one of the mains transformer pins was bent over and making only intermittent connection to the print. **P.B.**

GEC C2236

Excessive brightness was the complaint with this set. The RGB output stages are of the complementary-symmetry type and the voltages at the collectors of the lower, npn transistors were low. The bases of the upper, pnp transistors are biased by a network that includes R281 (82kΩ) which had gone open-circuit. **M.B.**

Rank T20 Chassis

We've had two of these sets in recently. The first had a fairly straightforward EW fault due to 4VT13 (BC148C) in the EW modulator control circuit being open-circuit. The trouble with the second set was a pulsating picture due to h.t. flutter. The cause was traced to 7C5 (47μF) in the chopper transistor's base circuit, though no fault could be found with this component. **M.B.**

Philips CTX-S Chassis

There was a raster and sound but no picture. A check on the voltages around the decoder chip produced a negative reading at pin 7 (contrast control). Simple I thought, something wrong in the contrast control network. The search took a bit longer than expected however. Beam limiting is also carried out at this pin and R3565 at the earthy end of the e.h.t. circuit was found to have increased in value from 36kΩ to 100kΩ. **M.B.**

GEC C1402H

A while back I reported a sound fault on one of these sets – no sound for the first two minutes then distorted sound. A couple more have since come in with much the same fault, except that the distorted sound was present from switch on. Again the trouble was due to C228 (100μF) in the audio feedback circuit. In both cases removing the capacitor revealed corrosion around one of the connecting leads. This looks like becoming a stock fault. **M.B.**

Sony KV2022UB

A picture usually appeared at switch on but eventually there'd be line break up and the power supply would shut down. A little probing around the line oscillator circuit suggested that the trouble was to do with the feedback capacitor C507 (0·033μF). It wasn't dry-jointed but was internally defective in some way – this was confirmed by refitting it as a check after clearing the fault with a replacement. **M.B.**

Thorn TX90 Chassis

This set had been struck by lightning. Replacing all the chips restored the picture but there was still no sound. Now if you have any ideas about fitting substitute audio output transistors I hope you have better luck than I had. I strongly advise that you save time and get the correct types from Thorn.

Low brightness was the fault on another of these sets. R231 (150kΩ) in the network that feeds the base of the beam limiter transistor had gone high in value. **M.B.**

Hitachi CNP190/CNP192

There was a tendency for the picture on one of these sets to pull on bright scenes: the picture was also slightly off centre. The trouble was traced to C711 (10μF) which smooths the supply to the line oscillator stage – it had gone low in value.

The trouble with another of these sets was that the colour faded to monochrome within an hour and a half. On soak this took about five hours, though applying a little heat to the decoder panel speeded things up. Applying freezer didn't have the opposite effect however! This was a tricky fault to trace. The cause was eventually found to be the first ident amplifier transistor TR26 (2SC458)

which was leaky though capable of operation (the output from the second ident amplifier stage was only slightly low). Fitting a BC237 in the TR26 position restored the gain and correct decoder operation. **M.B.**

Thorn 9800 Chassis

Whenever I come across one of these sets which is dead but ticking I start to have misgivings about the line output transformer. A new one had been fitted only a couple of months previously however. This time the trouble was traced to the 25V stabiliser circuit: since R708 (1·8kΩ) was open-circuit the series regulator transistor VT702 couldn't operate. **M.B.**

Hitachi NP82CQ Chassis

There was no output from the chopper circuit though h.t. was present at pin 1 of the STR454 chopper i.c. As a matter of course the transformer and print were examined but this failed to bring anything to light. The chopper feedback capacitor C907 (100μF, 16V) turned out to be open-circuit. **M.B.**

Thorn TX9 Chassis

We've had three faults in the chopper power supply (PC1044 main panel) recently. The trouble with the first set was no results with no voltage at the collector of the chopper transistor TR62: L105 which is in series with the transistor had a broken lead which we were able to repair. The second set was also dead but there was voltage at the collector of TR62. A check across the 115V h.t. line produced a short-circuit reading – the h.t. rectifier D71 had gone short-circuit. The fault on the third set was intermittent. At first glance it appeared to be a line output transformer fault: at high beam current the picture had ragged edges and there was a distant hissing noise, rather similar to the effect caused by a faulty tripler. Probing around the power supply seemed to cure the fault temporarily however. The cause was a dry-joint on C138 which is connected to pin 4 of the chopper control i.c.

The fault on another of these sets was excessive brightness at switch on. The voltages at the collectors of the RGB output transistors seemed about right and when the c.r.t.'s grid pin (pin 5) was touched the picture returned to normal. There was a dry-joint from the white lead to the series resistor R704. **M.B.**

Philips CTX-E Chassis

This set was only three months old, but what a lot had gone wrong! The report was dead set and I thought it would be a simple matter of replacing the 4·7Ω surge limiting resistor R3291. I had to replace this of course, also the mains fuse and the h.t. rectifier. The chopper transistor was next found to be short-circuit. It had taken with it the two 1·8Ω current sensing resistors and the two transistors in the trip circuit. Replacing these items restored the h.t. and the line output stage started up. Faults left were −1 on the channel display and no vision or sound.

A new VST panel cured the digital fault and on checking the 12b rail the 15Ω smoothing resistor was found to be open-circuit, though replacing this didn't cure the remaining faults. The voltages around the TDA2541

i.f. i.c. were next found to be incorrect. The 12V feed resistor R3153 had gone open-circuit and the a.g.c. output pin 4 was short-circuit to chassis. Replacing the i.c. left me with a snowy raster and a check on the tuner voltages revealed 12V at every pin including earth. A choke (L9157) in the earth line was open-circuit – it's not shown in the circuit diagram. When this was replaced we had sound and weak luminance: the video emitter-follower Tr7148 was the cause of the final fault.

Hopefully this was a one-off situation. I don't like to think what the cost would have been with the set out of guarantee. **P.W.**

Vintage TV: The Autumn of '55

Chas E. Miller

This autumn will see the thirtieth anniversary of the start of ITV in the UK, something that's now a subject fit for this vintage TV column.

After a period of honeymoon euphoria in the early fifties, viewers soon came to think that single network TV as then provided by the BBC left much to be desired. The level of discontent became so great that the government of the day was eventually moved to do something about it. Led by the then Mr. Winston Churchill, it produced in 1952 a White Paper (Cmd. 8550) which contained the words "(The government) has come to the conclusion that in the expanding field of Television provision should be made to permit some measure of competition". Consequently the BBC charter, which was then up for renewal, for the first time came to contain the description "non-exclusive". There was still a long way to go before viewers could hope to see alternative programmes however.

Although it was likely that any new service would be paid for by advertising, there was a great deal of opposition to the idea – especially to the US practice of sponsored programmes, in which advertisers can and do insert excessive commercial breaks. In addition to the legitimate objection to programme sponsoring there were those who felt that the prospect of advertising on TV would spell the end of civilisation as they knew it. Hordes of disgusted colonels and others from Cheam and elsewhere wrote to the top papers to protest, ignoring the facts that no one was going to twist their arms to make them watch the new service and that the newspapers to which they wrote were also strictly commercial enterprises that carried a far higher proportion of advertising to editorial matter than any TV station could ever hope to get away with! Then there was the celebrated politician who solemnly pronounced that a second network was unnecessary as no one could watch two programmes at once!

Getting the Service Going

The battle for commercial ("independent" as its supporters preferred to call it) TV was an intense one but in 1954 the Television Act was passed, setting up the Independent Television Authority. The ITA lost little time in planning a London service. Programmes were to be supplied by Associated-Rediffusion on weekdays and by ABC Television at the weekends. Then as now the news was provided by Independent Television News Ltd. A temporary transmitter was erected at Beulah Heights, South Norwood, prior to the building of the main Croydon station which would eventually have an e.r.p. of 350kW. With that side of the business settled it was over to the dealers, service engineers and aerial riggers to ensure that the public would be able to tune in on the opening night, which was planned for September 22nd, 1955.

Reception Problems

Generally speaking however many manufacturers were poised to make just the same sort of daft design mistakes that they had only a few short years earlier when they were feeling their way with Band I sets. It had for example taken perhaps five years for most firms to come to the conclusion that the normal coaxial plug/socket was best for aerial connection, after experimenting with all sorts of odd types. As soon as Band III came about back they went to the latter for another few years – as always, the poor old service engineer was on the losing end! We took this in our stride at the time because we were happy with the vast amount of extra business that ITV created. But we were having to learn about the vagaries of upper v.h.f. band reception as we went along, discovering that the new, tiny by comparison aerials could give a brilliant picture in one location but only a horrible graininess a few yards away. Reflections too seemed to be much more of a problem than in Band I. Nevertheless no engineer of that period will ever forget the sheer thrill of seeing for the first time a test card that wasn't being transmitted by the BBC!

It's impossible for anyone who didn't live through the period to appreciate the tremendous anticipation with which that date was awaited. The only more recent event in any way comparable, and even so to a much lesser extent, was the advent of ITV colour in November 1969. Long before the actual setting up of the ITA it had been known that Band III would be used for the new service, and setmakers had for some time been incorporating some form of conversion facility in their receivers in the knowledge that they would otherwise soon become unsaleable. Sometimes however the "convertible" label on a set meant no more than that a mains-power socket had been fitted for plugging in a converter! Pye fitted genuine 13-channel tuners in their new models – they used the incremental-inductance principle – and the firm's contemporary advertisements suggested that in due course a selection of stations on various v.h.f. channels might become available to viewers. Oh well, it was a nice thought.

Effects on the BBC

At last the great day dawned, but even then the effect of the new programmes was being felt by the BBC's viewers in a most unwelcome way. Until the imminence of competition, BBC TV enjoyed great flexibility in respect of programme timing. Most items were live, and if one should happen to overrun for a few minutes there was seldom any need to worry since the rest of the rather

meagre schedule could also be delayed. Then some bright person at the Beeb came up with the notion that ITV would have to be much more precise about their timing if the advertisements were to be shown at the times booked and that the BBC should follow suit. No one seemed to grasp the idea that the BBC might perhaps retain more viewers by remaining different. This was not to be the only occasion when that organisation was to display a regrettable tendency to imitate the competition. Shortly after the new policy was announced, an exciting boxing match was cut off only seconds before the final verdict merely to permit the commencement of a studio commedy show on time. This caused an awful lot of unnecessary bad feeling that lasted for a long time.

Official Opening

ITV's official opening was marred by two events. One was completely accidental – an electricity failure in London. The other one is open to speculation. The horrifying death of one of the fictional characters in the BBC's veteran "Archers" serial was timed to be broadcast just before the ITV's opening ceremony. It says much for the pulling power of radio at the time that such a ploy could have been considered as suitable for distracting viewers from the new service! That it was a forlorn gesture was soon to be demonstrated, for ITV took off in no uncertain manner.

The Conversion Business

About five million sets were in use during 1955-56, the vast majority of which were ripe for conversion to Band III. The orders poured in. All manner of "universal" converters appeared on the market, as well as the setmakers' own special jobs for specific models. Many of the universal converters used two humble EF80 r.f. pentode valves, demonstrating that they would work successfully at frequencies far higher than those envisaged by their designers! Of all the universal converters however the one that this writer will always recall was the "Stirling", an extraordinarily compact unit that employed just one valve, the ECC85 double triode which was primarily intended for use in v.h.f./f.m. tuners. It had a built in power supply with a small mains transformer and a contact-cooled rectifier, making it self-contained. Thus only one connection, a coaxial lead to the aerial socket, was required to the associated TV set. In practice however we used to favour soldering the converter's mains lead to the receiver's on/off switch so that there was no danger of the converter being left on accidentally. It's no exaggeration to say that we bought several dozens of these converters at the time. We sold them very rapidly at ten guineas complete with a three-element aerial, fully fitted, or at eleven guineas with a five-element aerial.

It seems incredible now. The demand was so great that we had to work until at least ten o'clock at night to satisfy it – using a spotlamp fitted on the van to illuminate the chimneys after dark! Inevitably there were a few odd places in our town where it was impossible to obtain a satisfactory off-air picture. In these cases we were able to offer a special converter which permitted an ordinary TV set to obtain signals from the local Rediffusion cable network. This cost six guineas, plus 3/9d per week to Rediffusion for the BBC and ITV programmes and four or five sound channels. But wait a minute: cable television? Isn't that supposed to be something frightfully new and revolutionary?!

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

16029	1.58	2SC1061	0.54	2SD898B	2.67	AN320	4.97	BC171	0.10	BD166	0.38	BF137	0.11	BLY49	2.00	BY203/20	0.18
16181	1.13	2SC1096	1.05	40408	0.45	AN322	4.38	BC172	0.09	BD168	0.66	BF152	0.28	BR100	0.20	BY206	0.17
16182	1.13	2SC1104	2.60	40594	1.39	AN331	2.99	BC172B	0.24	BD175	0.39	BF153	0.52	BR101	0.37	BY207	0.22
16334	0.88	2SC1106	4.12	40595	1.39	AN337	3.99	BC173	0.15	BD177	0.39	BF154	0.23	BR103	0.45	BY210-400	0.24
16335	0.72	2SC1114	5.61	40636	0.86	AN340P	1.06	BC174B	0.24	BD179	0.44	BF157	0.23	BR88B	0.58	BY210-600	0.27
16446	0.89	2SC1124	1.10	40871	1.39	AN355	3.36	BC177	0.18	BD181	0.90	BF158	0.16	BRC-M-300	1.58	BY210-800	0.30
16600	1.25	2SC1151A	4.29	40872	1.39	AN362	1.47	BC178	0.23	BD182	0.90	BF159	0.16	BRC116	0.60	BY223	0.85
16799	2.16	2SC1152	4.25	60857	1.10	AN5111	2.34	BC179	0.23	BD183	0.90	BF160	0.28	BRC1330	1.60	BY224-400	0.90
16801	0.86	2SC1157	4.12	74LS132	0.72	AN5132	3.99	BC182	0.08	BD184	1.10	BF167	0.34	BRC300	1.82	BY225-100	0.79
16802	1.03	2SC1162	0.95	74LS138	0.85	AN5250	3.33	BC182B	0.23	BD187	0.48	BF173	0.30	BRC4443	1.12	BY226	0.28
16803	4.81	2SC1172	1.92	74LS157	0.79	AN5435	2.80	BC182L	0.09	BD189	0.35	BF177	0.50	BRC4444	1.12	BY227	0.44
16905	1.35	2SC1195	2.83	74LS161AN	1.18	AN5610	6.75	BC182LB	0.12	BD190	0.59	BF178	0.36	BRC5296	0.70	BY228	0.54
17074	6.00	2SC1213	0.75	74LS196	1.25	AN5613	3.72	BC183	0.09	BD201	0.54	BF179	0.32	BRC6109	0.75	BY255	0.97
17127	3.91	2SC1226	1.32	74LS20	0.25	AN5620X	4.63	BC183L	0.09	BD202	0.54	BF180	0.32	BRC82	0.98	BY298	0.25
17376	1.43	2SC1306	0.85	74LS244	1.65	AN6320N	3.89	BC183LB	0.23	BD203	0.54	BF181	0.29	BRC83	0.98	BY299	0.25
1N4001	0.05	2SC1307	1.35	74LS30	0.29	AN6342	1.36	BC184	0.09	BD204	0.54	BF182	0.30	BRC84	0.98	BY476A	0.76
1N4002	0.05	2SC1316	3.40	74LS367	1.05	AN6344	4.68	BC184L	0.09	BD207	1.00	BF183	0.35	BRX44	0.54	BYW56	0.30
1N4003	0.05	2SC1364	0.49	74LS373	1.55	AN6363	10.20	BC184LB	0.23	BD208	1.00	BF184	0.39	BRX49	0.45	BYX10	0.26
1N4004	0.06	2SC1383	1.39	74LS47	1.05	AN6551	0.56	BC186	0.24	BD222	0.44	BF185	0.35	BRY39	0.50	BYX55-350	0.48
1N4005	0.07	2SC1398	0.51	74LS73	0.39	AN6552	0.52	BC187	0.18	BD225	0.44	BF194	0.15	BRY55	0.60	BYX55-600	0.25
1N4006	0.07	2SC1410	2.17	74LS74	0.39	AN7145	2.04	BC204	0.14	BD228	0.57	BF195	0.12	BRY56	0.38	BYX71-350	0.67
1N4007	0.07	2SC1413	3.68	74LS75	0.52	AN7150	2.22	BC207	0.12	BD229	0.63	BF196	0.15	BSR59	1.17	BYX71-600	0.85
1N4148	0.03	2SC1505	0.56	74LS86	0.49	AN7151	2.05	BC212	0.10	BD231	0.45	BF197	0.14	BSS38	0.30	BYX94	0.18
1N4448	0.12	2SC1578	6.57	74LS90	0.75	AN7156	2.05	BC212B	0.23	BD232	0.44	BF198	0.15	BSTBD1409	2.48	BYY56	1.09
1N5401	0.12	2SC1617	3.35	74LS92	0.75	AN7158	2.34	BC212L	0.09	BD234	0.38	BF199	0.15	BSTBD1405	4.37	BZV15-C12	0.72
1N5402	0.13	2SC1670	2.84	74LS93	0.75	AN7218	1.49	BC212LB	0.23	BD235	0.43	BF200	0.33	BSTCD146	2.25	BZV15-C12R	0.72
1N5403	0.14	2SC1678	1.25	74LS95B	0.85	AP58076	4.25	BC213	0.09	BD236	0.45	BF216	0.32	BSTC0233	2.25	BZV15-C24	0.72
1N5404	0.15	2SC1810	1.40	7805 TD-220	0.63	AS560S	1.43	BC213L	0.09	BD237	0.38	BF218	0.32	BSTC0246	4.51	BZV15-C24R	0.72
1N5408	0.18	2SC1815	0.41	7805 TD-3	1.05	AU106	1.96	BC213LB	0.23	BD238	0.29	BF222	0.50	BSTC1233	3.91	BZV15-C30R	0.72
1N914	0.05	2SC1829	2.01	7806	0.66	AU110	1.96	BC214	0.09	BD239	0.44	BF224	0.15	BSTC3146	0.71	BZX61 Range	0.16
1S44	0.06	2SC1875	4.77	7808	0.54	AU113	2.15	BC214L	0.12	BD240	0.36	BF237	0.59	BSTCC0143	2.79	BZX70-C11	0.54
1S5012A	0.73	2SC1891	3.35	7812 TD-3	0.54	AY102	2.62	BC214LB	0.23	BD240D	0.47	BF240	0.15	BSTC0643	3.06	BZX70-C12	0.54
1S921	0.09	2SC1929	2.25	7812 TD-220	1.05	AY105K	1.89	BC225	0.24	BD241	0.45	BF241	0.15	BSV57B	2.66	BZX70-C15	0.54
2S82	1.94	2SC1942	5.70	7815	0.55	AY106	1.98	BC237	0.09	BD242	0.45	BF244	0.23	BSW68	0.38	BZX70-C30	0.54
2N1302	0.24	2SC1945	4.11	7818	0.55	BA102	0.30	BC238	0.09	BD243	0.44	BF245A	0.33	BSX19	0.30	BZX70-C47	0.54
2N1303	0.34	2SC1953	1.75	7824	0.55	BA1310 (IC)	1.72	BC238A	0.11	BD243A	0.50	BF255	0.18	BSX20	0.30	BZX79 Range	0.09
2N2218	0.38	2SC1957	0.86	AC107	0.66	BA1320 (IC)	1.22	BC239B	0.08	BD244	0.44	BF256	0.25	BSX21	0.45	BZY88 Range	0.09
2N2219A	0.29	2SC1959	0.36	AC117	0.39	BA1330 (IC)	1.82	BC251A	0.15	BD244A	0.77	BF256LC	0.38	BSY52	0.45	BZY93-C12	0.99
2N2222	0.34	2SC1962	1.75	AC123K	0.39	BA145	0.17	BC252	0.12	BD245C	0.68	BF257	0.30	BSY79	0.46	BZY93-C18	0.99
2N2646	0.75	2SC1969	2.92	AC128	0.28	BA154	0.08	BC258	0.22	BD246C	0.74	BF258	0.29	BT100A	1.46	BZY93-C24	0.99
2N2904	0.32	2SC2027	2.67	AC138	0.08	BA155-01	0.12	BC261A	0.20	BD253	0.95	BF259	0.30	BT106	1.20	BZY93-C24R	0.99
2N2905	0.39	2SC2028	1.91	AC141	0.26	BA156	0.12	BC262	0.20	BD278A	0.60	BF262	0.51	BT108	1.31	BZY93-C30	0.99
2N2906	0.34	2SC2029	1.49	AC142K	0.39	BA157	0.17	BC287	0.45	BD317	1.96	BF263	0.51	BT109	1.31	BZY93-C47	0.99
2N3053	0.24	2SC2057	1.07	AC151	0.25	BA159	0.12	BC294	0.45	BD318	2.08	BF264	0.33	BT112	2.25	BZY93-C68	0.99
2N3054	0.90	2SC2073	1.40	AC153	0.30	BA182	0.17	BC301	0.36	BD375	0.38	BF271	0.30	BT113	2.25	BZY93-C7V5	0.99
2N3055	0.55	2SC2078	1.25	AC153K	0.36	BA222 (IC)	1.26	BC302	0.30	BD377	0.23	BF273	0.18	BT116	1.52	ZTK33	0.39
2N3055H	0.77	2SC2091	0.59	AC176	0.17	BA284/2	0.15	BC303	0.34	BD379	0.69	BF274	0.18	BT119	1.60	ZX18	2.47
2N3442	1.05	2SC2122A	4.65	AC176K	0.40	BA301 (IC)	0.92	BC307	0.09	BD380	0.69	BF324	0.16	BT120	1.60	C106D	0.46
2N3702	0.12	2SC2141	1.69	AC179	0.25	BA302	0.90	BC307A	0.14	BD410	0.44	BF336	0.27	BT121	2.25	C1129	0.52
2N3703	0.12	2SC2166	1.35	AC183	0.65	BA311 (IC)	1.06	BC308	0.12	BD412	5.70	BF337	0.36	BT122	2.25	CA1310E	2.45
2N3704	0.12	2SC2216	0.62	AC186	0.30	BA312 (IC)	0.98	BC308A	0.09	BD418	0.76	BF338	0.36	BT123	1.80	CA3044	3.18
2N3705	0.12	2SC2233	2.20	AC186K	0.50	BA313 (IC)	1.28	BC309	0.15	BD433	0.33	BF355	0.36	BT125	2.25	CA3046	2.23
2N3706	0.12	2SC2271	3.64	AC187	0.35	BA316	0.07	BC317A	0.11	BD434	0.39	BF362	0.54	BT126	2.25	CA3060	1.50
2N3707	0.14	2SC2278	1.03	AC187-01	0.40	BA317	0.07	BC323	0.92	BD435	0.42	BF363	0.54	BT128	2.25	CA3065	1.17
2N3711	0.14	2SC2335-KIT	7.61	AC187K	0.39	BA318	0.08	BC327	0.15	BD436	0.42	BF371	0.45	BT128P	2.79	CA3089	3.35
2N3771	1.85	2SC2526	1.70	AC188	0.33	BA328 (IC)	0.80	BC328	0.10	BD437	0.41	BF391	0.36	BT129	2.25	CA3089E	1.30
2N3772	1.55	2SC2551	0.95	AC188-01	0.40	BA333 (IC)	1.24	BC337	0.08	BD438	0.44	BF393	0.90	BT151-800R	1.47	CA3090	1.25
2N3773	1.65	2SC2570	1.80	AC188K	0.39	BA401 (IC)	0.58	BC338	0.10	BD441	1.29	BF417	1.20	BT151 500R	1.25	CA3094	2.00
2N3819	0.28	2SC2570A	0.95	AC193K	0.59	BA511 (IC)	1.98	BC360	0.30	BD442	0.56	BF418	1.70	BTT6018	2.20	CA3131EN	2.83
2N3823	1.06	2SC264A	4.38	AC194K	0.59	BA521 (IC)	1.81	BC368	0.23	BD507	0.54	BF422	0.26	BTT6218	2.20	CA3132EN	2.83
2N3904	0.56	2SC2671	1.99	AD140	0.96	BA532 (IC)	1.88	BC440	0.99	BD508	0.54	BF423	0.26	BTT8024	4.02	CAH76023N	6.00
2N3908	0.56	2SC2728	0.95	AD142	0.96	BA536 (IC)	2.72	BC441	0.40	BD509	1.29	BF435	0.49	BTT8124	4.44	CBF16848N-07	1.41
2N4101	1.10	2SC372	1.27	AD143	0.96	BA6304A (IC)	2.65	BC454	0.32	BD510	0.45	BF450	0.30	BTT8214	5.44	CD4001	0.24
2N4240	3.00	2SC373	1.05	AD145	1.45	BA843 (IC)	3.60	BC455	0.32	BD518	1.36	BF451	0.26	BTT8224	2.70	CD4002	0.24
2N4443	1.35	2SC383	1.20	AD149	0.81	BAV10	0.10	BC460	0.38	BD519	1.36	BF457	0.37	BU105	1.66	CD4008	0.96
2N4444	1.12	2SC388	0.45	AD161	0.30	BAV18	0.10	BC461	0.42	BD529	0.38	BF458	0.35	BU106	2.25	CD4011	0.23
2N4914	0.65	2SC41	1.99	AD162	0.30	BAV19	0.10	BC462	0.27	BD530	0.60	BF459	0.35	BU108	1.90	CD4012	0.24
2N5064	0.64	2SC458	0.55	AD262	0.95	BAV20	0.10	BC463	0.58	BD533	0.60	BF460	0.54	BU109S	1.90	CD4013	0.37
2N5293	0.45	2SC495	0.83	AF114	2.24	BAV21	0.17	BC464	0.58	BD534	0.36	BF469	0.27	BU110	2.52	CD4016	0.37
2N5294	0.45	2SC508	3.36	AF115	0.79	BAX12	0.10	BC465	0.58	BD535	0.44	BF470	0.28	BU111Y	3.78	CD4017	0.74
2N5296	0.40	2SC515A	1.28	AF116	0.79	BAX13	0.10	BC477	0.25	BD536	0.55	BF471	0.28	BU124	1.25	CD4020	0.92
2N5297	0.45	2SC537	0.49	AF117	0.75	BAX16	0.10	BC478	0.29	BD537	0.60	BF472	0.28	BU126	1.11	CD4021	0.24
2N5298	0.55	2SC558	3.35	AF118	0.75	BB105B	0.22	BC479	0.29	BD538	0.60	BF479	0.55	BU134S	4.15	CD4023	0.25
2N5490	1.35	2SC605L	1.05	AF121	0.50	BB119	0.15	BC532	0.25	BD544B	0.75	BF480	0.54	BU204	1.29	CD4025	0.54
2N5496	0.45	2SC620	1.32	AF124	0.36	BC107	0.13	BC546	0.15	BD580	1.06	BF495	0.58	BU205	0.98	CD4028	0.76
2N6107	0.53	2SC643A	1.40	AF125	0.36	BC107B	0.14	BC547	0.09	BD590	1.06	BF506	0.39	BU206	1.20	CD4047	0.96
2N6109	1.43	2SC673	1.11	AF126	0.36	BC108	0.12	BC548	0.09	BD598	1.13	BF509	0.37	BU207	1.50	CD4049	0.52
2N6122	1.60	2SC681	4.00	AF127	0.36	BC108A	0.12	BC549	0.09	BD645	3.62	BF523	0.18	BU208	0.98	CD4050	0.50
2N6130	0.65	2SC684	1.50	AF139	0.48	BC108B	0.15	BC550	0.36	BD677	0.55	BF594	0.24	BU208/02	0.98	CD4052	0.68
2N6133	0.57	2SC685A	2.62	AF178	0.75	BC109	0.11	BC556	0.12	BD680	0.69	BF595	0.24	BU208A	0.98	CD4053	0.72
2N6178	0.66	2SC693	0.69	AF179	0.50	BC109B	0.13	BC557	0.09	BD681	1.34	BF596	0.16	BU208D	1.43	CD4069	0.23
2N6180	0.66	2SC710	0.62	AF180	0.50	BC113	0.12	BC558	0.09	BD695	2.09	BF597	0.24	BU209	1.60	CD4081	0.26
2N696	0.39	2SC717	1.92	AF181	0.48	BC114	0.17	BC559	0.09	BD696	2.24	BF617	0.95	BU226	2.08	CD4093	0.72
2N698	0.39	2SC734	1.30	AF182	0.50	BC115	0.14	BC560C	0.10	BD697	3.27	BF618	0.95	BU312	2.16	CD4511	1.00
2N707	0.39	2SC735	1.05	AF186	0.48	BC116	0.20	BC635	0.18	BD698	1.68	BF694	0.20	BU326	0.75	CD4517	1.06
2SA1027	1.15	2SC782	2.24	AF239	0.48	BC116A	0.53	BC636	0.18	BD699	3.17	BF757	0.59	BU326A	1.40	CP5521	16.20
2SA1076	1.78	2SC790	1.15	AF279	0.80	BC117	0.18	BC637	0.18	BD700	3.36	BF758	0.59	BU326S	2.25	CV-12E	2.49
2SA329	0.36	2SC806	10.26	AL100	3.66	BC118	0.18	BC638	0.18	BD702	2.94	BF759	0.30	BU406	1.35	CX034	10.75
2SA351	1.06	2SC814	1.26	AL102	1.75	BC119	0.30	BC639	0.18	BD707	0.55	BF760	0.59	BU407	0.74	CX095D	2.85
2SA489	1.06	2SC828	0.25	AL103	2.43	BC125	0.18	BC640	0.18	BD709	0.72	BF762	0.30	BU407D	1.29	CX104	8.49
2SA490	1.51	2SC867A	2.49	AL113	1.80	BC126	0.18	BC879	0.28	BD710	0.72	BF870	0.27	BU412	4.80	CX108	6.92
2SA493	0.95	2SC926A	1.29	AN208	3.22	BC132	0.12	BC880	0.28	BD807	0.60	BF871	0.84	BU426	1.95	CX109	6.92
2SA628	1.03	2SC930	0.49	AN210	2.07	BC135	0.12	BCX32	0.33	BD809	0.60	BF900	0.68	BU426A	1.67	CX121	10.75
2SA637	1.32	2SC935	3.75	AN214	2.05	BC136	0.15	BCX33	0.24	BD810	0.60	BF907	1.62	BU427	2.67	CX130	4.90
2SA673	1.11	2SC936	1.58	AN214Q	2.05	BC137	0.16	BCX34	0.36	BD879	0.64	BF959	0.38	BU500	1.61	CX131	10.75
2SA683	1.46	2SC937	3.25	AN231	5.56	BC138	0.30	BCX37	0.60	BD880	0.65	BF970	0.55	BU508A	1.33	CX134	10.75
2SA684	1.33	2SC940	4.25	AN234	5.02	BC139	0.32	BCY70	0.27	BD895	1.98	BFR39	0.36	BU526	1.65	CX136	10.75
2SA748	0.68	2SD1138	0.78	AN235	4.84	BC140	0.33	BCY71	0.19	BD899	2.25	BFR52	0.45	BU608D	1.42	CX137	10.75
2SA818	1.65	2SD198	3.51	AN236	3.02	BC141	0.28	BCY72	0.18	BD901	0.55	BFR62	0.36	BU806	1.29	CX139	10.75
2SA835	2.27	2SD234	0.42	AN238	4.98	BC142	0.30	BD115	0.29	BDV64B	1.14	BFR79	0.29	BU806D	1.35	CX157	4.90
2SA940	1.64	2SD235	0.54	AN239	3.95	BC143	0.28	BD116	0.63	BDV65B	1.14	BFR81	0.45	BU807	1.40	CX158	3.44
2SA951	1.23	2SD257	2.67	AN240P	1.88	BC147	0.10	BD124	1.19	BDX32	1.50	BFR86	0.98	BU826A	2.79	CX170	6.92
2SA966-Y	0.54	2SD291	2.67	AN241	1.55	BC147A	0.42	BD124P+KIT	0.62	BDX53	0.80	BFR89	0.39	BUV46	1.13	CX177	5.99
2SB325	3.51	2SD292	2.35	AN245	2.54	BC148	0.11	BD131	0.38	BDX53A	3.58	BFT41	0.27	BUV84	1.12	CX506	8.48
2SB337	1.65	2SD313	2.59	AN247P	2.62	BC148B	0.11	BD132	0.38	BDX54B	2.37	BFT42	0.39	BUN81A	3.15	CX507	6.92
2SB375	3.51	2SD315	2.67	AN252	2.33	BC148C	0.11	BD133	0.48	BDX62A	1.32	BFT43	0.39	BUN84	1.56	CX758	6.92
2SB400	0.36	2SD325D	1.36	AN253	2.70	BC149	0.10	BD135	0.32	BDX63A	1.95	BFT84	0.36	BUX84	1.47	D1693	2.35
2SB407	2.94	2SD350	7.03	AN262	1.58	BC149B	0.11	BD136	0.32	BDX64A	2.37	BFW10	0.79	BY126	0.11	DEC1	1.52
2SB411	3.00	2SD350A	2.08	AN272	5.36	BC153	0.12	BD137	0.32	BDX65A	2.37	BFX29	0.30	BY127	0.11	DEC2	1.52
2SB511	1.48	2SD353	3.25	AN281	5.52	BC154	0.12	BD138	0.41	BDX76	0.53	BFX30	0.59	BY133	0.11	E1222	0.36
2SB54	1.26	2SD389	2.19	AN295	5.01	BC157	0.14	BD139	0.27	BDY20	1.10	BFX84	0.33	BY164	0.50	E5024	0.25
2SB56	1.26	2SD401	1.57	AN301	3.30	BC158	0.09	BD140	0.33	BDY62/01	4.20	BFX85	0.25	BY176	1.38	E5386	0.22
2SB618A	1.40	2SD551	2.20	AN302	3.62	BC159	0.14	BD144	1.30	BDY81	1.87	BFX87	0.50	BY179	1.42	E5529	0.22
2SB681	2.44	2SD588A	1.25	AN303	3.25	BC160	0.36	BD150	1.08	BF115	0.36	BFX88	0.30	BY182	0.95	E8021	1.17
2SB695	1.70	2SD621	8.88	AN305	8.07	BC161	0.36	BD157	0.60	BF117	0.36	BFX89	0.36	BY184	0.42	E9003	0.41
2SB75	0.94	2SD657	2.54	AN313	3.10	BC167	0.32	BD159	0.48	BF118	0.60	BFY50	0.24	BY187	0.70	E9005	0.45
2SB861	0.68	2SD731	1.72	AN315	2.12	BC168	0.32	BD160	1.45	BF121	0.22	BFY51	0.24	BY189	1.20	ER1400	10.12
2SC1034	5.61	2SD811	3.86	AN316	5.58	BC169C	0.14	BD163	0.64	BF123	0.11	BFY52	0.24	BY198	2.38	ESN310BP	3.86
2SC1050	3.66	2SD869	2.40	AN318	4.75	BC170	0.14	BD165	0.56	BF127	0.11	BFY90	0.96	BY201/2	1.36	ESM432C	4.18

