NOVEMBER 1985 Australia $2, New Zealand $2·50, Malaysia $5·75 £1·10

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

Servicing with a Logic Probe

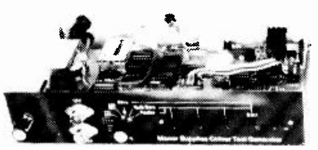
also inside:

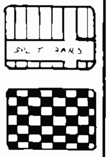
Transistor Field Timebase Circuits
Servicing Hybrid Colour Sets
Commissioning TVRO Systems
VCR Clinic • TV Fault Finding
Microcomputer Monitors • DX-TV

MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE





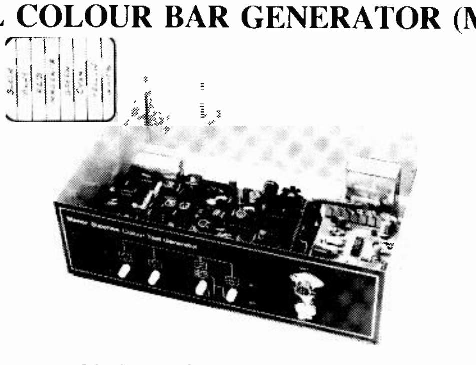
★ 40 different patterns and variations.
★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
★ Chequerboard.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

Price of Kit	£70.00
Case (10"×6"×2¼") app.	£7.40
Optional Sound Module (6MHz or 5.5MHz)	£3.90
Built & Tested in 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)



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

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £30.00. CASE £7.40. BATT HOLDERS £2.80. MAINS SUPPLY KIT £4.20 (Combined P&P £2.20).

MK 4 (BATTERY) BUILT & TESTED £58.00 + £2.20 P & P.
MK 4 (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. Converts any TV into a Teletext Receiver with Infra-Red Remote Control (incl. 25 Button Handset) new, boxed and fully tested. **£130.00** p.p. £3.00

THORN TX9 MK2/3, 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 **£48.00** 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.

PHILIPS G11 PANELS (tested).
Power, frame, IF, decoder **£18.00** each p.p. £2.00. Scan Panel **£28.00** p.p. £2.80.
PHILIPS G11 PANELS ex rental (untested).
Power, frame, IF, decoder **£10.00** each p.p. £2.00.
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). CTX, K35 Teletext + Video **£5.00** p.p. 80p.
THORN 9000 Fault Finding Guide **£1.00** p.p. 30p.
THORN 8800/9800 Remote Control Handset (2-button) **£10.00** p.p. £1.00.
THORN 8000, 8500, 8800, 9800 Power Supply Panels Tested/Exchange **£8.80** p.p. £1.50.
TX10 Remote & Tuning control panel (1515) **£9.40** p.p. £1.50
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,** KT3 Tested **£30.00,** Untested **£5.00** 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 with Panel Meter Indicator – can be adapted for latest CRTs **£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 A816 IF Panel (Surplus) **£1.00** p.p. 90p. 5 for **£4.00** p.p. £1.40.
GEC 2040 Decoder Panels. **£1.50** p.p. £1.80.
GEC 2110 PANELS Frame **£8.50** p.p. £1.40. Sound **£2.50** (tested) p.p. 80p.
GEC 20AX Switch Mode Power Supply **£5.00,** IF-Decoder **£12.50** p.p. £1.80.
PYE 691-7 CDA Panels. Makers tested stock. **£6.00** p.p. £1.45.
THORN TX9 Panels ex factory for small spares. Includes I.Cs & Semiconductors etc. **£3.00** p.p. £1.80.
THORN TX9 Panels salvaged ex factory for spares incl. 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 3000/3500 Power supply P.C.B. **£3.50** p.p. £1.00.
THORN 8000, 8500, 8800 IF Decoder Panels Tested **£10.00** p.p. £2.30.
THORN 8000/8500 IF/Decoder Panels salvaged **£3.20** p.p. £1.80.
THORN 9000 IF/Decoder Panels Salvaged. **£5.00** p.p. £1.60.
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 (tested).
G11 PANELS, Power, Frame, IF, Decoder, **£18.00** each. p.p. £2.00 (tested).
GRUNDIG 8630 Series Varicap Tuners **£5.00** p.p. £1.00.
VARICAP. ELC1043/5 **£7.80** p.p. 80p. Makers 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.
VARICAP VHF PHILIPS, **£6.90.** ELC 1042 **£7.90** p.p. 80p.
UHF/625 TUNERS, many different types in stock. DECCA Bradford 5 position, MULLARD 4 position **£2.50,** JAP Rotary **£4.80** p.p. £1.80.
TV SOUND IF Panels **£6.80** p.p. £1.00.
LOPT TESTER, Service Dept approved **£15.90** p.p. £1.20.
LOPTS New and guar. P/P Mono **£1.35,** Colour **£1.50,** Bobbins **80p.**

BUSH, MURPHY 774 series	£9.80	**R.B.M.** T20, T22	£9.80
BUSH, MURPHY A816 series	£9.80	**R.B.M.** T20, T22 Bobbin	£5.60
FERG., HMV, MARCONI, ULTRA 1400, 1500, 1590, 1591	£5.90	**DECCA** Bradford (state Mod No)	£8.80
THORN 1600, 1615, 1690, 1691	£9.15	**DECCA** 80, 100	£8.80
GEC series 1 & 2	£8.00	**GEC** 2110 series	£10.60
INDESIT 20/24EGB	£7.65	**ITT** CVC 5 to 9, CVC20	£9.80
ITT/KB VC200, 300	£7.65	**ITT** CVC25, CVC30 series	£8.80
PHILIPS 170, 210, 300 series	£7.65	**ITT** CVC45	£9.80
PYE, INVICTA, EKCO, 368, 169, 569, 769 series	£7.65	**PYE** 691-697 (state model no.)	£10.00
SPECIAL OFFER		**PYE** 725 (90°) 731 to 741	£9.20
DECCA 1700, 2001, 2020, 2401, 2420	£3.80	**PHILIPS** G8	£8.80
GEC 2114J/Junior Fineline	£2.80	**PHILIPS** G9	£10.80
PHILIPS 320	£2.80	**PHILIPS** KT3	£9.80
RBM A823	£4.80	**THORN** 3000/3500 SCAN, EHT	£6.90
GEC 2028, 2040, 2100	£4.80	**THORN** 8000, 8500, 8800	£12.80
PYE 713, 715	£6.80	**THORN** 9000 to 9600	£12.90
PHILIPS 570, 571	£6.80	**THORN** 9800	£19.80
		THORN TX9	£14.80

OTHERS AVAILABLE, PRICES ON REQUEST. ALSO LOPTS.
TRIPLERS Full range available. Mono & Colour.
Special Offer: GEC 2040/2100 EHT Tripler **£2.50** p.p. £1.30.
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
Telephone 01-794 8751, 794 7346

MANOR SUPPLIES

172 WEST END LANE, LONDON, NW6 1SD
NEAR: W. Hampstead Tube Stn. (Jubilee) Buses 28, 159, C11 pass door
W. Hampstead Brit. Rail Stn. (Richmond, Dalston, Stratford, N. Woolwich)
W. Hampstead Brit. Rail Stn. (St. Pancras, Bedford)
Access from all over Greater London.
Mail Order: 64 GOLDERS MANOR DRIVE, LONDON NW11 9HT
PLEASE ADD VAT 15% TO ALL PRICES INCL P+P

TELEVISION

SUBSCRIPTION RATES

	12 months	6 months
UK, CI, IOM, IR	£13	£6.50
Overseas surface mail	£15	£7.50

Air Mail rates available on request.

Please register the TELEVISION subscription(s) below:

Name ____________________

Address ____________________

____

12 months ☐ 6 months ☐ Price ____________

I would like to arrange a gift subscription to the person below:
(Enter your own name and address above as Donor).

Name ____________________

Address ____________________

____

12 months ☐ 6 months ☐ Price ____________

- I enclose payment of £ ____________
  (Cheques payable to Television)
- Please charge my credit card account the amount of £ ____________

Card No.

Valid from ____________ to ____________

Signature ____________________

Name and address of cardholder

Name ____________________

Address ____________________

____________________ 52

GIFT SUBSCRIPTION MESSAGE TO RECIPIENT

DETACH HERE

TELEVISION

November 1985

Vol. 36, No. 1
Issue 421

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 £13 in the UK, £15 overseas (by surface mail). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

BINDERS AND INDEXES
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.

BACK NUMBERS
Some back issues are available from the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF at £1·20p inclusive of postage and packing.

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

this month

OUR NEXT ISSUE DATED DECEMBER WILL BE PUBLISHED ON NOVEMBER 20

P. V. TUBES

104 ABBEY STREET, ACCRINGTON, LANCS BB5 1EE.
Tel: 0254 36521/32611 Telex: 635562 Griffin G (For P.V.)

HOW TO ORDER

ADD 87p per order P+P (U.K.). Heavier parcels e.g. cable, service aids, degaus. coils please allow £1.50 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. In some cases we may have to supply an equivalent.

SEMICONDUCTORS

AC107	35
AC126	34
AC127	34
AC128	34
AC128K	40
AC141K	39
AC142K	38
AC176	35
AC176K	35
AC186	41
AC187	38
AC187K	46
AC188	35
AC188K	46
AD143	82
AD161	54
AD162	54
AD161/62 MP	1.15
AF106	49
AF114	89
AF118	1.20
AF121	75
AF124	48
AF125	53
AF126	53
AF127	53
AF139	63
AF178	1.54
AF239	60
AL102	4.90
AU106	7.50
AU113	5.20
BA157	20
BC107	20
BC108	20
BC109	20
BC114	12
BC115	17
BC116A	35
BC117	30
BC118	24
BC119	36
BC139	32
BC140	32
BC141	30
BC142	30
BC143	31
BC147	13
BC148	9
BC149	12
BC157	16
BC158	16
BC159	15
BC160	52
BC161	32
BC170B	15
BC171	15
BC172	15
BC173	16
BC174	10
BC177	27
BC178	26
BC182L	15
BC183L	15
BC184L	15
BC186	35
BC187	25
BC204	10
BC208	13
BC209	10
BC212	15
BC212L	15
BC213	15
BC214	15
BC237	14
BC238	14
BC251A	18
BC252	12
BC261	33
BC262	30
BC300	50
BC301	53
BC303	33
BC307	20
BC308	25
BC323	99
BC327	22
BC328	18
BC337	18
BC338	18
BC461	42
BC547	13
BC548	13
BCX32 = BC637	39
BC549	10
BC550	10
BC557	10
BC558	9

BCY72	13
BD115	45
BD116A	90
BD124P	84
BD131	50
BD132	49
BD133	60
BD135	38
BD136	38
BD137	38
BD138	35
BD139	35
BD140	44
BD144	1.70
BD150	60
BD159	65
BD166	52
BD179	70
BD182	1.20
BD183	1.18
BD201	85
BD202	91
BD203	80
BD204	99
BD222	46
BD223	56
BD225	47
BD232	82
BD233	60
BD234	63
BD235	60
BD236	65
BD237	57
BD238	65
BD243	85
BD244	85
BD410	79
BD434	74
BD437	86
BD438	94
BD507	69
BD508	80
BD509	86
BD510	86
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	15
BF158	18
BF160	27
BF167	24
BF173	36
BF177	52
BF178	46
BF179	42
BF180	39
BF181	39
BF182	36
BF183	29
BF184	42
BF185	36
BF194/394	16
BF195	16
BF196	16
BF197	16
BF198	18
BF199	21
BF200	35
BF224	40
BF225	20
BF241	38
BF256	60
BF257	34
BF258	34
BF259	34
BF262	84
BF263	81
BF271	24
BF273	24
BF274	24
BF336	40
BF337	41
BF338	41
BF355	56
BF362	68
BF363	72

BF371	30
BF392	35
BF422	34
BF423	46
BF435	35
BF457	35
BF458	43
BF459	58
BF460 = BF462	86
BF469	63
BF470	66
BF597	16
BF757	54
BF758	54
BFR39	27
BFR40	30
BFR79	85
BFR90	1.74
BFT42	42
BFT43	42
BFW10	60
BFX29	40
BFX84	42
BFX85	30
BFX86	30
BFX88	46
BFY50	32
BFY51	32
BFY52	32
BFY90	95
BR100	34
BR101	95
BR103	83
BR303	1.46
BRC4443	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	1.31
BT116	1.87
BT119	3.56
BT120	3.66
BT151/800	2.07
BU104	2.00
BU105	1.58
BU108	1.80
BU124	1.90
BU126	1.75
BU204	1.50
BU205	1.87
BU206	1.80
BU208	1.60
BU208A	1.65
BU208D	2.20
=BU800	
BUW81A	3.84
BU208/02	2.10
BU326A	2.00
BU407	1.70
BU426	3.07
BU500	2.50
BU526	2.46
BU508	3.20
BU806	1.40
BU807	2.94
BUW84	1.45
BUX84	1.50
E1222	40
MCR101	45
MCR220	1.50
ME0411	20
MJE340	68
MJE520	50
MJ3000	1.98
MPSA92	35
MR814	45
MR854	55
MR475	2.46
MR479	2.60
OT112	1.91
OT121	1.91
R2008B	1.90
R2010B	1.92
R2265	1.50
R2322	84
R2323	67
R2461	1.50
R2540	
RC4558	2.20
RCA16334	90

RCA16029	1.18
RCA16039	1.18
RCA16092	1.18
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	93
TIP120	65
TIP2955	90
TIP3055	63
TIS91	32
TU106/02	1.80
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3054	60
2N3055	79
2N3702	16
2N3703	16
2N3705	10
2N3706	10
2N3708	17
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.82
2SC1096	1.72
2SC1172Y	5.50
2SC1173Y	1.69
2SC1306	2.73
2SC1307	3.00
2SC1449	1.67
2SC1520	68
2SC1678	2.67
2SC1909	2.90
2SC1953	1.44
2SC2028	1.82
2SC2029	2.60
2SC2078	2.90
2SC2091	1.34
2SC2166	2.73
2SD870 (Sony)	6.35
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	3.98
T6034V	81
T6036V	90
T9002V	1.12
T9003V	60
Transistor mounting kit TO66, TO3, TO220AB	30
STR441	6.50
STR451	6.50
STR6020	8.50

INTEGRATED CIRCUITS

AN214Q	3.91
AN240	3.84
AN318	6.37
AN262	4.10
AN301	5.15
AN715Q	3.97
AN6340	7.85
AN6341N	8.97
AN6344	7.85
BA521	2.80
BA536	3.00
CA555	46
CA556	84
CA741	25
CA748	45
CA3065	1.80
HA1151	3.89
HA1342	2.49
HA1306N	2.60
HA1366WR	2.80
HA1392	3.95
HA11219	4.21
HA11244	4.04
LA4031P	3.21
LA4032P	3.15
LA4102	3.37
LA4400	3.05
LA4422	3.28
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1011	3.25
LM1340T	75
MB3712	2.60
MC1307	1.99
MC1310P	1.84
MC1327	1.70
MC1351P	2.93
MC1349	1.99
MC1350	1.50
MC1352	1.75
MC1358P	1.50
MC1495L	3.00
MC14011BCP	66
MC14049UB	43
MC7742	1.35
MC7812	1.35
ML231 ETTR6016	2.20
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	8.50
SAA1124	5.34
SAA1250	4.99
SAA1251	5.75
SAA5000	6.15
SAA5010	6.30
SAA5012	6.50
SAA5020	5.90
SAA5030	8.25
SAA5050	8.50
SAA3210	2.93
SAS560S	2.07
SAS570S	2.07
SAS660	3.25
SAS670	3.25
SAS580	2.90
SAS590	2.90
SL901B	7.00
SL917B	9.25
SL1310	1.80
SL1327Q	1.20
SL1430	1.58
SL1432	3.36
SL76544	2.05
SN76003N =SN76013N	2.49
SN76023N	2.00
SN76110N	1.42
SN76115N	2.27
SN76131N	2.00
SN76226DN	2.72
SN76227N	1.18
SN76533N	1.70
SN76033N	2.49
SN76544N	2.35

SN76650N	1.24
SN76660N	80
SN76666N	1.52
SN76530A	1.47
STK015	7.36
STK032	=
STK078	13.25
STK043	15.25
STK433	5.65
STK435	1.06
STK436	6.50
STK437	7.85
STK439	8.40
STK459	9.50
STK441	11.57
STK461=465	12.60
STK463	14.30
SW153	3.90
TA7050P	95
TA7051P	95
TA7063P	2.20
TA7074P	3.46
TA7108P	3.43
TA7120P	2.43
TA7129AP	3.76
TA7130P	1.93
TA7146P	4.67
TA7193P	5.67
TA7171P	8.90
TA7172P	8.90
TA7173P	8.90
TA7176P	2.50
TA7202P	4.27
TA7204P	3.77
TA7205AP	3.72
TA7208P	3.40
TA7210P	6.60
TA7222	2.42
TA7223P	3.74
TA7227P	5.98
TA7228P	5.98
TA7310P	2.78
TA7609P	4.39
TA7611AP	2.92
TAA570	3.98
TAA310	2.83
TAA320	2.00
TAA550	55
TAA630	3.90
TAA8400S1	1.96
TAA661B	1.20
TBA120A	1.49
(A),(S),(AS),(SA).	
TBA120B	1.30
TBA120SB	1.37
TBA120T	1.49
TBA120U	1.49
TBA395	1.75
TBA396	1.75
TBA440N	2.75
(TBA1441)	
TBA440P	2.50
TBA480Q	1.82
TBA510	3.00
TBA520(Q)	1.68
TBA530(Q)	1.38
TBA540	1.76
TBA560(Q)	1.93
TBA570	1.79
TBA690	1.50
TBA641BX1	3.50
TBA673	2.45
TBA700	2.12
TBA720	2.64
TBA750	2.98
TBA800	1.62
TBA810AS	1.38
TBA820	1.70
TBA820M	1.25
TBA890	3.94
TBA920(Q)	3.00
TBA950(2X)	3.25
TBA970	4.09
TBA990	1.90
TBA14406	2.44
TCA760	2.30
TCA270SQ	2.50
TCA800	5.95
TCA830	3.44
TCA900	2.20
TCA910	2.20
TCA940	1.95
TDA440	2.20
TDA1002	1.95
TDA1003A	5.50
TDA1006A	2.50
TDA1005	3.60
TDA1010	3.30

TDA1011	4.00
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
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	1.50
TDA1415	1.40
TDA1470	4.67
TDA1770	5.60
TDA2002	2.80
TDA2003	1.20
TDA2004	2.52
TDA2006	1.78
TDA2010	2.40
TDA2140	5.95
TDA2150	2.22
TDA2020	4.66
TDA2030	2.80
TDA2522	2.56
TDA2523	3.40
TDA2524	2.25
TDA2525	4.00
TDA2530	2.70
TDA2532	2.90
TDA2540	3.84
TDA2541	3.84
TDA2560	3.50
TDA2571	4.90
TDA2576	3.75
TDA2576A	3.75
TDA2577	4.73
TDA2581	3.30
TDA2582	2.60
TDA2590	3.25
TDA2591	2.95
TDA2593	2.95
TDA2600	6.90
TDA2610	3.20
TDA2611A	2.35
TDA2640	2.92
TDA2652	7.31
TDA2653	5.90
TDA2680	3.40
TDA2690	2.72
TDA2710	5.67
TDA2720/1	6.77
TDA3190	2.00
TDA3500	6.90
TDA3560	6.00
TDA3561	6.66
TDA3562	8.60
TDA3571	3.75
TDA3651A	4.50
TDA4420	5.55
TDA4600	2.95
TDA9503	4.21
TEA1002	3.50
TEA1009	1.86
UPC554	2.63
UPC566H	2.95
UPC575C2	3.40
UPC576H	2.60
UPC587C2	2.34
UPC1025H	2.95
UPC1028H	2.52
UPC1032H	94
UPC1042C	1.56
UPC1156H	4.26
UPC1158H	3.50
UPC1163H	2.48
UPC1167C2	2.70
UPC1168C	3.20
UPC1176C	2.53
UPC1177H	3.15
UPC1178C	4.21
UPC1180C	1.84
UPC1181H	1.62
UPC1182H	2.95
UPC1183H	2.48
UPC1185H	3.66
UPC1188H	4.99
UPC1190G	1.20
UPC1198C	4.00
UPC1200V	1.18
UPC1211V	2.70
UPC1212V	1.34
UPC1215V	1.66
UPC1216V	1.20

UPC1217G	2.24
UPC1218H	1.80
UPC1223C	2.20
UPC1225H	2.00
UPC1226C	1.50
UPC1227V	1.20
UPC1228H	54
UPC1230H	4.39
UPC1238V	1.89
UPC1245V	1.35
UPC1350C	4.15
UPC1353C	4.76
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

COMPUTER SPARES

PLEASE ASK FOR ITEMS WHICH ARE NOT LISTED

2764	7.50
4116-2	2.17
4532	3.00
Z80 CPU	3.53
ZTX 213	17
ZTX 313	17
LM1889	1.77
8271	60.00
27128	9.50
4164	3.50
ZTX650	35
74LS260	55
UHF modulator UM1233	2.80
Micro cutters	5.00 a pair
Micro pliers	4.80 a pair
Anti static solder sucker	Std 5.40
	Lge 6.20
Double sided adhesive repair tape, Heavy duty	5.75 a roll

VOLTAGE REG.

7805	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

DIODES

AA119	9
BA102	17
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA317	26
BAX13	4
BAX16	8
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	
General Purpose Triac	95

ZENER DIODES

BZX61 130V	28
BZX61 Range (1.3W)	20
BZX79 Range (400mV)	10
BZY88 Range (400mV)	10
BZY93, 90 (18V)	1.18

I.C. SOCKETS

DIL to DIL

8 way	22
14 way	29
16 way	32
18 way	32
20 way	32
24 way	34
28 way	45
40 way	84

DIL to QUIL

14 way	32
16 way	34
18 way	37

QUIL to QUIL

14 way	32
16 way	36

We try very hard to stock all that we advertise but if for any reason beyond our control we do run out of anything we will inform you as quickly as possible. Some prices may change because of product availability.

THERMISTORS

VA1104	90
VA1040	75
VA8650	55
VA1039	35
GEC DUAL POS.	1.68
GEC DUAL THERM. CKI	1.98

OFFICIAL ORDERS ACCEPTED FROM SCHOOLS, LOCAL AUTHORITIES ETC.

CRYSTALS & FILTERS

6MHz	74
5.5MHz	74
4.3MHz	1.39
8.8MHz	1.48
9.94MHz	6.00
10.692MHz	6.00

L.E.D.'s

5mm Red, Green, Yellow	14
T1 ¾ Amber	22
T1 3mm Red, Green, Yellow	14
Flashing Red CQX21	52
CQX22	66
Panel Clips 3mm	04
5mm	04

P. V. TUBES

104 ABBEY STREET, (0254) 36521
ACCRINGTON, LANCS BB5 1EE. 32611

SONY PARTS

SEMICONDUCTORS

Diode CV12E	GEN	2.34
Diode GH3F	KV-GEN	1.42
Diode IS1555	GEN	25
Diode U05G	KV1810UB	96
Diode V11N	KV1810UB	96
Diode 10E2	GEN	25
Thyristor SG-264A	KV-GEN	4.08
Thyristor SG629	KV1810UB	6.42
Thyristor SG-6533	KV-GEN	13.20
BX342	SLC7UB	4.08
CX104A	KV1810UB	5.28
CX136A	VTR-GEN	7.74
CX143A	SLC5/7UB	7.20
CX186	SLC5UB	5.28
M51231P	KV2200UB	2.34
STK2129	STRYX50L	13.20
TCP4621AF6	SLC6UB	13.87
TDA2578A	KV2752UB	3.24

Please ask for any part not listed.