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

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

ESM532C	4.18	LM1303P/N	1.50	MPSU05	0.78	SAA5010	4.90	SN74190	1.81	T6029V	4.41	TBA395	1.35	TDA1230	2.93	TDA9503	2.60
ESM632C	4.18	LM1310P/N	1.25	MPSU10	0.78	SAA5012	6.50	SN7420N	0.30	T6032V	0.89	TBA395Q	1.80	TDA1235	3.52	TDA9513	2.40
ESM732C	4.18	LM3065N	0.77	MPSU55	0.90	SAA5020	5.25	SN7430	0.28	T6033V	0.73	TBA396	1.80	TDA1270	2.64	TE527	1.25
ETT6016	2.65	LM317CKC	1.30	MPSU56	0.30	SAA5030	7.50	SN7440N	0.24	T6035V	0.66	TBA400	2.17	TDA1327A	1.65	TE538	0.36
ETTR6016	2.16	LM339N	0.68	MPSU60	1.20	SAA5040A	14.75	SN7473	0.56	T6036	0.44	TBA440P	1.55	TDA1327B	1.65	TE626	1.35
FND500	5.25	LM3407	1.29	MR510	0.30	SAA5050	8.50	SN7474N	0.72	T6037	1.91	TBA480	1.42	TDA1330	1.60	TEA1002	3.15
FT3055	1.05	LM340T5	0.75	MR812	0.60	SAA661B	1.80	SN7490AN	0.93	T6041V	0.66	TBA480Q	1.67	TDA1365	6.35	TDA1009	0.96
GF758	0.82	LM340T12	0.75	MR914	0.46	SAA700	3.00	SN75110N	0.75	T6044V	0.86	TBA500PQ	4.95	TDA1412	0.95	TEA1020SP	5.34
GF759	1.02	LM340T5	0.75	MSSD7002	0.65	SAB1009B	4.53	SN76001ANQ	2.25	T6045	1.09	TBA510	1.55	TDA1420	1.48	TEA1087	0.46
GF761	0.78	LM342N	0.56	MVS240	0.52	SAB1046P	3.66	SN76003N	2.81	T6049	1.10	TBA510S	6.39	TDA1470	2.63	TIC106C	0.55
GH3F	1.65	LM384N01	1.84	MVS460	0.30	SAB3011	7.34	SN76013N	3.63	T6052V	0.76	TBA520	1.67	TDA1512	2.20	TIC106M	0.55
HA11211	2.30	LM567CN	1.30	MVS460-02	0.55	SAB3012	5.34	SN76013ND	2.25	T6058	0.46	TBA520Q	1.35	TDA1670	3.65	TIC116D	0.80
HA11215	4.60	LM748	1.65	ME545B	2.95	SAB3013	3.28	SN76013NDG	8.07	T6059	1.05	TBA530	0.86	TDA1770	5.56	TIC44	0.65
HA11225	3.90	LM8360	2.78	ME545B	3.80	SAB3021	7.18	SN76023N	2.35	T8001V	1.09	TBA530Q	0.85	TDA1905	1.25	TIC45	0.70
HA11226	7.56	LM8361	2.78	ME5534N	1.48	SAB3022B	12.34	SN76023ND	1.04	T9003V	0.86	TBA540	0.98	TDA1908	2.95	TIC47	0.70
HA11229	2.51	M1024	2.55	ME555	0.34	SAB3023B	11.18	SN76033N	2.33	T9005V	2.16	TBA540Q	1.15	TDA1910	2.38	TIP120	0.96
HA11235	3.60	M1025	4.70	ME556	0.75	SAB3024	4.77	SN76105N	2.36	T9010V	0.87	TBA550	1.95	TDA1940	2.54	TIP110	0.48
HA1124	4.70	M1124	2.54	ME5560N	3.16	SAB3209	4.75	SN76110N	1.13	T9011V	1.27	TBA550Q	2.25	TDA1950	2.54	TIP112	0.80
HA11244	4.32	M1130	4.86	ME565N	1.20	SAB3210	2.93	SN76115AN	1.46	T9013V	5.81	TBA560C	0.86	TDA2002	1.20	TIP117	0.86
HA1125	3.90	M191	5.74	ME645BN	3.80	SAB4209	12.75	SN76131	1.74	T9014V	1.52	TBA560CQ	1.15	TDA2003	1.05	TIP120	0.73
HA11251	3.38	M193	18.55	ME646N	3.80	SAF1031	2.30	SN76226DN	1.20	T9016	0.92	TBA570	1.55	TDA2004	2.52	TIP121	1.08
HA1137W	2.57	M51102L	4.02	ME650N	3.94	SAF1032	5.60	SN76227N	0.68	T9022N	0.39	TBA570A	1.55	TDA2006	1.25	TIP126	0.96
HA1138	3.56	M5115P	4.34	ME645BN	3.80	SAF1039	11.66	SN76228N	2.97	T9034V	1.25	TBA570Q	1.35	TDA2010	2.79	TIP127	1.30
HA11414	2.50	M51231P	2.79	MP1106	4.80	SAS5010	7.62	SN76231	2.31	T9035V	1.26	TBA625A	1.97	TDA2020	2.75	TIP2955	0.78
HA1144	6.38	M5124P	4.38	OA200	0.10	SAS560	1.68	SN76242	4.75	T9038V	6.15	TBA625B	1.97	TDA2030	1.65	TIP29A	0.41
HA1156	1.23	M5134-9341	3.75	OA202	0.10	SAS560S	2.97	SN76243	4.75	T9051	2.55	TBA625C	1.97	TDA2140	1.44	TIP29B	0.57
HA11580	7.80	M51394P	6.25	OA47	0.10	SAS560T	2.85	SN76322	2.51	T9053V	1.03	TBA641A12	3.75	TDA2150	5.63	TIP29C	0.40
HA1160	3.45	M5142P	4.38	OA90	0.07	SAS570	1.61	SN76360	1.97	T9054V	0.92	TBA641BX1	2.07	TDA2151	1.75	TIP3055	0.65
HA1166	3.08	M5143P	6.66	OA91	0.08	SAS570S	0.00	SN76390	2.80	T9057V	0.63	TBA651	1.60	TDA2160	3.64	TIP30A	0.41
HA1167	5.13	M5144P	3.42	OA95	0.08	SAS570T	2.50	SN76396	2.63	T9063V	2.94	TBA673	2.35	TDA2161	1.68	TIP30B	0.63
HA11711	16.13	M51513L	2.06	OC28	0.96	SAS580	4.41	SN76510N	0.95	TA5814	1.35	TBA700Q	2.19	TDA2190	3.11	TIP31B	0.35
HA11713	6.70	M51515BL	3.10	OC29	1.95	SAS5800	2.62	SN76530P	1.90	TA7020P	4.36	TBA720	2.85	TDA2510	1.82	TIP31C	0.63
HA11714	7.05	M51516L	3.40	OC35	0.96	SAS590	4.55	SN76532N	1.80	TA7027	4.36	TBA730	1.75	TDA2520	2.15	TIP32B	0.35
HA11715	7.05	M51517L	2.90	OC36	1.16	SAS5900	2.32	SN76533N	1.56	TA7050	1.58	TBA750Q	1.46	TDA2521	2.15	TIP32C	0.66
HA11718	6.79	M5152L	1.00	OC44	0.40	SAS660	2.50	SN76540N	1.80	TA7051	1.58	TBA760	1.55	TDA2522	2.81	TIP33C	1.25
HA11724	15.60	M51522	4.90	OC45	0.40	SAS6600	1.20	SN76544	1.60	TA7060AP	0.60	TBA780	3.00	TDA2523	2.75	TIP34	1.07
HA11725	16.60	M5191P	4.49	OC75	0.40	SAS660S	1.20	SN76545	4.55	TA7061AP	0.78	TBA800	0.00	TDA2524	4.50	TIP41A	0.39
HA1180	4.68	M5192	2.00	ON188	1.70	SAS6610	1.20	SN76546	3.15	TA7069	2.84	TBA810AS	1.46	TDA2525	2.96	TIP41B	0.28
HA1203	1.56	M53273P	0.92	ON236	2.90	SAS670	2.50	SN76546N	3.15	TA7070P	1.52	TBA810S	1.46	TDA2530	2.19	TIP41C	0.44
HA1306	1.74	M53274P	1.20	OT112	0.98	SAS6700	1.20	SN76549	2.35	TA7071	3.35	TBA810T	1.46	TDA2532	2.51	TIP42A	0.39
HA1322	1.74	MA06	0.97	OT121	0.70	SAS670S	1.20	SN76550	0.30	TA7072P	1.35	TBA820	0.83	TDA2533	2.09	TIP42B	0.71
HA1339	1.76	MA8001	0.74	PD144	2.03	SAS6710	1.20	SN76551	1.35	TA7073P	4.05	TBA820M	1.65	TDA2540	1.95	TIP42C	0.44
HA1342	1.80	MB3705	1.62	PT1017	2.43	SAS6800	2.30	SN76570	2.80	TA7074P	1.95	TBA890	1.85	TDA2541	1.95	TIP47	0.65
HA1350	2.97	MB3712	2.65	PT2014	2.76	SAS6810	1.30	SN76600	1.10	TA7076P	4.95	TBA900	2.25	TDA2545Q	3.16	TIP48	0.83
HA1365	3.65	MB3713	1.30	PT6042	1.82	SBA550B	1.95	SN76611	2.35	TA7089N	1.41	TBA920	1.50	TDA2560	1.97	TIP49	3.28
HA1366WR	1.62	MB3730	2.94	R1038	1.99	SBA750	1.46	SN76620	2.35	TA7089P	1.36	TBA920Q	2.10	TDA2571A	2.81	TIS43	1.21
HA1367	3.20	MC13002	4.66	R1039	1.99	SC9488P	1.90	SN76622	1.50	TA7092P	3.85	TBA940	1.70	TDA2575A	2.95	TIS90	0.22
HA1368	1.69	MC1303P	1.96	R2008B	1.20	SC9503	1.50	SN76623	0.62	TA7093P	1.64	TBA950	1.55	TDA2576A	2.58	TIS91	0.26
HA1368R	1.66	MC1307P	1.90	R2009	1.20	SC9504P	1.46	SN76630	2.31	TA7102P	5.34	TBA970	2.08	TDA2577	5.31	TL071CP	2.02
HA1370	2.97	MC1310P	1.25	R2001B	1.20	SC9511P	1.90	SN76640	3.85	TA7108P	1.40	TBA970Q	2.98	TDA2581	1.95	TMS1000NL	10.78
HA1377	2.68	MC1327P	1.20	R2029	1.20	SCR957	1.20	SN76650N	1.24	TA7109	3.37	TBA990	1.65	TDA2582	1.98	TMS3748NS	11.66
HA1389	1.62	MC1330P	1.23	R2030	1.20	SG264A	4.38	SN76651	1.35	TA7120P	0.58	TBA990Q	1.95	TDA2590	2.80	TMS4116	1.87
HA1389R	1.74	MC1349P	1.20	R2257	2.16	SG613	7.88	SN76660N	2.25	TA7122B/P	0.54	TBA231	2.33	TDA2591	2.80	TV106	1.20
HA1392	2.68	MC1350P	1.10	R2265	1.95	SG629	6.82	SN76665N	1.35	TA7124P	2.00	TC4001	1.29	TDA2591Q	2.80	TY6010B	2.70
HA1397	2.97	MC1351P	0.75	R2305	1.07	SG6533	9.37	SN76666N	0.98	TA7130P	1.15	TC4053BP	3.94	TDA2593	2.24	U05G	1.03
HA1398	2.68	MC1352P	1.01	R2306	1.23	SI-1020N	4.76	SN76705	3.38	TA7136AP	1.15	TCA150	1.62	TDA2594	2.80	U143M	2.80
HA1406	1.80	MC1357P	1.95	R2322	1.26	SI-1125HD	10.70	SN76705N	3.99	TA7137P	0.85	TCA160B	1.62	TDA2600	5.00	U3700	0.55
HA17723	5.40	MC1358P	1.55	R2323	1.23	SI-1130N	6.30	SN76707N	3.99	TA7141AP	3.51	TCA270Q	1.55	TDA2610	2.53	U37003	0.44
HBF4030AF	2.25	MC14001	7.15	R2348	1.82	SKB2/08	0.70	SN76709	4.65	TA7146P	8.04	TCA270S	1.95	TDA2611A	1.25	UA723CA	5.02
HD4480	15.60	MC14011	0.23	R2354A	1.82	SKE2F 1/04	1.26	SN76709N	4.95	TA7148P	1.51	TCA270SQ	1.65	TDA2611AQ	2.55	UA758PC	3.06
HD44801A05	15.90	MC14013	0.37	R2354B	1.82	SKE2G 2/04	0.95	SN76730	4.23	TA7149P	2.10	TCA290A	2.05	TDA2612Q	4.25	UA783P3C	1.07
HM6231	8.50	MC14016CP	0.37	R2441	1.23	SKE2G 3/04	0.95	SN76810N	0.62	TA7153P	4.53	TCA420A	1.90	TDA2620	1.96	UAA170	2.14
HM6232	7.71	MC14025	0.54	R2443	0.80	SKE4F 1/02	1.26	SN76920N	2.63	TA7161P	5.66	TCA440	1.65	TDA2630	2.34	UAA180	2.14
HM9102	2.92	MC14049UBC	0.52	R2461	2.10	SKE4F 1/06	0.66	SN94041	3.45	TA7162P	4.25	TCA4500A	1.95	TDA2631	2.48	ULN2165	1.35
HM9104	2.94	MC1438R	0.95	R2477	0.92	SKE4F 2/06	2.10	SN94042	3.95	TA7169	4.80	TCA530	1.80	TDA2640	2.25	ULN2204	7.00
HT4207	15.60	MC14493P	2.56	R2501	1.16	SKE4F 2/08	0.60	SP8385	0.50	TA7171P	2.53	TCA640	2.63	TDA2643	6.93	ULN2216F	1.95
IS689	1.87	MC14510BAL	3.15	R2540	1.80	SKE4G 2/02	0.87	STA441C	2.27	TA7172P	1.28	TCA650	1.85	TDA2651	2.95	UPC1001H	2.50
IS751	1.87	MC14566BCP	3.15	R2540X	3.00	SKE5F 3/10	1.45	STK0029	3.42	TA7176P	2.25	TCA660B	2.63	TDA2652	7.05	UPC1009C	5.74
ITT2003	0.20	MC1712	3.52	R2615	0.60	SL1310	2.85	STK0039	4.00	TA7193P	4.44	TCA730	3.84	TDA2653	2.95	UPC1020H	2.12
K174YP	2.95	MC7724CP	3.17	RCA195NB	1.96	SL1327E	1.20	STK0050	4.96	TA7201P	3.25	TCA740	2.25	TDA2654	2.91	UPC1025H	2.49
KA2101	2.65	MC7818C	1.98	RCA16029	1.82	SL1430	1.26	STK0059	6.48	TA7202P	2.24	TCA750	1.75	TDA2655B	3.15	UPC1026C	1.24
KC581C	5.47	MC7824CP	4.25	RCA16083	4.81	SL1430T	2.10	STK0080	8.32	TA7203P	1.95	TCA760B	2.79	TDA2660	2.24	UPC1028H	0.90
KC582C	3.45	MC78M12	0.75	RCA16334	0.92	SL1432	2.25	STK011	3.86	TA7204P	1.95	TCA800	1.65	TDA2661	2.24	UPC1030H	2.06
KC583C	4.80	MC78M24	0.85	RCA16335	1.23	SL414	3.35	STK013	7.04	TA7205	1.25	TCA800Q	2.25	TDA2670	2.50	UPC1031H	8.05
L129V	1.78	MCR101	0.60	RCA16600	1.25	SL432A	3.12	STK014	7.14	TA7208P	1.95	TCA830S	1.94	TDA2670A	1.76	UPC1031H2	6.00
L200CV	1.68	MCR106/5	1.17	RCA16799	2.16	SL437	6.00	STK015	5.12	TA7210P	3.25	TCA900	1.85	TDA2680	2.30	UPC1032H	0.94
LA1111AP	0.80	MCR220/7	1.34	RCA16801	0.86	SL439	2.25	STK016	4.82	TA7214P	2.90	TCA910	1.50	TDA2690A	2.40	UPC1154H	1.75
LA1201	0.90	ME0402	0.27	RCA16802	0.98	SL480	5.00	STK022	4.77	TA7215P	2.09	TCA940E	1.68	TDA2780AQ	2.18	UPC1156H	1.45
LA1210	1.38	ME0404	0.23	RCA17028	2.25	SL490	1.78	STK025	7.20	TA7217AP	1.36	TCE330	3.53	TDA2790Q	5.92	UPC1181H	1.25
LA1320	1.46	ME0404/2	0.42	RCA17074	6.00	SL901B	6.08	STK040	7.09	TA7222	1.95	TCE527	1.37	TDA2791	2.50	UPC1182H	1.82
LA1352	1.40	ME0411	0.45	RCA17376	1.43	SL917B	7.95	STK043	7.09	TA7227P	1.69	TCE82	0.98	TDA2795	2.95	UPC1185H	2.94
LA1357N	5.90	ME0412	0.21	RCA60857	4.50	SL918A	5.63	STK054	6.48	TA7229P	4.10	TCE83	0.98	TDA2800	6.12	UPC1186H	0.95
LA1364	2.74	ME4102	0.45	RGP10	0.45	SN6848	8.82	STK070	20.28	TA7310P	1.95	TCE84	0.98	TDA3000T	2.31	UPC1212C	0.95
LA1365J	2.79	ME545B	9.10	RT402	1.40	SN16861N-07	1.59	STK077	7.00	TA7313AP	1.36	TCEP100	4.80	TDA3030A	10.44	UPC1213C	0.95
LA1385	1.70	ME6002	0.23	RT905A	2.00	SN16862N-07	1.68	STK078	5.52	TA7314	5.10	TCEP100Q	9.31	TDA3190	1.75	UPC1217C	2.24
LA1387	4.57	ME6102	0.45	S0280	1.94	SN16880N	3.30	STK082	7.54	TA7609	3.00	TD190	0.54	TDA3300B	7.75	UPC1350C	1.75
LA3155	0.90	ME8001	0.26	S0281	1.94	SN16965	8.13	STK086	9.90	TA7611AP	3.54	TD3F700H	6.00	TDA3500	5.95	UPC1351C	1.64
LA3300	1.40	MJ2501	4.95	S041P	1.26	SN16966N	5.49	STK2101	5.74	TA7676P	3.05	TD3F800H	2.25	TDA3501	10.99	UPC1353	6.75
LA3301	1.28	MJ2955	1.34	S042P	1.46	SN29715N	5.49	STK2110	6.66	TAA300	2.99	TD3F800R	3.21	TDA3506	10.12	UPC1360C	4.10
LA3350	1.30	MJ3000	2.15	S1299	4.30	SN29716N	3.32	STK2230	6.66	TAA310A	0.27	TD3F900H	3.78	TDA3510	5.95	UPC1362	7.95
LA3361	1.30	MJ3001	1.30	S175	18.95	SN29717N	6.53	STK415	6.04	TAA320A	1.15	TD3F900R36	3.78	TDA3520	8.82	UPC1365	5.79
LA4030P	2.37	MJ3028	2.40	S2062D	1.88	SN29722	10.65	STK433	9.35	TAA350A	1.62	TDA1001A	2.10	TDA3521	12.17	UPC1366	4.23
LA4031P	3.00	MJ481	1.39	S2800	5.25	SN29723AN	6.95	STK435	5.44	TAA435	1.65	TDA1003A	2.15	TDA3560	6.87	UPC1458	7.87
LA4032P	1.48	MJ802	4.95	S2800D	2.55	SN29744N	2.08	STK436	5.70	TAA550	0.33	TDA1004A	2.15	TDA3561	7.50	UPC2002	1.48
LA4050P	1.42	MJE2955	1.71	S2802	3.15	SN29764AN	3.38	STK437	8.10	TAA570	1.58	TDA1005A	2.15	TDA3571Q	2.25	UPC30C	2.22
LA4051P	1.62	MJE3055	0.78	S3702S	4.73	SN29767	3.61	STK439	6.26	TAA611B12	1.50	TDA1006A	2.15	TDA3571A	5.67	UPC32C	4.49
LA4100	1.62	MJE340	0.44	S3703F	4.73	SN29770AN	2.04	STK441	8.96	TAA621AX1	2.00	TDA1010	2.43	TDA3576	4.76	UPC41C	3.72
LA4101	1.18	MJE520	0.44	S3707	3.92	SN29771BN	4.23	STK443	9.35	TAA630S	3.31	TDA1011	2.60	TDA3950	2.81	UPC554C	1.68
LA4102	2.55	ML231	2.28	S40VW	7.99	SN29772BN	4.21	STK459	6.56	TAA640	3.85	TDA1028	2.22	TDA3950B	1.40	UPC558C	3.67
LA4112	4.35	ML232B	3.30	S551	4.12	SN29773	2.28	STK460	5.78	TAA661B	1.59	TDA1029	4.44	TDA4050A	3.15	UPC566H	2.78
LA4125	2.46	ML237B	2.28	S552	4.12	SN29791	1.51	STK461	7.14	TAA700	2.35	TDA1034B	2.20	TDA4180P	1.74	UPC572	3.51
LA4138	2.00	ML238	4.02	S6080B	2.75	SN29798N	3.89	STK463	8.06	TAA840	2.27	TDA1035T	1.83	TDA4260	1.40	UPC575C2	3.72
LA4140	0.80	ML741CS	0.36	S6087AR	4.45	SN29845	2.14	STK465	7.32	TAA930	4.42	TDA1037	1.45	TDA4280	6.45	UPC576H	2.60
LA4192	2.88	ML923	2.18	SAA1020	4.32	SN29848	1.66	STK466	10.70	TAA970	2.57	TDA1041	1.96	TDA4290	4.06	UPC577H	0.64
LA4220	1.34	ML0926	3.25	SAA1021	4.32	SN29861	2.08	STK501	5.74	TAD100	1.91	TDA1044	1.61	TDA440	1.95	UPC587C2	2.34
LA4400	2.04	MM5314N	3.72	SAA1024	2.55	SN29862	2.08	STK502	5.74	TAG232-600	0.66	TDA1047	2.14	TDA4400	2.06	UPC592H	1.02
LA4420	1.56	MM5316N	3.72	SAA1025	4.70	SN72709	0.40	STR441	6.34	TAG626-600	0.84	TDA1054M	1.10	TDA4420	4.25	UPD1514C	7.56
LA4422	1.56	MM5318N	2.82	SAA1050	3.78	SN7400N	0.24	STR453	6.75	TBA120	0.95	TDA1059B	0.98	TDA4422	5.63	UPD851	14.39
LA4430	1.48	MM5369N	1.82	SAA1051	5.30	SN7401N	0.24	STR6020	7.20	TBA120A	0.95	TDA1060	2.01	TDA4430	4.34	UPX27C	1.98
LA4460	1.92	MM5387AA/N	11.50	SAA1061	3.28	SN7402N	0.59	T6007V	0.69	TBA120AS	0.95	TDA1092	2.65	TDA4431	2.06	X0022CE	3.67
LA4461	2.00	MM5841N	5.90	SAA1075	4.41	SN7404N	0.21	T6007N	0.62	TBA120S	0.95	TDA1104	5.95	TDA4432	2.06	X0035TA	4.35
LA5112N	1.62	MP8112	1.35	SAA1082	8.04	SN7408N	0.24	T6016	0.36	TBA120SB	0.95	TDA1151	0.65	TDA4440	2.52	X0056CE	3.90
LA7020	6.66	MP8113	1.35	SAA1121	4.32	SN7410N	0.24	T6017	0.65	TBA120T	0.95	TDA1170	2.15	TDA4600	2.58	X0062CE	4.95
LA7025	7.31	MP8512	1.23	SAA1124	2.55	SN74121	1.20	T6018V	0.65	TBA120U	0.95	TDA1170S	1.85	TDA4610	2.42	X0065CE	3.48
LA7800	2.12	MPF256C	0.54	SAA1130	4.86	SN74122	0.95	T6021	0.36	TBA120UB	3.47	TDA1180	2.25	TDA4620	4.50	X0109CE	6.10
LA7801	3.60	MPS6570	0.43	SAA1174	5.75	SN7413N	0.33	T6022V	3.56	TBA1440	2.08	TDA1190	1.91	TDA5500	2.48	X1074AF	6.36
LD3120	1.20	MPSA42	0.59	SAA1250	3.78	SN74141	1.41	T6026	0.89	TBA14406	3.48	TDA1190Z	2.25	TDA5600	2.68	XC949P	1.20
LM1011N	2.95	MPSA56	0.24	SAA1251	5.30	SN74151AN	1.51	T6027	0.73	TBA1441	1.59	TDA1200A	1.30	TDA5700	2.10	Y730	0.24
LM1017N	1.96	MPSA92	1.11	SAA5000	3.65	SN74154N	1.15	T6028V	0.35	TBA240A	3.42	TDA1220	2.25	TDA9403	2.90	Y969	0.60

All goods should be delivered within 4 working days

REGISTERED OFFICE: THE COACH HOUSE, MUXTON LANE, TELFORD

VCR Clinic

Reports from Steve Beeching, T. Eng., Derek Snelling, Mick Dutton, Les Harris and Peter Richards

Mitsubishi HS306

More problems with the HS306. We've had three with buzzing mains transformers due to loose laminations. Two were cured (by the use of a large hammer) but the third had to be returned for replacement. We've also had one with an open-circuit primary winding. A problem we sometimes get in Birmingham is radar interference from the Birmingham International Airport. It's at around ch. 36 and usually affects Hitachi machines. The cure is to tune down to ch. 32. We've now had this problem with an HS306 and unfortunately the r.f. converter tunes only from ch. 36 to ch. 40. With BBC-2 on ch. 40 it proved impossible to find a point where radar interference was missed and BBC-2 was not interfering or interfered with, even with the use of attenuators. Apparently the r.f. converter in this model is made by Panasonic, so perhaps the difficulty can arise with some of their current models.

D.S.

Ferguson 3V29

The complaint with this machine was that it "switched off after twenty minutes while playing". Sure enough after playing for twenty minutes the machine did just that. Pressing play resulted in the machine working for another ten minutes, after which it switched off again. It seemed to us that a pulse was disappearing occasionally, but when the machine was taken apart and a scope was connected it refused to go wrong. After resoldering a few likely joints we returned it to the customer.

The fault appeared two weeks later, but this time when we got the machine it was completely dead with the operate light failing to come on. A check around the fuses with a meter suddenly resulted in a working VCR. F8 turned out to be loose in its holder, and since tightening this the fault has not recurred. **D.S.**

Sharp VC7700

Intermittent recording was traced to the f.m. record amplifier section of i.c. I301: the output at pin 8 went off every so often. This was a case of connecting up one of the oscilloscopes and leaving it in a corner with the machine to monitor various signals until the cause of the signal loss could be tracked down. **S.B.**

Sanyo VTC5000

This model can exhibit similar threading problems to the VTC5300, but for a different reason. Reluctance to load and unload the tape in the 5300 is due to the drive belt and loading ring: with the 5000 it's due to wear on the worm gear clutch which drives the loading ring. The clutch must be replaced. **S.B.**

Hitachi VT8700

An interesting one here – an intermittent tuner/i.f. signal and no rewind. Rewind was no problem but the tuner/i.f. panel had to be removed to check for the intermittent loss of signal. I initially thought that this was probably a one-off case, but on investigation it seems that it could happen on other machines. The problem area is the earth connection to Q851 within the i.f. module: it's part of the can and vibration causes a very subtle crack around the metal tag where it's soldered. This leaves the collector of Q851 floating with no common return, which is not good for a common-base amplifier.

After cleaning the machine it was ready for the customer and the test cassette was rewound. It hit the end of rewind with a bit of a thump and after a couple of seconds the stop mode was entered. Funny, I thought. Tried it again. The start sensor wasn't working. The cassette lamp wasn't lit either, due to the resistor (R653, 220Ω) in series with the cassette lamp being open-circuit. This is certainly the first case I've come across where a VCR will operate with no cassette lamp: most others will shut down and refuse to perform as the system control is inhibited. **S.B.**

Ferguson Feedback

I was interested to read in the December issue of *Ferguson Feedback* about liquid contaminated PCBs. The point was made that cleaning the panels is only a short-term measure as further degradation and consequent failure will occur. If more than one panel in a VCR is affected the cost of replacement and subsequent alignment becomes prohibitive. I've never held the view that VCR panels should be replaced as part of servicing except in exceptional cases where panels are temporarily swapped to eliminate a suspect area when fault finding.

The January issue of *Ferguson Feedback* mentions the number of cases where microcomputer chips that are not faulty are returned under guarantee. Unless you know a machine very well it can be extremely difficult to determine whether a microcomputer chip is indeed faulty and it's often necessary to replace one on an elimination basis. It can sometimes be reasonably surmised that a microcomputer chip is faulty as the next case illustrates.

S.B.

Panasonic NV7200

When this machine was put into the timer mode the record indicator flashed on and off and the tape threaded up and ran in a stop-start fashion – this without even the set time being reached. A clue to the culprit was given when the clock came on to read 11·86. The microcomputer i.c.'s record output was pulsing on and off as soon as the timer mode was selected. Replacing the timer microcomputer i.c. restored normal results. **S.B.**

Sony SLC9

The complaint was that the clock had gone off and that the machine would not record though playback was possible. In fact the machine would record, but there was no output from the tuner. Power supply problems were correctly suspected and the power unit was removed. The cause of the fault was a small d.c.-d.c. converter module which should have produced a 38V supply and a −27V supply. Although the manual gives part numbers the module was well sealed and I couldn't find the number in the parts list. It's in fact 1-464-217-11, though there's a later version 1-464-217-21 with extra ventilation holes. I assume that the original version tended to overheat – it does run continuously.

I found an anomaly in the SLC9's power supply circuit diagram. This can be confusing. The supply line connected to pin 5 of CN657 is shown as 5·9V. The same reading is shown at the emitter of Q682. Now although the voltages across diodes D681 and D682 add up to around 5·9V they are not connected to chassis. There's a further voltage across R682 as a result of which the supply will measure more like 8V until loaded, so don't chase a red herring in this area. **S.B.**

JVC HR2200

This machine went into the alarm mode when switched on, which is all it will do under a fault condition. Usually, that is. So we checked through the inputs to the microcomputer control i.c. to find the cause of the problem. The clue was at input A2, which is connected to the brake switch. With the switch open the voltage should have been 10V. It was only 5V. I've encountered this problem before with these switch inputs. As the inputs are left floating when the relevant switches are open it seems that they're susceptible to static. Note that the micro fitted to earlier machines, type μPD553C-066, has been changed. The later type μPD553C-159 can be fitted in its place. It won't provide the improvements but carries on all right. **S.B.**

JVC HR7700

This HR7700 was sent in by a dealer as it wouldn't accept a cassette. The cassette-in switch worked but the message didn't get through to the control microcomputer via the data selector i.c. The reason for this was that the data selectors were not being scanned by the micro. A new micro failed to sort matters out but at least eliminated the device. We next found that the micro interrupt pin 6 was low, indicating a safety system fault. The trouble seemed to lie in the direction of the cassette lamp failure detector in IC30 – but the lamp was on! The input to IC30 was too low to switch the gate concerned and the lamp did seem a bit dim . . . the wrong type of lamp was fitted! It just goes to show that you can't go around stuffing any old substitute component into a VCR. The micro will know what you've done, very clever they are. So watch it! **S.B.**

Amstrad 7000

This machine wouldn't operate because the dew sensor was on. No problem we thought, just let it dry out for a while. After half an hour we came back to see if it had come on and found that the dew sensor light was still on. So we removed the top cover and tried again. This time the machine worked normally. We left it overnight and tried again next morning. The fault was back again and this time we were able to measure the dew sensor. There was a voltage at the earthy side and when we followed the lead to the chassis connection we found that it was corroded. Stripping this down and cleaning it provided a cure. **M.D.**

Panasonic NV333

Fast forward and rewind worked normally but sometimes the machine wouldn't go into record or play. We noticed that in the fault condition the capstan didn't rotate and the play idler wheel didn't move into its operating position. There was no capstan-on pulse from the microcomputer i.c. so we went chasing off after this and wasted a lot of time. We then found that the mode select switch wasn't travelling right into the play position, so we set up the cam gear and action gear as per the manual. This cured the problem for a while, but we then found that as the machine was loading the belt that drives the large pulley was slipping on the intermediate pulley. Cleaning the belt and the pulley wheels solved the problem. **M.D.**

Sony SLC7

We've had several tuning faults with these machines. For example the tuner might not select the right station – it may well lock on to a non-local station elsewhere in the band, depending on what's tuned in. Alternatively some channels might not work, or certain numbers can't be selected. The cause is the same – the CX761 tuner memory i.c.

The problem with another of these machines was that it ejected when switched on from standby, then worked normally. Now when any microcomputer i.c. misbehaves it's important to check the reset circuit. In this case replacing D6 and Q2 on the system control board SY11 cured the fault. **P.R.**

Sony SLC5

Intermittent crackling and/or instability on playback sound is often due to corrosion on one of the three relays in the audio amplifier circuit. The best cure is to replace all three, but note that they're not all the same. **P.R.**

Sony SLC9/SLC30

If the customer complains that the remote control transmitter works but the red LED doesn't light up don't be too keen to break it open to investigate. Check the batteries first! This is a telltale sign that the batteries are flat. **P.R.**

GEC V4100

A motorboating sound was accompanied by noise bands on the screen. To aid diagnosis I changed the audio board. Still the same. Next I unplugged PG619, the lead to the control head, and the motorboating stopped. The problem was found to be due to leakage of a few hundred ohms between the audio and control heads and was cured by cleaning the head terminal PCB. The leakage must have been lowering the level of the control pulses so that the capstan was unlocked, hence the noise bars. Methinks something had been spilt into that VCR! **L.H.**

Ferguson 3V22

Very snowy replay was not due to worn heads – the f.m. output at the head amplifier test point looked o.k. on the scope. The fault was traced to the SN76670N limiter i.c. (IC7) – there was an input signal at pin 14 but virtually no output at pin 6. **L.H.**

Hitachi VT33

The cassette loading mechanism on this machine was faulty due to two teeth broken off a small cog. Now this is a sturdy mechanism compared to that used in the Ferguson 3V35 etc. so I wondered how (the customer was a lady) it came to be broken. I subsequently found the lady's occupation from the shop manager – she's a dumper truck driver! Anyway, a replacement cog and much fiddling put the machine to rights. **L.H.**

Waveforms from Space

Harold Peters

Once a DBS enthusiast has collected his gear together and got it all working the problem arises that the dish is well out of sight and reach of the receiver. So even if it sports an S meter the initial capture of the wanted signal isn't going to be easy. Few of us have a spectrum analyser that we can watch at the foot of a dish, nor a suitable monitor, so we end up using an oscilloscope with a long input lead. Once a signal is obtained the scope can be of further use in identifying the broadcast – especially if it doesn't for some reason lock well on the TV display. Close inspection of the line and field blanking intervals can tell you quite a lot, as the waveforms shown in the present article will reveal.

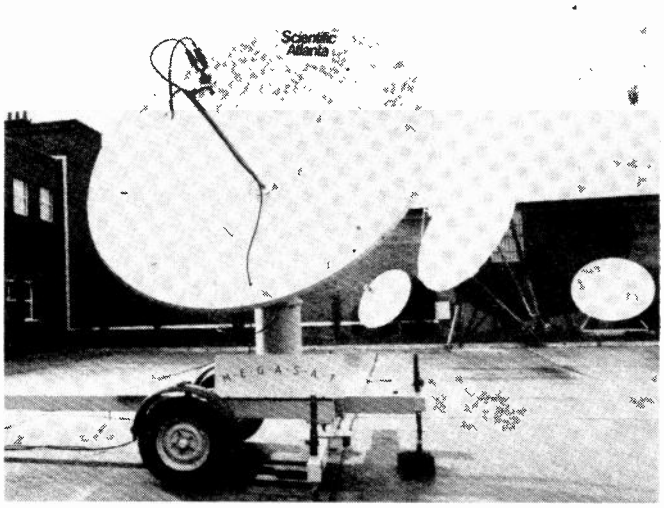
We are lucky that six of the strongest 11GHz band signals receivable in the UK employ standard PAL. The waveform shown in Fig. 1 can be seen from Music Box, RAI and the Swiss Teleclub via the ECS-1 (Eutelsat) satellite, all noise-free using a 2m dish, also from Premiere, Screen Sport and TEN via Intelsat V F4 which calls for a slightly larger dish. There are teletext magazines on Music Box and RAI and the Teleclub signal has a strong unmodulated subcarrier at 5·5MHz.

NTSC signals look very similar, with a smaller duration burst and a slightly different picture-to-blanking ratio – a monitor will show the difference better (the field will roll until you adjust to 60Hz, whereupon the picture will appear, squashed vertically). The only "local" NTSC bird is Intelsat IV F8 at 1°W, but it's very weak and has just lost its supply of steering propellant.

The waveform shown in Fig. 2 is SECAM. Note the extended burst on the back porch, which is unmodulated (neutral grey) red and blue subcarrier on alternate lines. Note also that the subcarrier is present throughout the active picture period of each line – it has to be, in order to stop "colour snow" appearing in uncoloured parts of the scene. The field blanking interval contains the original SECAM ident signal – ten lines of alternate red and blue subcarrier, the so-called ten green bottles. Modern SECAM decoders identify from the extended burst on the back porch.