UPC 1394C	KV2060/62U	2.34
UPD 546C107	SLC7UB	16.98
UPD 547C049	SLC7UB	8.94
TL494CN	SLC7UB	5.28
2SA 771	TAF5A	2.34
2SA 835	GEN	1.42
2SA 1027R	ICF-C820L	25
2SA 1175	SLC7UB	89
2SB 733	KV2204UB	96
2SB 740C	TCK88B	96
2SB 856	GEN SY8-724-375-01	1.42
2SC 403C	GEN	25
2SC 867A	GEN	2.34
2SC 1034	GEN	5.28
2SC 1061	GEN	46
2SC 1114	GEN	5.28
2SC 1124	GEN	96
2SC 1316	GEN	3.18
2SC 1362-7	GEN	25
2SC 1364	GEN SY8-729-341-34	25
2SC 1413A	KV-GEN	7.38
2SC 1475	KV1810UB	25
2SC 1982	GEN SY8-725-800-00	1.42
2SC 2009	GEN	25
2SC 2278	GEN	96
2SC 2335 Kit	SLC7	7.38
2SC 2369	SLC5/7UB	3.18
2SC 2551	KV-GEN	98
2SC 2785	AG-7UB	25
2SC 3153	KV2060UB	4.08
2SD 257	ST5150	2.34
2SD 725	KV2204/2704	8.94
2SD 773	BM715T	25
2SD 774	SL/HMK	96
2SD 870	KV2704E	6.42
2SD 1164	SLC6UB	96
2SD 1497-02	KV2252/2752	4.08
2SD 1497-06	KV2252/2752	4.08

SUNDRIES

UHF Tuner BT-871	KV1810UB	37.20
Booster Antenna	SLC7UB	31.38
RF Modulator	SLC6UB	60.38

SONY REMOTE CONTROLS

SLC5UB	19.80
SLC6UB	17.40
SLC7UB	42.00

VIDEO/AUDIO HEADS

Ace Assembly	SLC7UB	24.10
Ace Assembly	SLC6UB SYA-676-104-6A rep SYA-676-205-5A rep	47.22
Video Head DRS-21R	SLC9UB	43.20
Video Head DSR-35A	SLC20/30/40UB	41.34
Video Head DSR-36R	SLC5/C6/7UB	42.00
Video Head DSR-43A	SL8000UB	
Head Record-Play-back	PP128-3602C/GEN	13.87
Head Record-Play-back	181-3602D TC/HMK3000	4.12

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	2.95
Thorn 9000 focus unit	5.95
Thorn 8500 focus unit	4.75
Thorn Tx10 focus cont.	10.20
Decca bridge trans.	1.97

MECH. REPLACEMENT PARTS

Drum Assembly Main	SLC7UB	192.52
Idler Kit/Rewind Kit	SLC7/C5UB	5.95
Idler Kit/Rewind Kit	SLC6UB	3.95
Forward Assembly	SLC6UB	3.18
Gear Kit	SLC9UB	8.94
Guide Pin Kit	SLF1/C9UB	5.28
Pinch Roller	TC-GEN	96
Pinch Roller	TC204SD	1.42
Pinch Roller	HMK44/44B	96
Pinch Roller	TCK55	96
Cassette Holder Assembly	TCK44	1.42
Lever Forward Assembly	WM2	96
F/Wheel Assembly	WM2	3.18
Limiter Assembly	SLC7UB	2.34
Idler Assembly	SLC7UB/C5/3000	96
Brake Assembly	SLC7UB	1.42
Pinch Roller	SLC7UB	96
Pulley Loading Assembly	SLC6UB	96
Thrust Bearing Assembly	HMP70	3.18
Screw Cassette Lid	WM2	25
Coil Spring	WM2	25
Battery Lid	WM2	96
Lid Timer	SLC7UB	96
Gear Kit	SLC9UB	
Threading Gear	SLT6ME	96

BELTS

Belt	WMR2	96
Rubber Belt	TC-GEN	96
Take Up Belt	TC-GEN	96
Drive Belt	TC-GEN	96
Midway Pull Belt	TC-GEN	96
Capstan Belt	TC92	96
Capstan Belt	TC135/136SD	96
Flat New Belt	TC186SD	96
Capstan Belt	TC-GEN	96
Capstan Belt	HST300	96
Take Up Belt	HMK3000UK	96
Belt	HMK3000UK etc	96
Fast Forward-Rewind Belt	V02850P	1.62
Forward Belt	V02850P	1.02
Motor Belt	V02850P	1.62
Capstan Belt	VP2000	4.32
Forward Belt	SLC7UB/SLC5UB	25
Capstan Belt	SL8000UB	96
Extension Belt	SL8000UB	2.34
Drum Belt	SL8000UB	1.52
Fast Forward Idler Belt	SLC7UB	96
Threading Belt	SLC7UB	25
Capstan Belt	SLC7UB/CS	96
Eject Belt	SLC7UB	25
Counter Belt	SLC7UB	25
Fast Forward Belt	SLT7ME	96
Forward Belt	SL8000UB	96
Belt	SLC6UB	96
Fast Forward Belt	SLC6UB	96
Counter Belt	SLC6UB	96
Threading Belt	SLC6UB	96
Relay Belt	SLC6UB	96
Capstan Belt	SLC6UB	96
Belt	PS-5520 etc	3.18

SWITCHES

Switch, Filter	KV2022UB	96
Switch, P.B. Channel	1820/2 & 1340	18.86
Switch, Push Power	KV-GEN	1.20
Switch, Push	SL8000UB	96
Switch, Push Button Power	KV14/2060UB	3.68
Switch, Power	KV2022UB	4.08
Switch, Slide Record	SL8000UB	96
Switch, Slide Record-Playback	SL8000UB	1.42
Switch, Push	KV1612UB	4.08
Switch, Power	KV-GEN	5.50
Button, Stop/Eject	WM4	96
Knob, Control	SLC7UB	96

MANUALS (Zero VAT)

Instruction Manual	SLC9UB	2.00
Instruction Manual	SLC6UB Mk 2	2.00
Instruction Manual	SLC7UB	2.00
Instruction Manual	SLC5UB	2.00
Instruction Manual	SL6UB	2.00
Instruction Manual	KV2212UB/E2	2.00
Instruction Manual	KV2705UB	2.00
Service Manual	HMK3000	8.25
Service Manual	KV1810UB Mk 1	8.25
Service Manual	KV1400UB	8.25
Service Manual	SLC7UB	8.25
Service Manual	SLC5UB	8.25
Service Manual	SLC6UB	8.25
Service Manual	SLC9UB	8.25
Service Manual	SLC6UB Mk 2	8.25

IF Gain module	9.00	Decca Speaker 8R	3.75
C.D.A. Panel	20.00	G11 47K pot plus switch	65
G8 rear conv. panel	23.00	15R fused res. G9	55
Decca 30 width cont.	50	G11 line lin coil	2.95
Decca 2M2 HT cont.	25	G11 pot G2 R.G.B.	5.30
Pye 731 HF choke	6.50	G11 line scan panel	54.00
Delay lines DL20, DL60,		G11 power panel	37.50
DL50, DL700	2.20	G11 timebase panel	37.50
CRT tube base	1.40	G11 bridge trans.	1.97
EHT final anode cap	53	G11 EW correc. coil	1.95
6.3V CRT boost trans.	5.80	G11 final anode lead	1.50
Focus rod	1.25	G11 focus unit	5.80
Focus holder	2.20	G11 39R 3W resistor	60
AFC unit G8	8.82	G11 RGB 10G diodes	50

THORN/FERGUSON

SEMI-CONDUCTORS

Diode GL4850	TX10	74
Thyristor TIC45X	TX9	1.18
Diode 19022W	TX9	43
Thyristor T9053V	TX9	1.10
Thyristor T9054V	TX9	66
AN8360	3V29	6.81
HA11741	3V32	23.22
M293	TX90	7.10
M50790SP	3V35	6.98
M54544L	3V32	3.80
MC1300	38030	4.98
MC14493	TX9/TX10	2.74
MN1219	3V36	11.43
TDA1236	TX10	3.44
TDA3652	TX10	6.00
TDA4500	TX90	5.84
SL490	TX9/TX10/TX100	1.89
DTC144WF	3V35	30
R2540	ICE9000	6.00
TIP112H	TX90	69
T5051V	TX9	3.43
T6069V	TX9	38
T6071	TX100	1.46
T9063V	TX9	3.64
19064V	TX90	1.14
UP0553C 164	3V29	20.76
UP07519G 031 036	3V36	17.13
UP07538C 020	3V38	11.06
10 Volt TD5	3V29	8.74

MANUALS

Service Manual	TCE1690/1691	5.60
Service Manual	TCE1790	1.14
Service Manual	TCE9000	3.56
Service Manual	TCE9600	10.05
Service Manual	TCE9800	7.54
Service Manual	TX9	29.04
Service Manual	TX10	40.00
Service Manual	TX90	11.30
Service Manual	TX100	11.20
Service Manual	3V00	17.50
Service Manual	3V16	26.24
Supplement to 3V00	3V22	1.28
Service Manual	3V23	30.62
Service Manual	3V24	28.42
Service Manual	3V29	25.84
Instruction Manual	3V29	3.28
Service Manual	3V00	17.50
Instruction Manual	3V29	3.28
Service Manual	3V30	14.91
Instruction Manual	3V30	2.65
Service Manual	3V31	25.84
Instruction Manual	3V35	1.63
Service Manual	3V35/3V36	27.20
Supplement to 3V35	3V38	1.24
Supplement to 3V35/3V38	3V39	90

V.C.R. BELTS

Counter Belt 1	3292/3V00/3V16/3V22	60
Counter Belt 2	3292/3V00/3V16/3V22	60
Reel Drive Belt	3292/3V00/3V16/3V22	1.00
Relay Belt	3V00	2.79
Capstan Belt	3292/3V00/3V01/3V16/3V22	3.28
Unloading Belt	3292/3V00/3V16/3V22	60
Drum Motor Belt	3292/3V00/3V16/3V22	2.79
Cassette Drive Belt	3V23	60
Capstan Belt	3229/3V30	1.62
Loading Belt	3V23	60
Loading Belt	3V29/3V30	60
Loading Belt	3V35/3V36/3V38	60
Tape Spool Drive Belt	3V35/3V36/3V38	60
Take Up Clutch Belt	3V29/3V30/3V35/3V36/3V38	60
Capstan Belt	3V35/3V36/3V38	1.21

VIDEO HEADS

Upper Drum Assmb	3292/3V00	35.94
Upper Drum Assmb	3V22	35.94
Upper Drum Assmb	2200/3660/3V16/3V23/3V24/3V31/3V35/3V36/3V38/3V39	35.94
Upper Drum Assmb	3V29/3V30	35.74

VIDEO LAMPS

Tuning Indicator Lamp	TX9	62
Cassette Lamp	3292/3V00	3.66
Cassette Lamp	3V16	1.53
Cassette Lamp Holder	3V16	60
Cassette Lamp	3V23	1.95
Cassette Lamp Holder	3V29/3V30/3V31/3V32	60
Cassette Lamp	3V29/3V30	1.41
Cassette Lamp	3V31/3V32	1.60

PHILIPS KT3/K30 PARTS

KT3 positor	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 UF 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

V.C.R. MOTORS

Capstan Motor	3292/3V00/3V01/3V16	51.45
Drum Motor	3292/3V00/3V01/3V16/3V22	43.49
SMP Reel Motor	3V23	32.79
Cassette Housing Motor Assembly	3V23	10.32
Capstan Motord	3V23	52.81
Loading Motor	3V23/3V24/3V29/3V30	8.56
Capstan Motor	3V29/3V30	27.32
Reel Motor	3V29/3V30	32.79
Lower Drum Motor Assembly	3V29/3V30	78.72
Cassette Motor	3V35/3V36/3V38	6.92
Mode Control Motor	3V35/3V36/3V38	5.95
Capstan Motor	3V35/3V36/3V38	23.90

REMOTE HANDSETS

T723 Non Text	3767/3788	38.60
T725 Non Text	20A2/2282/3781/37041/37081/37101/3714/37351/37361/37371	19.40
T731 Text and Stereo	20A4/2284/37063/37093/37463/37493	20.01
T736 Text	20A3/2203/3795/3796/37003/37103/37353/37363/37373/37953/37963	31.60

SWITCHES

On/Off Switch	TX9	2.98
On/Off Switch	TX10	2.74
Focus Unit	TX10	10.20
8 Way Tuner Unit (Not Drawer)	37141	12.88
8 Way Tuner Unit (Not Drawer)	37360	13.50
8 Way Tuner Unit (Not Drawer)	37340/37370	20.44
Volume Control	38030	1.74
6 Button Switch Assmb	3722/4722/6722/8000	20.70

TRANSFORMERS & INDUCTORS

Line Output Transformer	TCE9000	25.53
FHT Transformer	TX10	33.80
Line Output Transformer	TX10	15.00
Line Output Transformer	TX9	23.85
Line Output Transformer	38030	6.18
RFI Choke	TX9	3.45
DC Input Choke	TX9	15.36
Mains Transformer	TX90	15.03
Linear Line Coil	TX9	1.77
RFI Input Choke	TX9	60

MECHANICAL SPARES – V.C.R. REPLACEMENT

Take Up Rubber Tyre	3292/3V00	60
Rewind Tyre	3292/3V00	60
Timing Gear Assembly	3V00	3.97
Audio Control Head Sub Assembly	3292/3V00/3V01/3V16/3V22	42.38
Fast Forward Idler	3292/3V00/3V16	1.63
Fast Forward Tyre	3V00/3V16	60
Pinch Roller	3292/3V00/3V01/3V16/3V22/3V23	7.30
Stop Solenoid	3V16	10.42
Pause Solenoid	3V16	16.60
Take Up Idler Assmb	3V00 up to Serial No. 19006; 3V16 up to Serial No. 16509; 3V22 up to Serial No. 27700	7.54
Take Up Idler Assmb	3V00 Serial No. 19007 onwds; 3V16 Serial No. 16510 onwds; 3V22 Serial No 27701 onwds	5.28
Rewind Idler	3V16	8.52
Take Up Tension Brkt	3V23	80
Roller Assembly	3V23	4.08
Take Up Spool Idler Assmb	3V29/3V30	2.12
Pinch Roller	3V29/3V30	8.66
Idler Counter Pulley	3V29/3V30	60
Cassette Housing Assmb	3V29/3V30	20.85
Take Up Clutch Assmb	3V29/3V30	2.36
Spool Carrier Idler Assmb	3V35/3V36/3V38	2.73
Cassette Housing Assmb	3V35/3V36	36.74
Lower Door Spring	3V35	60

TUNERS/MIXERS BOOSTERS

Mix Booster	3292	30.62
Mix Booster	3V29	24.70
RF Convertor	3V29	59.32
Mix Booster	3V31/3V32	24.50
UHF Tuner	3V35/3V36	38.12
RF Convertor	3V35/3V36/3V38	36.08
UHF Tuner	3V39	21.87
Varicap Tuner	TX9/TX10	16.34

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
K30-K35 sound panel	12.50
K35 tuner drawer	10.00
Diode ZTX 338	90

EAST CORNWALL COMPONENTS

☆ ☆ ☆ **85**

NEW 1985 CATALOGUE is now available – range of components greatly increased – over 125 pages fully illustrated. Price £1.00 per copy (free upon request with orders over £15). Includes 50p Credit Note, Special Offer Sheets, Order Form and Pre-Paid Envelope. Order your copy now – will be despatched as soon as available.

SERVICE AIDS

Switch Cleaner	1.18
Circuit Freezer	1.24
Foam Cleanser	1.16
Aero Klene	1.10
Plastic Seal	1.28
Excel Polish	1.12
Antistat Spray	1.18
Aero Duster	1.40
Super 40	1.82
Video Head Cleaner	1.06
Fire Extinguisher	3.06
Silicone Grease Aero	1.42
Ditto Tube	1.64
Heat Sink Compound	1.08
Solda Mop 0.12mm	0.74
Ditto 0.06mm	0.76

PLUGS & SOCKETS

Metal Co-ax Plug	0.18
Plastic Co-ax Plug	0.14
Metal Line Socket	0.50
Single Junc Socket	0.80
Plastic Phono	0.15
F.M. Plugs	0.20
PL259 Plugs	0.38
Reducer	0.15
Low loss splitter 1 in, 2 out	1.00

SOLDERING SECTION

Soldering Station complete with 30W or 40W Iron (state which)	49.95
XS25 W Iron kit/ complete with steel & plug attached	10.00
CS 18W, as above	9.90
Antex 15W iron	5.25
Antex 18W iron	5.50
Antex 25W iron	5.75
Antex elements	2.75
Antex bits	0.90
Antex stands	2.10
Soldersucker	4.50
Spare nozzles for Soldersucker	0.65

TERMINAL BLOCKS

2 amp 12 way	0.20
5 amp 12 way	0.24
15 amp 12 way	0.42
32 amp 12 way	0.88

INTEGRATED CIRCUITS (£) EACH

709	0.35	ML23713	2.30	TDA560C	1.50
741	0.25	NE555	0.25	TDA800	0.80
747	0.70	SAA1025	4.00	TBA810S	1.20
AN214Q	3.80	SAS560	2.50	TBA950/2A	3.05
AN240P	3.42	SAS570	1.85	TCA270SA	4.02
BTT6218	1.98	SAS580	2.85	TDA1003A	5.50
CA301AT	2.88	SN76023N	2.00	TDA1004	4.95
CA358	0.66	SN76033N	2.50	TDA1006A	2.45
CA801CM	1.20	SN76131N	1.99	TDA1035S	2.20
CA3020	2.10	SN76226DN	1.70	TDA1170S	1.99
CA3065	1.60	SN76227N	1.10	TDA1352A	1.80
CA3080E	0.68	SN76660N	0.75	TDA2002	1.80
CA3140	0.45	SN76666NO	1.40	TDA2020	4.00
HA1366W	1.59	STK015	6.20	TDA2030	1.90
LA4422	3.20	TA7146P	4.60	TDA2140	
LC7131	4.90	TA7203P	2.76	TDA2160	
LC7137	5.40	TA7204P	1.50	TDA2522	
LM324N	0.48	TA7205AP	1.30	TDA2530	
LM380N8-P	1.15	TA7222P	2.32	TDA2532	
LM380N14-P	1.80	TAA550	0.50	TDA2560	3.20
LM1011N	3.20	TAA611A12	3.50	TDA2561	4.65
LM1488N	0.98	TAD100	2.90	UPC57562	1.48
LM3900N	0.85	TDA120A	0.80	UPC741G	0.92
M51513L	3.18	AS/S/SB/T/U	0.80	UPC1156H	2.75
M51515L	3.18	TDA120B	1.30	UPC1182H	2.75
MC1307P	1.99	SA/SQ/UQ	1.30	UPC1218H	1.80
MC1327P	1.50	TBA520	1.50	UPC1370C2	2.50
MC1330P	1.60	TBA530	1.20	UPC2002H	2.78
ML23213	2.10	TBA540	1.64	UPC2002V	2.78

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
470nF1000V DC	60p

I.C. SOCKETS

Dil to Dil

8	pin	0.08	0.70/10
14	pin	0.10	0.90/10
16	pin	0.11	1.00/10
18	pin	0.14	1.30/10
22	pin	0.20	1.80/10
24	pin	0.20	1.90/10
28	pin	0.22	1.95/10
40	pin	0.28	2.00/10

PVC TAPE

25p each. 10 for £1.50. Assorted colours.

POTENTIOMETERS

Carbon Track Rotary 0.25W Log & 1 in values. All 1/4in Spindle 20ml body dia Shaft 2" long

4K7.2M2 Single Gang Log	.40	10/ 3.50
1K — 2M2 Single Gang Lin	.30	10/ 3.50
5K — 2M2 Single Gang DP Switch Log	1.05	10/ 9.50
5K — 2M2 Double Gang Log & Lin	1.25	10/10.50

DE-LUXE EMERGENCY LITE

Operating from 12V DC comes complete with 4 metres of cable and cigar lighter plug for easy operation. Magnet bas and solid state controlled blinking switch are incorporated 99p

FUSES Prices per 10

20mm Quick Blow. 100, 125, 160, 200, 250, 315, 400, 500, 630, 800mA, 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3A. **40p. 20mm Time Delay.** 100, 125, 160, 200mA **£1.80.** 250, 315, 400, 500, 630, 800mA. **£1.00.** 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3A **85p. 1" Mains.** 2, 3, 5, 7, 10, 13A **85p.**

REPLACEMENT TV MAINS DROPPERS

GEC2010	8R + 15R + 17R + 70R + 63R + 188R	0.95
GEC 2018	10R + 15R + 19R + 70R + 188R	1.15
Philips G8	2.2R + 68 R	0.80
Philips 70	6R + 124R + 84R	0.68
Philips 300	118R + 148R (with link)	0.85
RRI A640	250R + 14R + 156R 50W	1.05
RRI A816	302R + 70R + 6.2R	0.78
Thorn 1500	350R + 20R + 148R + 1.5K + 317R	1.34
Thorn 3000/3500	6R + 1R + 100R Fused	0.93
Thorn 8000	56R + 1K + 47R + 12R	0.95
Thorn 8500	1K5 + 40R + 50R	1.28

CHART RECORDER SPECIAL

Brand new 3 channel pen recorders complete with charts. Full spec. upon request. Once only price **£40 + £10 p&p + VAT.**

Fuseholders

20mm Panel Mounting	0.28
20mm Chassis Mounting	0.06
1¼" Panel Mounting	0.35
1¼" Chassis Mounting	0.12
Carline 1¼" holder	0.10

MULTISECTION ELECTROLYTICS

THORN	850	100+300+100+16/300V	1.80
	1400	150+100+100+100+150/320V	2.70
	1500	150+150+100/300V	2.00
	3000	1000/63V	0.74
	3500	175/400V+100+100/350V	2.56
	8000	400/350V	2.10
	8000/8500	2500+2500/63V	1.99
	8000	700/250V	2.15
		1000/70V	0.80
	9000	400/400V	3.00
Timer Amp		4700/25V	0.95
DECCA 10/30		400+400/350V	3.20
	1700	200+200+400/350V	3.75
GEC	2047	2048 2083 2084 2104	
		200+200+150+50/300V	2.50
		600/250V	1.85
ITT/KB		200+200+75+25/350V	2.90
		220/100V	1.95
PHILIPS	G8	600/300V	2.20
	G8 G9	600/300V	2.10
	G11	470/250V	1.80
	G9	2200/63V	1.25
EKCO	T148	125+200+100+32/275V	2.65
	691 Series	200+300/350V	2.50
		600/300V	2.20
RANK		300+300/300V	1.75
	A823	2500+2500/30V	1.50
		220/400V	1.85
		600/300V	2.25

TELEPHONE SPECIAL

BT App Telephone Plug + 3m Lead	£1.25
BT App Master Socket inc Wiring instrns	£2.85
BT App Secondary Socket	£1.95
4-way plug	58p each 10/£5.50
BT 4-Core Cable per metre	15p
Cable clips for above	100/75p

NI-CAD CHARGER

Universal Ni-Cad charger, charges PP3, AA, C, D
Price £6.00

Rechargeable Batteries

AA (HP7)	85p	10/ 75p each
C (HP11)	£1.75	10/£1.85 each
D (HP2)	£2.05	10/£1.95 each
PP3	£3.80	10/£3.70 each

Dry Cell Batteries – Button type for Multimeters – set of 3 £1.50

RESISTORS – CARBON FILM 5%

1/4W 1RO to 10M (E12 Range)	2p each. 15p/10. 75p/100
1/2W 2R2 to 10M (E24 Range)	2p each. 15p/10. 75p/100
1W 10R to 2M2 (E12 Range)	7p each. 65p/10. 6.00/100
2W 10R to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100

RESISTOR KITS – each value individually packed

1/4W pack 10 each value E12 – 10R to 1M 610 pieces	5.75
1/4W pack 5 each value E12 – 10R to 1M 305 pieces	3.35
1/2W pack 10 each value E12 – 2R2 to 2M2 730 pieces	7.95
1/2W pack 5 each value E12 – 2R2 to 2M2 365 pieces	4.75
1W pack 5 each value E12 – 2R2 to 1M 353 pieces	15.00
2W pack 5 each value E6 – 10R to 2M2 317 pieces	18.50

RESISTORS – WIREWOUND. Generally 5%

2.5W – 0.22 to 270R – Available in preferred values	0.20
4W – 1R0 to 10K – Available in preferred values	0.21
7W – 0.47R to 22K – Available in preferred values	0.25
11W – 1R0 to 22K – Available in preferred values	0.29
17W –1R0 to 22K – Available in preferred values	0.37

ZENER DIODES

400mW Plastic	3V–75V	8p each. 10/75p.
1.3W Plastic	3V 200V	15p each. 10/£1.40
15W Flange	4.7–47V	£1.26 each*
2.5W Plastic	7.5–75V	64p each*
20W Stud	7.5–75V	£1.35 each*

*Only available while stocks last

HV Disc Ceramic (†)
1kV 1.5nF 18p
8kV 10, 47, 56, 82, 100, 120, 150, 180 30p

ZENER DIOOE PACK

400mW – 5 each value – 11 values – individually marked and packed – 55 Zener Diodes.
Price £3.50 each.