The Russian 4GHz Gorizont satellite and the French TV5 service via ECS-1 (with the religious EBNET programme sharing the same channel) use SECAM. TV5 and EBNET scramble the signal, using the Discret-1 system described in Andy Emmerson's Canal Plus article last December, though the transponder is sometimes used to relay unscrambled material with PAL colour to Catalina.

The waveform shown in Fig. 3 is to be seen on the two W. German channels Sat1/PKS and the weaker 3Sat, both via ECS-1. The line sync pulse is shortened and digital sound is inserted up to the burst and again after the burst. This upsets the sync and chroma on the average monitor/receiver and can be regarded as a form of scrambling.



Demonstration aerials at Megasat's central London premises. From left to right: transportable dual-polarised 2·8m dish aligned with ECS-1; 1·8m dish aligned with Gorizont; 3·7m motorised dish aligned with Intelsat V; 1·8m dual-polarised dish for ECS-1.

Oak Orion Encryption

Fig. 4 shows the Racal/Oak Orion scrambling system used for Sky Channel via ECS-1. It has no line sync pulse as such and the total amplitude is 0·7V peak-to-peak. Line sync is by means of a burst of a.c. sinewaves which are followed by full-amplitude digital sound pulses right up to the PAL colour burst, which is in the correct place. Between the burst and the start of the picture there's a computer-controlled inversion signal. The picture information itself may or may not be inverted.

The MAC Waveform

The waveform shown in Fig. 5 will turn up sooner or later: it's MAC and can be regarded as scrambled since the sound is digitised and the chrominance and luminance information is compressed and transmitted in sequence, producing an effect on a conventional set similar to a cinemascope film shown on an ordinary screen. At the present time it's used only by the Norwegian transponder on ECS-2 at 7° (was 10°) E.

Sound Channels

Sound channel frequencies are shown in Table 1. An intercarrier receiver tunable from 6MHz to 7MHz is required for sound. The only transmissions likely to give problems are TV5 whose non-standard pre-emphasis produces sibilance and Teleclub whose strong unmodulated

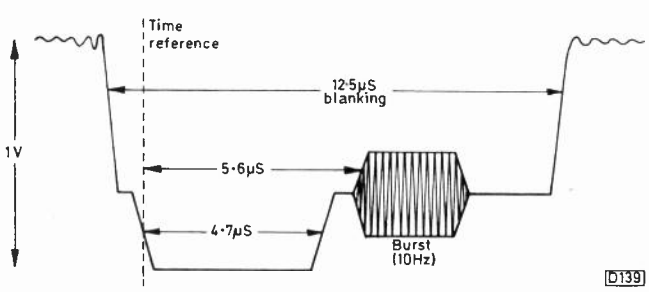


Fig. 1: Standard PAL line blanking period waveform.

Table 1: 11GHz band satellite TV services.

Service	*Country*	*UK E.I.R.P. dBW*	*Sound*
Sky Channel	UK	47	Digital
Music Box	UK	47	6·6MHz*
Sat 1/PKS	W Germany	47	Digital
TV5	France	47	6·55MHz
RAI	Italy	47	6·7MHz
Teleclub	Switzerland	47	6·5MHz
Euro TV	Holland	47	6·6MHz
Esselte	Belgium	—	—
Premiere	UK	45	6·6MHz
Screen Sport	UK	45	6·65MHz
TEN	UK	43	6·6MHz

*Digital stereo at 7·1MHz and 7·2MHz.

5·5MHz subcarrier could produce beat effects. Without the proper decoders there seems little point in trying to resolve the digitised sound signals, which include Wegener stereo with Music Box at 7·1MHz and 7·2MHz.

Signal Capture

Satisfactory reception of ECS-1 at 13°E is possible with dishes as small as 1·2m. Intelsat V F4 at 27·5°W requires a 3m dish for clean signals. The bigger the dish the touchier the alignment – even tightening up can tune it right off.

If you're unsure of the polarity of the wanted signal, mount the converter assembly at 45° until initial signal capture then rotate it for optimum reception.

The two easy K (11GHz) Band signals are Music Box via ECS-1 and Premiere/the Children's Channel via Intelsat V F4 as they are both on all day. Music Box even transmits mixed syncs out of hours to carry the teletext signals.

Fig. 6 shows how Band K is split, with a gap between 11·2GHz and 11·45GHz. Most available receivers will cover either but not both sections of the band since they are based on US 4GHz designs.

Our own way of capturing Intelsat V F4 was to tune first to ECS-1 at 13°E and display the RAI signal. This puts the receiver and low-noise converter on the right channel and polarity for the Children's Channel from Intelsat V F4 at 27·5°W. We then swung the dish around by the right amount and dropped its elevation by 3°. Once we find a signal we mark the adjusting arms of the dish mount and produce from this a linear calibration of azimuth and elevation. This will be handy in the coming months.

ECS-3 is due up in August and is already fully booked. It will be at 7° or 10°E. There will be two UK TV transponders and RAI intend to move across from ECS-1. Finally, before M. Binet, Head of Eutelsat's Conference, Documentation and Public Relations Division writes in, we should perhaps mention that once the ECS satellites have become officially accepted they become Eutelsats. Since the writer is in no position to determine exactly when a bird has been approved and paid for however he prefers to play safe and call them ECSs.

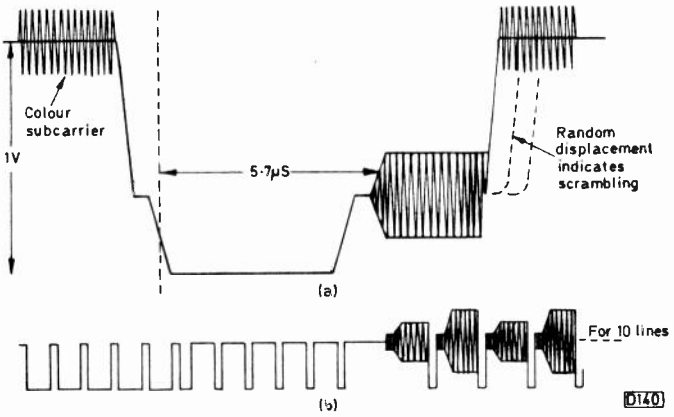


Fig. 2: SECAM waveform: (a) line blanking period, (b) field blanking period (part).

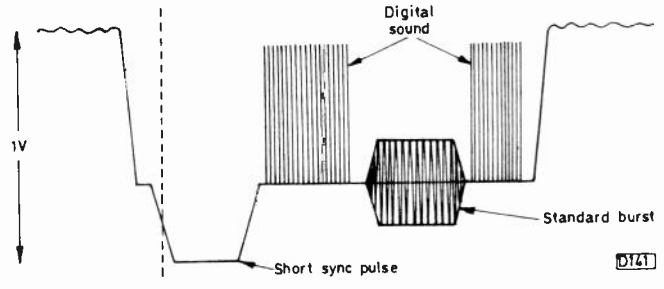


Fig. 3: PAL with digital sound added.

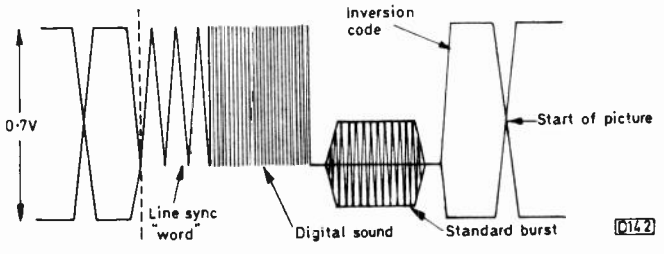


Fig. 4: Oak Orion encrypted signal waveform.

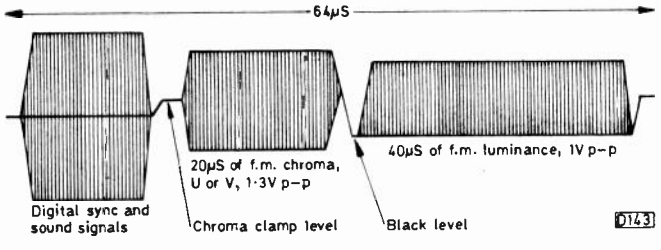


Fig. 5: MAC waveform for a complete line.

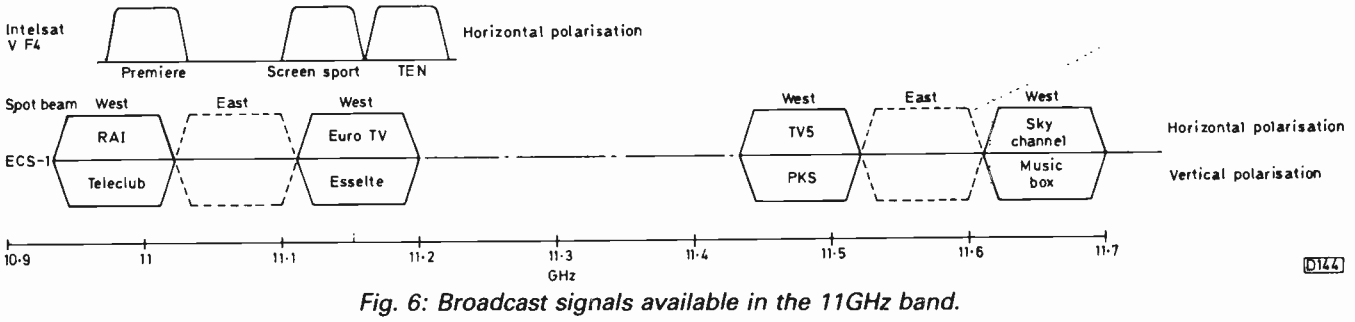


Fig. 6: Broadcast signals available in the 11GHz band.

Chips for Tomorrow's Sets

Details of a comprehensive range of new-generation i.c.s for use in TV chassis have recently been released by Mullard. The range extends from i.c.s that enable a relatively simple economy chassis to be produced to those capable of providing a great many extra features, for example more sophisticated PAL decoding, computer control throughout the chassis and features based on the use of a memory able to store a TV field. Some of the i.c.s are already in production while others are being supplied to setmakers in preproduction form for development work. The following notes describe some of the i.c.s we're likely to be seeing in new chassis before long.

Economy CTV Chassis

Two i.c.s in the range provide the entire signal processing required in an economy set: only a tuner and the necessary output stages have to be added. The TDA4501 contains the i.f. strip, with a.g.c. and a.f.c. outputs for the tuner, the sound channel up to an audio preamplifier, inter-station sound muting, the sync separator, VCR time-constant switching, and the line and field timebase and sandcastle pulse generators. The similar TDA4500 has been used in the Thorn TX90 chassis for some time. The TDA3565 is an economy, 18-pin version of the TDA3561A PAL colour decoder chip without teletext compatibility. The pinning of the TDA3565 has been arranged so that a dual-pierced PCB can be used with either this or the TDA3561A.

Alternative PAL Decoding Techniques

Picture quality can be considerably improved by increasing the slope of the detected colour-difference signal transitions to match those of the luminance signal, thus compensating for the narrow chroma signal bandwidth. The TDA4510, TDA4560, TDA3505 chip set provides this feature – see Fig. 1. The TDA4510 is a conventional PAL decoder with YUV outputs. The TDA4560 provides the colour-difference signal sharpening feature, using differentiation and integration with sample-and-hold circuits for the purpose. This delays the colour-difference signals by some 800nsec, so the luminance signal must be delayed by the same amount. A switchable gyrator luminance delay line is incorporated in the TDA4560 for this purpose. The following TDA3505 provides signal clamping; RGB matrixing; contrast, brightness and saturation control; beam limiting; RGB inputs with signal source switching; white point adjustment; and c.r.t. black current stabilisation.

An alternative approach to PAL decoding is provided by the TDA3569 and TDA8450 – Fig. 2 shows the general arrangement. The TDA3569 is a conventional PAL decoder chip designed to interface with the TDA8450 which incorporates all the filters and delay lines required for PAL (and SECAM) decoding in solid-state form. This latter i.c. employs time-discrete analogue signal processing, i.e. for the purposes of filtering and delay the signals are sampled, as in digital signal processing, but the signals are not converted to digital form. There are therefore no AD or DA converters, there is no need for shielding to prevent interference from a clock signal, and the power consumption is minimal. This method of analogue signal processing requires very few peripheral components or adjustments and can be integrated on reasonable areas of silicon. Profiled peristaltic charge-coupled devices are used for the delay lines and filters.

Digital Tuning/Remote Control

The latest Mullard digital tuning/remote control system is based on the use of an MAB8400 series microcomputer chip with a non-volatile memory such as the PCD8572 to store the preset channels and the preferred analogue

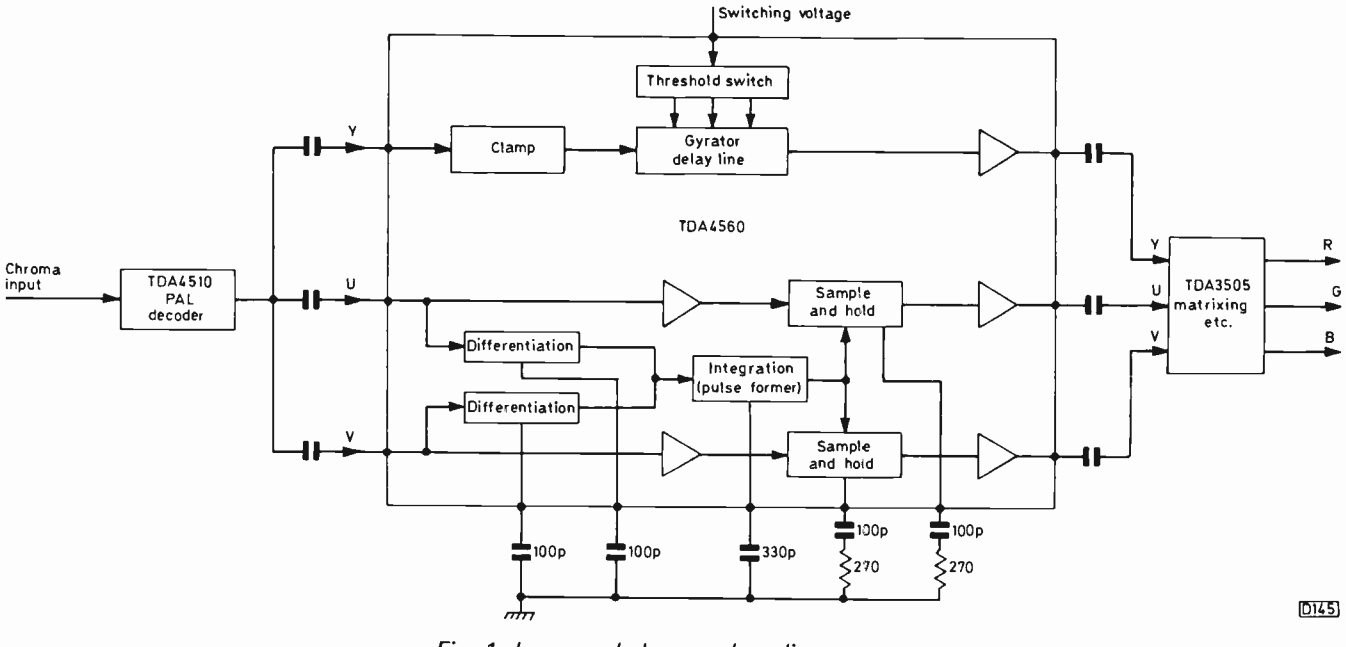


Fig. 1: Improved chroma decoding system.

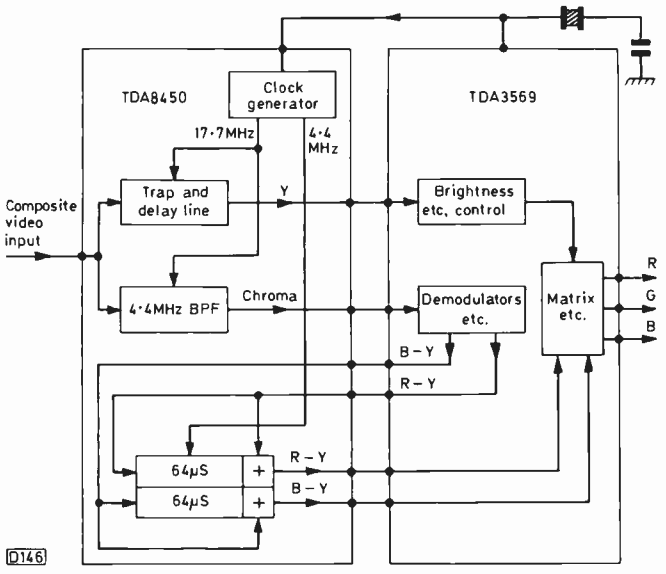


Fig. 2: Decoding with solid-state filters and delay lines.

control settings. All connections to and from the microcomputer i.c. are made via a simple bidirectional two-wire bus. The system is upwards compatible in that it can be extended via the bus to provide microcomputer control of teletext operation and automatic setting of the picture geometry and colour balance.

Teletext Chip Set

The latest teletext chip set consists of the SAA5230 and SAA5240, see Fig. 3. The SAA5230 processor is used to convert the video input to a serial data stream. It incorporates an adaptive data slicer for optimum performance under poor signal conditions: the circuit provides automatic compensation to improve the eye pattern if it detects that the incoming signal has poor h.f. response. The clock generator uses an a.p.c. loop and a double-frequency crystal oscillator to provide a constant-amplitude clock signal of the correct phase: this is an improvement on earlier clock regenerator circuits using a tuned circuit.

The SAA5240 carries out data acquisition and incorporates the timing chain, character generator and memory

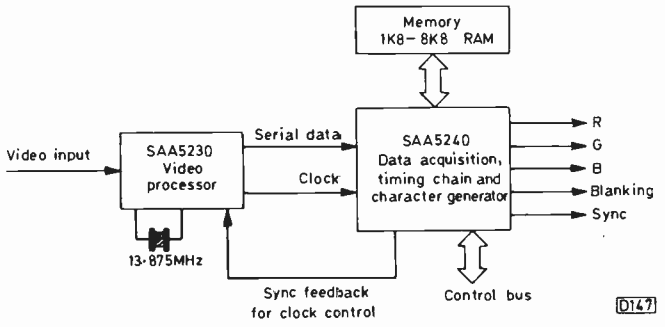


Fig. 3: Two-chip (plus memory) teletext decoder.

interface: it's designed for microcomputer control. The data acquisition section receives the data and clock signals from the SAA5230 and provides a Hamming o.k. signal which can be interfaced with an echo equaliser for use under poor signal conditions. Outputs from the timing chain include composite sync signals to allow pages to remain displayed in the absence of an off-air signal. The character generator provides RGB drive signals, dot and box blanking, a contrast reduction signal and a luminance output for use with a page printer.

This new generation of teletext chips gives faster access to pages, owing to simultaneous search of up to four pages, storage of up to eight pages, improved display features (non-interlaced with 12 × 10 dot matrix), and new features such as linked pages and language switching (a three-language character set is included).

Computer-controlled TV

The Mullard approach to computer-controlled TV via the bidirectional two-wire bus referred to earlier is sketched in Fig. 4. Several new i.c.s are used to enable computer control to be put into effect – the TDA8460 PAL decoder, which operates with the TDA8450 previously mentioned, the TDA8431 sync processor/timebase generator and the TDA8440 video/audio signal switch (there are also computer-controlled i.c.s in the sound channel).

The TDA8460 decoder chip is similar to the established TDA3561A but with a YUV interface to match the TDA8450 and the addition of bus control. The TDA8450/TDA8460 combination forms a complete, alignment-free

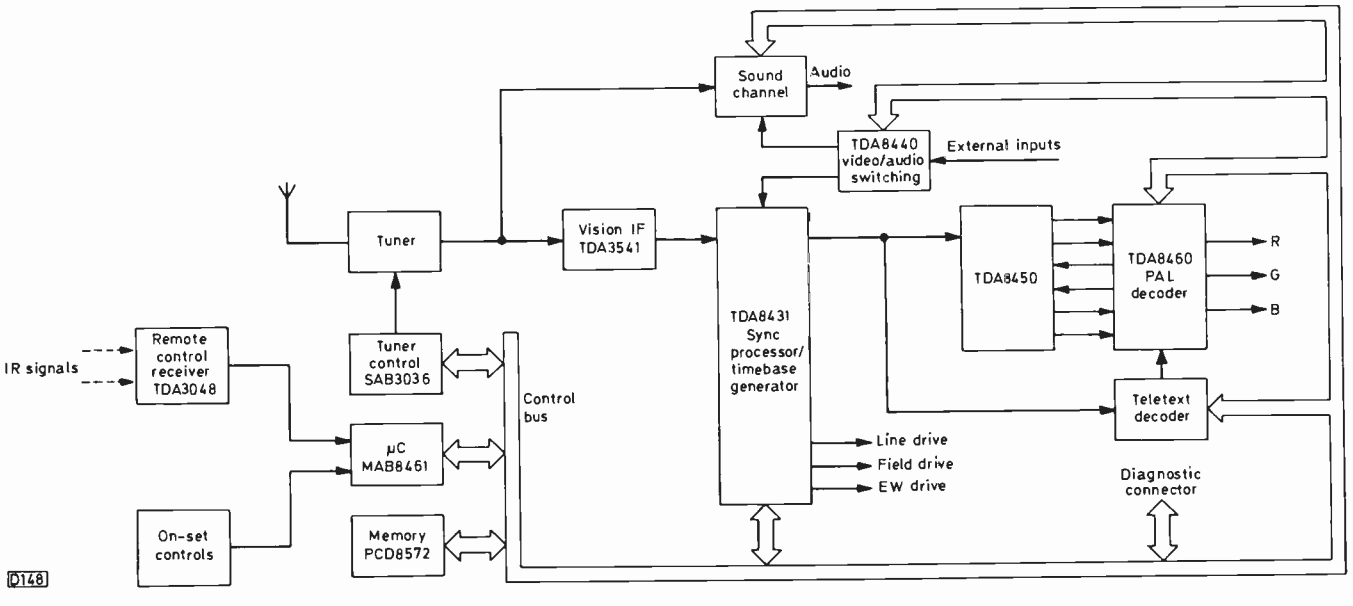


Fig. 4: Computer-controlled TV via a two-wire bidirectional bus.

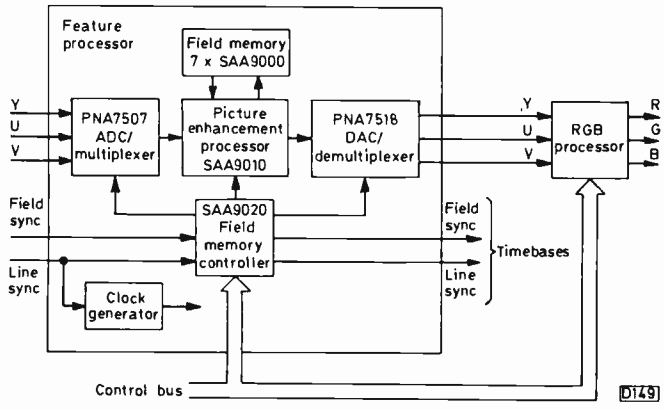


Fig. 5: Feature processing with a field store memory.

PAL decoder without any wound components and with a minimum of peripheral components: the subcarrier oscillator is self-adjusting.

Digital Timebase Control

The TDA8431 sync processor/timebase generator i.c. performs all the functions carried out by the well-known TDA2579. Additional computer-controlled functions are: switching between internal and external composite video sources, automatic control of the line oscillator, and automatic adjustment of the raster size, position and geometry. The voltage-controlled line oscillator is set up under the control of a production line computer via the bus line and a DA converter. As the DAC's output voltage is incremented, the oscillator frequency falls until it coincides with the signal frequency. At this point a "centre" bit is generated and is read via the bus: the production line computer then stops incrementing the DAC and the digital value required is stored in the set's non-volatile memory.

The line oscillator's output is passed through a divider to obtain an accurate field frequency input for the field waveform generator. This circuit generates four basic waveforms which are used to produce drive signals for the field output stage and for raster geometry correction. The waveforms are produced by multipliers so that there are no integrator time-constants. As a result, the waveforms are frequency independent and bounce free. These waveforms are fed to multipliers and adders in the field and EW correction drive circuits where they are mixed under the control of the bus-line data. Raster amplitude, linearity and shift can be independently set via an optical sensor on the screen and the production line computer. The correct digital values for scan and dynamic amplitude correction can be stored directly in the set's non-volatile memory. Picture width (static and dynamic), parabola, trapezium and corner correction can be independently set via the bus line and the sensor system.