MIXED DIALECTRIC CAPS

.01mf	1000V	30p
.022mf	1000V	20p
.1mf	1000V	48p
.47mf	1000V	78p

DC MOTORS (Min)

6-12V 75p ea. 3.00/5

SCREENED CURLY LEADS

Black 3 core (2 metres extended)
75p each 6.00/10

SPEAKERS

4" Round 1 6W 4 ohm	£1.50 pair
2¼" Round 1.6W 8 ohm	85p each
4" Round 1 6W 4 ohm plus mounting bracket	£1.00 each

SONY TV & VIDEO SPARES

Rewind Kits SLC5-SLC7	A-670-634-8A	4.50
SLC6	A-670-639 1A	3.50
Video Heads SLC6-SLC7	A-676-203-8A	48.25
SLC5	A-676-204-4A	45.60
Motor Kit	X-354-931-41	13.45
Idler Assembly	X-365-331-50	0.95
Cap. Film 0 18mf/1.5Kv	1-129-952-11	1.35
Relay	1-515-323-00	5.10
Switch Power	1-516-390-11	2.30
Switch Push Button	1-552-503-11	3.25
Thyristor SG264A	8-726-420-00	4.00
SG6533	8-726-330-00	13.45
Service Manual		20.00

VALVES

Type	Price (£)
DY802	0.95
DY86/87	0.66
ECC81	1.00
ECC82	0.92
ECC83	1.00
ECC84	0.80
ECC85	0.95
ECC88	1.25
ECF80	1.20
ECH81	1.40
ECH84	1.50
ECL82	1.10
ECL86	1.75
EF80	0.75
EF86	1.80
EF183	0.90
EF184	1.00
EH90	0.98
KT66(G.E.C.)	16.00
KT88(G.E.C.)	19.00
EL34	3.25
EL84	1.00
EL509	7.85
EM87	2.55
EY86/87	0.67
EY500A	2.50
PCC84	0.60
PCC85	1.75
PCC89	0.75
PCC189	0.85
PCF80	0.95
PCF86	1.25
PCF200	1.95
PCF801	1.05
PCF802	1.05
PCF806	1.20
PCL82	1.00
PCL83	2.50
PCL84	1.00
PCL86	0.90
PCL805/85	1.05
PD500	2.90
PFL200	1.85
PL33	1.50
PL36	1.75
PL81	0.85
PL82	0.75
PL83	1.20
PL84	0.75
PL95	2.00
PL504	1.40
PL508	2.70
PL509/519	5.25
PY88	1.80
PY500A	2.20
U26	1.90
UCH81	2.00
UCL82	1.80
30FL12	1.60

TRANSISTORS + OIOOES

Type	Price (£)
AC127	0.28
AC128	0.30
AC128K	0.34
AC141	0.58
AC141K	0.38
AC142	0.56
AC142K	0.38
AC151	0.45
AC152	0.45
AC153	0.57
AC153K	0.46
AC176	0.30
AC176K	0.38
AC187	0.28
AC187K	0.38
AC188	0.28
AC188K	0.38
ACY22	1.50
AD142	0.88
AD143	1.10
AD149	0.72
AD161/162	1.20
AD162	0.52
AF114	1.20
AF115	2.10
AF116	2.10
AF121	0.56
AF124	0.42
AF125	0.58
AF126	0.58
AF127	0.38
AF139	0.40
AF178	2.28
AF239	0.50
AF279S	1.40
AL100	5.40
AL102	4.40
ASY80	5.20
ASZ17	2.00
AU110	2.80
AY102	4.40
B40C200	1.03
BA110	0.68
BA115	0.10
BA121	0.40
BA129	0.38
BA148	0.16
BA155	0.12
BA157	0.28
BB105B	0.30
BB105G	0.48
BB110B	0.42
BC107	0.10
BC108	0.10
BC109	0.10
BC113	0.42
BC115	0.12
BC116	0.12

Type	Price (£)
BC117	0.22
BC118	0.16
BC119	0.28
BC125	14
BC140	0.27
BC141	0.24
BC142	0.24
BC143	0.26
BC147	0.18
BC147B	0.14
BC148	0.10
BC148B	0.12
BC149	0.10
BC149C	0.14
BC157	0.10
BC158	0.12
BC159	0.12
B/C	0.14
BC160	0.30
BC161	0.30
BC168B	0.20
BC169C	0.12
BC170	0.16
A B or C	0.16
BC171	0.10
A or B	0.10
BC172	0.12
B or C	0.12
BC177	0.24
A B or C	0.24
BC182	0.10
A,B or C	0.10
BC182L	0.12
LA LD LC	0.10
BC183	0.10
A B or C	0.10
BC183L	0.10
LA LB LC	0.10
BC184	0.10
A B CL LC LB	0.10
BC207	0.15
BC212	0.10
A B or C	0.10
BC212L	0.09
LA LB	0.10
BC213	0.10
A B or C	0.10
BC213L	0.10
LA LB LC	0.10
BC237	0.11
BC238	0.12
BC251	0.14
A B	0.14
BC262	0.28
A B	0.28
BC301	0.30
BC302	0.30
BC303	0.30
BC307A	0.18
BC317A	0.18
BC323	0.90

Type	Price (£)
BC327	0.16
BC328	0.16
BC337	0.12
BC338	0.12
BC350A	0.24
BC351	0.16
BC440	0.36
BC441	0.40
BC461	0.58
BC478	0.24
BC516	0.48
BC547	0.12
A or B	0.10
BC548	0.12
A B or C	0.10
BC549	0.10
A or B	0.10
BC550	0.10
A or B	0.10
BC557	0.10
BC558A	0.10
BCY70	0.16
BCZ10	3.21
BCZ11	2.60
BD124P	0.70
BD129	0.90
BD130Y	0.68
BD131	0.36
BD132	0.36
BD135	0.26
BD136	0.26
BD137	0.28
BD138	0.30
BD139	0.30
BD140	0.28
BD142	1.26
BD145	1.82
BD150A	0.72
BD160	1.58
BD165	0.45
BD183	0.70
BD201	0.52
BD202	0.57
BD204	0.50
BD222	0.50
BD225	0.40
BD232	0.45
BD234	0.30
BD235	0.30
BD236	0.38
BD237	0.38
BD410	0.76
BD434	0.58
BD438	0.58
BD439	0.85
BD441	1.00
BD507	1.05
BD520	1.20
BD687	0.88
BD707	0.88
BDX18	1.00
BDX32	1.48
BF115	0.32

Type	Price (£)
BF117	0.50
BF119	0.82
BF120	0.38
BF125	0.42
BF127	0.41
BF154	0.14
BF157	0.46
BF158	0.30
BF160	0.23
BF167	0.32
BF177	0.28
BF178	0.26
BF180	0.27
BF181	0.27
BF182	0.32
BF183	0.32
BF184	0.30
BF185	0.28
BF194A	0.15
BF195	0.12
BF200	0.30
BF222	0.38
BF224	0.16
BF224J	0.20
BF240	0.30
BF241	0.30
BF244	0.34
BF244A	0.30
BF257	0.22
BF258	0.26
BF259	0.30
BF262	0.34
BF263	0.38
BF270	0.30
BF271	0.28
BF273	0.22
BF274	0.46
BF294	0.46
BF336	0.32
BF337	0.28
BF338	0.28
BF355	0.37
BF363	0.35
BF367	0.24
BF371	0.27
BF422	0.30
BF450	0.38
BF457	0.36
BF458	0.37
BF459	0.35
BFR51	0.36
BFR61	0.32
BFR90	0.86
BFT41	0.68
BFT43	0.86
BFW11	0.84
BFW44	0.88
BFX29	0.28
BFX48	0.78
BFX80	6.46
BFZ85	0.35
BFY50	0.22
BFY51	0.22

Type	Price (£)
BFY52	0.22
BFY90	0.80
BFY90S	1.34
BR100	0.25
BR101	0.40
BR103	0.50
BR303	2.75
BRY39	0.50
BRY56	0.42
BSX19	0.32
BSX20	0.30
BSX59	0.78
BSX76	0.65
BSY52	0.35
BSY95A	0.25
BT100A/02	0.90
BT101/300	2.75
BT101/500	3.25
BT102/300	3.60
BT106	1.15
BT108	1.25
BT109	1.15
BT116	1.20
BT119	3.30
BT120	3.50
BT121	2.99
BT138/600	1.30
BT151/560R	0.90
BTY79/400R	2.80
BU100A	2.30
BU104	1.80
BU105	1.20
BU105/02	1.55
BU108	1.75
BU124AE	0.98
BU126	1.40
BU133	1.90
BU204	1.30
BU205	1.30
BU206	1.50
BU208	1.40
BU208A	1.40
BU208/02	2.06
BU326S	1.75
BU407	1.10
BUX80	3.70
BUY20	2.75
BUY69A	2.60
BUY69B	1.98
BY100	0.80
BY103	0.50
BY122	0.60
BY126	0.10
BY127	0.10
BY133	0.06
BY135	0.35
BY164	0.45
BY179	0.56
BY182	0.80
BY184	0.38
BY187	0.65
BY189	6.75
BY198	0.64

Type	Price (£)
BY199	0.72
BY206	0.14
BY207	0.16
BY210/400	0.21
BY210/600	0.24
BY210/800	0.28
BY227	0.22
BY228	0.46
BY238	0.65
BYX10	0.20
BYX36/150	0.40
BYX36/600	0.48
BYX48/300	0.70
BYX55/600	0.30
BYX71/600	1.18
BYZ12	0.78
C106D (400V)	0.48
C106F (50V)	0.36
D40C1	1.08
D40N1	1.12
E1222	0.30
E5024	0.30
GET872	0.60
GET881	1.70
GET882	1.90
ITT2001	0.18
ITT2003	0.34
MCR106/5	1.20
ME0413	0.70
ME6002	0.26
MEU21	0.62
MJ400	0.45
MJ2955	1.00
MJ3000	1.80
MJE340	0.46
MJE520	0.44
MJE2955	1.60
MJE3055	1.40
MPSA05	0.30
MPSA12	0.30
MPSLO1	0.34
MPSUO5	1.05
MPSUO6	1.18
MR502	0.40
MR854	0.88
OA91	0.07
OA210	0.66
OC26	2.65
OC35	4.75
OC36	1.75
OC44	0.72
OC72	0.70
OC81	0.68
ORP12	0.85
R2008B	1.20
R2010B	1.20
R2540	2.71
TIC45	0.45
TIC47	0.70
TIC29	0.30
TIP30A	0.32
TIP31C	0.39
TIP32	0.35

Type	Price (£)
TIP33A	0.55
TIP34A	0.70
TIP41C	0.42
TIP42	0.44
TIP47	0.42
TIP121	0.63
TIP2955	0.70
TIP3055	0.58
TIS43	0.88
TIS88	0.50
TIS90	0.27
TIS20	2.45
Y728	0.14
Y969	2.80
ZE75	0.60
ZTX107	0.14
ZTX502	0.22
IN4001	0.04
IN4003	0.05
IN4004	0.05
IN4006	0.07
IN4007	0.07
IN4148	0.04
IN5400	0.12
IN5402	0.13
IN5405	0.16
IN5406	0.17
IN5408	0.19
IS44	0.06
IS920	0.07
2N1306	1.42
2N2122A	0.34
2N2222	0.30
2N2904A	0.48
2N2926G	0.14
2N3053	0.30
2N3054	0.60
2N3055	0.65
2N3703	0.10
2N3773	2.80
2N3904	0.20
2N3906	0.20
2N5294	0.80
2N6107	0.80
2SB337	1.80
2SC1098	0.84
2SC1172Y	1.70
2SC1173Y	0.88
2SC1279	0.50
2SC1306	0.92
2SC1307	1.50
2SC1413A	2.70
2AC1449	0.60
2SC1507	0.60
2SC1678	1.00
2SC1758	0.68
2SC1909	1.20
2SC1923	0.30
2SC1945	2.88
2SC21953	0.70
2SC1957	0.70
2SC1969	2.80
2SC2028	0.73

Type	Price (£)
2SC2029	2.70
2SC2078	1.05
2SC2091	0.70
2SC2098	2.90
2SC122A	3.20
2SC2314	0.80
2SC2335	1.50
2SK135	3.80
3N211	3.52
3SK88	0.60
3SK88L	0.80
40636	1.65
40673	1.80
74LS	
74LS00	0.24
74LS01	0.24
74LS02	0.24
74LS03	0.24
74LS04	0.24
74LS05	0.24
74LS08	0.24
74LS09	0.24
74LS10	0.24
74LS11	0.24
74LS12	0.24
74LS13	0.33
74LS14	0.48
74LS15	0.24
74LS19	0.44
74LS20	0.24
74LS21	0.24
74LS22	0.24
74LS24	0.28
74LS26	0.24
74LS27	0.24
74LS28	0.24
74LS30	0.24
74LS32	0.24
74LS33	0.24
74LS37	0.24
74LS38	0.24
74LS40	0.24
74LS42	0.50
74LS47	0.79
74LS48	0.85
74LS51	0.24
74LS55	0.24
74LS73	0.30
74LS74	0.33
74LS75	0.44
74LS76	0.38
74LS83	0.88
74LS85	0.82
74LS86	0.35
74LS90	0.48
74LS91	0.90
74LS92	0.54
74LS93	0.54
74LS95	0.60
74LS96	1.20
74LS107	0.40
74LS109	0.44

Type	Price (£)
74LS112	0.44
74LS113	0.40
74LS114	0.39
74LS122	0.68
74LS123	1.00
74LS124	1.15
74LS126	0.50
74LS132	0.60
74LS135	0.26
74LS136	0.42
74LS138	0.44
74LS139	0.58
74LS145	0.93
74LS147	1.64
74LS148	1.28
74LS151	0.70
74LS153	0.70
74LS155	0.55
74LS157	0.45
74LS158	0.58
74LS160	0.62
74LS161	0.68
74LS162	0.70
74LS163	0.68
74LS164	0.74
74LS165	1.10
74LS166	1.50
74LS168	1.48
74LS170	1.40
74LS173	0.98
74LS174	0.75
74LS175	0.70
74LS190	0.82
74LS192	0.98
74LS193	0.98
74LS194	0.75
74LS195	0.74
74LS196	0.84
74LS197	0.96
74LS221	0.85
74LS240	0.80
74LS241	0.80
74LS242	0.94
74LS243	0.94
74LS244	0.80
74LS245	1.20
74LS247	1.00
74LS251	0.75
74LS257	0.73
74LS258	0.75
74LS259	1.20
74LS266	0.55
74LS237	1.20
74LS279	0.70
74LS283	0.80
74LS353	1.10
74LS365	0.50
74LS366	0.50
74LS367	0.50
74LS368	0.50
74LS373	1.00
74LS374	1.00
74LS375	0.70

EAST CORNWALL COMPONENTS
119 HIGH STREET
WEM
SHROPSHIRE SY4 5TT TEL: 0939 32689
TELEX: 35565

ORDERING: All components are brand new and to full specification. Please add 60p postage/packing (unless otherwise specified) to all orders and then add 15% VAT to the total. Minimum order £5.00. Either send cheque/cash/postal order or send/telephone your Access or Visa number. Official orders from schools, universities, colleges etc most welcome. (Do not forget to send for our 1985 catalogue – only £1.00 per copy). Delivery by return on ex-stock items.
NEW RETAIL 1000 sq ft shop now open Mon-Fri 9.00-5.00. Sat 9-12.00.

TELEVISION

EDITOR
John A. Reddihough

ADVERTISEMENT MANAGER
Roy Smith
01-261 6671

CLASSIFIED ADVERTISEMENTS
Pat Bunce
01-261 5942

Please note that the telephone numbers above are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 1.

Satellite TV Manoeuvres

In 1977 the World Administrative Radio Conference produced quite a detailed plan for European satellite TV, specifying channel allocations, satellite orbital positions and so on. It was, I suppose, logical at the time to reach agreement on a plan for the allocation of the frequency space available in the proposed satellite broadcasting band. But the concern then must have been mainly for the politico-geographical and technical niceties rather than about what anyone was likely to do in practice. For example, the republic of San Marino (population 4,150) was allocated five channels using a satellite at 37°W. Andorra (population about 20,000) was allocated five channels from the same orbital position. And so on. Was it seriously thought that the good people of San Marino and Andorra would get together and arrange for the launch of a satellite that would be able to provide them with five-channel services? That hardly seems likely. One has to assume that the effort was an exercise – perfectly justifiable – in bureaucracy, to get some sort of plan agreed to forestall future squabbling and perhaps to form the basis for future horse-trading.

Eight years on we are more concerned with the practicalities of satellite TV – how can the satellites and channels be financed and the programmes provided? It no longer seems quite so important to ensure that Monaco, Lichtenstein and the Vatican City get a square deal. It's a question of who can find the funds and how they'll go about it.

The first UK attempt to get DBS services started collapsed ignominiously three months ago. As was then expected, the government's next move was to ask the IBA to have a go at seeing what could be done. The IBA has now called for submissions from interested parties – those who'd like to start broadcasting and those who might wish to provide finance etc. The IBA made its announcement on September 3rd and called for replies by the end of October. Why this unseemly haste? This is after all an important and complex matter, and to ask for responses within two months looks suspiciously like chivvying. But then it may have been felt that those interested have already had quite a time to consider what they might wish to do and ought therefore to be able to rough out proposals fairly quickly. There might also have been a feeling that matters are already moving quite fast and that there's a possibility of satellite services being established while the traditional broadcasting authorities are napping. Two or three recent moves suggest that this interpretation is quite likely.

First we have the consequences of the deregulation that's already taken place, with viewers entitled to receive TV transmissions from existing low/medium power satellites on payment of a modest, once for all licence fee (£10) provided they enter into agreements with the channel providers and can afford the necessary receiving hardware. The price of the latter is already falling sharply, with talk from several quarters of installations at under £1,000 (the figures that are bandied about are usually rather vague about VAT, installation charges and exactly what would be included in an installation), Japanese manufacturers already advertising equipment, and suggestions that this Christmas would be a good opportunity to get sales rolling. It's clear that if manufacturers can think and plan in terms of Europe-wide sales then prices will indeed come down appreciably.

Secondly we have the intriguing French proposals reported in Teletopics last month. It seems that the French are determined to get a DBS satellite up and providing services first. To do so they are prepared to go about things in a way that was hardly foreseen by the planners at WARC 77. All and sundry seem welcome to participate in providing the finance required, and the satellite may well carry English, German and other language programming and maybe channels.

Thirdly, once you start thinking in terms of Europe-wide footprints and channels supported by advertising you're into a whole new ball game. The deliberations of the Peacock committee begin to look parochial in the extreme, and the channel allocations to Andorra and the like take on a new significance. Such an approach neatly sidesteps the established arrangements for the control of broadcasting, and for its viability depends solely on being able to persuade people to buy the necessary equipment and to change their viewing habits. The decision by the IBA to ask Robert Maxwell to relinquish his directorship of Central Television in the event of his going ahead with plans to run one of the French TV satellite's channels has to be seen in this light.

Would it matter all that much if the established broadcasters were left in control of their existing terrestrial networks while brash newcomers took over the provision of satellite TV services? It would certainly represent a total change in the way in which the provision of TV services has developed so far, in the UK at any rate. Traditionally it's been a question of ensuring that best use, in the interests of the public at large, is made of the limited amount of broadcasting bandwidth available. Satellite broadcasting bandwidth is also finite of course, but what if the existing networks are unable to make use of it? Do we allow a free for all, within a possible trans-European context, and does it matter? From the long-term viewpoint it could mean that the existing networks are left providing a second-best service while the newcomers reap the benefits of improved signals, higher definition and in due course lower costs.

These are not easy questions to answer, and at present it looks rather likely that we shall just have to wait and see. There's a great deal of manoeuvering going on just now and a great deal of uncertainty as to the form that European satellite TV broadcasting will eventually take.

COVER PHOTO

The digital logic probe shown on our cover this month is available from Tandy under part number 22-302 – see article on page 21. Our thanks to Tandy for providing the transparency.

SPARES AND DATA

Our thanks to several readers who have supplied information on Contec sets. Briefly, these were sold by Dixons and manuals/spares are available from Dixons Service Division or Mastercare. Further details next month. Now does anyone know about Tensai sets?

Long-distance Television

Roger Bunney

Now that autumn has arrived propagation via the E layer has greatly reduced. At the time of writing, in early September, conditions are extremely quiet. There were several high-intensity Sporadic E openings during August however, though these were nothing like the activity experienced during June/July. The Perseids meteor shower, which peaked on August 12/13th, provided some meteor scatter signal pings: the 13th was the more active day though pings were present in Band I on both days and there was evidence of "super pings" at the low end of Band III (i.e. chs. E5/R6). Sunspot activity has declined to a minimum and on many days during August there were no visible spots on the sun's surface. A minor Aurora was logged in Scotland on August 26th, producing Scandinavian TV signals in Band I.

There were two tropospheric openings during August. The 14th produced short-distance signal propagation in Band III and at u.h.f., with Norwegian Band III signals being well received in east Scotland and Dutch, Belgian and the nearer W. German stations being seen in Anglia and the south east. The only signals received here in central southern England came from TDF (France), though they came from as far as the French/German border and were present in both Band III and at u.h.f. The tropospheric opening on the 28th was much better. Very strong French signals were received in the Southampton area throughout Band III/u.h.f. while W. German Band III/u.h.f. signals were received in the south east. As I type these words on September 6th a slow-moving high-pressure system is building up over the UK and may well provide a traditional September opening – a pity it couldn't have been on the weekend of the 14/15th to coincide with the ATV International contest!

The SpE log for August to early September is as follows:

7/8/85 RAI (Italy) ch. IA, IB; JRT (Yugoslavia) E3, 4; TVE (Spain) E2, 3, 4; TSS (USSR) R1, 2; SR (Sweden) E2, 3.
8/8/85 TSS R1; TVP (Poland) R1; SR E2; NRK (Norway) E2.
9/8/85 TVE E2, 3; RAI IA, IB; NCT (Italian "private" station) E3; JRT E3; ARD (West Germany) E2; CST (Czechoslovakia) R1, 2; TVP R1.
10/8/85 DR (Denmark) E3; TVP R1; TSS R1, 2; MTV (Hungary) R2; RAI IA, IB; TVE E2, 3; RTP (Portugal) E2.
11/8/85 TSS R1; TVE E2, 3.
12/8/85 DR E3; SR E2, 3; TSS R1; TVE E2.
13/8/85 TVP R1, 2; SR E2.
14/8/85 MTV R1, 2; TVR (Rumania) R2; CST R1; TVP R1; TSS R1, 2; RAI IA.
15/8/85 MTV R1; CST R1, 2; ORF (Austria) E2a; RAI IA, B; TSS R1, 2.
16/8/85 NRK E2; SR E2; TVP R1; ARD E2; TVE E2.
17/8/85 +PTT (Switzerland) E2; ORF E2a, E3; RTS (Albania) IC; TDF (France) F3; JRT E3; MTV R1, 2; RAI IA, B; ARD E2, 3; CST R1, 2; DFF (East Germany-GDR) E4; TVP R1, 2; TSS R1, 2; SR E2, 3; NRK E2; TVE E2, 3, 4; RTP E2, 3.
18/8/85 RTP E3; TVE E2; RAI IA, B; ORF E2a; JRT E3, 4; +PTT E2; ARD E2; TSS R1, 2; NRK E2, 3; TVP R1, 2.
19/8/85 TVP R1; CST R1; ARD E2; +PTT E2; SR E2; NRK E2.
21/8/85 NRK E2; SR E3; DR E3; RAI IA; TVE E2.
22/8/85 CST R1; SR E3.
23/8/85 TVE E2, 3; SR E3; RAI IA; ORF E2a.
25/8/85 RAI IA; YLE (Finland) E3.
26/8/85 SR E2.
27/8/85 TVE E2.
31/8/85 RAI IA.
7/9/85 TSS R1, 2.

Unfortunately it seems that the transatlantic SpE opening on July 30th from 2230-2400GMT was missed by UK TV-DXers – at any rate no reception reports have come in. N. American 50MHz amateur radio stations in Philadelphia, Maryland, Delaware, South Carolina, Virginia and as far as Florida, operating with powers of only a few watts, established two-way contacts with UK stations in central England, so it's more than likely that ch. A2 signals could have been received. In past seasons transatlantic reception has occurred during late evenings (say 1900 onwards) in July. On an otherwise dead evening it might be rewarding to turn the aerial towards the west/north west . . .

My thanks to the following who sent in reception reports this month: Roger Pates (Nottingham), Bill Cotterill (Tipton), Dave Shirley (Hastings), Jeremy Cecil (Shoreham), Iain Menzies (Aberdeen) and Simon Hamer (Powys).

News Items

Czechoslovakia: We've received a report that a network transmitting the TSS (USSR) programme one has been set up. Apparently it's not too popular apart from sporting events. The signals appear to be supplied via Gorizont's 3·675GHz Euro-beam. Transmitters and channels are as follows (transmitter powers are not known at present): ch. R1 Zvolen; ch. R21 Karlovq Vary; ch. R27 Ruzomberok, Kosice, Plzen; ch. R41 Prague (Praha); ch. R49 Banska Bystrica, C. Budejovice; ch. R50 Bratislava; ch. R51 Ostrava; ch. R52 Brno.

Stereo sound: Various transmitters in Finland and Holland are at present carrying stereo/two-channel sound test transmissions and Italy hopes to start transmissions by the end of the year. A Dutch correspondent comments that a normal TV set or VCR, i.e. one without dual-channel sound facilities, shows a +6dB higher signal in the mono and two-channel sound modes than in the stereo mode, also that both f.m. sound transmitters are modulated with the same programme/test-card audio during normal transmissions.