Sound Channels

There are several i.c.s for use in the sound section of a TV set. These provide stereo/dual-channel sound and computer-controlled operation. One problem here is that no dual-channel sound transmission standard has yet been agreed upon for UK use. Interesting i.c.s for the sound channel include the TDA2556, a quasi-split sound i.f. channel with intercarrier mixer and dual f.m. demodulator, and the TDA8405 computer-controlled stereo/dual-sound decoder. The computer-controlled TDA8420 is not dependent on the TV standard being used: it incorporates an internal/external audio source selector, mode selector (mono/stereo/dual-channel A/ dual-channel B), spatial/pseudo stereo sound facilities and stereo volume and tone controls. It also has a separately controlled channel for connection to headphones.

Field Store

The incorporation of a field store in a TV receiver opens up all sorts of possibilities – teletext page storage, picture noise suppression without having to limit the bandwidth (the noise may be due to a weak aerial signal or a poor quality VCR output), reduced cross-colour interference and picture freeze under remote control via the bus line. All these can be achieved by Mullard's "feature processor" arrangement (see Fig. 5). It will also eventually be possible to reduce flicker and incorporate zoom and picture-in-picture with this system.

The Mullard field store consists of seven SAA9000 CCD memory chips with a capacity of over 2·2Mbits. The cell size per bit with this type of memory is only a third of that of a conventional memory (RAM). In addition its serial nature (no addressing required), high speed (20·25MHz clock) and on-chip logic minimise the number of data lines and peripheral components required.

Feature Processor

Several chips have been developed for use in conjunction with the field store in the Mullard feature processor. Since the system operates digitally, AD and DA converter multiplexers/demultiplexers are required at the input and output – the PNA7507 and PNA7518 respectively. The SAA9010 picture enhancement processor incorporates noise reduction algorithms together with a movement detector and cross-colour reduction circuitry. The SAA9020 field memory controller adjusts the timing of the line and field sync pulses: it also controls the delay of data from the field memory (previous field information).

If teletext data from an SAA5230 video processor i.c. is to be stored in the field memory before application to an SAA5240 teletext decoder i.c. two further i.c.s must be incorporated in the feature processor, an SAA9030 background memory controller and an SAA9040 computer-controlled teletext extension i.c. – these two i.c.s could be used with up to fourteen CCD memory i.c.s as a teletext page store independent of any feature processing.

In Conclusion

In conclusion, the introduction of computer control and alignment of TV sets brings several important advantages. Manufacturing costs can be reduced since the time taken to produce a set is decreased while the process becomes less labour intensive – this also means that the likelihood of human errors is minimised. Furthermore the much simplified peripheral circuitry and monitoring of alignment throughout a set's life should increase reliability and reduce the need for servicing. The latter should be simplified by the fact that a diagnostic tester can be connected to the bus line.

In addition to the devices mentioned in the above notes there are others for SECAM and NTSC signal processing and for handling various sound signal transmission systems used in Europe and N. America.

Some G11 Problems

Ivan C. Tucker

There have been several articles in these pages on the Philips/Pye G11 chassis: this present contribution describes some problems that have come my way recently.

The first started with a call from a very pleasant gentleman who said that his set had a very wavy picture. As I was a bit pressed for time I took him a loan set and brought the G11 back to the workshop. When I switched it on the next day there was a picture with an hour-glass appearance: not the usual convex curved sides we get with EW correction faults but a sharp Ving in at the sides and a hum bar that moved slowly downwards. The h.t. was high at some 166V instead of 153V.

My first move was to check the 470μF h.t. reservoir capacitor C4029 which was of the notorious red variety. I changed it for a pretty green one – the old one's pins had obviously been arcing and sparking at the rivets, and we all know the problems that this causes. When I switched on again the picture remained the same, so I checked the conditions around the BD201 series transistor (see Fig. 1) in the active smoothing circuit. Its collector and emitter voltages were roughly the same, at about 166V, which meant that the circuit was inoperative. I suspected that either the BD201 or its BCX32 base bias transistor was short-circuit: wrong again, cold checks showed that they were in order. I changed them anyway, in case they were breaking down under load. The hour-glass picture was still there when the set was again switched on, so in desperation I changed the 10μF electrolytic (C4034) that smooths the voltage at the base of the BCX32, not really suspecting that it was the culprit. Sure enough, back came the hour glass.

All the resistors in the circuit were found to be well within tolerance so I turned my attention to the 27V zener diode D4021. It didn't appear to be leaky when cold checked, but you know how sensitive these devices can be. So I thought I'd change it and – bingo!, a perfectly shaped picture appeared with the voltages back to normal. On went the back cover and the set was returned to a thankful customer who remarked "that's great, we've been watching the wavy picture for months". It's amazing what some people with put up with, and I hate to think of the other problems that might be lurking in the set after operating for all those months with a high h.t. voltage.

The next G11 caused much head scratching and turned out to be a very expensive repair. My customer reported that the picture had collapsed to a horizontal white line and then gone off. The set was dead when I arrived: resistance checks revealed that the mains fuses were intact while the h.t. fuse F4037 was open-circuit – the h.t. voltage on the supply side of the fuse was slightly high and steady at 159V, which is fairly normal with an unloaded supply. A check on the BU208A line output transistor showed that this was short-circuit, so a replacement was fitted. I then checked over the line output panel for the usual dry-joints and, not forgetting the customer's original complaint, checked the TDA2600 field timebase i.c. on the timebase panel. This was short-circuit internally and the l.t. supply fuse F3143 on the line output panel was open-circuit.

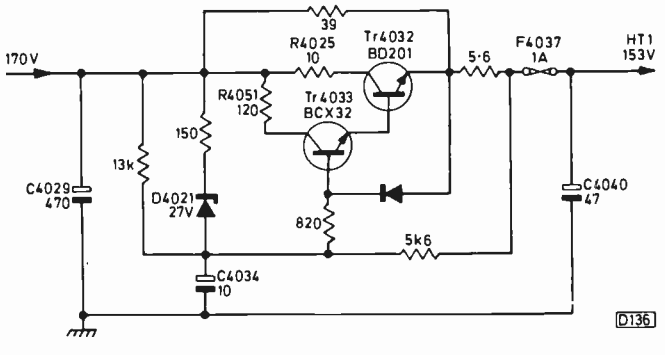


Fig. 1: The active h.t. filter circuit used in the G11.

After replacing the fuse and the i.c. I switched on, to be greeted with violent arcing and spluttering from the pins of the h.t. reservoir capacitor. Yes, another red one. Silly me, why hadn't I noticed? I replaced it with one of the recommended type and switched on again. To my dismay, this time the power supply started cycling on and off. As this is usually due to faults in the beam limiter circuit or a heavy beam current I decided to disconnect the e.h.t. cap. The power supply then functioned normally, with the e.h.t. only slightly high, which was to be expected as it was not loaded.

I then noticed that the c.r.t. heaters were not alight. The heater supply fuse F3155 was intact and there was a heater supply at the c.r.t.'s pins on the base panel. It seemed that the c.r.t. itself was defective so I applied my trusty B and K analyser to its task. When the tester was switched on only one gun lit up (not over brightly) then slowly died away. There was no indication of a heater-cathode short on the tester but a resistance test on the heaters revealed that these were now open-circuit.

A new c.r.t. was quickly fitted – it's quite a simple task with these sets – and after setting up the convergence etc. the set behaved very well with normal beam current. On examining the old tube I discovered that internal arcing just under the retaining collar on the scan coils had punched a star shaped hole through the glass neck, as a result of which the tube was down to air. I subsequently learnt from tube rebuilders that they receive a fair number of these tubes in this condition, which coincides with arcing at the pins of the h.t. reservoir capacitor. So it's as well to replace this item as a matter of course if of the suspect type.

These violent fluctuations in the power supply had created destructively high pulses in the line output stage (hence the demise of the BU208A and the TDA2600) and then broken down the c.r.t. insulation – a very costly chain reaction. Fortunately the line output transformer survived. Or will it fail before long? – I always was a pessimist.

Another set had a slight hum bar on the picture, again with the voltages at the collector and emitter of the BD201 in the active filter circuit equal and the h.t. high at 160V. This time R4051 had burnt and gone open-circuit, in turn due to the 5W wirewound resistor R4025 having gone open-circuit.

Field jitter or intermittent fold-up at the bottom of the picture can be caused by poor contacts on the TDA2600 i.c.'s holder. Cleaning may help, but the best course is to change the holder – don't forget to clean the i.c.'s pins carefully. I suspect that many a good i.c. has been discarded because the holder is faulty – and these i.c.s are expensive.

Until another day then here's wishing you successful fault-finding!

The Lid off Microcomputers

Part 2

Mike Phelan

This month we'll consider in a little more detail what goes on inside the microprocessor i.c. used as the central processing unit in a microcomputer. As we've seen, the microprocessor can do no more than fetch a series of instructions from a block of memory together with any data to be operated on (these are termed the operate codes and operands respectively) and carry out the required operations. The microprocessor decodes the op code and will know how many of the following bytes, if any, are operands, and increments the programme counter by one each time a byte is fetched – it can, therefore, decide when the next byte is an op code. To initiate all this we need a series of bytes resident in a block of memory and to feed the lowest address (base address) of the block into the microprocessor's programme counter. These tasks can be built into the hardware or performed by the user – see later.

Microprocessor Architecture

Fig. 1 shows the internal structure (architecture) of a microprocessor in as much detail as we need to know it – a circuit diagram with tens of thousands of transistors would not be of much help! We'll take the 6502 microprocessor as our example – most of our discussion will centre around this device as the writer is more familiar with it than with others.

Registers

To recap, a register is something that can store eight bits (one byte), i.e. any number from 0 to 255 or, in hexadecimal, from 0 to FF. It's much easier to work in hex, splitting each byte into two groups of four bits – each can then be represented by one hex digit. Imagine that the registers consist of eight bistables each. Eight such registers are shown in Fig. 1 – though one of them seems to have nine bits!

Starting at the bottom, we have an instruction register (IR). This is for the microprocessor's internal use only and receives the next byte from the data bus if this is an op code. It's then decoded by the instruction decoder which organises what happens next – how many bytes to fetch and what to do with them, the latter being the actual execution of the op code. If the instruction decoder receives an invalid op code the system will probably "crash" and nothing more will happen until reset occurs.

Registers PCH and PCL form the programme counter – sixteen bits as it has to be able to contain addresses from 0 to 65,535 (#FFFF) to address 64K of memory. PCH and PCL can be read from or written into via the data bus.

Accumulator and ALU

The accumulator register A works in conjunction with the contraption marked ALU (arithmetic/logic unit). All additions and subtractions – the only calculations that can be done by the microprocessor – are carried out here: one of the quantities usually comes from the accumulator, the other from the data bus. The result of the calculation goes back into the accumulator. Certain instructions are to tell the microprocessor to jump forward or back several addresses: this is the reason for PCH and PCL being connected to the ALU.

Status Register

The processor status register PSR is exceptional in that the different bits of the byte it contains have no connection with each other – they represent different "flags" that are set if conditions occur such as the result of an operation being negative or zero, or that a carry has occurred – the bits are not all used. Some of the instructions in the set that cause forward or backward jumps do this if a certain flag in the PSR is set to 1 or 0. For example, an instruction which we call BNE (branch if not equal to zero) will branch if the Z (zero) flag is not set (0) by the result of the previous operation. The op code for BNE (#D0) will be followed by one byte of operand, this being the number of addresses to jump. The programme counter has its contents changed by this amount, the calculation being performed by the ALU. Conversely if the Z bit is set (1), the programme counter will be incremented by one and the next op code will be fetched.

Working Registers

Registers X and Y at the top are working registers that can be used to park bytes. More importantly, they can be used as index registers. This means that the contents can be added to say an address to fetch data from the accumulator. As there are also instructions to increment or decrement X and Y by one this facility can be used to read data from a "table" somewhere in memory.

Stacking

The remaining register, the stack pointer (S), has nine bits, though the extra bit is permanently set to 1. We had better first explain what a stack is.

During complex calculations it's often necessary to park bytes somewhere. We could admittedly use any area of memory for this purpose, but it's useful if the program doesn't have to keep track of the addresses. We can put bytes on the stack and take them off in reverse order. Some microprocessors have their own internal stack, which of course is limited in size. The 6502 uses a page of memory (255 bytes). Here we hit a snag, as unless we use page zero (0-FF) more than one byte is needed for the address. For speed, page zero is reserved for special instructions that have operands of only one byte, so this cannot be used. The 6502 gets around the problem rather neatly by using page one (#100-#1FF). The S register contains the address of the top of the stack, the ninth bit always being one – this goes on the ninth bit of the address bus. There are instructions to put the contents of the accumulator on the stack and vice versa.

Another important use of the stack is to save the contents of all the registers prior to an interrupt, so that the microprocessor can carry on where it left off. Also,

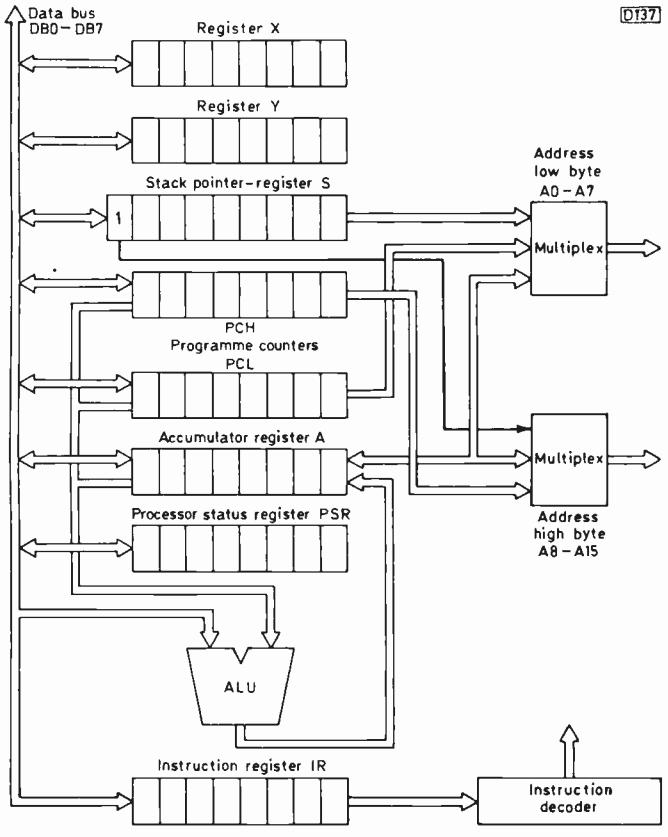


Fig. 1: Microprocessor architecture – the internal arrangements used in the 6502.

there are certain instructions that cause a jump to a segment of program somewhere: this will be executed and the main program resumed where the microprocessor left off. We must clearly save the content of the program counter on the stack so that we can go back to the next address – this is rather like putting a bookmark in a book before we look at the end to see whodunnit! Some sort of stack is obviously essential then.

Summary of Microprocessor Operation

To summarize, the microprocessor i.c. fetches data from the addresses held in the program counter registers, attempts to decode it, next fetches any operands, executes the decoded instruction using the operand(s) if required and present, increments the program counter and then repeats the cycle of fetch, decode and execute. For those who still think that fetching a byte from RAM has something to do with obtaining a meal from an Indian takeaway, we are working on a future series to be called "servicing the abacus" . . .

What we have up to now is a machine that will carry out instructions provided we've put them there in the first place. Provision has to be made for doing this. All those nice new micros we see in the shops or play with at home say things like "BLOGGS BASIC V2:0" on the screen when we switch on. What's called for is an "operating system". At this point we must digress slightly on to the subject of computer languages.

Computer Languages

We have talked about the microcomputer carrying out a program stored in memory as a series of eight-bit binary words, each of which the microprocessor decodes as one of a set of fifty or so instructions it can follow. This is the lowest level of computer language, "machine code" – direct microprocessor instructions that do not take up any memory space apart from that needed to store the op codes and operands. On the debit side this approach requires many steps to carry out a simple process. It's very fast however.

For the average home user a method of programming that's much easier is required – a "high-level" language. The one most used is Basic. One of the features of a high-level language is that it's relatively easy to look at a program and ascertain what it does. For example, a Basic command "PRINT 1+3+4" will display 8 on the screen. Home computers usually have Basic as a resident language, i.e. it's in the ROM (see Fig. 1 last month).

Basic is what's known as an interpreted language, which means that the ROM contains an interpreter. The Basic commands that are keyed in or that come from an external program are interpreted as a machine code routine which is carried out to produce the required result. It takes time and memory space, but this is the price we pay for user convenience. Basic also contains commands to place bytes in RAM locations and to run a machine code program from this, i.e. the base address is loaded into the program counter.

Conditions at Switch on

So far so good. But when the machine is powered the program counter will contain zeros after the reset, the RAM could contain anything, the microprocessor will fetch whatever is in address 0 in the RAM, attempt to decode it, and will then crash! So maybe we should put something in address 0 at switch on. But we need a working microcomputer to do this. Back to the operating system. Still with the 6502, remember that page 0 of a memory is part of the RAM, so we cannot start with any known values in address 0 onwards. We need something in the ROM to get the thing off the ground, but the ROM addresses are above page 0, also above page 1 (the stack). In fact the top 16K or so of the memory map is generally used – #C000 to #FFFF, assuming a 48K RAM (0 to #BFFF).

What's needed then is some way of getting a ROM address into the program counter at switch on. The method used is to employ an interrupt. There are two types of interrupt with the 6502: suffice it to say that they are called IRQ and NMI. IRQ can be used for such things as keyboard scanning but NMI is much more powerful – it overrides *everything* else. What an NMI interrupt does is to jump to an address stored in the ROM at #FFFA and #FFFB and carry out the routine found at this address. It's a bit like going on a service call and finding a note on the door saying "go to number FFFA and you'll find a note telling you where the key is". So if an NMI is carried out at switch on, following reset – this is done by applying a reset pulse to the interrupt line – the system will start from whatever the manufacturer has put into the ROM at address #FFFA and #FFFB. This routine carries out several "housekeeping" jobs – emptying the RAM (more often filling it with bytes of #55 – binary 01010101), clearing the screen and printing the welcome message.

Next Month

Next month how all this relates to the microcomputer i.c.s used in VCRs etc. and a closer look into a state-of-the-art machine, the Amstrad CPC464.

Long-distance Television

Roger Bunney

Another quiet month with very little by way of long-distance TV signal propagation. The only rays of light in the prevailing gloom were two tropospheric openings, though these were only fair. They occurred on February 15th and, for a longer period, around the 23rd-24th. The earlier opening produced signals mainly on an east-west path, giving excellent reception from Benelux and France at u.h.f. and in Band III. Here in central Hampshire W. German signals didn't quite make it, though reception was reported in Kent. The opening on the 23rd-24th, with prevailing thick fog, was more active with widespread reception of signals from distant UK stations, Benelux, France and, for those more fortunately located, W. Germany, though it must again be said that the opening was hardly fantastic. Canal Plus is being increasingly received – more on this later. Reg Roper at Torpoint, Cornwall received excellent, noise-free signals from RTE-1 Dublin on channel IH. Dave Shirley (Hastings) reported an unusual tropospheric logging on February 4th – a negative-going TF1 (French) signal on roughly ch. E46/47, seemingly not the result of overloading and from the east. Could this be a French forces' transmitter? Any ideas?

Sporadic E reception during February was minimal. My log is as follows:

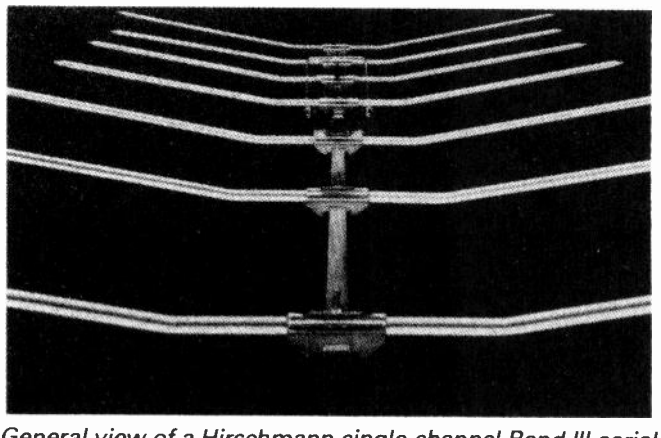
12/2/85 TSS (USSR) ch. R2; unidentified programmes on chs. E2/R1.
21/2/85 TSS R1; CST (Czechoslovakia) R1; TVE (Spain) E4.
26/2/85 Unidentified signals from Scandinavia and the south at 1245.

Simon Hamer (Powys) received the RETMA test pattern on the 18th, thought to be from Czechoslovakia (ch. R2). This is a rare catch in these days of electronic pattern generation. The RETMA card was common in the early sixties, mainly from MTV (Hungary) and TVP (Poland).

Solar activity has remained relatively quiet, though slight Auroral activity was noted in Scotland on February 27th, at 2200.

In all then another rather depressing month. My thanks to Simon Hamer, Tony Privett (Basingstoke), Iain Menzies (Aberdeen), Dave Shirley and Reg Roper for supplementing my own meagre loggings.

Simon Hamer took to the hills with his Hitachi K2300 receiver and a u.h.f. log-periodic aerial and extended his range of reception considerably – from the Borders down to the south coast, even in mediocre conditions. ATV has also been quiet, though Dave Shirley logged G4CRJ (High Wycombe) on the 4th, with quality P4, using domestic bowties and preamplifiers.



General view of a Hirschmann single-channel Band III aerial array with forward-angled elements.

News Briefs

Tele-Monte-Carlo is now available from TDF operated transmitters at Marseilles and Toulon, more than doubling its coverage . . . A private satellite broadcasting company, Japan Satellite Broadcasting Inc., is to be established to operate the BS-3 service that's due to start in 1989 . . . Burundi is investigating the possibility of starting a TV network . . . A new S. African network, channel TV4, was due to start this February, using TV2/3 transmission facilities initially . . . Zaire plans to extend its TV service with up to 45 transmitters throughout the country.

The 500W ch. E48 Brussels relay closed last November. New EBU listing: Bonn WDR-1 ch. E43, 100kW e.r.p. with horizontal polarisation.

Canal Plus

Following the recent announcement by the French government that private, local commercial TV stations are to be allowed, Canal Plus subscriptions have fallen considerably. As a result, a further three hours of unscrambled "prime time" programming is planned – provided commercial backing can be found.

Band I Canal Plus channel allocations (previously chs. B, C' and C) are now as follows: ch. F2 55·75MHz, F3 60·5MHz, F4 63·75MHz. The sound carrier is spaced 6·5MHz below the vision carrier. The Band III allocations (previously numbered 1-6) are now: ch. F5 176MHz, F6 184MHz, F7 192MHz, F8 200MHz, F9 208MHz, F10 216 MHz. In Band III the sound carrier is spaced 6·5MHz above the vision carrier.

No Band I transmitters are in operation so far. The main transmitters now on air are Paris (Eiffel) ch. F6, Lille F5, Marseille F5, Lyon F10. Rather than list all the other known allocations, if any reader wants details I can provide a list on receipt of a stamped foolscap SAE and a 13p stamp (to cover the cost of photocopying). For another 13p stamp I can supply a list of the W. German ZDF transmitters with stereo sound.

The 50MHz Amateur Band

Twenty five Norwegian amateurs have been given permission to operate experimentally in the band 50-54MHz, with a maximum of 25W e.r.p. from a dipole and using all modes – as for the 144MHz allocation. An application for 24-hour use of the experimental UK 50-52MHz allocation has been turned down – the RSGB says that no extension of the present permitted operating hours is likely in the foreseeable future. Only the UK and Norway (in Europe) have allowed amateur operation in this band, which is still in use for TV broadcasting in most of W./E. Europe. No complaints of interference from amateurs have to date been received by the DTI in the UK, but the DTI has suggested that the experiment will be terminated if such a report is received.

A 50MHz beacon has been proposed for siting on

Mount Eagle near the Rosemarkie transmitter, with call sign GB3RMK. The site makes it an ideal pointer for Auroral conditions. During a recent tropospheric opening I received the RSGB's Potters Bar 50·5MHz beacon here in Romsey, though it was very weak.