France: Further information on the plans for private stations is emerging. The government favours two terrestrial networks, one with the emphasis on musical programmes and the other carrying general entertainment material. Up to fifty local independent stations could also be fitted into the existing channel allocation system without giving rise to interference problems. A map published in the August 2nd isue of *Le Monde* shows that two transmitters could operate in the Channel coast areas of Dunkirk, Bethune, Lens and Arras while two network and a local transmitter are possible at Amiens, Rouen, Caen, Rennes, Brest and at other main population centres away from the W. German border. The transmitters at sites in S.E. France are likely to be low powered and located at new positions in the town whereas co-siting with existing transmitters will be possible elsewhere.

In brief: Teletext tests using the Antiope system are being carried out in New Delhi, using English initially. If successful up to fifteen languages might be used . . . The 1985 *World Radio-TV Handbook* reports that RUV (Iceland) transmits Norwegian TV prior to the start of its own programming. The NRK programmes are received via ECS-1 . . . The French-language service TV5, broadcast via ECS-1 using the SECAM system, is likely to change to PAL shortly . . . The AFRTS ch. A2 transmitter at Iraklion, Crete is still in operation: the transmissions are regularly seen in Hungary via SpE propagation . . . CNN (Ted Turner's Cable News Network) has announced that it intends to scramble its Atlanta, USA programme output in the near future.

Satellite TV News

Space Communications (SAT-TEL) Ltd. of Edgemead Close, Round Spinney, Northampton NN3 4RG hope to introduce shortly a 10·9-11·7GHz receiving package (TVRO) intended for domestic reception of the various satellite TV downlinks at present available and intended primarily for cable operators. The suggested price of the package, which will consist of a 1·2m offset feed plastic dish, a low-noise amplifier/converter, an automatic polarisation rotor and remote control receiver, is approximately £995 plus VAT, something of a breakthrough. With a 1·8m dish to enable the half transponder Intelsat downlinks to be received the suggested price is £1,175 plus VAT. A motorised elevation/azimuth mount with programmable controller is expected to be available at £350. If sales across Europe pick up it's hoped that the price of the complete package with motorised dish could fall to £700-£800.

If interest in satellite TV reception grows it's likely that Premiere (the Movie Channel) will start to use scrambling. Other satellite TV channel providers may welcome increased viewing figures since these could boost advertising revenue.

Oxmann Ltd., who have been advertising in this magazine, have introduced a 3·7-4·2GHz band downconverter with 400-900MHz tunable i.f. and have indicated their intention of marketing attractively priced receiving equipment for the 3·7-4·2GHz and 11·7-12·5GHz bands.

Home Box Office, the major US provider of programmes for cable system operators, is to introduce scrambling once its present customers have equipped themselves with decoders. Individuals will be able to purchase a decoder for $395 from dealers and pay a monthly fee which will include "electronic authorisation" of their addressable decoders. There seems however to be some disagreement in the US cable industry over the type of scrambling to use. Showtime, another programme provider, has expressed interest in a simpler system requiring decoders that cost only $50 each: subscribers have an "electronic ticket/key" mailed to them each month.

If FCC approval is obtained a company called Antares Satellite Corporation is planning to launch two satellites with twelve 100W Ku band (12GHz) transmitters each at 61·5° and 157°, covering London to Tokyo. Use of a dish system retailing at about $500 and monthly payments of $20 for the service provided are foreseen.

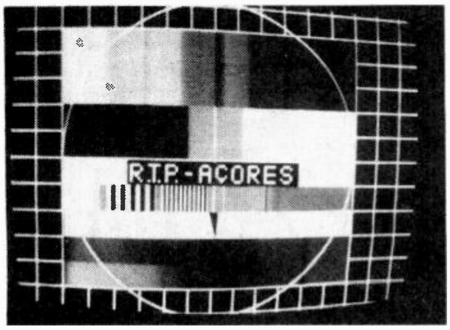
It's expected that a million 4GHz satellite TV receiver systems will be sold in the USA this year. Dealers have been advised to sell dual-band (4/12GHz) systems though 12GHz retrofit kits for attachment to 4GHz systems may be possible. Lowrence Electronics of Tulsa, Oklahoma are at present marketing a dual-band system consisting of a common dish, dual feedhorn, separate LNAs and downconverters and output switching to a common i.f. for the receiver.

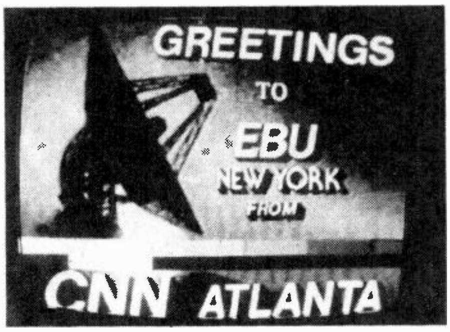
Steve Birkill reports that a form of "Voice of America TV" is now available on the ECS-1 satellite's transponder four from 1200-1400 GMT daily Mondays-Fridays. The service is provided by the US Information Agency and includes a news/information package. Cable operators are being encouraged to make use of the material which is free of copyright. Many US embassies are installing receiving equipment to enable the material to be made available to interested parties in videocassette form.

A recent report of a Russian Soyuz launch to the Salyut 7 space station mentions voice communications being monitored on various passes at 121·75MHz. A further frequency mentioned, again with voice communications, is 142·4MHz. Any scanner should resolve these frequencies with ease.

New Labgear Masthead Amplifier

The quest for improved weak-signal reception is never ending. Very recently Labgear have introduced a new u.h.f. masthead amplifier that provides an effetive improvement in this demanding field, particularly in areas where there are strong local signals close to the wanted





Satellite TV reception by Frank Lumen at Denver, Colorado – see last month. Left: RTP-Azores test pattern via Satcom-3, transponder 5. Centre: CNN news feed to New York via Westar-3, transponder 21. Note that noise is present on this transponder: others on the same craft are noise-free, suggesting that transponder 21 has low output. Right: News link to Korean Broadcasting, Seoul, from a Washington facility studio via Westar-5 transponder 5.

weak ones. The CM7271 has replaced the previous CM7060: both are single-stage amplifiers. The CM7060 featured a gain of 10dB with a 12V supply and a noise figure of 1·8dB: the signal handling capability of 40mV for one throughput signal wasn't too good however, particularly with four signals in a given group. The CM7271's gain is quoted as 15dB ±2dB at 12V, with a noise figure of 1·6dB and a dramatically improved signal handling capability of 200mV for a single throughput signal. The CM7060 used the extremely stable, reliable, low-noise BFR91 transistor: the four-lead device used in the CM7271 doesn't carry an identification. As with the earlier amplifiers in the Labgear series the CM7271 is housed in a circular, dark green case with cable connections via saddle clamp/screws.

I've no facilities for measuring noise performance but have made a gain check across the intended bandwidth. The following voltage gain figures were obtained with a 12V supply (current drawn 12·5mA) and 75Ω matching: 13·9dB at 470MHz, 14dB at 500MHz, 14dB at 600MHz, 14·5dB at 700MHz, 14dB at 800MHz and 15dB at 850MHz.

The ultimate test is operational use. The mast was scaled, the existing Fringe Electronics 1·9dB noise preamplifier removed and the CM7271 fitted in its place. The local group A signals produce very high-level receiver inputs at this location, typicaly measured at 48dB when amplified by a 26dB head amplifier (the use of Triax Grids tends to give a level response on all the local channels). Even with an earlier CM7060 cascaded with a Wolsey Orbit a degree of amplifier overload occurred. The CM7271's lower througput gain coupled with its claimed (and confirmed) higher signal handling capability provided a marked improvement, allowing the aerials to be swung very much closer to the local signal direction before overloading took over. Noise checks on known weak signal sources, particularly Crystal Palace BBC-2 (ch. E33), gave a noticeable improvement with a lower noise ("snow") level.

In conclusion I was impressed with the marked improvement obtained with this amplifier, in terms of better weak signal quality, reduced overloading and reduced cross-modulation between adjacent channels. I can recommend it for weak signal/DX use.

From Our Correspondents . . .

Roger Pates (Nottingham) has sent in useful information on the receiver he's at present using and an efficient Band III log-periodic aerial he's designed. The set was purchased because of its system L (French) reception capability: it's an inexpensive multi-standard set that seems to be ideally suited to DX use. Roger bought the French manufactured Thomson Model T2502PI from Greens (in Debenhams) for £299: it's a 16in. PAL/SECAM set with full remote control, able to resolve system B/G/I and L vision and sound with full colour. System D (E. Europe) sound can't be received but the SECAM colour locks. The 48-300MHz continuous v.h.f. and 470-860MHz u.h.f. coverage is available via a preprogrammed frequency synthesizer or by scanning. Switching between PAL and SECAM decoding is automatic when the input signal reaches a preset level. Other facilities include a SCART connector, headphone socket, remote tuning, nineteen preset channels and digital channel readout identification. Roger reports that the tuner's gain is "about average" though the selectivity is very good. It can be operated from the mains or a 12-24V d.c. input.

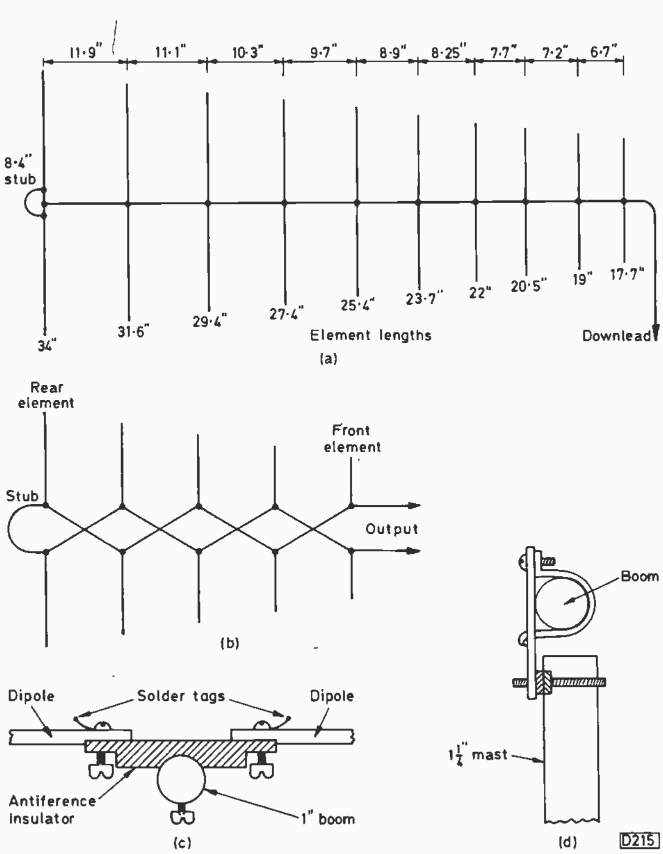


Fig. 1: Roger Pates' Band III log-periodic aerial. (a) Dimensional details. (b) Method of cross-connecting the dipoles. (c) Insulator assembly. (d) Tilt/swivel clamp.

POST A PART ELECTRONICS

6 CHAPMAN COURT, CHARFLEETS ROAD, CANVEY ISLAND, ESSEX SS8 0PQ.
Telephone 0268 690868
Telex 99305

BARCLAYCARD VISA — Access

TRADE COUNTER OPEN

ORDERS DESPATCHED SAME DAY
ADD 75p P&P, THEN 15% VAT.
ADD POSTAGE FOR OVERSEAS ORDERS.
ORDERS WITH AEROSOLS, PLEASE ADD 25p PER CAN.

Thorn 10Ω 20W (3500) R751 Safety Resistor	75p
Pye 713 Speaker 5" × 3" 70Ω	1.00
Pye 713 Complete Tube Base Panel with Focus Slider & Leads	2.75
Pye 725 Complete Tube Base Panel	1.25
TX9 Complete Tube Base Panel	2.75
TX10 Complete Tube Base Panel	3.75
TX90 Complete Tube Base Panel	4.75
Pye 713 Control Knobs	4 for 50p
Tube Base Socket ITT CVC32	45p
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 VDR E299D/HP230 3000/8000	25p
Degause Thermister C8-ROH (TX90)	1.80
Control Knob Thorn TX90	4 for 2.00
On/Off Knob Thorn TX90	65p
Push Button Assy Thorn TX90	9.80
Tube Neck Correction Assy. 20AX AT1081	5.00
EHT Cable	Metre 25p
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
Thorn 2000 Focus Pot	1.00
Thorn 9000 Focus Pot	3.75
Thorn 9600 Focus Pot	2.00
Thorn 8K5 Focus Pot	2.40
Thorn 4000 Focus Pot	2.75
Thorn TX10 Focus Pot (New Type)	9.00

SERVICE AIDS

Ambersil MS4 Silicone Grease	12oz	2.15
Ambersil Freezer	12oz	1.99
Ambersil Amberlube	6oz	1.89
Ambersil Ambertron	16oz	2.25
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
250MA	10 for 50p	750MA	10 for 65p
315MA	10 for 50p	7A	10 for 50p
500MA	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 Mains TX 9000 (T701)	10.00
Thorn Mains TX 9600 (T512)	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 9000	10.00
Thorn LOPT 9600	12.00
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
Thorn LOPT TX10	19.00
Thorn LOPT TX90	13.75
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
Thorn Line Drive TX. TX9 (T2)	3.00
Thorn Line Drive TX. 8K etc. (T402)	1.85
Thorn Line Drive TX. 9K (T705)	2.00
Thorn Switch Mode TX. 9K6 (T511)	3.75
Thorn Input Choke TX9 (L64)	4.00
Thorn Choke TX90 (L120)	2.95

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
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
20 Mixed Valve Bases	1.00

						BF154	25	BFR52	31	NKT276	20
						BF167	24	BFR62	28	NKT453	1.65
AC128	39	BC174B	23	BCX33	22	BF173	29	BFR81	29	OT112	1.92
AC131	40	BC177	24	BCX34	11	BF179	32	BFR87	25	DT121	2.08
AC138	40	BC182LB	12	BD115	49	BF180	33	BFR90	1.74	R1038	80
AC141K	39	BC183L	12	BD131	30	BF181	30	BFR91	2.08	R1039	80
AC142K	38	BC184L	13	BD132	46	BF184	30	BFT42	30	R2008B	1.40
AC153	39	BC187	24	BD133	59	BF185	30	BFT43	30	R2010B	1.10
AC176	33	BC204	15	BD139	36	BF194	16	BFX38	40	R2030	70
AC176K/		BC208	9	BD140	38	BF195	16	BFY50	30	R2265	1.30
AC128K	93	BC212L	9	BD144	1.70	BF196	16	BFY51	34	R2305	80
AC188	38	BC213L	12	BD150	50	BF197	15	BFY52	34	R2322	50
AD142	1.18	BC237	12	BD163	98	BF198	19	BRC116	1.50	R2443	25
AD143	1.08	BC238B	8	BD201	74	BF199	15	BRC1693	1.43	RCA16446	30
AD149	98	BC238L	8	BD203	78	BF223	18	BU105	1.00	RCA16599	1.25
AD161	32	BC250A	15	BD204	99	BF224	19	BU126	1.10	RCA16600	1.40
AD162	32	BC251	8	BD222	48	BF238	20	BU207	1.05	RCA16799	1.13
AD263	1.05	BC252A	20	BD225	52	BF240	9	BU208	1.15	RCA16800	1.42
AF127	45	BC294	37	BD232	50	BF241	21	BU208A	1.15	RCA16802	1.38
AF139	38	BC301	32	BD233	60	BF255	10	BU326A	1.30	RCA16815	1.20
AF239	41	BC303	31	BD234	60	BF256LB	38	BU407	1.70	SP8385	2.65
BC107	15	BC307	10	BD237	55	BF256S	20	BU408	2.76	S1299	2.25
BC108	15	BC308	8	BD238	65	BF257	28	BU500	2.30	S28000	1.25
BC109	15	BC309	14	BD241	59	BF259	28	BU526	2.46	T6050V	1.30
BC115	16	BC327	18	BD244	85	BF271	25	BU806	1.80	T6052V	1.30
BC117	21	BC328	18	BO278A	81	BF274	11	BU807	2.94	T9003V	1.25
BC125	26	BC337	17	BD386	68	BF337	29	C1129	9	T9010V	1.45
BC126	23	BC338	17	BD433	71	BF338	34	C1172B	9	T9053V	1.30
BC139	27	BC347	8	BD437	83	BF355	40	E5386	54	T9054V	1.00
BC141	34	BC394	8	BD592	1.20	BF362	50	E9003	28	T9039V	1.10
BC142	30	BC454	8	BD589	1.20	BF391	21	E9005	25	TIC45X	50
BC143	31	BC455	8	BD677G	1.35	BF394	16	ME0404	10	TIC46	48
BC147	12	BC456	10	BD679	1.42	BF422	47	ME0412	10	TIC106C	40
BC148	12	BC460	40	BD701	1.04	BF423	53	ME6002	10	TIP29	42
BC149	12	BC463	22	BD702	1.12	BF450	43	MJ2501	2.36	TIP30	42
BC153	16	BC546	8	BD707	95	BF453	53	MJ3001	2.21	TIP31	35
BC1540R	16	BC547	12	BO708	95	BF458	37	MJE340	50	TIP32	43
BC154YL	16	BC548	12	BD839	1.30	BF459	40	MJE520	50	TIP33	61
BC157	12	BC549	3	BDX10	93	BF461	59	MJE2955	1.40	TIP41	42
BC158	12	BC557	10	BDY20	1.09	BF556B	35	MJE3055	1.50	TIP42	45
BC159	15	BC558	10	BDY82	99	BF596	15	NKT241W	8	TIP110	61
BC171	9	BC559	3	BF137	20	BF694	16	NKT241G	8	TIS91	25
BC172	9	BC595	3	BF153	20	BF757	62	NKT241Y	8	ZTX550	30

INTEGRATED CIRCUITS

BRC1330	1.40	SN76013ND	1.80	TBA530	1.26	TDA2030	2.10
BRC3064	1.00	SN76023N	1.80	TBA540	1.00	TDA2522	2.10
BRC/M/200	1.00	SN76033N	2.00	TBA550Q	1.82	TDA2530	2.61
BRC/M/300	1.00	SN76115	2.00	TBA560C	1.50	TDA2540	3.50
CA3060	1.58	SN76131N	1.58	TBA641	2.05	TDA2560	3.50
LM1303P	1.48	SN76226N	1.25	TBA651	2.50	TDA2581	3.00
ML231B	2.20	SN76227N	1.00	TBA720A	2.49	TDA2591	1.96
ML237B	2.00	SN76530P	1.30	TBA750	2.20	TDA2611A	1.95
ML239B	2.86	SN76622N	1.00	TBA800	1.62	TDA2640	2.90
MC1327AP	1.25	SN76660N	80p	TBA810S	1.00	TDA2690A	1.50
MC1358P	1.30	SN76666N	75p	TBA810AS	1.00	TDA3560	6.00
MC1455P	18p	SN76744	1.92	TBA920	2.08	TDA4500	5.40
MC14516BCP	60p	SY153A	2.50	TBA950	2.54	TDA9503	2.90
SAA1025	7.20	TA7117P	1.00	TBA1440	1.92	TCEP100	3.48
SAA1124	4.50	TA7103AP	2.80	TCA270SA	1.05	TEA1009	1.95
SAA5010	6.00	TAA611	1.40	TCA270C	1.05	MC14426P	4.80
SL432A	1.80	TBA120B	1.20	TCA270CQ	1.05	MC14429P	4.50
SL1430	2.50	TBA120C	1.20	TDA1035T	3.50	MC14514	5.00
SL1432	2.50	TBA120CQ	70p	TDA1037	2.72	UA758PC	2.50
SN15846N	60p	TBA120S	70p	TDA1170	2.15	UAA1008A	2.66
SN74123N	65p	TBA120U	1.00	TDA1170S	1.76	ULN2165	1.30
SN74154N	1.40	TBA395	1.00	TDA1200	2.42	ULN2216A	1.25
SN76001N	1.40	TBA480Q	1.40	TDA1270	2.76	UPC1365C	5.75
SN76110N	1.14	TBA510	1.90	TDA1327	2.53	SC9488P	1.40
				TDA2002	2.80	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 new boxed	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 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	50p
Indoor Aerial With Reflector to Help Combat Ghosting Problems	2.50
Line Connectors	38p
Coax Plugs	10 for 1.65
Band Change Switch Assy, Pye 725	40p
Coax Cable Low Loss	per Metre 22p
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 6+1+100	92p

Thermal Cut-Out

Thorn 3000 Metal	1.45
Thorn 8/8500 Plastic	1.45

EHT TRAYS

Thorn 3000	5.50
Thorn 8000	4.50
Thorn 8500	6.00
Thorn 9000	7.90
Thorn 9600	6.00
Thorn 900/950	1.50
Thorn 1500 3 stick	2.40
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

220+47	350V	65p
200+150+50	350V	60p
200+200+100	325V	54p
32+32+16	275V	52p
200+200+100+32	350V	70p
100+50+150	350V	58p
400+400	200V	72p
32+32+16	350V	52p
200+32+300+100	350V	70p
225+25	350V	50p
200+200+100	350V	70p
200+100	325V	65p
200+100+100+50	350V	60p
200+200+100	350V	55p
200+200+75+25	350V	60p
50+50+8	300V	55p
100+50+100	350V	55p
100+150+50	350V	55p
2500+2500 (Thorn 8K)	63V	1.20
150+150+100	300V	1.80
200+47	250V	65p
500+500 175V Thorn TX9		1.00
175+100+100 350V Thorn 3K5		2.25
400 400V Thorn 9K		2.50
470 250V Weldel Type Philips G11		1.71

CAN TYPES

0.2MF 250V	50p
2MF 250V	50p
22MF 275V	50p
50MF 275V	50p
100MF 150V	65p
100MF 250V	70p
220MF 450V Thorn 4K	1.30
400MF 350V Thorn 8K	1.00
400MF 400V Thorn 9K	2.95
800MF 250V	70p
1000MF 100V Thorn TX90	2.90
1250MF 40V	50p
1250MF 50V	50p
1500MF 100V	1.05
2000MF 30V	50p
2200MF 40V Thorn 4K	95p
2200MF 63V Philips G9	1.25
2500MF 35V	65p
2500MF 40V	65p
3000MF 30V	65p
3300MF 16V	50p
3300MF 25V	60p
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 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
Thorn TX90 On/Off Switch	1.85
10K Lin Pot. TX9/TX90	75p

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
BT106	1.50	IN5254B	8p
BT116	1.00	IN5349	14p
BT119	2.56	IN5400	12p
BT120	2.82	IN5401	12p
BT151 650	1.00	IN5402	14p
BY127	12p	IN5404	12p
BY188	16p	IN5406	16p
BY204	26p	IN5408	16p
BY206	16p	IS025	8p
BY207	16p	IS131	8p
BY208/800	38p	IS1658	8p
BY223	95p	MR854	35p
BY225	1.20	SKE1/02	20p
BY227	28p	MCR106/1	1.00
BY298	22p	MCR406	35p
BYX22/400	30p	2N4444	1.50
BYX55/600	30p	Y827	80p
BYX71/350	80p	Y969	75p
BZV15 C12R	1.16	ZX150	12p
BZV15 C24R	1.16	OA91	5p
IN60	8p	MCR106/7	1.00
IN2070	8p	MCR106/8	1.50
IN4001	4p	BY255	30p
IN4002	4p		

Details of Roger's log-periodic aerial are shown in Fig. 1. He comments that the gain over much of the bandwidth equals or betters that of a commercial, twelve-element wideband Yagi for Band III. The gain of a Yagi rises with frequency, from typically 7-8dBd on ch. E5 to perhaps 10-11dBd on ch. E12. With a log-periodic the gain will be more even at around 7-8dBd across the band, higher than that of a Yagi at the lower end of the spectrum. In addition the polar response is much smoother though the forward −3dB beamwidth will be wider at the higher frequencies.

Roger made his aerial with materials intended for outdoor use. This could present difficulties for those with no source of insulators in the quantity required – buying new insulators could cost around £20. So improvisation could be the order of the day unless loft mounting is to be used. The cross-connections between elements are made with copper wire soldered to the tags shown. If the aerial is to be used outside, protect the soldered connections with silicon caulk to prevent corrosion. The feeder is connected to the front of course – use 75Ω coaxial cable. Since the log-periodic is a balanced system, for a good match to unbalanced coaxial cable either use a 1-to-1 balance/unbalance transformer based on ferrite or run the cable back to the mast taped tightly to the boom. It's also important to mount the aerial at the top of the mast since the mast's metal will degrade the low-frequency performance if it's allowed to pass through the array.

Our thanks to Roger, who's a professional aerial rigger/engineer, for providing these details. I'd be interested to hear from anyone who makes the aerial – or any other aerial for this or the other TV bands.

Lastly Mr. R. J. Lewin is seeking a couple of 19in. monochrome TV sets with wide/narrow i.f. selectivity, positive/negative video switching and v.h.f./u.h.f. tuners – an older dual-standard set that could be modified would be ideal. Mrs Lewin's address is 345 Tom's Lane, Bedmond, Watford, Herts WD5 0RA and he can collect.

TV Fault Finding

Reports from Lawrence Ingram, Chris Avis, Philip Blundell, Eng. Tech., Jeff Herbert, Roger Burchett and Steve Illidge

Hitachi/GEC Field Problem

Many Hitachi and some GEC sets use various sorts of thick-film module in the field output stage. We've had several cases of field scan variation, sometimes very intermittent. Dry-joints occur where the module joins the main board and also on the modules themselves, at the lead-out point. A satisfactory repair can usually be made, with care and a small iron, if the module is very carefully removed and all leads and the end lugs are fixed firmly in a vice. **L.I.**

Rank T20 Chassis

Intermittent blowing of the 1·6A d.c. power supply fuse after several days was found to be due to a loose contact on the main electrolytic. It just happened to be a red item bearing the Pye label. Shades of the G11 . . . **L.I.**

Thorn 9600 Chassis

This set gave us quite a bit of trouble. It came in with a blackened mains fuse and a short-circuit chopper transistor (VT512). Before replacing VT512 we checked the drive waveform across its base-emitter junction. It wasn't right due to R518 (1Ω) having gone high in value. Another check on the drive waveform was made after replacing R518 and as it looked right we replaced VT512 and switched on. Result: shattered fuse and VT512 short-circuit. A cold check revealed that diode W514, which is connected between the emitter of VT512 and the trip circuit, was leaky. A check from the emitter of VT512 to chassis produced a reading of less than an ohm and the drive was still o.k. Fit another VT512 and start the set up slowly, with the fuses in the supplies derived from the chopper circuit lifted to eliminate loading effects.

After a minute or so the set went off again. This time we found that VT512's emitter resistor R522 was open-circuit while its decoupler C520 gave a reading of less than one ohm. After doing all that was necessary we switched on again. The set switched itself off a few seconds later and this time zener diode W520 in the trip sensing circuit was the culprit. Replacing this produced a very welcome e.h.t. rustle and the c.r.t. heaters lit. Victory at last!

I turned the set round to check the raster and found that it was only about two-thirds of the correct size all round. It transpired that VT814 (BC147) in the width-height compensation circuit had a considerable leak. Try again. This time the width was correct but there was field cramp due to VT804 (BF256C). The customer admitted that the picture had been intermittently reducing in size for a long time. Questions: which caused what to happen, how do you make the customer believe it, and how much do you charge him?! **L.I.**

Thorn 3500 Chassis

An elderly 22in. Ferguson set fitted with the 3500 chassis sat on the bench. The complaint was that "the picture flickers". The picture was indeed flickering, at random on all channels, and after checking for erratic beam limiter/brightness presets and faulty connections around the 1·5Ω wirewound resistor R907 on the beam limiter board I noticed that it was the contrast rather than the brightness that was fluctuating.

A spare tuner panel was quickly hooked up as a check but the problem persisted. Faulty i.f. transistors can cause assorted effects on this chassis, so each received the arctic/tropical treatment from freezer and hairdryer. The outlook still remained changeable! The voltage across the a.g.c. smoothing capacitor C179 (10μF) was not unexpectedly found to be varying in sympathy with the displayed symptom, and to discover whether the tail was wagging the dog its associated feed resistor R172 was disconnected and a suitable low d.c. voltage was hooked up instead. Success! The Channel 4 test card was displayed crisply on the recently replaced tube, with not even a flicker of misplaced interlace to mar the view. Not wishing to waste further time hunting for some obscure troublemaker in the a.g.c. circuit I fitted a known good i.f. panel and switched on. The fault was back, defiantly flickering with renewed vigour!

At any rate the i.f. panel had been cleared of suspicion. What else was there? A "set-white" switch is provided on the video panel for making grey-scale adjustments. It alters the operating conditions in the a.g.c. and brightness control circuits and collapses the field scan by disconnecting the 60V supply to the field output stage. The switch is of the same type as used for first anode supply switching in early models and suffers from the same fault – internal tracking. In this case the tracking was between the contacts of the a.g.c. and 60V rail switch sections, and resulted in the persistent picture flicker symptom. The switch can be replaced but a cheaper and adequate remedy is to remove the offender and bridge the appropriate holes in the board. **C.A.**

Hitachi NP81CQ Mk II Chassis

These sets are prone to dry-joints around the STR441 chopper i.c.'s base circuit (usualy at C912 or R905/6). The result is an intermittent whistling noise from the power supply with the picture going unstable on bright scenes. For field foldover at the top of the raster replace the field scan coupling capacitor C610 (220μF). **P.B.**

ITT 80-90° Chassis (CVC820 PSU)

A common fault on this chassis causes it to be dead but burst into life for five seconds after being switched off! This is due to R405 (820kΩ) in the power supply going open-circuit. **P.B.**

Sharp C2095

This set was the first Sharp TV I've come across with electronic tuning – and of course it had a tuning fault. You could search and find a station but you couldn't memorise it. The power supplies on the board were checked first: the 5V rail was o.k. but the 10V line was low at 6V while the −7V rail was high at −10V. The stabiliser transistors are driven by an X0135 i.c. so this was changed as a first step: the fault persisted. Several biasing resistors go to this i.c. from the 115V line. These were checked and one of them, R1072 (33kΩ, 0·5W), turned out to be open-circuit. **P.B.**

Philips K35 with VST Tuning

I've had a rush of these sets recently, all with the following fault. Intermittently the set won't respond to remote control and the buttons on the local keyboard have to be held down for a long time before the set reacts. Even if the fault isn't present it's worth checking the voltage at pin 13 of the VST microcomputer i.c. The reading should be 0V with the remote control unit not in use. If it's higher than this check D32 which is likely to be leaky. **P.B.**

Thorn TX10 Chassis

We recently had a very intermittent problem with one of these sets – it was a stereo/teletext version. The complaint was field roll and tripping on and off with the stereo indicator LEDs flashing. The obvious thing to try was the focus unit but the fault persisted. In fact we never could get a hold on the fault – it seemed to be dependent on temperature and the way the wind was blowing . . . After replacing various i.c.s we eventually traced the source of the problem to breakdown on the main PCB between ferrite bead FB721 and the core of the chopper transformer. After removing the bead and cutting away the burnt section of board with a knife we resoldered the bead clear of the panel. We've since heard of other TX10s that have suffered from the same problem, so it's one to watch out for. It took us two months and many calls to get to the bottom of this fault. **J.H.**

Thorn TX9 with Remote Control

The problem with this set was intermittent loss of colour with the volume going to full, returning to normal when the reset button on the remote control unit was pressed. The cause turned out to be internal arcing in the c.r.t. itself – it upset the remote control receiver. The only clue was black arcing lines across the screen on white parts of the picture. The fault showed up when changing channels; in addition clicking could be heard from the speaker in sympathy with the black arcing lines. **J.H.**

Philips G11 Chassis

This set gave the no results symptom but there was plenty of h.t. We found that there was no line drive and that R2010 (5·6kΩ) which provides the TDA2590Q sync/line oscillator i.c. with a start-up supply was getting warm. The cause of the trouble was that the isolating diode D2015 (BA317 or BA318) was short-circuit. **R.B.**

Thorn 9000 Chassis

All the electric light bulbs in the house blew when the overhead power lines were struck by lightning. Unfortunately the set had been on at the time. The obvious damage was a "welded-on" mains switch, a short-circuit mains rectifier, open-circuit surge limiter and blown fuse. These items were replaced but the new fuse shattered at switch on. No short could be detected but the set wouldn't work until the h.t. reservoir capacitor C702 (400μF) had been replaced. **R.B.**

GEC C2110 Series

Having replaced R506 (560kΩ) to cure a case of low first anode voltages I was surprised to get a call-back for the same fault within a week. R506 was intact and the first anode controls were o.k. so I turned the controls up and got a very washed out picture. A certain amount of time was wasted checking around in the contrast control circuit – the customer contrast control was doing very little – before I realised that it was another "old friend", R701 (180kΩ). When this resistor goes high in value the beam limiter circuit is brought into operation. **R.B.**

Sanyo CTP5103W

This is a rare set for us. The field scan consisted of a three-inch, non-linear horizontal band at the centre of the screen. We found that C451, a non-polarised 330μF, 10V capacitor, was leaky. **S.I.**

Hitachi NP81CQ Chassis

A quickie. One of these sets came in with the symptom lack of brightness. R308 (56kΩ) was found to be open-circuit, as a result of which the brightness control was inoperative. **S.I.**

Servicing with a Logic Probe

David Botto

Pete stared at the VCR on his bench, noting with dismay the intermittently flashing LED indicators and the cassette that refused to load. Inside the machine the video heads spun round merrily, ignoring the stop command. "It must be a faulty microcomputer control i.c." he said to himself. "But suppose it isn't? Forty pins to solder and unsolder on fine print! And it'll have to be ordered from the manufacturers."

Pete's problem serves to illustrate one of the difficulties that TV/video engineers face today. TV sets, and VCRs especially, contain a bewildering complexity of digital and microcomputer circuitry.

A typical VCR system control board – taking as our example the Panasonic NV7000 since we deal with quite a lot of these – contains ten digital logic i.c.s, a forty-pin microcomputer i.c., thirty five transistors and diodes in profusion – all contained on just one of the PCBs! Understanding how the circuitry works before even starting to locate the cause of a fault is no easy task. To make life even more difficult some TV engineers are now expected to service domestic microcomputers as well . . .

A digital logic probe is a great help in servicing digital circuitry. It's extremely useful because by simply touching the probe tip to the point under test you get an instant indication of the circuit condition there. In fact it enables fast checks to be made around various digital i.c.s without having to spend hours of expensive time working out exactly how, in minute detail, all the circuitry interacts. If you're not already using such a probe you'll soon find it an indispensible addition to your test gear. It certainly won't collect dust on the shelf.

Logic States

As *Television* readers will know, in logic circuitry we deal with signals that assume one of two binary states, binary one or binary zero. In its simplest form a digital logic probe does no more than indicate whether a binary or logic one or zero is present at a given point in a digital circuit. Using positive logic (as almost all the digital circuitry a TV engineer encounters does) the logic one voltage will be high and the logic zero voltage low.

Fig. 1 shows at (a) a simple inverter circuit that operates from a 5V d.c. supply and at (b) its logic symbol. If a logic one is fed to the input of this circuit the output will be a logic zero. A logic zero at the input will be inverted to give us a logic one at the output. Logic one will in fact be about 3·6V d.c. and logic zero about 0·4-0·8V. You'll often find several such inverters incorporated in a single i.c. In the following text we'll use H (high) to represent the logic one condition and L (low) for logic zero – this is what most TV and VCR service manuals use to indicate logic levels.

An extremely simple logic probe circuit is shown in Fig. 2. When the probe detects an H condition the output from the first inverter will be in the L condition and the output from the second inverter in the H condition. Thus LED2 will light to indicate that H is present at the probe tip. When the probe detects an L condition LED1 lights to indicate this. The circuit is all right for experimenting but is of little use for practical servicing.

Probe Requirements

For professional TV and VCR servicing a digital logic probe must not only indicate static H and L conditions, it must also respond to fast-changing levels and pulse trains – something the type of oscilloscope generally used for servicing can't handle. When you obtain a logic probe, make sure that it has at least the following features:

(1) A high input impedance of not less than 100kΩ.
(2) The ability to operate with d.c. supplies of about 4·8-15V with low current consumption, and that it's protected against overloads and wrong polarity connection.
(3) Full compatibility with TTL, CMOS, MOS and other types of logic circuitry, including memories and microprocessor/microcomputer i.c.s.
(4) Capable of detecting pulse trains, responding to very narrow pulse widths of as little as 50ns.
(5) An operating frequency of at least 10MHz.
(6) In addition to visual indication of logic levels (usually by means of different coloured LEDs) an audio indication of levels is a useful and worthwhile feature.
(7) It should be light and easy to handle and robust enough to stand up to workshop conditions.

You may feel that such a probe will be expensive. Not long ago it would have been. Several companies now offer digital logic probes that easily meet the above requirements for well under twenty pounds however.

Probe Use

Before starting to make any checks on digital circuitry always measure the supply rail voltage with a digital voltmeter to ensure that it's correct within the specified limits. The logic probe has two power supply leads, fitted with small crocodile clips, to connect across the supply rail of the equipment under test at some convenient point.

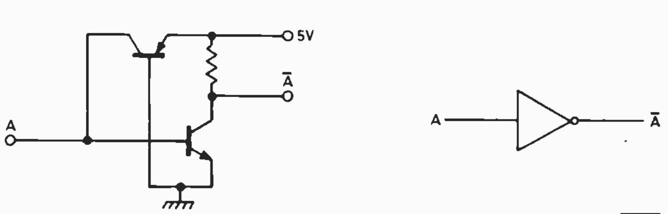
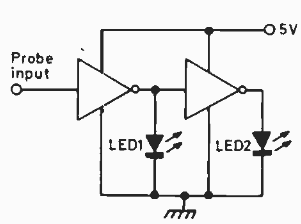


Fig. 1: Inverter circuit (a) and symbol (b).



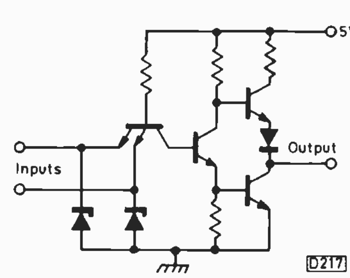


Fig. 2 (left): Simple digital logic probe.

Fig. 3 (right): Typical TTL logic gate circuit.

Next set the probe's selector switch (usually a slide switch) to the type of logic device you're going to check. This may be TTL (transistor-transistor logic) or MOS/CMOS (complementary metal-oxide semiconductor, i.e. a f.e.t. type arrangement) – note that you'll sometimes find i.c.s of both types on the same board. With MOS/CMOS devices an H will be around 70-75 per cent of the supply rail voltage while an L will be about 28-32 per cent of supply rail voltage. You don't have to worry about exact voltage levels because the digital logic probe adjusts itself to these.

When the probe is connected to a digital i.c. pin in the L condition the low (usually green) LED will light and if the probe has an audible indication a low-tone sound will be heard. If the probe is connected to an H point the high LED (usually red) will glow and a high tone will sound. If neither LED lights and no sound is heard there's either an open-circuit or the circuit is well out of tolerance. Always make sure that the supply voltage (Vcc) is actually present at the appropriate pin(s) of the i.c. and that the chassis connection pin (GND) is actually connected to the negative side of the supply (note that with CMOS i.c.s the supplies are labelled Vdd and Vss respectively).

With the probe's slider switch in the "pulse" position pulse activity is indicated by a third LED, usually yellow in colour, and a warbling sound tone.

Logic Circuitry

Most TV engineers are by now familiar with the truth tables for the various types of logic gate, but for your convenience the tables for the usual types of gates encountered in TV, VCR and microcomputer servicing are shown in Table 1. For fast servicing with a logic probe you really need to memorise the principles of the various logic gate conditions so that you don't have to continually refer to truth tables. This is not as difficult as it sounds – many readers will already have done so.

Fig. 3 shows a typical TTL AND gate circuit and Fig. 4(a) the logic symbol. There can be more than two inputs. The simple rule is that every one of the inputs must be in the H condition for the output to be at H. If pulse signals varying from H to L are applied to the inputs and are in phase a pulsed output will be obtained. The thing to remember is that all inputs must go high together – or one must be permanently high with pulses fed to the other. Fig. 4(b) shows the NAND circuit symbol. In this case when every input is at H the output will be at L. Any other condition gives an H output.

The other basic gates are the OR, NOR, exclusive-OR and exclusive-NOR gates. The symbols are shown in Fig. 4(c)-(f) and the input/output conditions in Table 1.

You'll also meet the three or tri-state buffer gate (Panasonic are very fond of this one!). The symbols are shown in Fig. 5. These have an enable input which may call for an H or L signal for the gate to function. In the Panasonic NV7000 (first version) system control board 1 has two μPD4503 i.c.s, IC6004/5, each with six buffer gates. Each buffer has an inverter at its enable input – Fig. 5(b) – four of these enable inputs being connected to pin 1 of the i.c. and the other two to pin 15. Only when the correct logic levels are applied to pins 1 and/or 15 will the buffers operate and pass signals.

Another basic logic circuit is the flip-flop. It's again easy to check with the digital probe. All that a flip-flop does is to store one bit of binary information, H or L.

There are various kinds of flip-flops (bistable multivibrators) from the simple latch to the D type and JK version. The type one usually seems to encounter is the D one – in its various versions. Fig. 6(a) shows how this type of flip-flop can be produced using four NOR gates and an inverter. Fig. 6(b) shows the logic symbol. There are two inputs, D (data) and T (toggle), and two outputs (Q and inverted-Q). When Q is high and inverted-Q low then the flip-flop is said to be set. If Q is low and inverted-Q stores a high the flip-flop is reset. In the circuit shown the D line responds to H and L inputs only when input T is high. There are two D-type flip-flops in each of the μPD4013 i.c.s (IC6706/7) on the Panasonic NV7000's still board. The 4013 has its two toggle inputs labelled C for clock as these inputs are often driven at high speed by the pulse output from a clock oscillator. It also has extra S (set) and R (reset) connections.

The logic probe enables the conditions at all the pins of these D-type flip-flops to be easily checked even when the flip-flop is rapidly changing states. For example, at pin 11, the clock input for one flip-flop in IC6706, the probe will initially indicate an L. The relevant Q and inverted-Q outputs will be at H and L respectively. Press the VCR's play button and the probe should show pulse activity at pin 11 as the clock oscillator starts up: pins 13 and 12 (Q and inverted-Q) will also show pulse activity, indicating that the flip-flop is switching from set to reset as the C input toggles it.

Waveform Duty-Cycle

If the H LED is brighter than the L LED when the logic probe detects pulse activity this indicates that the waveform is as shown in Fig. 7(a). If the L LED is the brighter one the waveform will be as shown in Fig. 7(b).

Servicing Procedures

If you handle certain models of TVs, VCRs and microcomputers on a regular basis you'll find it helpful to make notes of the various logic levels encountered, marking these on the appropriate circuit diagrams. We deal with fair numbers of the Panasonic NV7000, so here for your reference (see Table 2) are the logic levels found at the pins of the MN1400VP microcomputer i.c. on system control board 1, together with the changes in these logic levels produced by pressing the various operating buttons. The logic probe must be switched to MOS/CMOS when checking this device.

So how did Pete solve his problem (see earlier – he'd an NV7000 on the bench)? He first connected the supplies to his probe – connector P6001, pin 1 on system control board 1 is a handy place for 5V d.c., the other side to chassis. He then turned his attention to the MV1400VP microcomputer i.c. Pin 40 produced a logic indication of H + P + L at high speed, so he knew that the clock oscillator was running. Pins 10-13 showed the correct pulses. But many of the pins that should have given L logic readings showed up as H. The i.c. was definitely faulty! Removing it isn't too bad a job provided you use a temperature-controlled soldering iron and really good quality desoldering braid. Rather than solder a new MN1400VP straight on to the board fit a forty-pin i.c. holder – you might need to change it again one day.

The cassette lid then closed and the fast forward and rewind functions worked. But the machine wouldn't play. Using the logic probe once more the search speedily ended at IC6003, a 4049 containing six inverters. The

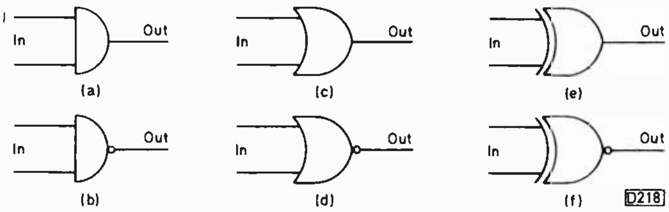


Fig. 4: Logic gate symbols. (a) AND gate. (b) NAND gate. (c) OR gate. (d) NOR gate. (e) Exclusive-OR gate. (f) Exclusive NOR-gate.

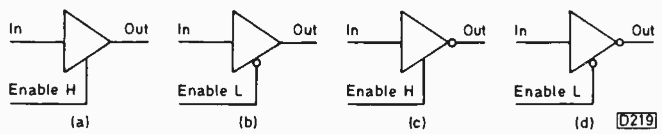


Fig. 5: Tri-state gate symbols.

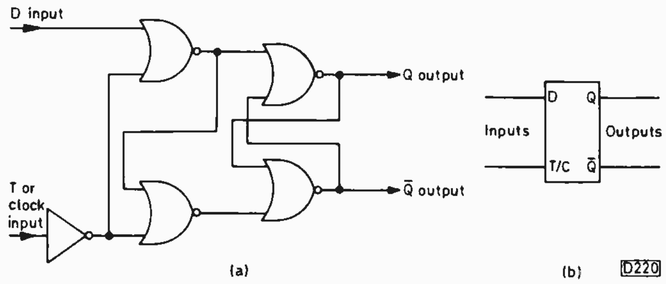


Fig. 6: D-type flip-flop made from an inverter and four NOR gates. (a) Circuit. (b) Symbol.

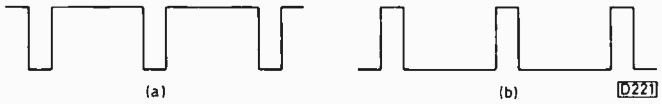


Fig. 7: Duty-cycle waveforms.

input to gate C0 (pin 3) receives a pulse input from pin 13 of the microcomputer i.c., so the correct indication was obtained here. The output, an inverted pulse reading of H + P + dim L, should appear at pin 2. As the probe indicated no activity at all at pin 2 Pete knew that inverter C0 was faulty. When he replaced IC6003 the machine worked correctly in every respect.

If the output of an inverter or gate appears low whatever the input, before condemning the i.c. desolder the relevant output pin to clear the print on the board and check again with the probe. This is to make sure that some other component in the circuit isn't pulling the logic level down, or perhaps the print is shorting due to a solder link.

Besides gates and microcomputer i.c.s a logic probe is useful with decoders – which consist of gates within an i.c. – such as the ones that feed seven-segment LED indicators and various remote control and tuning devices. In fact a probe is useful with any digital circuitry, especially when it comes to domestic microcomputers. The more you use a logic probe for servicing the more indispensible it becomes.

The author first used a digital logic probe when the early PET microcomputers began to appear on the workshop bench. That first probe had a response of just 1MHz and cost quite a sum of money. You can now obtain excellent 10MHz probes from such firms as Continental Specialities, Heathkit (Maplin), RS Components and others. The one I use in the workshop at present is a Tandy 22-302 which cost just £13·95. It comes with a very useful instruction leaflet – and it incorporates audio tone indication as well as LEDs.

Table 1: Standard gate truth tables.

AND gate

Inputs		*Output*
L	L	L
L	H	L
H	L	L
H	H	H

OR gate

Inputs		*Output*
L	L	L
L	H	H
H	L	H
H	H	H

NAND gate

Inputs		*Output*
L	L	H
L	H	H
H	L	H
H	H	L

NOR gate

Inputs		*Output*
L	L	H
L	H	L
H	L	L
H	H	L

Exclusive-OR gate

Inputs		*Output*
L	L	L
L	H	H
H	L	H
H	H	L

Exclusive-NOR gate

Inputs		*Output*
L	L	H
L	H	L
H	L	L
H	H	H

Table 2: MN1400VP pin conditions in NV7000 VCR

Pin	*No operations*	*Button(s) operated*	*Probe indication*
2	H + P	Play/record/ rewind/FF/eject	L
3	L		
4	L	Play	H + P after few seconds
5	L	Cue/FF	H + P
6	L	Eject	H + P
7	L	Eject	H + P
8	L	Pause	H
9	L	Play	H + P after six seconds
14	L	Stop held down or review	H + P + L
15	L	Cue	H + P + L
16	L	Review/play/ pause when held down	H + P + L
17	L	FF held down	H + P + L
18	L + P		
19	L	Play	H + P + L
20	H + P + dim L	Play/FF/ review	dim H + P + L
21	H + P + L		
22	L	Review held down	H
23	L	Play	L
24	L	Play	H
25	L	FF/rewind	H
28	H		
29	L		
30	H + P + L		
31	L	Play	H
32	L		
33	L	Review	H
34	L	Record	H
35	L		
36	L	Review	H
37	L	FF	H
38	L	Eject	H then L

Notes: P = pulse reading. Pins 1 and 26 are connected to chassis. Pins 10-13 are always L + P + very dim H. Pin 27 records H in the TTL position. Pin 39 is connected to the 5V line. Pin 40 is the internal clock oscillator – H + P + L.