In view of the impact that 50MHz amateur operation could have on Band I TV-DXing I'll be keeping an eye on this subject.

From our Correspondents

Nick Harrold reports that despite a snow covering of more than one inch over about half the area of his 12GHz TVRO dish during recent weather conditions there was no noticeable loss of picture quality. Robin Crossley has for sale a 1·9m dish, 100°K LNA, downconverter and receiver – in fact a complete working 4GHz station – for around £425. If any DXer is interested – Robin hopes to sell the equipment as a package – write in with an SAE and letters will be forwarded.

Peter Simpson has started DXing in Folkestone. His equipment includes an omnidirectional Band I aerial, a four-element Band III array and a Wolsey Colour King for u.h.f., the receivers being a modified Rediffusion Mk. 13 monochrome set and a Philips G8 with switchable 5·5/6MHz sound. The Belgian BRT-1 and -2 programmes are received in colour all the time and French Band III/u.h.f. signals come in at colossal strengths. Unfortunately overloading is experienced as Peter lives just two miles from the main Dover u.h.f. transmitter (group C).

Robert Copeman (near Melbourne, Australia) reports that the ch. 0 outlets at present used for the Ethnic TV services will be closed down next January. This will clear much of the v.h.f. spectrum for DXing!

Reg Roper has been thinking of using a small Yagi with the elements bent in the form of a shallow V, the point of the V being away from the transmitter. He mentions that old US arrays were often manufactured like this and that he's been using a two-element Band I array of this type in his loft for some years, with much success. I recall a firm that traded as C Aerials and produced Band III aerials of this type with a strange form of loop dipole at the rear. It's interesting that the W. German Hirschmann company still manufacture up-market arrays with the elements slanted forwards. This tends to narrow the forward acceptance beamwidth and results in a cleaner polar response. A relatively high front-to-back ratio and high gain is claimed: for example a ten-element, single-channel array is quoted as having a gain of 13dBd, a front-back ratio of typically 30dB and a horizontal −3dB beamwidth of around 38°.

Blue Eagle TV

Detailed information on the airborne Blue Eagle transmissions during the Vietnam War was included in this column last month. I've since heard from Noah

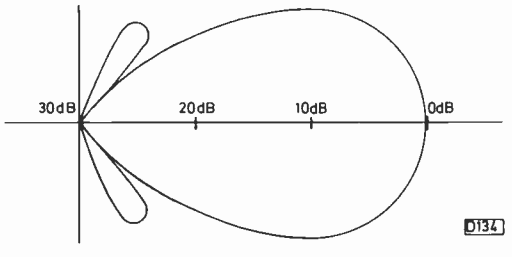


Fig. 1: Polar response of the single-channel, ten-element Hirschmann 313AN (ch. E7) angled-element array.

Hutchison who now works at a NY State USAAF base and was posted at the Blue Eagle base during the late sixties. He recalls that the TV sets used were mainly standard US household types and that telescoping "rabbit ear" indoor aerials were generally used. Reception was fair to good depending on the position of the plane. He remembers only English language programmes and mentions that GIs felt the service improved morale considerably.

Danish Local TV

A local TV service is being set up in Denmark using 200W e.r.p. u.h.f. transmitters. The associated STLs (studio-transmitter links) also operate at u.h.f., with some 50W (directional). Alexander Wiese has provided the following transmitter list:

Transmitter	*Channel*	*STL*	*Name*
Aalborg	E54	E38	TV Aalborg
Aarhus	E54	E36	Kanal A
Horsens	E52	–	HDH-TV
Kobenhavn-1	E53	E38	Kanal 2, KKR or Weekend TV
Kobenhavn-2	E56	E38	Kanal 2, KKR or Weekend TV
Kobenhavn-3	E25	–	Vestegnes Lokal TV
Odense	E53	E28, E36	Kanal Fynn
Skjern	E54	–	–
Svendborg	E52	E36	TV-Svendborg
Bornholm Island-Renne	E59	E56	TV-Bornholm

There are test transmissions during the daytime, generally with the FUBK pattern or a variant of this, also studio identification slides. Approximate programme timings are 1800-2100 weekdays plus possibly afternoon transmissions at the weekends.

Falklands TV

The British Forces Broadcasting Service is at present working on a project to bring TV to the Mount Pleasant airfield complex some 28 miles south west of Port Stanley. Completion is due next spring: the programmes will consist of BBC and IBA material played out locally on high-band U-matic machines. An omnidirectional aerial will provide an e.r.p. of between 500W and 1kW giving a coverage of five-six miles radius. Extending the coverage to Port Stanley would involve additional linking and relay equipment – Sapper Hill at 160m a.s.l. provides screening behind Port Stanley. The BFBS already operates a v.h.f. radio service covering the Falkland Islands and providing programmes for 16 hours daily. This supplements a limited MW/SW service from Port Stanley.

4GHz Satellite DX-TV

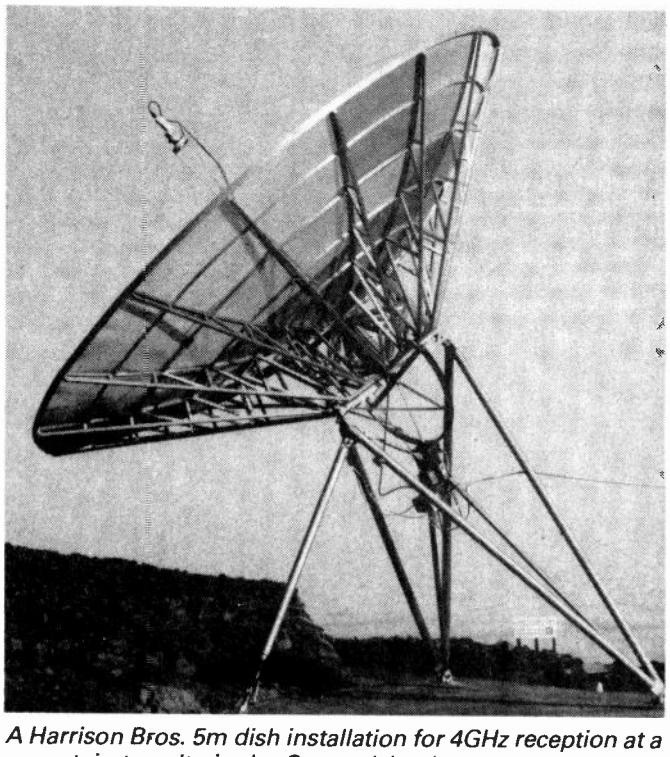
Is 4GHz satellite TV reception a worthwhile extension of our DX-TV activities in the UK? I've been giving thought recently to the signal sources and financial aspects of this. With terrestrial TV it's a question of what may or may not come over the radio horizon, whereas with satellite TV if you can see it you can receive it.

Gorizont at 14°W provides excellent reception of the Russian Programme-1 on a dish as small as 90cm via its 46dBW, 3·67GHz spot beam. Apart from this, 4GHz reception in Europe calls for a dish of 1·9m minimum, preferably 2·5m, and a 100°K LNA to get even DX-TV quality pictures. With this equipment acceptable signals could be resolved with e.i.r.p.s. down to 30dBW, but for really exotic signals such as Libya, Oman, Nigeria, Sudan etc. where the e.i.r.p.s. are much lower dishes of 3m or more would be required.

Thus apart from Gorizont, reception calls for considerable financial outlay. A one-channel Gorizont TVRO terminal can be purchased for under £800, whereas a 1·9m dish and receiving package from Harrison Bros, with 120°K LNA, costs £945 plus VAT and anything extra required to take into account exchange rate variations. This package allows some freedom in tuning to other satellites, though the quality would be somewhat noisy even with reduced receiver bandwidth.

A further complication for most of us with limited garden space is the physical size and visual impact of the aerial. Planning authorities do not take kindly to six foot dishes and may well object to a dish mounted on a permanent foundation – suffice it to say that my own local authority wrote to query a 1·9m dish propped against a fence in my garden and advised that planning permission would have to be sought should I intend to erect it! In theory a 4GHz TVRO installation requires DTI permission in the form of a development licence, which is provided only for test and development by manufacturers of receiving equipment.

Though 4GHz TVRO terminals are in common use in N. America, Europe has opted to use the 11/12GHz band for DBS purposes. With high-level 4GHz signals available only from Gorizont, budget-priced US TVRO systems have not appeared in the UK in any quantity. I'm forced to the conclusion therefore that we must dismiss thought of 4GHz DX-TV activity and concentrate on the 11/12GHz band. Here again however prices are high with present small-quantity production – far too high for most enthusiasts – though Hugh Cocks is at present providing in these pages details of a modestly priced 11GHz system (down converter February, LNA to follow). Doubtless inexpensive 12GHz equipment will be with us before long, meanwhile has anyone thought of converting a Radiospares Doppler Microwave Module (RS8960) for receiving use? It operates at 10·69GHz . . .



A Harrison Bros. 5m dish installation for 4GHz reception at a mountain top site in the Canary Islands.

Service Bureau

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

HITACHI NP8CQ CHASSIS

There's a strange colour fault on this set (GEC C2055H) – the three colour outputs from the decoder have to be rearranged at the flyleads to produce a correctly coloured picture. The decoder chip has been replaced and the output transistors checked. All voltages in these areas are correct. I suspect that the shadowmask has moved or warped, but the picture is only slightly impure at the sides.

Go through the purity setting adjustment procedure carefully. If you cannot get a correct magenta field (work in red if it's easier) there's little doubt that the tube is faulty. If acceptable purity can be obtained "wrong beam" as it were it might be best to settle for this and save the cost of a new tube – at least until the mask slips farther.

THORN 1612 CHASSIS

The original fault with this monochrome portable was field collapse. This was cured by replacing the TBA641 field output i.c. The problem now is intermittent field slip with line pulling and bent verticals.

It's essential to check with an oscilloscope at pin 9 of the sync/timebase generator i.c. to see whether the sync pulses here are crushed when the fault is present. If not, the bias resistor at this pin (R75 220kΩ) and the i.c. itself (SN76544N-07) are suspect. If the sync pulses are crushed, first check the TCA270Q video demodulator/a.g.c. chip and zener diode W1 which stabilises its supply. If necessary go on to check the voltages around the i.f. amplifier transistors VT1, VT2 and VT3. Incorrect voltages here could be due to failure of one of the 0·01μF emitter decouplers C14, C24 or C34 or the 100μF electrolytic C23. The latter is the a.g.c. smoothing capacitor and should have 2V across it.

FINLUX PEACOCK

Have you any details as to how to disable the colour-killer on this set?

You will find a grey link wire connected to R24 on the chrominance module. To override the colour-killer, disconnect this from its pin and plug it on to the adjacent pin.

GRUNDIG 2 × 4 SUPER

On playback of any tape the picture starts in monochrome. Poor colour appears after about twenty minutes – with greenish faces and slight rainbow effects. After a further quarter of an hour there's a perfect colour picture.

Check the voltage at pin 11 of IC610 with the chroma off (fault condition). If the reading is 1V or less, the killer is in operation because the a.p.c. loop is not locked or no signal is reaching the burst gate. Check the two crystals, IC610, IC509 and the associated components with a freezer and hairdryer. If the killer voltage is 1V or more the fault must lie in the signal circuit – T649 onwards. Voltage checks should track it down.

SOVEREIGN SR17

Both the field output transistors Q503/4 in this Korean made 17in. monochrome set have gone short-circuit. Q503 is type KSD401 or KSD298-0·Y and Q504 type KSA614-0·Y. Unfortunately no one seems to be able to supply them or suggest alternatives. Any ideas?

These are obscure devices indeed! We've discovered however that they are 4A silicon transistors with a dissipation of 40W and a gain of 75. It should be possible to use a TIP31 in the Q503 position and a TIP32 in the Q504 position. Be careful to get the connections right.

HITACHI CBP260 (NP9A CHASSIS)

When first switched on the set goes to standby and cannot be turned on with the remote control unit. If the set is switched off and on several times it will come on and remain on. After it comes on, if it's switched off for a short time (less than five minutes) then on again it comes on: if it's left off for any longer you have to go through the on/off switching routine. We have two of these sets with the same fault.

There are several common causes of this symptom. Start by removing the chopper transformer T901: clean and tin all its pins then replace it. If necessary remove the solder from the pins of the line output transformer T703, treat them with flux and resolder. Next replace the h.t. error sensing module CP901 (HM9105) and check its jointing, along with that of the associated resistor R910. Finally make sure that the "ever 18V" line (at C984) is correct.

SONY/FIDELITY VCR/TV COMBINATION

On playback there's a continuous background hum on sound. This is not present when the TV set (CTV14R) is used for off-air reception, either on its own or via the VCR. The hum is not noticeable when there's background music or noise that masks it and varies with the volume control setting. The problem does not arise when the VCR (SLC30) is used with another set. Apart from the hum the sound is clear with no distortion.

It could be that the Fidelity TV set is being overloaded by the output from the VCR, in which case a 6dB coaxial attenuator in the set's aerial lead will probably cure the problem. If not the things to check are (a) the setting of the playback *video* level in the VCR and (b) the adjustment of the TV set's sound detector coil L10 – only a very slight adjustment to this should be necessary.

PHILIPS T-VETTE 11TG190AT

The DY51 e.h.t. rectifier and its base are both broken but these items are difficult to obtain. Would it be possible to use a silicon e.h.t. rectifier and if so which type should be used?

There is no reason why a stick rectifier of the type used in the ITT VC300 chassis or Thorn portables shouldn't be used. Discard the heater winding and connect the anode to the line output transformer's overwinding, cathode to the c.r.t. cap, ensuring that the soldered connections are smooth and well-rounded and that the stick has at least 3cm clearance to adjacent wiring or metalwork.

TELEFUNKEN 711 CHASSIS

When the set is switched on there's neither sound or vision, just snow and a loud hiss, as though the aerial was disconnected. The channel selector (touch control) is locked to the number one indicator.

Start by dismantling the touch-control unit and thoroughly cleaning the contacts – leakage here can cause the problem. If the fault persists, check R1001 (8·2MΩ) which is in series with selector one by substitution, then the two selector i.c.s (SAS560 and SAS570). R1101 (6·8MΩ) in the selector one circuit is also worth a check.

SANYO VTC5000

Playback is o.k. but on record there's an intermittent fault that can sometimes be present for anything up to a week. It consists of a constant variation of the speed of both the drum and the capstan motors and occurs only when the machine is tuned to ITV, the other channels not being affected. The machine will work satisfactorily on ITV if the colour is tuned out.

This machine suffers from a slight shortcoming in its sync separator circuit as a result of which the field sync pulses, from which the control track pulses are derived, get distorted. Sanyo supply a tiny panel ("noise-masking kit") which can be added to solve the problem.

PHILIPS TX2 CHASSIS

The problem is no signals, just a rushing noise on sound and a screen full of snow.

The trouble is either in the U321 tuner or the 33V regulator alongside (IC155). If the latter produces 33V and this voltage reaches the tuner, try scratching the tuner's i.f. output pin. A sensitive i.f. strip will give twinkles on the screen and possibly some shortwave signals on sound when this is done. If so, the tuner is faulty.

GRUNDIG 2 × 4 SUPER

On record everything works up to the programme/day and start/stop switches, from which there are no results.

If playback is o.k. and the display shows CASS when record is attempted check the record safety switch under the deck, front left – it tends to become intermittent. If the display doesn't change on pressing prog/day and/or start/stop, check the continuity of the key switches and lines to the microcomputer i.c. – the conductive paint on the "bubble pack" keyboard can go open-circuit.

RANK Z179 CHASSIS

The report that came with this set was "smoke from the back". I found that 4R38, which is in series with the emitter of the line output transistor, had burnt out – and burnt a hole in the panel – while the three nearby capacitors had partly melted. These items were replaced, along with the line output transformer, and everything seemed to be in order, with all rail voltages correct. A couple of hours later however the trip operated and the line output transistor was found to be short-circuit. After fitting a new BU208A the set worked all right apart from lack of width – full width could just be obtained at maximum adjustment. After three hours the line output transistor again went short-circuit. Any ideas?

It seems to us that the line output transistor is not being correctly driven. The most likely suspect is its 1Ω base resistor 4R29. If replacing this fails to cure the problem, replace or check the line driver transistor and the driver transformer's damping components 4C18 (0·0068μF) and 4R26 (4·3kΩ). A more remote possibility is the driver transformer itself.

THORN 3000 CHASSIS

The contrast level jumps about. Sometimes it's so low it's as if the rear control has been turned right down. Then it will flick up to an overloading level. The fault is on the video panel – established by panel substitution – but I'd like to repair the original panel.

Concentrate on the area of the post-luminance delay line amplifier transistor VT201 – this is the most likely fault area. The transistor itself is suspect, as are the coupling electrolytics C204/5 and diode W210. First however carefully examine the print in this area for dry-joints, particularly at the lead-outs from the luminance delay line L203.

GRUNDIG 5010

The initial fault was a dead set with the trip operating at switch on. On investigation the thyristors in the line output stage were found to be defective. Replacing these gave us sound but a field scan that covered only half the screen. The supply to the field output stage was found to be low while the transistors were cold. The mains fuse then blew and one of the surge limiter resistors went open-circuit. These items were replaced and a new mains bridge rectifier was fitted. There now appears to be an audible pulsating oscillation from the line output stage area of the set which is dead apart from the tube heaters being alight.

There may well be a link between the lack of field scan and the line output stage trouble since the supply for the field output stage is derived from the line output transformer. Check the relevant rectifier diode, Di627 (BY197), also the soundness of the connections to the line output and combi transformers. Di504 (1N4004) and R504 (39Ω) which are in series with the width control transductor can cause the oscillatory effect described. Another possibility is that the e.h.t. tripler is loading down the line output transformer.

PYE 697 CHASSIS WITH VCR

The problem is field roll when the set is used with a VCR. I've carried out the recommended modifications to the line sync circuit (May 1982 issue) – these give nice straight verticals but the field hold won't lock.

Check that the field sync pulse integrating capacitor C41 is 4,700pF and is not open-circuit, also the value of the contrast control which tends to go high. If necessary try decreasing the value of the sync separator's base bias resistor R33 from 4·7MΩ to 3·3MΩ.

TEST CASE

269

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

When a Sony colour set comes in with the complaint "no go" the thing to do is to check the model number and screen size! The small 13 and 14in. sets will probably not present too great a problem, the 18in. KV1810UB is bad news while the KV1820UB will usually be suffering from no more than a short-circuit efficiency diode. Sets fitted with 20in. tubes vary considerably . . .

The problem this month concerns a 20in. Model KV2000UB Mk. II whose symptom was just that – no go. Its power supply arrangements are a little different from the Mk. I version (see August 1984 *Television*), some of the relevant detail being shown in Fig. 1. The mains fuse had shattered and there was a measurable short-circuit across the 135V h.t. line. Suspecting the efficiency diode (D807 on board E – this was the later version of the Mk. II chassis) we first disconnected the red wire that goes to the anode of the line output GCS Q901 as a check. Back dropped the ohmmeter pointer! Inspection showed a burn mark on the 330pF protection capacitor C901 which is in parallel with the GCS so this was quickly replaced. Since the h.t. line resistance reading was now correct we replaced the fuse and switched on. Bang! Somewhat demoralised, we rechecked the h.t. line resistance then turned to the power supply board. The chopper transistor Q607 was short-circuit.

Taking no chances with doubtful substitutes we found and fitted the correct 2SC1670 device then carried out thorough cold checks on the other semiconductor devices on the board. Finding all well, and by now surrounded by jeering workshop staff, we switched on. This time we were rewarded by instant sound and the rustle of e.h.t. voltage build up.

No sooner had the gaggle of so-called engineers dispersed than a low and ominous squealing sound came from the bowels of the set. This lasted a few seconds. Then the set cut out, leaving the neon "on" indicator alight, the mains fuse intact and no activity in the power supply department. The set was switched off and after restoring power a few minutes later the same ten-second sequence of events occurred – normal operation, three seconds of squeal, then shut down. Why didn't we pick a simple job like editing a magazine or driving a train?

Voltage checks on the power supply panel quickly revealed that the protection circuits were operating. After shut down some 600mV was present at the base of Q603 in the trip circuit. We weren't going to disconnect it: discretion is the better part of valour! Instead we replaced the 12V zener diode D606 in the over-voltage sensing circuit. This made no difference, and the possibility that the power supply's output voltages were high was discounted by making meter and scope (for ripple) checks on the h.t. line. Perhaps the trip was coming into operation due to excess current? The sensing is done in the chopper transistor's emitter circuit (voltage across R635/6). Unlikely we decided: the total h.t. current drawn from the 135V line in the few seconds of normal operation from switch on was around 500mA, which is well within the norm for this chassis.

One further clue to aid our diagnosis was obtained. By resetting the h.t. preset control RV601 for an h.t. supply of about 95V we got the set to run continuously though with a small picture. So what was wrong? See next month!

ANSWER TO TEST CASE 268

– page 336 last month –

Our JVC HR7200 VCR last month was guilty of unprovoked and spasmodic attacks on innocent tapes. From time to time it would sweep them, during the loading phase, into its gnashing teeth – à la Jonah and The Inscrutable Whale. After some fruitless investigation of the friction on the feed spool and some liberties with the loading tension brake we turned our thoughts to the head drum itself. Its rate of acceleration during the initial stages of loading was normal – why was it picking up the tape?

Thoughts of the friction problems we've encountered with the upper drums in Toshiba machines (tape binding on fast rewind) prompted us to concentrate on the surface of the head drum periphery. Could it be that this was somehow "sticky" to pick up the tape in this way? We cleaned the surface (it looked all right) and finally polished it with a soft cloth. This greatly improved matters, but on some occasions with some makes of tape the spilling and crunching of the ribbon would still occur.

The trouble wasn't eliminated entirely until we'd fitted a gleaming new head drum. It was a sad case, because the heads themselves were in perfect order.

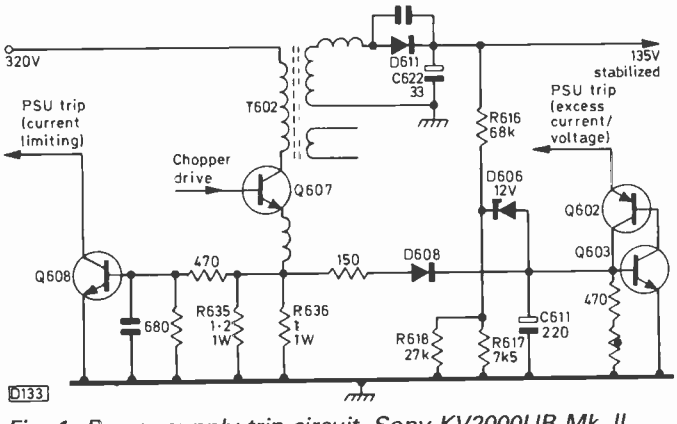


Fig. 1: Power supply trip circuit, Sony KV2000UB Mk. II.