The Lid off Microcomputers

Part 7: Microcomputer Monitors

Mike Phelan

Many home computers spend their lives hooked up to the family TV set. For several reasons this isn't an ideal arrangement. In particular the luminance signal bandwidth is insufficient for good text reproduction – with 40 or 50 characters per line you may just get away with it, but many home micros can now use the 80 characters per line business standard. The same problem arises with graphics displays that have fine lines. If we try to reproduce colour as well the effect is even worse – the 1·5MHz chroma bandwidth makes 80 c.p.l. text totally illegible (even more so with say blue text on a red background).

Alternative Approaches

Nevertheless a small-screen colour set with good cross-colour performance, an effective notch filter for the 4·43MHz subcarrier and low decoder noise can give passable results, without the crawling subcarrier becoming too obtrusive (this is most noticeable on a black and white, i.e. no chroma, background).

The next best solution is to use a set with composite video input, thus bypassing the computer's modulator and the set's tuner and i.f. strip. This will produce better results with less noise on the display, but the bandwidth problem remains. Some computers don't have a composite video output but the signal will be there, in the feed to the modulator.

The ideal approach is to employ a purpose-built monitor: either one with RGB plus sync inputs or a monochrome one which may have a white, green or orange phosphor c.r.t. This will provide much better results, free of noise, as the signal is being applied directly to the video output stage(s). The definition is limited only by these stages and the c.r.t. itself. Colour monitors have poorer resolution than monochrome ones, all other things being equal, due to the tube's slotmask structure. Despite this there are many professional monitors with high-definition colour tubes and near perfect convergence – you get what you pay for.

Sadly some home micros don't have RGB plus sync outputs: furthermore these signals may be present in the computer only within an i.c.

Amstrad Range

Two monitors are available for the Amstrad CPC464 computer we've been considering in previous instalments, the GT64 green screen monochrome one and the CTM640 colour monitor. Both give excellent results for the price. The GT64 is very simple – see Fig. 1. Both monitors provide a stabilised 5V supply for the computer. In the GT64 Q501 looks after this – it's input is taken from a separate winding on the mains transformer. The stabiliser chip IC501 provides Q501 with drive. To provide protection, Q503 monitors the current through R506. If the current exceeds 3A Q503 conducts, turning on Q504/5. This turns Q506 off and as IC501 is then without a supply line Q501 is deprived of drive and switches off. Q503 then turns off once more and the supply starts up. If the overload is still present the cycle repeats.

The line output stage is conventional, the output transistor being transformer driven and a Hartley type oscillator being used as the line generator stage. The sync amplifier Q601 feeds the line and field oscillators via the usual *RC* differentiating and integrating networks respectively. An i.c. is used for the field timebase.

The luminance input goes to a three-stage video amplifier (Q602/3/4) which drives the output transistor Q605. The latter is mounted on the c.r.t. base panel and has a low-value load resistor (2·7kΩ): these features result in an excellent bandwidth. The 100Ω resistors connected to the RGB inputs are included to preserve the correct d.c. levels at the computer's RGB outputs. Since the luminance signal is a mixture of RGB, derived within the computer, omission of these resistors would mean that

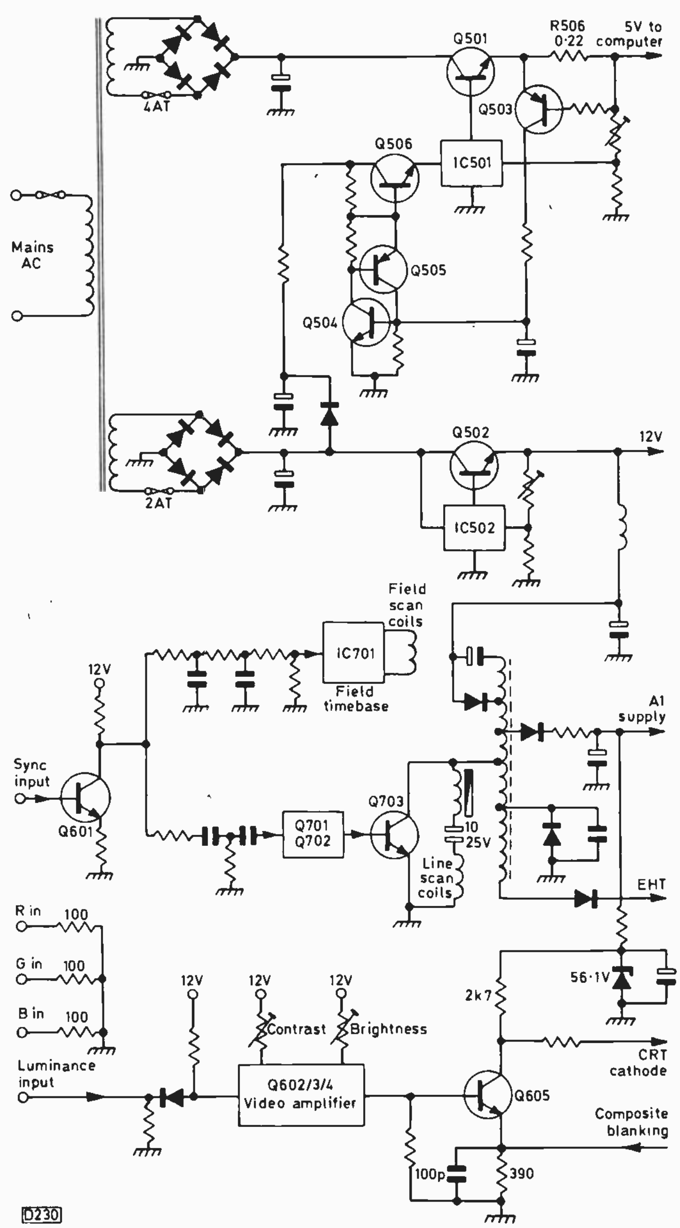


Fig. 1: Basic arrangement of the circuitry used in the Amstrad GT64 monochrome (green screen) monitor which also provides the power supply for the microcomputer.

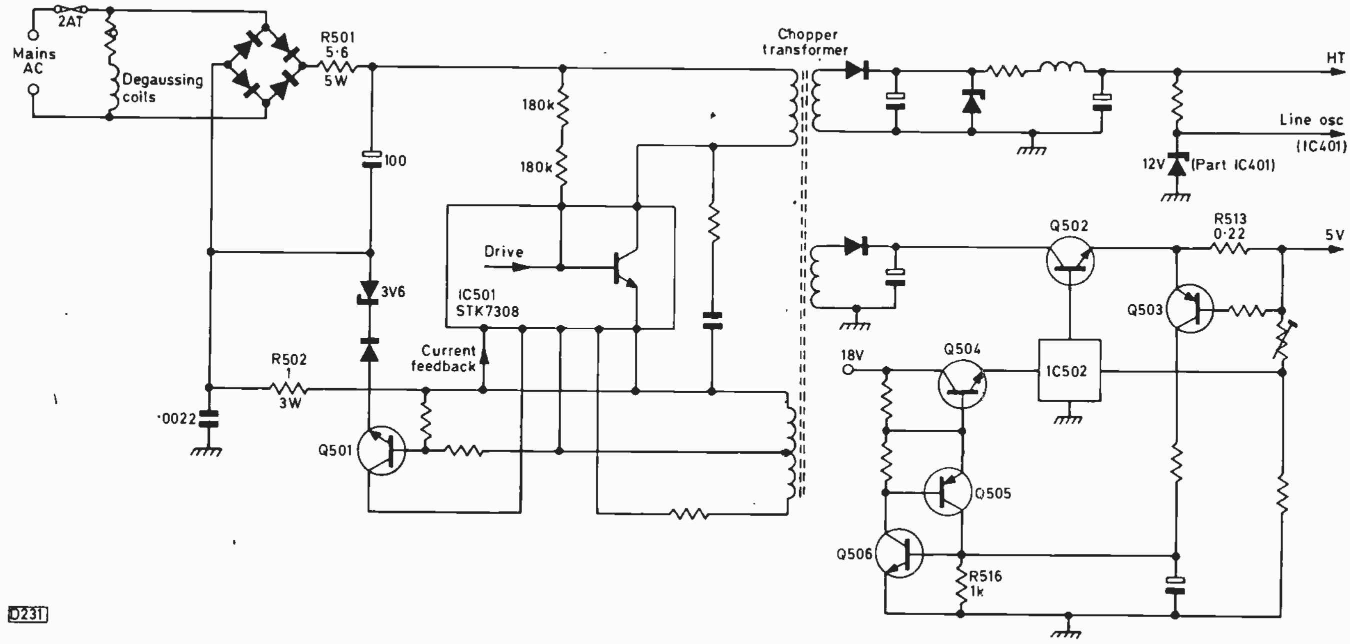


Fig. 2: Switch-mode power supply arrangement used in the CTM640 RGB monitor.

only eight shades of green would be available instead of 27.

This raises another interesting point. Many professional monitors have logic rather than linear inputs, i.e. the RGB signals are applied to logic gates which recognise only logic zero or one inputs. As the Amstrad computer is designed to provide its monitor with a linear input the use of a monitor with logic inputs would give only black, white and six colours, not 27 as produced by the Amstrad monitor – if you recall (see Fig. 3, July) the computer produces its RGB outputs using tri-state logic (zero, one or open-circuit) in conjunction with resistive matrixes, part of which are in the monitor.

The RGB Monitor

The CTM640 RGB monitor is naturally a little more complicated. Fig. 2 shows the power supply arrangement, which again includes a separate 5V section to power the computer. This time a chopper circuit is used to provide the h.t. and computer 5V supplies – the monitor's l.t. supplies are derived from the line output stage in the usual way.

The bridge rectifier produces approximately 310V d.c. which is applied to the chopper transformer's primary winding. The chopper transistor is actually part of IC501, which contains most of the circuitry. R502 (1Ω) monitors the current, providing feedback to IC501. One end of the tapped secondary winding is returned to R502 and the chopper transistor's emitter. The tap is connected to the base of Q501 which is normally off as its emitter has a 3·6V zener diode and an ordinary diode in series with it. If the output voltage from the chopper circuit rises, due say to reduced demand over and above that in normal use, the pulse at Q501's base will be sufficient to switch it on. Q501's collector current then acts on IC501 to reduce the h.t. The remaining connection on the tapped secondary winding feeds a negative pulse to IC501. This is rectified internally to provide a feedback voltage for stabilisation.

The circuits driven by the chopper transformer are completely isolated. A simple diode rectifier produces the h.t. supply. Q502/IC502 provide a stable 5V supply for the computer. As with the GT64 there's an excess current trip. IC502 receives its supply from the line output stage via Q504.

One of the video output stages (red) is shown in Fig. 3. There's nothing unusual about this – it's a conventional class A stage. The common chassis return for the RGB output stages is via Q403, whose emitter is normally at about 6V. This voltage is determined by the setting of the brightness control which sets Q401's base bias. Composite blanking is applied to the base of Q402 which is otherwise non-conductive. When positive-going flyback blanking pulses turn Q402 on, Q403 and the output stages turn off.

Under normal operation with no signal applied a slight residual current flows via the 6·2V zener diode and the 100Ω and 2·7kΩ resistors in series with it. The output transistor's base will thus be at about 6·3V and the appropriate tube gun will be cut off. VR801 and its counterparts in the blue and green output stages enable the cut-off points to be set. When the input signal goes high the 6·2V zener diode is forward biased and the video output stage turns on to an extent set by the brightness control and VR402, which effectively set the gains of the three output stages. VR804 and its counterpart in the blue channel thus provide highlight settings. As the input

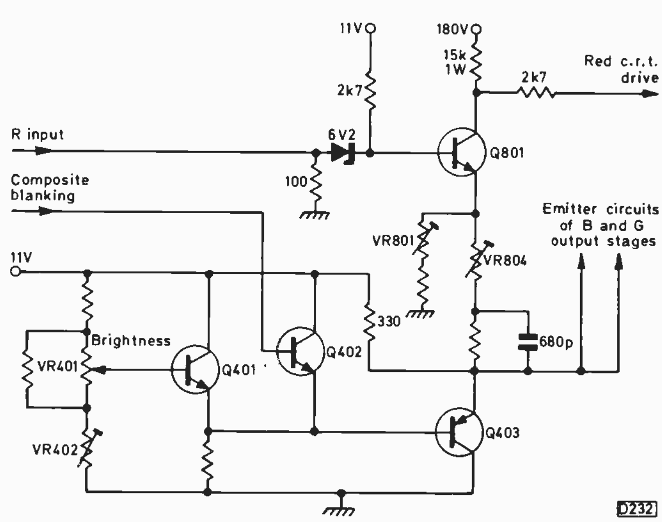


Fig. 3: The CTM640's red video output stage circuit.

signals are a known quantity there's no provision for beam limiting, so don't set the preset brightness control VR402 too high: the display can remain stationary for hours (or days) and phosphor burn is a real risk.

The rest of the circuit is conventional, with a diode-split line output transformer and i.c.s for the field output and the line and field generator stages. A trip circuit shuts the line oscillator down if the e.h.t. rises drastically. This works by monitoring the conditions at one of the pulse taps on the line output transformer. The manual refers to it as an X-lay protector . . .

Computer Fault Finding

Now for something we should have said last month when discussing microcomputer servicing. When surrounded by so much logic circuitry it's easy to forget certain basic fault-finding principles. Don't overlook the fact that many weird and wonderful fault symptoms – even apparently intermittent ones – can be caused by very simple fault conditions such as unstabilised or incorrect supply rails. Also don't forget to check supply decoupling and all earths. With so many high-speed switching signals about, simple continuity of the supply and earth is insufficient: typically each i.c.'s supply is decoupled, as closely to the chip as possible.

To Follow

Next month we'll go on to a totally different subject, the Philips/Mullard teletext decoder, with particular reference to the Philips G11 chassis.

VCR Clinic

Reports from Derek Snelling, Steve Beeching, T. Eng. and William G. Lockitt

Hitachi VT5000

The complaint with this fairly early machine was that the playback was too fast. On test we found that the capstan speed was excessive in playback but correct on record. This was unusual to say the least. Loss of the reference pulses on playback could result in an unlocked capstan, but the machine would probably switch off – and anyway the capstan wasn't unlocked, it was running at about twice the normal speed. A look at the circuit showed that the record and playback 9V lines are fed to the capstan circuit separately, but checks revealed nothing amiss here. Whilst carrying out various checks in the hope of finding a clue I noticed that the machine wouldn't go into pause when pause was pressed. Now a pause circuit is fairly easy for fault finding so I decided to approach the problem from this angle. It was at this stage that fate took a hand. Following the pause line back from the capstan circuit brought me (so I thought) to IC504. This was changed and the problems were cured. The i.c. forms part of the circuit for shunting the noise bar off the screen in pause, and it was only later that I discovered that the line I'd been tracing back didn't in fact go to this i.c. – I'd crossed wires while tracing through the diagram. Still, it makes a change to have luck on your side. **D.S.**

Hitachi VT8000 Series

The following problem is becoming common on Hitachi VT8000 series machines. The impedance roller – the large brass roller next to the full erase head – consists of a brass cylinder on a plastic or nylon hub. The problem is that the rim of this hub tends to shear off, allowing the brass sleeve to fall. This obviously affects the tape path and causes tape damage and tracking errors – as if the guide rollers are off. We've had half a dozen cases of this trouble in the last six months. **D.S.**

Ferguson 3V22

The complaint with a 3V22 was no tracking. A check showed that there was no sound either. It was as if the audio/control head was way out of alignment and sure enough the tape was well up the head which missed the control part completely. Adjusting the head brought the sound back and stabilised the picture but the screws were almost fully out – and anyway how did they come to be out of adjustment? I then noticed what I should have seen straight away: the pinch roller arm was bent, causing the pinch roller to meet the capstan at an angle. As a result the tape rode up the head. Straightening the arm and realigning the head to its original position cured the problem. **D.S.**

Mitsubishi HS710

We've just had in the new Mitsubishi HS710 – the replacement for the popular HS700. Unlike the HS700 it has infra-red remote control as standard, has insert edit and audio dub and comes supplied with a rechargeable battery. A cassette light has been fitted so that if a button is pressed the cassette compartment is illuminated to enable you to see how far through the tape you are, something long overdue on VCRs. Otherwise the HS710 retains all the features of its predecessor in a restyled cabinet. **D.S.**

Toshiba Models V31/V33

We've had several instances recently of the following problem with Toshiba V31/V33 machines: noisy, rattling, pulsing or slow rewind. The cause is rattling guides on the loading ring and wear on the upper cylinder. We've had five machines with this trouble in the last two months – generally after the machine has been in use for about ten months. A temporary cure for the noise can be achieved by putting a little grease on the guide shafts, taking care not to get it near the tape path. For a permanent cure however the loading ring should be replaced. **D.S.**

Hitachi VT8000 and VT9000 Series

Regular readers will know about the problem of intermittent vision in the record/E-to-E mode with Hitachi VT8000 series machines due to dry-joints in the earthing on the i.f. module. I've just had a VT9300 in with the same problem due to the same cause. It seems that the VT9000 series machines use the same i.f. module as the VT8000 series, so the problem can be expected on these as well.

While on the subject of VT8000 series machines, we've had a couple in recently that refused to complete the loading sequence. In both cases this was due to a stretched loading belt. The belt is at the back of the machine, behind the luminance/chrominance board, and is easy to replace. **D.S.**

Ferguson 3V29

The reported complaint with this machine was no picture. When I arrived and tried to play a tape I found that the head was ready to take off. IC201 (VC1029), the frequency-to-voltage converter in the drum servo, turned out to be faulty. **D.S.**

Ferguson 3V44

We've recently had in the new Ferguson 3V44. It's a non-remote control, front-loading machine made in W. Germany and has a one-event, two-week timer, instant record and a picture sharpness control. There are a couple more novel features: the clock can be switched to either twelve- or 24-hour operation, and in addition the display can be switched off altogether, presumably in response to claims that burglars look out for the light of VCR displays at night when deciding where to strike. After the front loading problems with the 3V35/36 this machine seems to have a much lighter operation. The pause is of the stop it dead type but doubles as a frame advance, so it's possible to shunt the noise bar off screen by successive operations of the pause button. The machine is otherwise standard, with the good picture quality we've come to expect from most current machines. **D.S.**

Aerial Sockets

A fairly common problem we get with Ferguson 3V29/30 machines is failure of the aerial socket. The cause of the trouble is that the socket has no reinforcing ring around the outer earth: so if the aerial plug is knocked sideways the socket breaks – particularly if an attenuator has been fitted. The problem is by no means confined to these machines or this brand, it's just that we have more of them out on rental than most others. It needn't happen of course if better quality sockets with a reinforcing ring were fitted. As far as I know the sockets are not available from the manufacturers separately, so a replacement r.f. booster has to be ordered. This is a bit expensive however just for a socket, so a colleague has devised a way of removing the old socket and fitting a chassis-mounting type that's available from local suppliers. This has the added advantage that the socket is of better quality than the original one.

To replace the socket, remove the booster amplifier from the machine and take off the covers. Desolder the socket's centre pin thoroughly then, with a large pair of pliers, turn the whole socket anti-clockwise until the securing nut beneath is loose enough to undo by hand – you'll find it almost impossible to get at the nut with anything other than the end of your finger. After removing the nut and the old socket clean the area thoroughly with emery cloth and tin slightly using a 60W iron. Thoroughly clean and tin the new socket and fit it in place, then solder it to the chassis of the booster. It's a good idea to fit an aerial plug in the socket while doing this as the heat can make the plastic of the socket soft with the result that the centre pin goes off-centre – if it's not held in place. All that's now necessary is to enlarge the hole in the booster cover slightly to accommodate the larger socket. The result is perhaps not as tidy as the original but is probably stronger and is certainly cheaper than fitting a replacement booster unit. **D.S.**

Sony SLC7

After about two months this machine came back with the same fault – no E-E sound. I'd previously replaced the TBA120UB intercarrier sound chip to cure intermittent loss of audio. Could the second TBA120UB have failed? – the demodulator certainly wasn't working. In fact the cause of the trouble was C521 (0·047μF) which is connected from one of the input pins to chassis: it was short-circuit. The defective capacitor could have been responsible for the previous intermittent sound trouble. **S.B.**

Sony SLC7

In the event of sound and picture muting on certain tapes, first check for tape edge damage. If the tape is o.k. suspect the audio/control head.

One machine we had wouldn't change from channel number 18. The cause of this was a defective gate in IC7 on the timer board.

The problem we had with another of these machines was that the cassette compartment wouldn't open after unthreading. The cause was the threading ring turning. Adjustment of the threading ring friction with the roller at the back of the drum mechanics put matters right.

Finally on this machine a worthwhile modification. To increase the gain of the control signal amplifier change R123 from 1·5kΩ to 2·7kΩ and replace D30 with a 180Ω resistor. **W.G.L.**

Letters

BELT BOILING

I object to the inference by E.T. in your magazine (VCR Clinic, September) that Newark Video "boils belts". This is not true. Well not all of them anyway. This inference comes from a so-called engineer who appears to spend hours changing the belts on the loading drive motors of the 3V29/30 and HR7200/7300/7350 instead of replacing the whole assembly. In order to replace the drive belt the motor and worm gearing must be removed and replaced, avoiding grease contamination of the new belt. When the belt reaches the point at which it has to be replaced the motor will also be well worn. In many cases we've found that the motor has failed within three months of belt replacement, resulting in an under-guarantee loss for motor replacement. The whole assembly, including the belt, costs only about £10 retail (plus VAT). Surely the labour cost of replacing the belt is much more than this – unless E.T. is paying very low wages!

Steve Beeching, BBC (Belt Boilers Confederation), Newark, Notts.

PHILIPS 10CX1120

The problem we had with two of these sets (the 9in. portable with FS tube) was varying brightness, volume and colour levels in conjunction with the channel indicator trying to light up 88. The fault was traced to the output from the L387 5V regulator that supplies the microcomputer i.c. varying between 5V and 5·5V. Changing the regulator didn't cure the trouble however. Tests showed that the 5V regulator's earth pin was at 0-0·5V above chassis potential. Resoldering the chassis connections still didn't provide a cure. We had to connect a wire from the earth pin to chassis.

K. W. Howle, Director, Telefaults (S-O-T) Ltd., Stoke-on-Trent.

Editorial comment: Other readers have reported trouble in this area. The 5V regulator i.c. can draw over 500mA yet deliver only 250mA to the microcomputer i.c. Naturally this blows the 500mA anti-surge fuse S661 – which doesn't look at all like a fuse. The Pye version is Model 25KX1201.

AERIAL-MAINS ISOLATION

Having read the letter from Rothley Stevens in the September issue (page 614) I feel I must make the following observations. I've been engaged in the radio/TV servicing trade for over 35 years and have yet to encounter a TV receiver that doesn't, by design, have isolation between the mains supply and the aerial socket in one of the following three ways: (1) by use of a double-wound mains transformer; (2) by use of isolation components in the aerial socket; (3) as in modern sets, including the Hitachi one mentioned, by use of the switch-mode power supply to provide isolation. Isolation components in the aerial socket are unnecessary with arrangement (3). In the instance quoted by Rothley Stevens, surely the *set's* fuse would have blown, via the earth lead on the amplifier, had the isolation been defective.

The problem is more likely to have been the result of the set being inadvertently connected to the preamplifier's input socket or the preamplifier's isolation capacitor being short-circuit or maybe not fitted. This would effectively put a short-circuit across the 12V supply for the amplifier, via the tuner unit's input circuit, thus blowing the fuse in the amplifier.

It's most unlikely that any setmaker would omit isolation from his sets in these safety-conscious times. That would give rise to many other problems – not least the possibility of some unsuspecting aerial rigger being thrown off the roof, having received a shock on touching an aerial with the mains voltage applied to it.

R. E. Foster, Ganegrade Ltd., Nottingham.

BUZZING MAINS TRANSFORMER

Mention of the problem of coils whistling annoyingly at line frequency has been made in the past in *Television*. A similar problem was present in a monochrome portable I had for repair, only the complaint this time was of a 50Hz buzz that emanated from the mains transformer. Rather than scrap the transformer I decided to tackle the fault, which of course was due to the laminated sections vibrating against the transformer's outer casing. After applying Araldite Rapid to the casing and laminated section, followed by reassembly, the noise had completely gone.

A tip perhaps for anyone who has a buzz problem and who may be unable to obtain a transformer for an older set.

G. Pattinson, Glenrothes, Fife.

ITT SERVICE DEPARTMENT

You mention ITT's change of premises in your September issue (Teletopics, page 639, under the heading "Business Moves"). Unfortunately your information regarding service departments was incorrect. The main service department at Chester Hall Lane also moved to the new premises in Paycocke Road – all service matters should now be referred to:

ITT Consumer Products Services,
Paycocke Road,
Basildon, Essex SS14 3DR.

The telephone number is 0268 27788 – for spares orders phone 0268 288818/9.

The service departments at East Kilbride and Kearsley were closed earlier this year, though the depots remain for warehousing and distribution.

P. R. Brook, Service Manager, ITT Consumer Products Services.

THE G11's HT RESERVOIR CAPACITOR

The problem of the h.t. reservoir capacitor in the Philips G11 chassis is not as simple as S. Simon suggests in the September issue. First, in addition to red and green capacitors I've also found several silver coloured cans that are just as suspect. Secondly and more importantly, replacement blue capacitors can be suspect. I've fitted only capacitors supplied by Philips and have had no trouble with these. Recently however I've had three G11s in the workshop fitted with blue L.C.R. capacitors by other repairers. The first set took me a while to deal with as I didn't suspect the capacitor, being a new blue one. Examination of the three blue capacitors showed burning around the rivets however. I believe these L.C.R. types

were supplied by independent wholesalers. Oddly enough the latest capacitors supplied by Philips are an L.C.R. type, but they have the code number 3PC 471 ED 250W and much longer rivets.
Alan V. Turner,
Warrington, Lancs.

ITT CVC45/1 CHASSIS

Keith Harmer and Garry Smith mention a dead ITT set (CVC45/1 chassis) with R809 open-circuit. When this situation is met it's recommended that R808, R809, R818, R829 and R833 are all changed. Failure of R833 (1·5MΩ) will cause repeated failure of the BU326 chopper transistor. If the problem persists D8 and D10 (both type 1N4148) should be changed. ITT recommend replacing R833 as a matter of course whenever one of these sets is serviced. The same comments apply to the CVC40 (16in. tube) chassis.
Paul J. Bradford,
Whitley Bay, Tyne and Wear.

TAPE RELOADING

With reference to M. Catchpole's attempt at reloading V2000 cassettes (Letters, September), I was faced with the same problem but was a little more successful. I'd previously used a Philips N1500 VCR and had quite a number of redundant LVC cassettes which I decided to try to make use of. I obtained from Stan Willets of West Bromwich second-hand VCC120 Philips instruction tapes at 50 pence each and reloaded these with tape from the LVC cassettes. Computer tape stop foils were placed at the beginning and end (three, spaced at about six inches for safety). This has given good results with my Grundig 1600 machine and increased the tape playing time eightfold. I hope this information will be of use to previous N1500 and N1700 owners.
F. Holt,
Walsall, W. Midlands.

MISIDENTIFIED CLOCK

An error occurred in your September issue's DX-TV section. In the caption to the photographs it says that the clock received by Ryn Muntjewerff on May 20th at 1927 GMT is the Syrian clock on ch. E3. In fact it's the Jordan TV clock. In addition Jordan is plus three hours to GMT and the time shown on the clock is 2300 local (2000 hours GMT), the time of the second news bulletin in Arabic. I hope this information will help Mr. Muntjewerff to correct his records for future reference.
G8206168 JT M. B. Sayers,
12 SU RXER site, BFP053.

PHILIPS G9 CHASSIS

The fault with one of these sets was wavy horizontal contraction of the raster sides, coinciding mostly with points of high brightness, such as shots panning to the sky, or when advancing the brightness control's setting rapidly. After hours of unsuccessful fault finding I eventually found that the trouble appeared to be due to poor regulation in the line output transformer. Replacing this item cured the fault. I hope this may be of help to anyone else faced with this baffling condition.
Michael J. Levy,
Harrow, Middx.

Rocking all the time

Les Lawry-Johns

Things are most certainly not what they used to be. People even talk a different language now and I find it difficult to know what they are on about. Take Mr. Flasher for example. He held up a small Philips TX2 portable.

"Thought I'd let you have a look at this for me, right? Picture valve's gone, right? Don't mind paying you to look at it right? I'd do it myself but haven't got the time, right?"

"No. If it needs a valve, tell me which one and I'll sell it to you. I don't want to look at it because it's white and white gives me spots before my eyes and makes me feel ill, especially this soon after breakfast."

Mr. Flasher was taken aback. "Don't know what you're on about, right? What I'm saying is I'll pay you to put a new picture valve in my set, right?"

"I could put a valve in your set but it would just flop around because there's nowhere to fit one. If you want me to repair the set because you've not the time you'll have to leave it here. It won't involve valves because the set doesn't have any, right?"

So he left it and went out muttering about shopkeepers who had no right to have a shop and the government ought to do something about it.

I took the shell off the little Philips set so that it wouldn't hurt my eyes, plugged it in and switched on. The sound sounded but the screen showed only a line down the centre. So I checked the scan coupling capacitor and it had capacitance, then I checked the tracks to the line output transformer and they were intact. Next I wondered.

I checked the winding on the transformer. It was open-circuit. Oh dear, I certainly didn't have one of these little perishers. With enormous dexterity and wonderful presence of mind I removed the transformer and located the break. It could be soldered and it was. Back it went and the set now showed a picture. But it was upside down. My eyes narrowed as I got Mr. Flasher in my sights. So he'd been flashing around. I looked again at the scan coils. They hadn't been disturbed. I looked at the print. It didn't look as though it had been disturbed. Mr. Flasher was a phantom. So I reversed the field scan coils and the picture was the right way up. I could read the news on BBC-2 in the mirror. Something stirred in my brain. I've never been able to do that before, and people always shake hands with their left hand in the mirror. I looked directly at the screen: the picture was back to front. This made me very angry but everything looked all right when I'd reversed the line scan coil leads. I wrote the bill out with amazing attention to detail.

In fact it was Mrs. Flasher who came to collect the set. "I told Harry there's nothing much wrong with the set, right? I said why don't you do it as you're always pulling the radio to pieces, right? But he said 'I don't know about TVs, they've got valves in them'."

I gave up and ushered her out of the door – the dog wanted to go across the road and chase his ball on the green.

Now you'd think a simple thing like taking the dog across the road to play with his ball would be a simple thing, right? No wrong. In the first place he's still a puppy, albeit a rather large one. In the second place chasing a ball is to him the most exciting thing on earth. As soon as he catches sight of his lead and the ball he goes berserk. Absolutely mad. I'd like to see Barbara Roadhouse calm him down. A choke chain? He's got one and it's high up but he chokes himself to death because he can't get the ball out of his mind.

We eventually cover the few feet across the road to where he knows the chain is coming off and the struggling reaches fever pitch. Whilst I'm trying to remove the chain he hurls himself this way and that until he finally rips my arm off and runs away with it. I manage to retrieve it and tuck it inside my cardigan and throw the ball with my left arm. When he eventually tires we make our way back to the shop, him panting like a steam engine (you can hear him miles away). With him laying on the floor lapping his water because he's too tired to stand Honey Bunch asks "Why did you let him do that? Come here and I'll stick it back on. You'll have to mix the glue though, I can't stand the smell of that stuff."

So I mixed up the epoxy with my left hand and made it good and strong. H.B. stuck my arm back so that I could work properly, then ran her iron over the joint so that it would harden quickly and I'd be able to get on with the jobs.

Puppets heal very quickly you see.

The Decca 80

An old friend then arrived with a set I'm not familiar with: I've done a few, but not many. A Decca CT0802 – 80 series chassis. I plugged it in and switched on. Nothing, or at least I couldn't hear anything. The tube base voltages were present, as was the e.h.t., so I came to the conclusion that the l.t. supplies were absent. I looked for the circuit. A very brief reference in the book that did mention it referred me to the 1977-8 book for full details. I'd just lent that one to Tony. No not that Tony, the other one (sorry Tony).

So I swung up the chassis and took the cover from the line output stage. Everything seemed to be in order but I didn't like the look of the soldering on the l.t. output socket. I resoldered the contacts to make them look better, then switched on. The sound roared out and after a short wait the screen lit up. I plugged in the aerial and the picture looked good. So what? The moral is that if you lend someone a manual for a set you're not too familiar with one will promptly come along. Right?

Looking in the Window

For a long time I've been struck by the fact that nearly every female that walks past the shop turns to smile in at me. Well I can't help being an attractive man. Reliable, sort of, maybe a little staid, sort of . . . I don't know, just fascinating I suppose. After all, those girls can't all be wrong, especially when the sun is shining. Yes that's another thing, they seem to look in more when the sun is shining. It was shining the other morning when I went across the road to post a letter. Coming back I was surprised to note that I couldn't see inside the shop at all. All I could see was myself . . .

Fading GEC

It was just an ordinary GEC 2120 or something like that, with the complaint that the picture would fade out for varying periods before returning as good as ever. I had it on test and had left the rear cover on to keep the heat in. After about half an hour the picture faded out, so I whipped the back off to make my definitive tests. These were not required since the picture had returned. So I left the back off. About an hour later the picture faded out and I leapt to the tube base to check the voltages. They were all present and the picture had returned.

I resolved to do nothing the next time. I just looked – at the tube base socket. The tube's heaters faded out. Ah, ha! I checked the heater supply and it was present – and the tube's heaters were glowing normally. So I left the prods connected and lay in wait. The tube's heaters faded but the meter continued to record some 4V a.c. It just had to be pin contact. A thorough clean of the tube's base pins and the socket cleared the trouble, well for a while I suppose.

More Fading

The next day a similar GEC set appeared. Complaint: picture fades out leaving the sound normal. I resolved to play it cool: meter on the tube base socket to read the applied heater voltage, watch it carefully. After a while the picture faded leaving the heaters glowing merrily. The smile faded and when the meter was switched to the 1kV range we found that all three first anode voltages were missing. There was plenty of voltage at one end of the 560kΩ feed resistor (R506) on the convergence board but little at the other end. A new resistor restored normal, continuous viewing.

At the Coach

Having had a couple upstairs, perhaps three or four, we decided to go next door to the Coach. Dave's place. Not Dave from the garage, Dave from the pub. We had quite a few while H.B. tried to beat the machine, and of course Dave kept filling my glass so that I was having twice as much as H.B.

Towards the end of the evening I was dully aware that Tony and Jim had come in. They slapped me on the back to make me growl and I did. So they got their drinks and moved over to H.B.

Now H.B. loves to tease Tony because he blushes so easily. So she set out to make him blush and he did. "Got your black tights on tonight?" she asked, "see you haven't got your high heels on."

Tony went along with it all. "Thought I'd give 'em a rest so's not to make all you girls jealous."

Quite unexpectedly a young man standing by broke in. "If he wants to wear black tights and high-heeled shoes why shouldn't he?"

Tony blushed an even deeper red. "They're only joking" he muttered to the young man.

"Maybe they are" said the Y.M., "but what's wrong with you doing it if you want to? I'm fed up with this place and its narrow minds. I'm off."

As he went out Dick came in. H.B. loves teasing him too. Er, I think we'll leave it at that. Whatever next?

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

16181	1.04
16182	1.04
16334	0.51
16335	0.80
16446	0.98
16600	1.38
16799	2.88
16801	0.54
16802	1.14
16803	5.30
16905	0.86
17074	9.30
17127	3.51
1N4001	0.06
1N4002	0.06
1N4003	0.06
1N4004	0.04
1N4005	0.08
1N4006	0.08
1N4007	0.07
1N4148	0.04
1N4448	0.05
1N5401	0.14
1N5402	0.15
1N5403	0.16
1N5404	0.15
1N5408	0.35
1N914	0.04
1S44	0.09
1S5012A	0.81
1S921	0.10
2N1302	0.27
2N1303	0.38
2N2218	0.42
2N2219A	0.40
2N2222	0.38
2N2646	0.80
2N2904	0.36
2N2905	0.43
2N2906	0.38
2N3053	0.27
2N3054	0.99
2N3055	0.61
2N3055H	0.85
2N3442	1.16
2N3702	0.14
2N3703	0.14
2N3704	0.14
2N3705	0.14
2N3706	0.14
2N3707	0.16
2N3711	0.11
2N3771	2.04
2N3772	1.71
2N3773	2.29
2N3819	0.41
2N3823	1.17
2N3904	0.62
2N3908	0.62
2N4101	1.33
2N4240	3.30
2N4444	0.90
2N4914	0.72
2N5064	0.71
2N5293	0.50
2N5294	0.50
2N5296	0.49
2N5297	0.50
2N5298	0.61
2N5490	1.49
2N5496	0.59
2N6107	0.59
2N6109	1.58
2N6122	1.76
2N6130	0.72
2N6133	1.25
2N6178	0.73
2N6180	0.73
2N696	0.43
2N698	0.43
2N707	0.43
2SA1027R	0.45
2SA1076	1.96
2SA329	0.40
2SA351	1.17
2SA489	1.17
2SA490	1.67
2SA493	1.05
2SA628	1.14
2SA637	1.46
2SA673	1.27
2SA683	1.61
2SA684	1.33
2SA748	1.08
2SA818	1.82
2SA835	2.50
2SA940	1.81
2SA951	1.26
2SA966-Y	1.16
2SB325	3.87
2SB375	3.87
2SB400	0.40
2SB407	3.24
2SB411	3.30
2SB511	2.50
2SB54	1.39
2SB56	2.80
2SB618A	2.22
2SB681	3.96
2SB695	1.98
2SB75	1.04
2SB861	0.85
2SC1034	6.75
2SC1050	5.06
2SC1061	1.26
2SC1096	1.16
2SC1104	3.98
2SC1106	4.54
2SC1114	6.75

2SC1124	1.26
2SC1151A	4.72
2SC1152	4.68
2SC1162	1.05
2SC1172	2.22
2SC1172Y	2.20
2SC1195	3.26
2SC1213	0.89
2SC1226	1.46
2SC1306	1.98
2SC1307	1.98
2SC1316	4.10
2SC1364	0.49
2SC1383	1.20
2SC1398	0.84
2SC1410	2.39
2SC1413	3.55
2SC1505	1.00
2SC1578	8.74
2SC1617	3.89
2SC1670	3.13
2SC1678	1.98
2SC1810	1.70
2SC1815	0.66
2SC1829	2.22
2SC1855	1.88
2SC1875	4.77
2SC1891	3.69
2SC1893	3.02
2SC1929	2.25
2SC1942	5.70
2SC1945	4.53
2SC1953	1.93
2SC1957	0.95
2SC1959	0.31
2SC1962	1.93
2SC1969	2.92
2SC1985	1.75
2SC1983 TR	7.00
2SC2009	0.34
2SC2029	2.33
2SC2027	1.42
2SC2028	2.11
2SC2057	1.18
2SC2073	1.54
2SC2078	2.39
2SC2091	1.30
2SC2122A	5.12
2SC2141	1.86
2SC2166	1.98
2SC2216	0.69
2SC2233	2.20
2SC2271	4.01
2SC2278	1.14
2SC2314	0.87
2SC2335	10.41
2SC2526	1.87
2SC2551	1.26
2SC2570	2.39
2SC2570A	1.05
2SC2578	6.75
2SC264A	4.82
2SC2671	1.99
2SC2728	0.95
2SC2785	0.75
2SC372	1.40
2SC373	1.16
2SC383	1.33
2SC388	0.50
2SC394V	0.81
2SC41	2.19
2SC458	0.34
2SC495	0.92
2SC508	3.70
2SC515A	1.85
2SC536	0.29
2SC537	0.54
2SC558	3.69
2SC605L	1.16
2SC620	1.46
2SC673	1.23
2SC681	4.40
2SC684	1.65
2SC685A	2.89
2SC693	0.63
2SC710	0.69
2SC717	1.14
2SC734	1.43
2SC735	1.16
2SC782	2.47
2SC790	1.27
2SC806	11.29
2SC814	1.39
2SC828	0.28
2SC867A	3.04
2SC876	0.96
2SC901	4.55
2SC926A	1.42
2SC930	0.54
2SC935	4.13
2SC936	5.25
2SC937	3.58
2SC940	4.68
2SC982	0.70
2SD1051	0.75
2SD1128	2.25
2SD1138	0.94
2SD1265	0.76
2SD1398	2.25
2SD1453	0.75
2SD198	3.87
2SD234	0.49
2SD235	0.60
2SD257	2.94
2SD291	2.94
2SD292	2.59
2SD313	2.59
2SD315	2.94
2SD325D	0.91

2SD348	16.13
2SD350	5.20
2SD350A	2.29
2SD353	7.50
2SD389	2.41
2SD401	3.55
2SD551	2.42
2SD588A	1.99
2SD600	3.25
2SD621	12.67
2SD636	0.40
2SD657	2.80
2SD679	3.35
2SD731	2.11
2SD787E	0.62
2SD811	5.54
2SD823	1.98
2SD856	6.61
2SD869	7.17
2SD898B	7.45
40408	0.50
40594	1.53
40595	1.53
40636	1.43
40871	1.53
40872	1.53
60857	1.21
74LS30	0.32
7805 TO-220	0.63
7805 TO-3	1.16
7806	0.73
7808	2.39
7812 TO-3	2.85
7812 TO-220	1.16
7815	0.64
7818	0.70
7824	0.64
AC107	0.73
AC117	0.43
AC123K	0.43
AC128	0.34
AC138	0.09
AC141	0.29
AC142K	0.43
AC151	0.28
AC153	0.34
AC176	0.30
AC179	0.28
AC183	0.72
AC187	0.39
AC187K	0.43
AC188	0.37
AC188-01	0.44
AC188K	0.43
AC193K	0.65
AC194K	0.65
AD140	1.06
AD145	1.60
AD149	0.90
AD161	0.56
AD162	0.45
AD262	1.05
AF114	2.47
AF115	1.24
AF117	0.50
AF118	1.20
AF127	0.50
AF139	0.53
AF178	1.45
AF179	0.55
AF180	0.55
AF181	0.53
AF182	0.55
AF186	0.53
AF239	0.53
AF279	0.88
AL100	4.03
AL102	5.69
AL103	2.68
AL113	1.36
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	2.28
AN214	2.26
AN214Q	2.40
AN231	14.89
AN234	5.92
AN236	3.33
AN238	6.79
AN239	5.88
AN240P	1.72
AN241	1.71
AN245	4.49
AN247P	4.22
AN252	2.57
AN253	2.97
AN262	1.98
AN272	7.92
AN281	6.53
AN295	5.52
AN301	5.55
AN302	3.99
AN303	4.39
AN305	8.88
AN313	3.41
AN315	2.46
AN316	5.53
AN318	6.20
AN320	5.47
AN331	4.59
AN337	5.37
AN340P	1.17
AN355	5.98
AN362	1.75
AN5111	2.92
AN5132	4.39
AN5250	2.89

AN5435	3.08
AN5610	7.43
AN5612	3.51
AN5613	3.41
AN6320N	4.28
AN6326	3.98
AN6342	1.61
AN6344	5.87
AN6363	16.00
AN6551	0.68
AN6552	0.68
AN7115	2.52
AN7145	2.80
AN7146	9.90
AN7150	2.45
AN7151	2.26
AN7156	2.78
AN7158	6.75
AN7218	1.64
AP58076	4.68
AS560S	1.58
AU113	2.97
AY105K	2.08
AY106	1.09
BA130	0.14
BA1310	1.98
BA1320	1.38
BA1330	2.75
BA145	0.19
BA148 DIOD	0.33
BA154	0.40
BA156	0.05
BA157	0.22
BA159	0.12
BA182	0.19
BA222	1.66
BA284/2	0.17
BA301	0.87
BA302	1.24
BA311	1.32
BA312	0.97
BA313	0.76
BA317	0.04
BA318	0.09
BA328	4.77
BA333	1.37
BA401	0.64
BA511 (IC)	2.92
BA521	2.02
BA524	8.94
BA526	7.98
BA532	2.67
BA536	3.44
BA6304A	2.92
BA843	3.96
BAV18	0.21
BAV19	0.11
BAV20	0.11
BAV21	0.34
BAX12	0.11
BAX13	0.11
BAX16	0.11
BB119	0.17
BC107	0.13
BC107B	0.11
BC108	0.15
BC108B	0.15
BC109	0.12
BC109B	0.15
BC113	0.14
BC116A	0.25
BC119	0.36
BC126	0.20
BC132	0.14
BC135	0.14
BC137	0.18
BC138	0.34
BC139	0.28
BC140	0.45
BC141	0.34
BC142	0.34
BC143	0.33
BC147	0.08
BC147A	0.12
BC148	0.13
BC148B	0.13
BC148C	0.11
BC149	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC157	0.14
BC158	0.10
BC159	0.16
BC160	0.40
BC161	0.28
BC167	0.36
BC168	0.36
BC169C	0.16
BC170	0.16
BC171	0.11
BC172	0.10
BC172B	0.27
BC173	0.17
BC174B	0.27
BC177	0.20
BC178	0.26
BC179	0.26
BC182	0.09
BC182	0.11
BC182B	0.26
BC182L	0.10
BC182LB	0.14
BC183	0.10
BC183L	0.11
BC183LB	0.26
BC184	0.13
BC184L	0.14
BC184LB	0.26

BC186	0.27
BC187	0.28
BC204	0.16
BC207	0.14
BC212	0.11
BC212B	0.26
BC212L	0.10
BC212LB	0.26
BC213	0.10
BC213L	0.10
BC213LB	0.15
BC214	0.10
BC214L	0.14
BC214LB	0.26
BC225	0.40
BC237	0.10
BC238	0.10
BC238A	0.13
BC239	0.12
BC239B	0.25
BC251A	0.12
BC252	0.10
BC258	0.25
BC261A	0.22
BC262	0.22
BC287	0.76
BC294	0.50
BC301	0.45
BC302	0.53
BC303	1.04
BC307	0.18
BC307A	0.14
BC308	0.18
BC308A	0.11
BC309	0.17
BC317A	0.13
BC327	0.11
BC328	0.11
BC337	0.08
BC338	0.12
BC360	0.34
BC368	0.24
BC440	1.09
BC441	0.44
BC454	0.36
BC455	0.36
BC460	0.42
BC461	0.47
BC462	0.30
BC463	0.64
BC464	0.64
BC465	0.64
BC477	0.32
BC478	0.32
BC479	0.41
BC532	0.28
BC546	0.17
BC547	0.10
BC548	0.10
BC549	0.10
BC550	0.40
BC556	0.16
BC557	0.10
BC558	0.10
BC559	0.10
BC560C	0.14
BC635	0.36
BC636	0.20
BC637	0.24
BC638	0.20
BC639	0.20
BC640	0.24
BC879	0.31
BC880	0.31
BCX32	0.42
BCX33	0.27
BCX34	0.40
BCX37	0.67
BCY70	0.30
BCY71	0.21
BCY72	0.20
BD115	0.36
BD116	0.70
BD124	1.31
BD124P+KIT	0.69
BD131	0.42
BD132	0.42
BD133	0.53
BD135	0.36
BD136	0.36
BD137	0.36
BD138	0.46
BD139	0.34
BD140	0.37
BD144	1.43
BD150	0.75
BD157	0.67
BD159	0.53
BD160	1.60
BD163	0.71
BD165	0.62
BD166	0.42
BD168	0.73
BD175	0.43
BD177	0.43
BD179	0.49
BD181	0.99
BD182	0.99
BD183	0.99
BD184	1.21
BD187	0.53
BD189	0.69
BD190	0.69
BD201	0.67
BD202	0.60
BD203	0.60
BD204	0.40
BD207	1.79
BD208	1.23

BD222	0.49
BD225	0.49
BD228	0.63
BD229	1.05
BD231	0.50
BD232	0.50
BD234	0.42
BD237	0.47
BD238	0.45
BD239	0.45
BD240	0.37
BD241	0.39
BD242	0.50
BD243	0.50
BD243A	0.37
BD244	0.51
BD244A	0.85
BD245C	0.99
BD246C	0.86
BD253	1.05
BD278A	0.80
BD317	2.60
BD318	2.59
BD375	0.42
BD377	0.26
BD379	0.76
BD380	0.76
BD410	0.49
BD412	6.27
BD418	0.87
BD433	0.41
BD434	0.43
BD435	0.49
BD436	0.60
BD437	0.41
BD438	0.49
BD441	1.42
BD442	0.66
BD507	0.60
BD509	1.42
BD510	0.75
BD518	1.50
BD519	1.50
BD529	1.32
BD530	1.10
BD533	0.67
BD534	0.53
BD535	0.77
BD536	0.61
BD537	0.74
BD538	0.67
BD544B	0.83
BD580	1.17
BD590	1.17
BD598	1.25
BD677	0.53
BD679	0.57
BD680	0.76
BD681	1.48
BD695	2.30
BD696	2.47
BD697	3.60
BD698	1.85
BD699	3.49
BD700	3.70
BD702	3.70
BD707	1.06
BD709	1.12
BD710	0.80
BD807	0.34
BD809	0.75
BD810	0.69
BD879	0.74
BD880	0.79
BD895	2.18
BD899	2.48
BD901	0.79
BD902	0.61
BDV64B	1.26
BDV65B	1.26
BDX32	1.75
BDX53	1.25
BDX53A	4.93
BDX53B	3.35
BDX54B	2.61
BDX62A	1.96
BDX63A	1.96
BDX64A	2.61
BDX65A	2.61
BDX76	0.59
BDY20	1.21
BDY62/01	4.62
BDY81	1.18
BF115	0.40
BF117	0.66
BF118	0.67
BF121	0.25
BF123	0.13
BF127	0.13
BF137	0.29
BF152	0.31
BF153	0.58
BF154	0.26
BF157	0.33
BF158	0.18
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.34
BF177	0.55
BF178	0.40
BF179	0.36
BF180	0.36
BF181	0.32
BF182	0.34
BF183	0.39
BF184	0.43
BF185	0.39
BF194	0.14