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AA117	9p	BC337	6p	BF184	20p	BFY57	25p	TIP32A	24p	2N.1131	28p	BY296	20p	7818	35p	PCL805	55p	LA4461	180p	TBA560	100p	74LS22	24p
AA119	9p	BC338	6p	BF185	20p	BFY64	25p	TIP32C	28p	2N.1132	28p	BY298	26p	7824	35p	PFL200	85p	LA5112	120p	TBA750	100p	74LS24	47p
AAY32	9p	BC557	6p	BF194	5p	BFY90	45p	TIP33	50p	2N.1613	24p	BY299	28p	7905	35p	PL36	80p	LM301	26p	TBA800	35p	74LS26	24p
AC107	28p	BCY32	150p	BF195	5p	BLY48	85p	TIP34	50p	2N.1711	24p	BY476	90p	7912	40p	PL82	45p	LM311	35p	TBA810S	60p	74LS27	24p
AC126	17p	BCY33	150p	BF196	6p	BLY49	85p	TIP41A	22p	2N.2102	50p	BYX10	15p	7915	40p	PL83	32p	LM324	35p	TBA820	75p	74LS28	24p
AC127	15p	BCY33	150p	BF197	7p	BR100	14p	TIP41C	25p	2N.2160	300p	BYX55/350	30p	7918	40p	PL84	50p	LM325	45p	TBA920	100p	74LS30	24p
AC128	15p	BCY42	20p	BF198	7p	BR101	43p	TIP42A	22p	2N.2218A	24p	BYX55/600	30p	7924	40p	PL95	140p	LM339	40p	TBA990	100p	74LS32	24p
AC128K	23p	BCY56	16p	BF199	6p	BR103	37p	TIP42C	25p	2N.2219	24p	BYX55/800	32p	78L05	28p	PL500	110p	LM348	80p	TCA270	40p	74LS33	26p
AC141K	30p	BCY70	16p	BF200	16p	BSX20	18p	TIP47	40p	2N.2221	23p	BYX70/500	32p	78L12	28p	PL504	95p	LM380	100p	TCA800	200p	74LS37	24p
AC142K	30p	BCY71	16p	BF240	16p	BSX26	18p	TIP48	40p	2N.2222	23p	BYX70/800	38p	78L15	28p	PL508	170p	LM381	150p	TCA940	100p	74LS38	24p
AC153K	23p	BCY72	16p	BF241	10p	BSX29	19p	TIP50	60p	2N.2369	15p	BYX71/600	80p	78L18	28p	PL519	450p	LM382	130p	TDA1170	100p	74LS42	24p
AC176	18p	BD115	28p	BF255	12p	BT106	90p	TIP51	120p	2N.2484	20p	OA47	8p	78L24	28p	PY81	70p	LM387	100p	TDA1412	80p	74LS48	48p
AC176K	20p	BD124P	50p	BF256	18p	BT109	90p	TIP52	120p	2N.2646	40p	OA79	40p	79L05	40p	PY88	48p	LM709 DIL	30p	TDA2002	80p	74LS47	78p
AC187	15p	BD124	110p	BF257	18p	BT116	80p	TIP53	120p	2N.2904	20p	OA90	4p	79L12	45p	PY500A	160p	LM723	40p	TDA2003	150p	74LS48	78p
AC187K	20p	BD128	35p	BF258	18p	BT119	100p	TIP54	140p	2N.2905	20p	OA91	4p	79L15	48p	**LINEAR IC'S**		LM741 DIL	18p	TDA2020	140p	74LS51	24p
AC188	17p	BD131	28p	BF259	18p	BT120	100p	TIP105	65p	2N.2906	18p	OA200	7p	LM309K	100p	AN-214P	200p	LM741 MET	45p	TDA2030	140p	74LS54	24p
AC188K	23p	BD132	25p	BF262	25p	BU100A	110p	TIP106	65p	2N.2907	18p	OA202	7p	LM317T	180p	AN-240P	150p	LM747	58p	TDA2522	90p	74LS55	24p
AC187	48p	BD135	20p	BF263	25p	BU104	100p	TIP107	65p	2N.2926	8p	IN.914	2p	LM323K	420p	AN-360	120p	LM748	35p	TDA2530	100p	74LS73	28p
ACY19	48p	BD136	20p	BF270	18p	BU105	80p	TIP110	47p	2N.3019	28p	IN.4001	4p	LM723	32p	AN-7110	140p	LM1458	33p	TDA2532	100p	74LS74	33p
AD142	60p	BD137	20p	BF273	15p	BU108	100p	TIP111	50p	2N.3053	18p	IN.4002	4p	78HGKC	870p	AN-7114	160p	LM3900	30p	TDA2540	100p	74LS75	35p
AD149	45p	BD138	20p	BF311	21p	BU110	110p	TIP112	40p	2N.3054	35p	IN.4003	4p	78HG5KC	820p	AN-7115	180p	LM-5113L	180p	TDA2560	100p	74LS76	28p
AD161	22p	BD139	20p	BF324	25p	BU111	140p	TIP115	45p	2N.3055	35p	IN.4004	4p	78GU1C	190p	AN-7120	140p	M-51515BL	270p	TDA2593	100p	74LS78	35p
AD162	22p	BD140	20p	BF336	20p	BU124	60p	TIP116	45p	2N.3055H	50p	IN.4005	4p	79GU1C	215p	AY3-1270	880p	M-51516	280p	TDA2690	100p	74LS83	65p
AF124	25p	BD144	90p	BF337	20p	BU126	70p	TIP117	50p	2N.3440	58p	IN.4006	4p	79HGKC	670p	AY3-1350	300p	M-51517L	280p	UPC-555H	60p	74LS85	75p
AF125	25p	BD150	30p	BF338	20p	BU204	75p	TIP120	43p	2N.3442	85p	IN.4007	5p	IN.4148	2p	AY3-8910	360p	MB3712	150p	UPC-556H	80p	74LS86	32p
AF126	25p	BD157	38p	BF355	28p	BU205	70p	TIP121	46p	2N.3702	9p	**VALVES**		IN.5400	9p	AY3-8912	400p	MB3730	260p	UPC-575C2	100p	74LS90	45p
AF127	25p	BD158	38p	BF362	30p	BU208	75p	TIP122	47p	2N.3703	9p	DAF96	60p	IN.5401	10p	AY5-3600	570p	MB3756	260p	UPC-577H	84p	74LS91	85p
AF139	22p	BD166	30p	BF367	13p	BU208A	80p	TIP125	47p	2N.3704	9p	DF96	50p	IN.5402	10p	CA270	40p	MC1327	70p	UPC-592H2	95p	74LS92	50p
AF239	22p	BD175	30p	BF371	17p	BU208D	100p	TIP126	56p	2N.3705	9p	DL92	47p	IN.5403	11p	CA3046	60p	NE555	20p	UPC-1001H	220p	74LS93	48p
AL112	70p	BD177	30p	BF414	18p	BU325	55p	TIP127	58p	2N.3706	9p	DY86	50p	IN.5404	11p	CA3048	190p	NE556	40p	UPC-1025H	230p	74LS95	60p
AL113	80p	BD179	32p	BF420	16p	BU326	85p	TIP141	90p	2N.3707	9p	DY87	50p	IN.5405	12p	CA3060	280p	SAS560	110p	UPC-1026C	105p	74LS96	80p
ASZ15	100p	BD181	45p	BF421	18p	BU406	85p	TIP142	90p	2N.3708	9p	DY802	45p	IN.5406	13p	CA3089E	70p	SAS570	110p	UPC-1028H	90p	74LS107	39p
ASZ17	100p	BD182	60p	BF422	21p	BU406D	95p	TIP145	65p	2N.3771	85p	EABC80	60p	IN.5407	13p	CA3086	55p	SN76003N	140p	UPC-1031H2		74LS109	39p
AU110	110p	BD183	60p	BF423	15p	BU407	75p	TIP146	90p	2N.3772	90p	EB91	44p	IN.5408	13p	CA3089E	150p	SN76013N	140p		180p	74LS112	40p
AY102	180p	BD187	30p	BF440	16p	BU407D	95p	TIP147	100p	2N.3773	100p	EBF80	45p			CA3090AQ	300p	SN76023N	140p	UPC-1032H	70p	74LS113	52p
AY106	180p	BD201	33p	BF451	17p	BU408	85p	TIP2955	42p	2N.3819	29p	EBF89	50p	**ZENERS**		CA3130E	80p	SN76033N	150p	UPC-1155	200p	74LS114	42p
BA145	10p	BD202	38p	BF455	14p	BU408D	95p	TIP3054	45p	2N.3866	68p	ECC82	40p	400MV		CA3130S	100p	SN76110N	70p	UPC-1156H	140p	74LS122	56p
BA148	10p	BD203	42p	BF458	19p	BU409	95p	TIP3055	42p	2N.3903	11p	ECC83	43p	BYZ88 Range		CA3140E	38p	SN76115	70p	UPC-1181H	115p	74LS123	70p
BA154	6p	BD204	42p	BF459	19p	BU426	120p	TIP5443	45p	2N.3904	11p	ECC84	40p	2V7 to 39V	6p	CA3189E	250p	T2800D	52p	UPC-1182H	150p	74LS125	95p
BA157	12p	BD222	31p	BF461	60p	BU500	110p	TIS44	40p	2N.3905	11p	ECC85	40p	1.3W Zeners		CA3240E	90p	UPC-1185H2		TA-7120	55p	74LS125	38p
BB101	13p	BD225	31p	BF462	82p	BU526	80p	TIS61	15p	2N.3906	11p	ECH81	49p	BZX61 Range		HA-1156W	110p	TA-7137P	83p		250p	74LS126	42p
BB103	16p	BD232	31p	BF469	30p	BU801	95p	TIS88A	45p	2N.4031	25p	ECH84	52p	2V7 to 39V	12p	HA-1197	150p	TA-7146P	400p	UPC-1350C	150p	74LS132	53p
BB105B	18p	BD234	32p	BF470	28p	BU806	120p	TIS90	15p	2N.4036	25p	ECL80	57p	**JAPANESE**		HA-1306W	170p	TA-7193P	400p			74LS133	48p
BB205B	24p	BD235	28p	BF471	28p	BU807	95p	TIS91	18p	2N.4037	25p	ECL82	59p	**TRANSISTORS**		HA-1319	280p	TA-7200	200p	**74LS SERIES**		74LS136	35p
BC107	7p	BD236	30p	BF479	30p	C106D	23p	TIS93	20p	2N.4058	13p	ECL84	57p	2SB324	55p	HA-1339	170p	TA-7201	200p	74LS00	24p	74LS137	48p
BC108	7p	BD237	21p	BF493	18p			VK1010	88p	2N.4443	75p	ECL85	57p	2SB507	68p	HA-1342	170p	TA-7203	180p	74LS01	24p	74LS138	47p
BC109	7p	BD238	24p	BF494	16p	MJ2500	100p	VN.10KM	60p	2N.4444	76p	ECL86	49p	2SB754	80p	HA-1366WR		TA-7204	110p	74LS02	24p	74LS139	45p
BC115	10p	BD244	50p	BF595	16p	MJ2501	110p	VN.46AF	88p	2N.5061	20p	EF80	31p	2SB754A	90p			TA-7205	80p	74LS03	24p	74LS145	90p
BC118	11p	BD245	50p	BF596	16p	MJ2955	55p	VN.66AF	100p	2N.5294	30p	EF85	34p	2SC495	60p	HA-1368	160p	TA-7210	200p	74LS04	24p	74LS147	130p
BC140	19p	BD433	28p	BF597	16p	MJ3000	115p	VN.88AF	115p	2N.5296	30p	EF89	43p	2SC1060	99p	HA-1377	220p	TA-72222AP		74LS05	23p	74LS148	120p
BC141	19p	BD434	30p	BF615	30p	MJ3001	115p	VN.89AF	110p	2N.6106	40p	EF183	45p	2SC1061	200p	HA-1385	140p		120p	74LS08	24p	74LS151	45p
BC142	19p	BD435	31p	BF758	41p	MJE29A	30p			2N.6107	40p	EF184	53p	2SC1096	78p	HA-1392	230p	TA-7310P	100p	74LS09	25p	74LS153	60p
BC143	19p	BD437	28p	BF869	22p	MJE30A	30p	ZTX107	11p	2N.6109	40p	EL34	190p	2SC1161	110p	HA-1397	250p	TA-7609	270p	74LS10	25p	74LS154	180p
BC147	6p	BD438	36p	BF870	22p	MJE340	25p	ZTX108	11p	3N.128	55p	EL36	80p	2SC1172	150p	HA-1398	240p	TAA550	16p	74LS11	25p	74LS155	58p
BC148	6p	BD439	40p	BF872	23p	MJE350	80p	ZTX109	12p	3N.143	65p	EL84	50p	2SC1306	90p	LA-1201	85p	TBA120S	45p	74LS12	25p	74LS156	65p
BC149	6p	BD440	40p	BF960	38p	MJE520	30p	ZTX212	27p			EL95	50p	2SC1307	100p	LA-1352	120p	TBA395	60p	74LS13	30p	74LS157	35p
BC157	6p	BD441	40p	BF963	40p	MJE2955K	90p	ZTX300	13p	**DIODES**		EL500	80p	2SC1678	120p	LA-1365	140p	TBA396	60p	74LS14	40p	74LS158	50p
BC159	6p	BD442	40p	BF964	38p			ZTX301	16p	AA119	9p	EL504	100p	2SC1969	130p	LA-3301	120p	TBA520	100p	74LS15	24p	74LS160	55p
BC182	6p	BD533	50p	BF966	40p	OC28	100p	ZTX302	16p	BY100	40p	EY86	31p	2SC2028	75p	LA-3350	120p	TBA530	100p	74LS20	24p	74LS161	58p
BC182L	6p	BD534	38p	BFR40	25p	OC29	80p	ZTX303	24p	BY103	32p	EY87	31p	2SC2029	120p	LA-3361	115p	TBA540	100p	74LS21	24p	74LS162	58p
BC183	6p	BD535	38p	BFR51	21p	OC35	100p	ZTX304	17p	BY126	6p	EY88	42p	2SC2078	120p	LA-4036	200p					74LS163	60p
BC183L	6p	BD536	38p	BFR62	21p	OC36	120p	ZTX320	29p	BY127	8p	EZ35	45p			LA-4031	140p						
BC184	6p	BD537	40p	BFR79	25p	OC45	50p	ZTX326	29p	BY133	8p	FZ80	50p	**LOW PROFILE**		LA-4032	140p						
BC184L	6p	BD538	40p	BFR90	52p	OC71	30p	ZTX500	13p	BY164	40p	EZ81	55p	**SOCKETS**		LA-4050	130p						
BC212	6p	BD675	40p	BFR91	99p	OC72	50p	ZTX501	13p	BY176	85p	GZ34	180p	8pin	6p	LA-4051	160p						
BC212L	6p	BD676	40p	BFX29	20p	OC200	180p	ZTX502	18p	BY179	35p	PC97	100p	14pin	8p	LA-4100	120p						
BC213	6p	BD677	38p	BFX84	20p	R2008B	100p	ZTX503	18p	BY182	32p	PCC85	42p	16pin	9p	LA-4101	100p						
BC213L	6p	BD678	40p	BFX85	20p	R2010B	100p	ZTX504	25p	BY184	32p	PCF80	58p	18pin	12p	LA-4102SK	140p						
BC214	6p	BD679	40p	BFX87	15p	TAG4443	76p	ZTX550	24p	BY187	32p	PCF200	135p	20pin	14p	LA-4112	280p						
BC214L	6p	BD680	40p	BFX88	15p	TAG4444	76p	2N.696	26p	BY196	20p	PCF801	110p	22pin	16p	LA-4125	210p						
BC237	7p	BD681	45p	BFX89	60p	TIP29	15p	2N.697	22p	BY206	11p	PCF802	57p	24pin	18p	LA-4140	70p						
BC238	7p	BD682	45p	BFY17	30p	TIP29A	22p	2N.698	40p	BY207	11p	PCF806	115p	28pin	20p	LA-4201	120p						
BC300	16p	BDX32	100p	BFY18	40p	TIP29C	25p	2N.699	45p	BY208	18p	PCH200	100p	40pin	25p	LA-4220	120p						
BC301	18p	BDX65	80p	BFY41	28p	TIP30	25p	2N.706A	22p	BY210	22p	PCL81	54p	**VOLTAGE**		LA-4400	190p						
BC302	18p	BDY92	100p	BFY50	14p	TIP30C	30p	2N.708	22p	BY223	72p	PCL82	63p	**REGULATORS**		LA-4420	140p						
BC303	18p	BF180	16p	BFY51	14p	TIP31A	24p	2N.914	28p	BY225	120p	PCL84	50p	7805	35p	LA-4422	130p						
BC327	6p	BF181	18p	BFY52	14p	TIP31C	30p	2N.918	36p	BY226	18p	PCL85	55p	7812	35p	LA-4430	130p						
BC328	6p	BF183	20p	BFY56	25p	TIP32	24p	2N.930	18p	BY227	19p	PC86	55p	7815	35p	LA-4460	170p						
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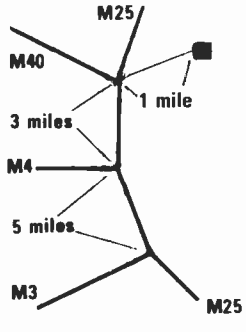

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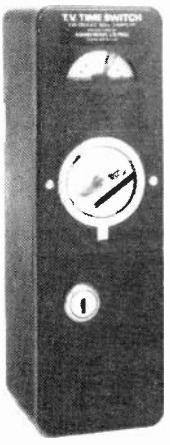

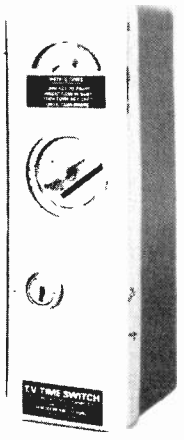

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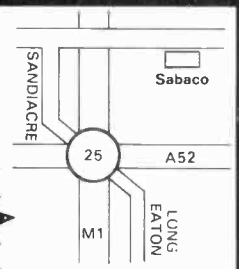

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6 Push button VHF/UHF for v/cap. GEC-Decca type	£7.00
7 Push button for CVC5 ITT	£8.00
KT3 12 Push button unit	£2.00
KT3 (Export) 12 P.B.u	£2
6 Push button Unit Thorn	£1.00
6 Push button Unit fits GEC & Decca etc.	£6.00
Hearing aid unit	£3
6 Push button unit PYE 713	£7.00
7 Button Unit GEC with Lamps	£7

Mains Droppers

G8 2R2+68R	£1.25
G8 47R 15 watt	75p
Pye 731 3+56+27R	50p
Pye 3R5/15R/45R	50p
Thorn 50/17/1K5	£1.00
120/20/20/48/117	£1.00
270/10/6 for Thorn 4000	50p
18/320/70/39	£1.10
Thorn 50-40R-1K5	50p
Ac Socket & Lead	
GEC, ITT, Philips, Pye	25p
7×3¾ Thorn	£1
Rank Toshiba Tube Bases	30p

Speakers

6×4 G11	25 ohm	70p
5½×2½	3 ohm	£1.00
5×3	80 ohm	70p
5×3	50 ohm	50p
5×3	35 ohm	70p
6×4	15 ohm	£1.00
7×3	70 ohm	£1.00
8×5	8 ohm 15 watt	£2
8×5	8 ohm	£1
5×3	8 ohm	70p
7×3	16 ohm	£1.00
5" dia	16 ohm	£1.00
5" dia	8 ohm	£1.50
6½" dia	4 ohm	£1.50
6½" dia	3 ohm	£1.50
2¾" dia	8 ohm	75p
3" dia	8 ohm	75p
4½" sq.	15 ohm	75p
KT3 speaker	K30	75p
3" dia	15 ohm	60p
1690 5×3	12 ohm	£1
K45 Philip	15 ohm	75p
K30 15 watt		£1

KT3-K30

OF-550	E.W.	10p
OF-513	correction	10p
OF-557		50p

Diodes

BY 127	10p
BY 133	10p
BY 134	10p
BY 164	50p
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	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 229/400	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 602	10p
F 247	10p
XK 3102	50p
XK 3123	50p
Hitachi 2A/1500V metal case wire end	20p

20.AX

GEC Degausing Panel 809 with PT37	£1.00

Line Transformers

Hitachi Split Diode and GEC 1981 to 1984	£13
2 J/Pots 3,500 1 off each type	£3.00
G8 Symmetry Coil	£2.00
G8 Trans. Philips	£7.00
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
1690 Thorn EHT over-wind with diode lead & anode cap	£2.50
GEC 2040	£3.00
GEC 2110	£7.00
Mullard AT 2036	£1.50
Pye 169 Line Trans	£3.00
Pye mono	£3.00
Rank mono T704A	£3.50
Split Diode Trans	£7.00
GEC 20 AX Rank Z522	£3
Rank L.O.P.T. Z970	£3
CVC 5-8-9	£3.00
CVC20 ITT	£3.50
AT2080/15	£5.00
CVC30 ITT	£5.00
CVC32 Line Tran	£4.75
CVC800 Line Trans	£6.00
CVC40 Slip/Diode	£12.00
CVC 45	£5.00
GEC Portable G1OT2041	£3.00
GEC Portable G1OT2046	£3.00
EHT Split Diode Leads ITT	£1.00
Ex panel "14" Fidelity portable	£5
3500 L.O.P.T. & HT Trans	each £2
LOPT Rank Z763	£5

Triplers

ITT CVC 5-8-9	£3.50
Rank T25LE Tripler	£2.00
Rank 11TCP AR23	£3.50
TU 25 30K Rank	£3.00
8500 Triplers	£6.50
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
9000 Thorn	£5
9500 Thorn	£4.50
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
TVK 76/9	£3.00
G8	£4.00
CVC 825 ITT CVC 20/25/30/32	£3.50
Decca 80 100	£4.50
Grundig TVK 52	£2.50
11TBQ Pye 731	£3.00
11THY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/63	£4.00
BG 100/41	£3.25
KT3 BG200/43	£3.50
T/text ultrasonic rec'r panel	£14.00
Video cassette lamps on lead. 12-14V	50p or 3 for £1.00
20 for £5.00	200 for £25.00
GEC 8 touch unit assy complete with all I.C.'s + pots	£4.00
G11 E.W. Transformer	50p
G11 E.W. coils	£1.00
G11 Transient Suppressors 245V	10 for £1.00
G11 Scan Coils	£5.00
G11 100K tuner pots	12 for £1
KT3 IF panel	£6.00
KT3 line OSC transformer	£1
KT3/K30 infra-red receiver head	£1
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
Pye, K30, GEC, etc. Pre-mains stand-by switch	£1
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
Control panel 5 sliders + mains lead	£1.50
G11 8 touch button unit replaces old 6 P.B.U.	£24
Tube base + base unit for 820 Euro chassis	£4.00
GEC Line O/P Trans. & Rec Stick for Portable	£3.00
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
G11 Line Driver Transformer	35p
KT3 Front Panel Control Assy.	£2.50
BTW 30/50	50p

TELETEX DECODER

I.C. SAA 5051	K30
I.C. SAA 5042	
I.C. SAA 5030	
I.C. SAA 5020 etc.	£8.00

International Rectifier EHT Diodes G770/HV34 6KV	3 for 8p
6A/600V Stud Diodes	20p
6A/1000V Stud Diodes	20p
BTW 92/800R	£3
25A473 PNP C/P	10p

5 Volt Mains Transformer 2 Amp	50p
30V Power Supply 500M/A 4×2¾	£2.50
Pye 731 Power Panel	£13
6 Diode Universal Triplers	£3.25
NEW PYE 725 line O/P panel with L.O.P.T. & Tripler	£10.00
Thorn Mains Isolator unit for 70-80W. Ex-speaker	£2
NEW GEC 20AX Power Supply Switch Mode	£12.00
Complete new GEC portable chassis M1201H/M1501H with P.B.U./ v.cap/LOPTI	£10
Field + Jungle panel for GEC 3133/3135	£1.50
GEC 2110 line panel with transformer	£7.00
GEC 2110 tuner unit + IF Panel	£12.00
Pye/Chelsea Line op-panel	£12.00
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
Pye 607/205 Line panel with transformer	£10.00
Pye CDA/205 panel	£6.00
GEC portable chassis + LOPTI 2114 New Thorn 1613/1713 chassis	£4.00 9.75

NEW MULLARD TELETEX

Decoder Panel (VM6230)	£15.00
Panel 6101	£15.00
Panel 6330	£15.00
G8 Tuner Unit + Panel	£6.00
G8 Convergence Panel (late type)	£12.00
G8 Power Supply	£6.00
G8 6 Sloping PBU	£8.00
G8 IF & Chroma	£10.00
G8 Chroma	£6.00
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
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
GEC Power Supply (Export)	£10.00
G11 dynamic correction panel	£6
CVC 20 Front panel with sliders + mains input panel	£4
CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots	£14
CVC9 slider pots panel	50p
CVC 5 Mains on/off + 5 pots	£2
Universal Focus Fits Pye, Thorn and Decca Units. Large Type	75p
Decca Small	75p
KT3 Focus Unit	75p
K30 Focus Pot	75p
TX10 Focus Units	£6.00
CVC 32 Focus Unit	75p
3500 Thorn Focus Unit	£1.00
ITT Small for use with Split Diode	50p
TV11	50p
Remo TV12SP	50p
TV13	50p
TV14	50p
TV18	60p
TV20	£1.00
TV45	50p
Thorn 14/1500 rec stick	5p

G7000 Philips Video Games Packs

11 types	£8.00 each

G11 drawer ASS 3 pots Mains switch and lead	£2.00
Line O/P panel GEC 2217/2218/2213/ 2214/2226/2227/2228	£10

CLOCK DISPLAY

4 SEG ACDM45	£1.00
4000 thick film	£2.00

DISPLAYS

4040 Clock	£1.00
7seg Red LED	50p
2 digit LED 8.8	50p
2 digit LED + I.8 with panel + MC14511	£1.00
4700/63	£1.50

250/64	10p
3300/70	50p
.1/100	5p
1/100 × 10	30p
22/100	10p
4.7M/100	5p
470/100	20p
2000/100	70p
4700/100	75p
47/160	10p
300 300/300V	80p
800/160	50p
.1/250 Pulse	5p
G11 0.47/250	10p
2,2 250v	10p
3n3/250 A.C.	10p
.33/250V	20p
.39/250V	15p
4n7/250 tested 5KV	25p
.91/250	35p
.91/400	30p
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
10/375	10p
22/375	15p
220/385	75p
330/385 CVC 820HT	60p
0.1/400	15p
KT3 E/W .39/400	20p
.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
.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	15p
2n2/1500	15p
.01/1600	15p
G11.8200/2KV	15p
0.1/2KV	20p
10n/2kV	15p
3n9/2KV	15p
0.001/52KV	10p
5n2/2kV	10p
6n2/2kV	15p
2n0/2kV	15p
2n2/2KV	15p
7500pf/2KV	10p
4n7/2KV	15p
8n2/2KV	15p
0.0082/2500	10p
150/3500	5p
1800/4KV	10p
4.7nf/5KV	10p
170/8kV	10p
180/8KV	10p
210/8KV	10p
1000/10KV	80p
.47/100V	

CVC 20-25-30 Mains Switches	75p
Infra Red and Ultrasonic G11 Teletext Decoder Panel	£30
RANK & ITT Mains Remote On-Off Switch (720F)	£1.50
RANK & ITT Mains Remote Switch 2865 ohm	£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
THORN Rotary Mains Switch	50p
G8 Mains Switch	75p
Thyristor 600/4 amp C106/2	24p
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
Thorn 12 or 24 volt battery convertor for portable colour T/V	£6.00
Tape Heads R/Play/Back Mono/Stereo	£1.00

Mains Isolation Transformer (R.S. 500V/A Type)	£25.00
Rank Secam Decoder Panel UHF & VHF	
T115A	£13.00

NEW GRUNDIG SPARE PANELS

Set No SC4127; SC4337; SC6217; SC6237

GRUNDIG MODULE TYPES

Tuner IF. AF TRX LOP. TP preamplifier. Tuning board. Colour RGB. LED Board. Deflection Board

From £3 to £8

Multi-Caps

470/250 G11	10 for £15
Thorn 3500 175/100/100/350v	£1.00
KT3/200/25/25/385v	£1.00
300+300+150+100+50MFD 350V	£2
47/220/350v	60p
150/150/100/100/100/320v	£2.00
2500/2500/63v	50p
150/200/200/300v	70p
400/400/200v	£1.70
300/100/100/16/275v	£1.50
100/200/325v	40p
150/150/100/375v	£1.50
300/300/100/32/32/300v	2.00
1500/2000/30v	50p
Jelly pot Thorn 00D4/013	£3
150/150/100/100/320v	£2.00
100/350 + 300/200/100/16/275v	£2.00
300+300/300	£1.00
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 Panels

CVC 40/2 Chassis, new £30, complete with mtrfase panel	
CVC 820 Line O/P Panel	
CVC20 Mains Panel	£3.00
ITT 8 & 6 Push Button Unit	£1.00
CVC40/2 New Chroma Panel	£10.00
CMA 10	£2.00
CMA 11	£2.00
CMA 30	£2.00
CMA 40	£1.50
CMC 10/2	£5.00
CMC 16	£4.00
CMC 38	£8.00
CMC 45	£1.50
CMC 47	£1.00
CMC 52	£15
CMC 57	£6.00
CMC 58	£8.00
CMC 59	£8.00
CMC 67	£3.75
CMC 67/2	£4.00
CMC 68	£4.00
CMD 12	£10
CMD 32	£5.00
CMD 33	£5.00
CMD 40	£5.00
CMD 41	£5.00
CMD 800	£10.00
CMF 25	£2.00
CMF 26	£2.00
CMF 40	£2.00
CMH 10	£1.50
CMH 31	£1.00
CMK 12 (untested)	£4.00
CMK 30 (untested)	£4.00
CMN 20	£1.50
CMN 21	£1.50
CMN 40	£1.00
CMN 45	25p
CMP 10	£2.00
CMP 11	£4.00
CMP 40	£2.00
CMS 11	£2.00
CMS 40	£2.00
CMU 12	£10.00
CMU 14	£8.00
CMU 30	£7.00
CMU 45	£7.00
CMZ 30	£5.00
GMA 90	£5.00
GMC 120	£2.50
GMR 64	£5.00
TMN 2	£2.00
VCA 20	£10
VCA 21	£10.00
VMC 26	£3.00
VMC 34	£5.00
VMC 44 + 45	£4.00
VMC 51	£5.00

Hand Sets

G11 Ultrasonic Teletex Handset	£24.00
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	£24.00
Rank. Infra-red	£10.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Hitachi infra red handset	£18
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)	£12.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
Philips infra red full remote 12 channel for 60 CP2605	£12.00
Philips Key Pad set KT3/K30	£3.00
KT3/K30 T/Text	£15.00
KT3/K30 Full remote	£15.00
KT3 Power supply	£4.00
Hitachi 8 button unit with resistor unit. Last year mod.	£7.00
GEC infra-red 2236-2026	£4.00
GEC push pad hand set button blobs 10p each	
Pye & Philips handset KT3-K30 chassis. No RC4001-RC5150-RC5176-RC5171-RC5177.	
Special Price	£13.00
ITT Hand Set with TV-Teletex-VCR	£12.00

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Tuner Units

V/Cap Rank UHF Z776T/Unit	£6
V/Cap Rank VHF Z773T/Unit	£5
NEW G8 Tuner V/Cap	£5.50
ELC2000 on Panel	£2.50
GEC 6 Push Button Unit	£6
ITT 6 Push Button Unit	£6
DECCA 6 Push Button Unit	£6
GEC or Hitachi 6 push button unit 2110 Conversion	£8
GEC 2110 V/Cap	£5
ELC1043 (Ex Panel)	£3.75
ELC1042 NEW	£5.00
ELC2000	£4.00
ELC2004	£10.00
ELC2006 NEW	£10.00
GEC Tuner V/Cap Hitachi After 1979 ET548, ET547, ET451	£10.00
U322 (UHF) ..	£4.00
V314 (VHF) ..	£5.00
V317 (VHF)	£5
V334 (VHF)	£5
U321	£6
U341 UHF	£7.00
U342 (UHF)	£5
U411 UHF	£7.00
U.V. 411 Tuner	£10.00
ELC1043/05 Thorn	£5.90
ELC1043/06 Thorn	£5.00
Small V/Cap Mitsumi UHF ..	£4.00
VHF ..	£3.00
G8 Tuner	£6.00
Portable & rotary Tuners Sanyo & Mitsumi UHF	£5.00
NSF-UHF/VHF Varicap (old type)	£8.00
Mosfit UHF/VHF (new type)	£8.00
SONY 1400KV Tuner unit	£3.50
Thorn Tuner PANEL with 6×100K pots + cursors NO TUNER	£1.00
HITACHI 20 Turn Pot	40p
U321 on panel	£6.00
Tuner unit VHS Sylvania GTR Videon MTS 900	£2.50

Multard Video Modulator. Application, video tape recorders, TV cameras, video games, closed circuit T/V, C.C.T.V. system Data supplied. **£10.00**

VT 100 Sound Tuner Kit. TV. Viewsound. The latest design in low noise fitted with DNR, RF output and audio **£30.00**

Sylvania UHF F4720B	£6.00
Sylvania VHF 900	£6.00
Decca Bradford Tuner 5 Button	£4.00
Small Tuner DX 175-220MHz Auto Changeover	£5.00
9000 Thorn Tuner on Panel	£7.00
D.P.D.T. switch Black knob: Chassis or PCB mount	4p
	each or 40 for £1.00

THORN 1400 4P.B. Mech. Tuner	
THORN 1500 4P.B. Mech. Tuner	
THORN 1590 4P.B. Mech. Tuner	
THORN 3500 4P B. Mech. Tuner	
THORN 8000 4P.B. Mech. Tuner	
THORN 8500 Mech. Tuner All new & boxed	£4.00 each

Delay Lines	
DL20A 80p	DL600 £1.00
G8 (Old Type)	£1
DL600	£1.00
DL710	£1.00
UDL11	30p
KT 3 Luminence	75p
Luminance Delay Line (CVC 45)	
10×630ma fuse	25p
10×2A fuse	50p
10×3.15 fuse	50p
10×500mA	80p
10×1 amp	80p
20 3.15 AS Fuses	£1.70
Co-Ax Joint	15p
Co-Ax Belling Lee Plug	12p
Co-Ax Splitter	£1.00
UHF Modulator CCIR	£3.00
Infra Red Emitting Diode	28p
NE286H Small Neon Lamps GEC & Philips	5p
Mullard 5 Watt Amps. LP1162 New	75p

T.V. Tubes

12" A31/300 Hitachi	£10
15" A38/170W Hitachi	£8
18" Hitachi PIL tube with scan coils 470 KCB22-TC03	£25
10" Green tube scan coils & line trans	£6.00
12" 90° Tubes Type 310GNB4	£12
14" 110° Tubes Type 310GNB4	£12

Integrated Circuits

AC76003	£1.50
AM25LS23PC	10p
BAV40	40p

BF694	10p	2SD180 TO3 80v/6A	15p	BC440	30p
BF758	30p	2SD200	£2.00	BC454	10p
BF760	30p	2SK30A	10p	BC455	10p
BFT34	15p	BC107	10p	BC456	10p
BFT43	10p	BC108	10p	BC460	25p
BFT44	8p	BC109	5p	BC462	10p
BFW11	20p	BC113	10p	BC463	10p
BFX29	30p	BC114	10p	BC478	10p
BFX84	25p	BC115	10p	BC527	10p
BFY50	15p	BC116	10p	BC532	10p
BFY52	20p	BC117	20p	BC546	10p
BFY90	25p	BC119	20p	BC547	10p
BLY49	25p	BC125	10p	BC548	10p
BPW41	25p	BC126	10p	BC556	10p
BRC116	25p	BC139	10p	BC557	10p
BRX43	15p	BC140	30p	BC558	10p
BRX48X	10p	BC141	25p	BC559	10p
BRY56	30p	BC143	25p	BC635	10p
BSS68	10p	BC147	10p	BCX31	25p
BSY79	10p	BC148	10p	BCX32/36 Pair	75p
BSY95a	10p	BC149	10p	BCX32	25p
BTY80	20p	BC153	10p	BD116	25p
BSX19	17p	BC154	10p	BD124	50p
BSX20	17p	BC157a	10p	BD124 (metal)	60p
FT3055	30p	BC158	10p	BD130Y	25p
TCE82	30p	BC159	10p	BD131	30p
2N930	5p	BC160/16	25p	BD132/238	30p
2N2221	8p	BC171	10p	BD135	25p
2N2222	8p	BC172	10p	BD136	30p
2N2906	10p	BC173	10p	BD138	30p
2N3055	40p	BC174	10p	BD140	30p
2N3566	10p	BC183	10p	BD176	25p
2N3702	10p	BC184	10p	BD182	£1.00
2N3711	10p	BC204	10p	BD183	70p
2N3583	50p	BC207	10p	BD202	60p
2N3904	15p	BC212	10p	BD204	60p
2N4355	10p	BC213	10p	BD221	20p
2N4442	£1.00	BC214	10p	BD222	30p
2N4444	£1.00	BC237	10p	BD228	30p
2N5296	40p	BC238	8p	BD226	20p
2N5983	30p	BC239	10p	BD233	30p
2N6099	40p	BC250	8p	BD235	30p
2N6109	40p	BC251	10p	BD238	30p
2N6130	50p	BC252	10p	BD239	15p
2N6133	20p	BC262	10p	BD243c	30p
2N6348	20p	BC263b	20p	BD244	50p
2N6399	10p	BC294	30p	BD250a	30p
2X 2N6099 on heat sink	50p	BC298	10p	BD252	20p
2SA437	20p	BC300	30p	BD253B	50p
2SB407 Sanyo TO3	10p	BC301	30p	BD331	20p
2SB474	30p	BC303	30p	BD373b	20p
2SB566	10p	BC307	7p	BD416	25p
2SC381	10p	BC308	7p	BD433	25p
2SC458	50p	BC309	10p	BD437	25p
2SC515	10p	BC327	10p	BD439	50p
2SC732	10p	BC328	10p	BD678	30p
2SC733	10p	BC329/338 pair	15p	BF761	30p
2SC1038	£1.00	BC337	10p	BF858	30p
2SC1172A	10p	BC338	10p	BF871	30p
2SC1173	10p	BC347	10p	BFR39	15p
2SC1419	20p	BC349b	10p	BFR52	7p
2SC1546	20p	BC350	20p	BFR79	15p
2SC1725	20p	BC365	10p	BFR81	15p
2SC2068	20p	BC384	10p	BFR87	10p
2SC2073	8p	BC394	10p	BFS60	10p
2SC2122A	£1.00	BC413	10p	BFT42	20p
2SC2229	15p	BC414	10p	MR1366	20p
2SC7350	15p	BC416	10p	BRC-M-200	40p

BRC-M-300	50p
BRC 1330	75p
BRC 3064	£1.00
BTT822	£1.00
BTT6016	£1.20
BTT6018/ML237B	£1.50
BTT6218	£1.50
BTT8124	£1.00
BTT8224	£1.00
CA270AE	50p
CA270CW	50p
CA270CE	50p
CA920AE	£1.00
CA1310	50p
CA3065Q	50p
CA3089Q	50p
CA3094AE	50p
CA3123	40p
CA3146	£1.00
CA3189	40p
CBF16848	50p
CD4510	30p
DM7492	50p
HA1196	40p
HA1370	£2.00
HA11223	40p
HEF4001	10p
HBF4011AF	10p
HEF4053B	30p
LA3220	50p
LM1011N	£1.00
M913	£2.00
M1024=SAA	£2.00
M1025=SAA	£2.00
MC476p	£1.00
MC1307	75p
MC1312	
MC1330	75p
MC1349	50p
MC1352	£1.00
MC1358	£1.00
MC14002	15p
MC14013	25p
MC14016	25p
MC14066	30p
MC14514	50p
MC1748	80p
MEM4956	£1.00
ML231	£2.50
ETT6016	£3.00
ML232	£3.00
ML236E	£1.00
ML237B	£1.00
ML238B	£4.00
ML239	£2.00
MM5387	£1.00
MM5611	£1.00
MM5840	75p
MM5290N-4	75p
MM53108N	£4
MR1366	20p
N64100	£1.00
NE545B (Dolby)	75p
NE555P	60p
NE555	60p
IL-1	20p
OPT600	20p
OPT601	20p
SAA611	50p
SAA661	£1.75
SAA1020	£4.00
SAA1021	£4.00
SAA1024	£2.50
SAA1025	£2.50
SAA1073	£3.00
SAA1074	£3.00
SAA1075	£3.00
SAA1124	£2.00
SAA1130	£2.50
SAA1174	£3.00
SAA1176	£3.00
SAA1250	£3.00
SAA1251	£4.00
SAA1272	£3.00
SAA1276	£3.00
SAA3027P	£4.00
SAA5000A	£1.50
SAB3013	£2.00

Filters

5·5MHz	15p
6MHz	30p
BFU455K	5p

Thyristors

BT151/800R	80p
TD3F800	£1.50
BT106 Plastic	30p
BT106 Metal	£1.20
BT119	£1.00
BT120	£1.00
BRC4443	75p
G11 Thyristor	60p
Decca 80-100	60p
2N4444	£1.00
MCR72-6	25p

Thermistors

G8 Degausing	35p
Philip type VA1104	70p
ITTP7266312	15p
PTH451 AOR	15p
PT37P Fits Pye & PT34	20p
Degausing Thermistor (fits most sets)	20p
GEC Double Thermistor	25p

SAB4209	£2.00
TBO0124	£1.00
SAA5000A	£1.50
SAA5012A	£5.00
SAA5020	£3.50
SAA5030	£5.00
SAA5040	£3.50
SAA5040A	£4.40
SAA5050	£3.50
SAF1032p	£2.50
SAF1039	£2.00
SAS560	£2.00
SAS660	£1.00
SAS670	£1.00
SL901B	£4.50
SL918	£4.50
TA7122	£1.15
TAA320A	50p
TAA470	£1.50
TAA570	75p
TAA611B	50p
TAA621	£2.00
TAA661	50p
TAA641	£1.50
TA7117	50p
TA7120P	50p
TA7315AP	50p
TA7607AP	40p
TA7609P	50p
TBA120A	40p
TBA120AS	50p
TBA120SA	40p
TBA120B	40p
TBA120SB	40p
TBA120T	50p
TBA120SQ	£1.00
TBA120U	75p
TBA120Q	30p
TBA120C	40p
TBA1441	£1.00
TBA231	75p
TBA395Q	50p
TBA396Q	£1.00
TBA396	75p
TBA440P	£1.00
TBA1440C	£1.00
TBA480Q	£1.00
TBA520	£2.00
TBA530	£2.00
TBA540	£1.00
TBA550Q	£1.75
TBA560CQ	£2.00
TBA570	£1.50
TBA625	50p
TBA641	£2.00
TBA651	£2.00
TBA673	£1.00
TBA720A	£1.50
TBA750Q	£1.50
TBA780	£1.50
TBA800	50p
TBA810AP	60p
TBA810S	60p
TBA820	60p
TBA890	£1.00
TBA900	£1.50
TBA920	£1.50
TBA920Q	£1.50
TBA950	£1.50
TBA990Q	£1.00
TMS1000NL	£2.00
TMS1943 (clockchip)	£1.00
TMS9980	£4.00
TMS9901	£1.00
TMS2716JL	£1.00
TMS3529	£1.00
TMS3720ANS	£3.00
TMS4014	70p
TX-012	£1.00
TMS9902	£1.20
ULN2216	75p
UPD8049HC	£2
SN29848	50p
SN29770BN	£1.00
SN29771BN	£1.00
SN29772BN	£1.00
SN7402N	£1
SN7472N	£1
SN74107	£1.00
SN74167	70p
SN7472N	20p
SN75108AN	£1.00
SN76001	£1.00
SN76003	£1.00
SN76013ND	£1.50
SN76018	£1.00
SN76008	£1.00
SN76023N	£1.50

BLY49	50p
I.C. Heat Sink	20 for £1
20×TO5 Heat Sink	£1.00
CVC 9 power supply board	£1.50
CVC 20/2 mains panel	£2.00
ITT Mains Filter . 1/250v/	
CVC 20 to 45 chassis	50p
Pots 10 k with Switch	25p
Pots 47 k with Switch	25p
Mullard Surface Wave Filter RW 153P Colour TV Filter	40p
Mullard Surface Wave Filter RW 154 Colour TV Filter	40p
G11 Line Scan P.C.B.	£1.00
G11 Power Supply P.C.B.	£2.00

SN76033	£1.50
SN76110N	£1
SN76115AN	50p
SN76131	50p
SN76141N	£1.00
SN76226	£1.00
SN76227N	£1.00p
SN76228N	£1.00
SN76270	£1.00
SN76532N	50p
SN76544N	£2.00
SN76546	£1.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76650	50p
SN76660N	40p
SN76620AN	50p
SN76666	£1.00
SN76705N	£1
SN76707N	75p
SN76708AN	75p
SN76720	£1.00
UA783P3C	40p
BT100A/02	40p
BT138/10A	70p
BT146	30p
TBA540Q	£1.50
TCA270	£1.00
TCA270Q	£1.00
TCA640	£1.00
TCA660	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA800	£5.00
TCA830	£1.00
TCEP100	£2.25
TCE120CQ	£1.00
TDA440Q	£1.00
TDA1003A	£1.00
TDA1010	£1.00
TDA1060A	£1.50
TDA1035T	£3.50
TDA1035S	£2.00
TDA1072	£1
TDA1151	80p
TDA1170	£1.00
TDA1190	£1.00
TDA1200	75p
TDA1327A	£1.00
TDA1365	£3.00
TDA1412	50p
TDA2003	80p
TDA2004	£2
TDA2010	£1.00
TDA2140	£3.50
TDA2030	£2.00
TDA2525	£1.00
TDA2640	£2.00
TDA2522	£1.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2571AQ	£2.50
TDA2575A	£1.00
TDA2581	£2.50
TDA2590	£1.00
TDA2593	£1.00
TDA2560	50p
TDA2600	£5.00
TDA2611A	£1.00
TDA2611AQ	£1.00
TDA2653	£4.00
TDA2002	£1.00
TDA2640	£2.00
TDA2680	£1.00
TDA2690	£1.00
TDA2593	£1.00
TDA3190	£1.00
TDA3560	£4.00
TDA3571Q	£1.50
TDA3710	£3.50
TDA9403	£3.00
TDA3651AQ	£3
UPC1365	£3.00
TDA3300B	£6
SN74LS 125AN	30p
SN74LS 248	50p
SIL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7300	40p
RGP30G	10p
MPSA14	10p
MPSA43	10p
MJ13005	30p
MJE5IT	25p
MJE340	20p
MJE660	25p

MJE661	25p
MJE3055	£1.00
MJE2801	30p
MJE2955	50p
MJE13005	30p
Sanikrom Diode	30p

Philips Cartridges

GP422 (4CH)	£6.00
GP412	£6.00
GP412/1E	£6.00
GP406	£6.00

Transistors

A1222	15p
A1223	15p
AC106	15p
AC121	15p
AC124	15p
AC128	15p
AC137	15p
AC151	15p
AC131	15p
AC138	15p
AC152	15p
AC153K	15p
AC142K	15p
AC169	15p
AC176	15p
AC176K	15p
AC178K	15p
AC179	15p
AC186	15p
AC187K	15p
AC188	15p
AC188K	15p
ACY21	25p
AD143	50p
AD149	50p
AD161/162	pair 40p
AF17A	25p
AF139	25p
AF181	£1.00
AF239	25p
AF367	25p
AL102	£1.75
BC161	30p
BD507	50p
BD509	30p
BD510	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	30p
BD646	50p
BD676A	30p
BD678	50p
BD681	25p
BD807	20p
BD826	50p
BD948	30p
BDX75	20p
BDX32	£1.25
BF115	20p
BF121	20p
BF127	20p
BF137	20p
BF157	20p
BF160	20p
BF161	20p
BF164	60p
BF179	30p
BF180	20p
BF181	20p
BF182	20p
BF184	20p
BF194	10p
BF195	10p
BF196	10p
BF197	12p
BF198	10p
BF199	10p
BF200	20p
BF222	10p
BF224	15p
BF238	20p
BF240	16p
BF244	40p
BF245b	20p
BF257	20p
BF258	25p
BF262	15p
BF263p	25p
BF264	15p
BF271	10p
BF273	10p
BF274	10p
BF324	25p
BF337	50p
BF555	30p
BF362	20p
BF363	15p
BF367	15p
BF391	15p
BF394	10p
BF419	30p
BF422	15p
BF423	15p
BF448	30p
BF450	20p
BF458	30p
BF459	30p
BF468	30p
BF469	30p
BF470	20p
BF480	50p
BF504	10p
BF597	10p

TV Crystals

4MHz	
4·433-619	
6MHz	
8·867238	
Large or small	50p each
GEC Power Panel	
TV106 Thermistor	
PT34 New	£1.00

NEC 4730312	£3.00
Line Tran Tripler in Case Amstrad Isolators	
Disc Type	20p

I.C. Holders

DIL – DIL		DIL – QIL	
40 Pin × 4	£1.00	16 Pin × 10	£1.00
42 Pin × 5	£1.00	18 Pin × 10	£1.00
28 Pin × 5	80p	28 Pin × 4	£1.00
16 Pin × 10	70p	8 Pin × 10	50p
24 Pin × 5	75p	16 Pin G11	each 10p
14 Pin × 10	70p	AB Mains Switch m/v	30p
18 Pin × 10	80p		