BF195	0.14
BF196	0.17
BF197	0.16
BF198	0.17
BF199	0.17
BF200	0.37
BF216	0.36
BF218	0.36
BF222	0.55
BF224	0.17
BF237	0.65
BF240	0.17
BF241	0.17
BF244	0.57
BF245A	0.37
BF255	0.20
BF256	0.28
BF256LC	0.42
BF257	0.34
BF258	0.36
BF259	0.34
BF262	0.57
BF263	0.57
BF264	0.37
BF271	0.34
BF273	0.20
BF274	0.20
BF324	0.23
BF336	0.33
BF337	0.36
BF338	0.40
BF355	0.49
BF362	0.60
BF363	0.60
BF371	0.50
BF391	0.25
BF393	1.59
BF417	0.84
BF418	1.87
BF422	0.29
BF423	0.29
BF435	0.54
BF450	0.35
BF451	0.29
BF457	0.41
BF458	0.39
BF459	0.52
BF460	0.99
BF469	0.31
BF470	0.55
BF471	0.31
BF472	0.33
BF479	0.61
BF480	0.60
BF491	0.54
BF495	0.64
BF506	0.43
BF509	0.41
BF523	0.20
BF594	0.27
BF595	0.27
BF596	0.18
BF597	0.27
BF617	1.05
BF618	1.05
BF694	0.22
BF757	0.59
BF758	0.65
BF759	0.47
BF760	0.65
BF762	0.75
BF870	0.30
BF871	1.81
BF900	0.83
BF959	0.42
BF970	0.69
BFR39	0.44
BFR52	0.50
BFR62	0.50
BFR79	0.29
BFR81	0.50
BFR86	1.08
BFR89	1.63
BFT41	0.30
BFT42	0.43
BFT43	0.43
BFT84	0.40
BFW10	0.60
BFX29	0.34
BFX30	0.65
BFX84	0.37
BFX85	0.39
BFX87	0.55
BFX88	0.34
BFX89	0.44
BFY50	0.32
BFY52	0.27
BFY90	0.61
BLY49	2.20
BR100	0.22
BR101	0.70
BR103	0.66
BR88B	0.64
BRC-M-300	0.97
BRC116	0.67
BRC1330	1.76
BRC300	2.01
BRC4443	1.02
BRC4444	1.02
BRC5296	0.77
BRC6109	0.83
BRC82	1.08
BRC83	2.19
BRC84	2.08
BRX44	0.60
BRX49	0.53
BRY39	0.69
BRY55	0.67
BRY56	0.50

BSR59	1.29
BSS38	0.59
BSTB0140G	4.98
BSTC0146	2.48
BSTC0246	6.99
BSTC0233	6.12
BSTC1233	4.34
BSTC3146	0.79
BSTCC0143	3.07
BSTC0643	3.37
BSV57B	3.49
BSW68	0.60
BSX19	0.34
BSX20	0.34
BSX21	0.87
BSY52	0.50
BSY79	0.51
BT100A	1.61
BT106	1.18
BT108	1.45
BT109	1.45
BT112	2.48
BT113	2.48
BT116	1.20
BT119	1.76
BT120	2.17
BT121	2.48
BT122	2.48
BT123	1.98
BT125	2.48
BT126	2.48
BT128	2.48
BT128P	3.07
TBA970	3.06
BT151-800R	1.15
BT151 500R	1.38
BTT6018	2.42
BTT6218	2.51
BTT8024	4.43
BTT8124	4.89
BTT8214	5.99
BTT8224	2.97
BU105	1.50
BU106	2.48
BU108	1.50
BU109	2.25
BU110	5.69
BU111Y	4.16
BU124	1.38
BU126	0.90
BU134S	4.57
BU204	1.58
BU205	1.08
BU206	1.27
BU207	1.65
BU208	1.12
BU208/02	1.97
BU208A	1.12
BU208D	1.95
BU209	1.93
BU226	2.45
BU312	2.38
BU326	2.00
BU326A	2.20
BU326S	2.20
BU406	1.49
BU407	0.82
BU407D	1.29
BU412	5.29
BU426	1.90
BU426A	1.67
BU500	1.78
BU508A	1.89
BU526	2.02
BU608D	1.57
BU807	0.94
BU826A	1.63
BUV46	1.53
BUV84	1.24
BUW84	1.39
BUX84 TRAN	1.53
BY126	0.13
BY127	0.13
BY133	0.11
BY164	0.47
BY176	1.52
BY179	1.42
BY182	1.05
BY184	0.47
BY187	0.77
BY189	1.76
BY198	1.62
BY201/2	1.50
BY203/20	0.41
BY206	0.17
BY207	0.22
BY208	0.46
BY210-400	0.18
BY210-600	0.27
BY210-800	0.34
BY223	0.85
BY224-400	0.99
BY225-100	1.13
BY226	0.25
BY227	0.49
BY228	0.60
BY255	1.07
BY298	0.20
BY299	0.60
BYW56	0.34
BYX10	0.29
BYX55-350	0.53
BYX55-600	0.15
BYX61 RANGE	0.18
BYX71-600	1.25
BYX71-350	0.72
BYX71-600	0.85
BYX94	0.14
BYY56	1.20

BZX79 RANGE	0.10
BZY88 RANGE	0.10
C106D	0.46
C1129	0.58
CA1310E	2.70
CA3044	3.50
CA3046	2.06
CA3060	1.65
CA3065	1.29
CA3089	0.83
CA3089E	1.43
CA3090	1.38
CA3094	2.20
CA3131EM	3.12
CAH76023N	6.60
CBF16848N-07	1.56
CD4001	0.38
CD4002	0.27
CD4008	1.06
CD4011	0.29
CD4012	0.24
CD4013	0.47
CD4016	0.45
CD4017	0.82
CD4020	1.23
CD4021	0.39
CD4023	0.28
CD4025	0.64
CD4028	0.84
CD4047	1.06
CD4049	0.46
CD4050	0.55
CD4052	0.75
CD4053	0.80
CD4069	0.29
CD4081	0.35
CD4093	0.72
CD4511	1.10
CP5521	17.83
CV12E	3.07
CX034	11.83
CX095D	3.14
CX104	9.64
CX108	8.16
CX109	7.86
CX121	11.83
CX130	5.55
CX131	11.83
CX134	11.04
CX136	11.49
CX137	11.83
CX139	11.83
CX157	4.84
CX158	4.10
CX170	7.62
CX177	6.75
CX506	9.33
CX507	7.62
CX755	12.95
CX758	7.62
D1693	2.59
DEC1	2.20
DEC2	2.20
E1222	0.40
E5024	0.28
E5386	0.25
E5529	0.25
E8021	1.29
E9003	0.46
E9005	0.50
ESM432C	4.60
ESM532C	4.60
ESM632C	4.60
ESM732C	4.60
ETTR6016	2.65
FND500	5.78
FT3055	1.16
GF758	0.84
GF759	1.13
GF761	1.20
GH3F	1.82
HA11211	2.53
HA11215	5.06
HA11223W	0.00
HA11225	4.29
HA11226	8.71
HA11229	2.88
HA11235	2.48
HA1124	5.25
HA11244	2.82
HA1125	4.29
HA11251	4.47
HA1137W	2.87
HA1138	5.03
HA1141	5.65
HA11414	5.65
HA1144	7.87
HA1156	1.16
HA11580	9.00
HA1160	3.80
HA1166X	5.36
HA1166	3.25
HA1167	5.36
HA11711	20.16
HA11713	8.13
HA11714	7.76
HA11714	8.13
HA11715	8.13
HA11724	22.25
HA11725	18.26
HA11738	22.25
HA1180	5.15
HA1192	0.00
HA1196	7.43
HA12005 IN	9.00
HA1203	1.72
HA1306	2.26
HA1308	6.95
HA1322	2.18

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

Field Timebase Circuit Survey

Part 2: Transistor Circuits

S. W. Amos and E. Trundle

The advent of transistors in TV receiver circuits revolutionised the design of field timebases. Because a transistor can operate at a low voltage and high current it's ideally suited to driving low-impedance scan coils. If the decision is taken to use a matching transformer between the transistor and the coils the output transistor's low optimum load means that the primary inductance need not exceed a fraction of a Henry, so a small transformer is adequate. Moreover the Ic-Vb curve of a transistor is a closer approximation to the ideal shape for the primary current waveform (see Fig. 6 last month) than the corresponding valve characteristic is. The low supply voltage that can be used for transistor operation is an attractive feature since it makes possible the production of portables powered by a 12V battery. There are nevertheless some problems. One is the need to ensure that the output transistor is not damaged by the voltage peak generated across the scan coils during the flyback. A second problem is the limited voltage available for the charging circuit that generates the basic sawtooth waveform.

Early Transistor Circuits

It's not surprising that the first transistor field output stages followed a similar basic design to that used in valve output stages. In some sets the scan coils themselves formed the collector load of a class A stage with a sawtooth input, the static beam deflection being offset by permanent magnets built into the scan coil assembly – see Fig. 1(a). This circuit requires good stabilisation of the mean collector current, and the dissipation in both the coils and the transistor is high. Consider for example a pair of coils requiring a peak-to-peak deflection current of 0·5A. The mean collector current could be stabilised at 0·3A: this means that if the power supply voltage is 12V the power taken from the supply is 3·6W. This power is dissipated in the coils and the transistor, so a power transistor fitted with a heatsink is necessary. Stabilisation of the mean collector current in the circuit shown in Fig. 1(a) is carried out in the conventional manner: the potential divider R1/R2 provides a base bias voltage while Re determines the mean current.

To reduce the dissipation in the coils and operate with a higher collector voltage a common technique used in early transistor circuits was to employ a choke with the scan coils in parallel – see Fig. 1(b). The choke was sometimes tapped to provide a connection for the transistor's collector or the coils, enabling the output transistor to be presented with a suitable load impedance value. In this case the choke acts as an autotransformer of course. Sometimes a coupling capacitor was included – see Fig. 1(c) – even though an enormous capacitance value (typically 2,000μF) was required in order to preserve the low-frequency response. The capacitor was not bulky since only a low voltage rating was needed. *RC* coupling between the transistor and the coils was not favoured due to the dissipation in the resistor and the loss of collector voltage.

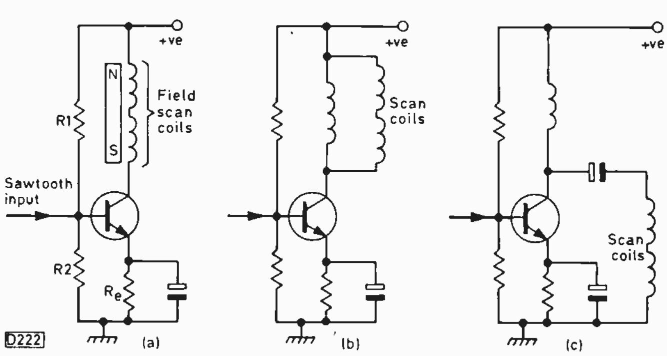
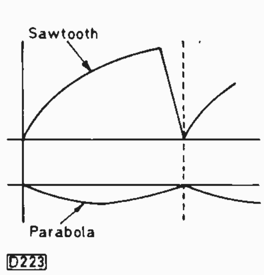


Fig. 1: Some early class A transistor field output stages.



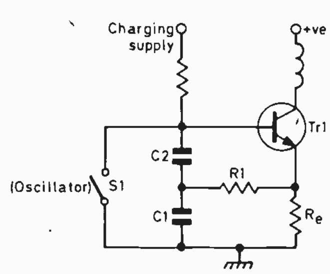


Fig. 2 (left): A sawtooth and the parabola derived from it by integration have opposite forms of curvature.

Fig. 3 (right): A commonly used method of linearising a sawtooth produced by a charging circuit.

Drive Waveform Linearisation

The input sawtooth waveform for these early transistor output stages was obtained in the conventional manner, from a capacitor which was charged from the supply line to give the forward stroke, being discharged during the flyback time by a blocking oscillator or multivibrator oscillator. In a valve circuit where perhaps 10V out of a possible 250V is used for the forward stroke the linearity is good, but with a transistor circuit where perhaps 2V out of 12V is used the curvature is significant and requires correction.

A common linearising technique is to add a field-frequency parabolic waveform to the sawtooth. As Fig. 2 shows, the sawtooth and parabola have opposite curvature: combining the two gives a good approximation to a straight line. As Fig. 14 in Part 1 indicated, a parabola can be obtained from a sawtooth waveform by integration. A suitable sawtooth is often available at the emitter of the field output transistor. Fig. 3 shows a typical circuit using this principle. The sawtooth developed across Re is integrated by R1 and C1, the signal developed across C1 being applied to the base of Tr1 via C2. The series combination of C1 and C2 functions as the charging capacitor, the oscillator being represented by switch S1.

For full integration the time-constant of R1, C1 should be long compared to the field period (20ms), but in a number of circuits it's comparable. The purpose of the circuit is not to carry out a precise mathematical operation but to obtain a satisfactory sawtooth and it may well be that the shape of the correction waveform produced by a comparable time-constant is more effective than that

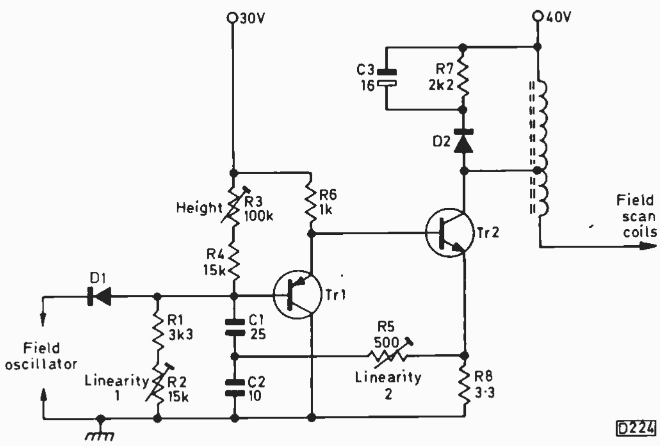


Fig. 4: Class A circuit used in the Thorn 3000 chassis.

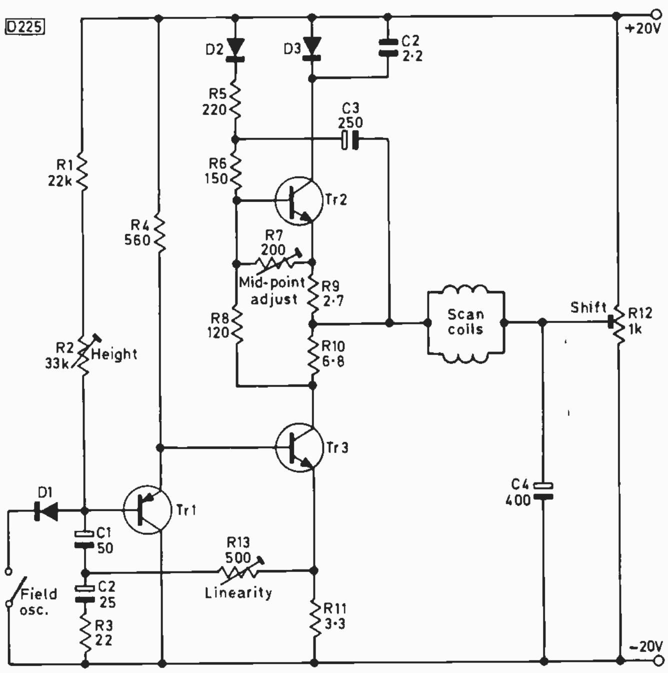


Fig. 5: Two-transistor class A output stage and driver.

given by a longer time-constant. Resistor R1 is often a preset to provide linearity control.

Class A Output Stages

Fig. 4 shows, simplified, the field driver and output stages used in the Thorn 3000 chassis – dating from 1969. Apart from the emitter-follower driver transistor the circuit follows the arrangement shown in Fig. 3. The integrating resistor R5 acts as a linearity control: a second linearity control is provided by R2 which limits the voltage to which C1 and C2 can be charged, thus modifying the shape of the voltage rise across the capacitors.

The output transistor Tr2 is cut off during the flyback, which is produced by the collapsing magnetic field around the inductive load components. The positive-going flyback pulse developed at the collector of the output transistor could damage the transistor unless steps are taken to limit its peak value. Protection is provided by the clamp circuit D2, R7, C3. Diode D2 conducts when the pulse tries to exceed the supply rail voltage: the charge developed across C3 ensures that D2 remains cut off during the forward scan.

In some class A field output stages the choke was replaced by a transistor, giving the arrangement shown in

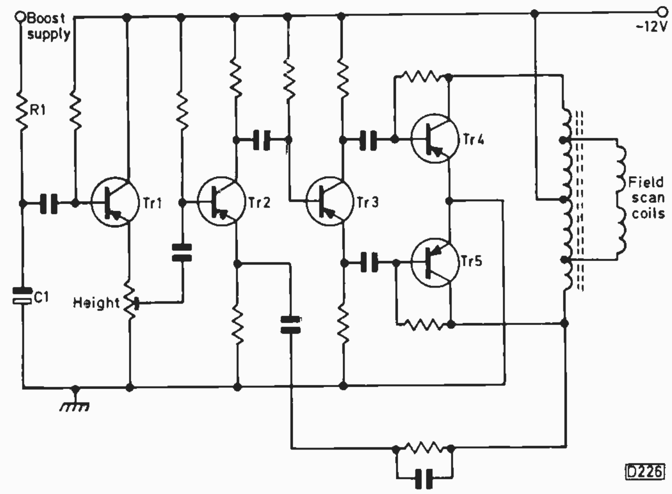


Fig. 6: Early field timebase with class B output stage.

Fig. 5. The output transistors Tr2/3 are connected in series across the supply, with the parallel field scan coils connected between the output stage's mid-point and the slider of a potentiometer that acts as the shift control. From the signal point of view the 400μF electrolytic C4 acts as the field output coupling capacitor.

With Tr3 cut off Tr2 will be saturated by the bias provided by D2, R5 and R6. One side of the field scan coils will then be at approximately 20V. With Tr3 saturated the voltage developed across R9 and R10 will cut off Tr2 and the same side of the scan coils will be at roughly −20V. During the forward scan Tr3 is driven progressively into saturation and Tr2 is driven progressively towards cut-off, the coils thus being driven by a 40V ramp. C3 provides drive to the base of Tr2 – the time-constant of C3, R5 is long compared to the field scan period so there is little loss in the coupling network.

The flyback starts when Tr3 is abruptly cut off – Tr1 is driven to saturation by the discharge action of the field oscillator, providing a short-circuit between the base of Tr3 and chassis. What happens next is rather ingenious. Because of the inductance of the field scan coils the positive voltage jump at the mid-point exceeds 40V. This voltage is applied to the base of Tr2 by C3 as a result of which Tr2 is saturated, connecting the field scan coils and C2 in parallel. The resonant circuit thus produced begins a half-cycle of oscillation, the positive-going excursion reverse biasing D2 and D3 so that the active part of the circuit is disconnected from the supply line. At the end of the flyback the circuit tries to swing negatively: D2 and D3 then commence to conduct and Tr3 receives drive from Tr1.

Class B Output Stages

Class B operation is more efficient than class A but in a field output stage brings the problem that any distortion at the crossover point causes objectionable nonlinearity. Nevertheless a number of class B circuits have been used. A very early example is shown in Fig. 6. The coils are fed via an autotransformer connected to a complementary-symmetry pair of output transistors (Tr4/5) which are driven by a phase splitter transistor (Tr3). A.C. feedback is applied over three stages and the charging circuit C1, R1 is isolated from the following amplifier stages by the emitter-follower Tr1. This straightforward circuit owes an obvious debt to audio techniques.

A later and more elegant circuit is shown in Fig. 7. Tr1-Tr5 form a direct-coupled amplifier, with Tr1 a common-

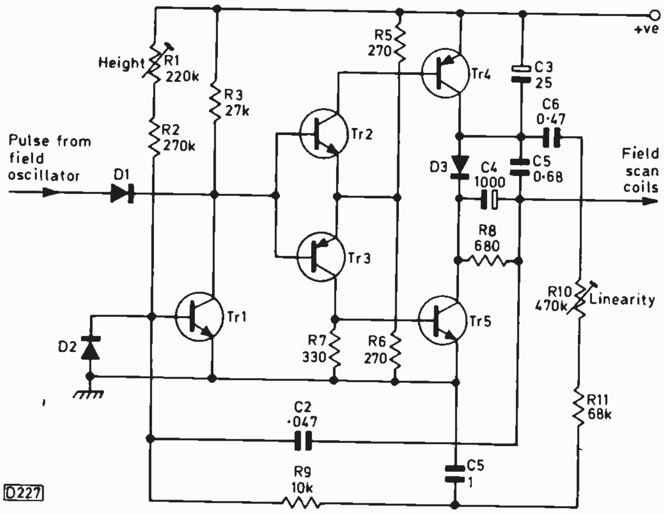


Fig. 7: Class B field timebase using the Miller integrator technique.

emitter stage, Tr2-Tr3 a complementary-symmetry driver stage and Tr4-Tr5 a complementary-symmetry output stage. The field coils are fed from the collectors of Tr4-Tr5 via the 1,000μF coupling capacitor C4. There's a significant difference between this circuit and those previously described: the charging capacitor C2 is returned to the amplifier's output terminal instead of to chassis. It thus bridges the amplifier's input and output terminals, making this an example of a Miller integrator, a standard circuit arrangement well known for its ability to generate a sawtooth output of good linearity and of amplitude nearly equal to the supply voltage. The circuit shown was widely used in monochrome portables produced during the early seventies – it was also used in the Rank A816 large-screen solid-state monochrome chassis.

An interesting feature of the circuit is the effective multiplication of the charging time-constant (a feature of the Miller integrator). For every volt placed on one plate of C2 by resistors R1 and R2, A volts are placed on the other plate by the output transistors, where A is the amplifier's voltage gain. So the capacitor behaves as though its capacitance is (A + 1)C2, and in order to achieve an effective time-constant of 500ms (typical of the values used in earlier circuits) a physical time-constant of about 20ms is used. Thorn for example in the 1590/1591 series chassis used an 0·047μF capacitor and a charging

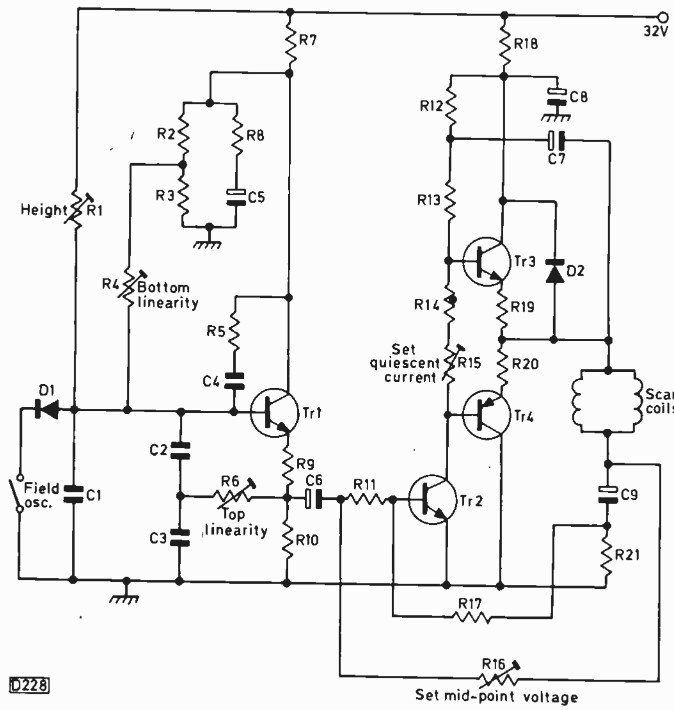


Fig. 8: The class B output stage in this field timebase circuit incorporates mid-point voltage stabilisation.

resistance of 370kΩ (with the height control at midsetting), giving a time-constant of 17ms – less than a field period!

R10, R11 and C5 form an integrating circuit, the parabolic waveform generated across C5 being fed to Tr1's base via R9. R10 is a preset to provide linearity control.

Positive-going pulses from the field oscillator initiate the flyback. The pulse passes via D1 to the bases of Tr2/3, Tr2 switching on while Tr3 switches off. In consequence Tr4 saturates and Tr5 is cut off. Thus the voltage at the output terminal rises smartly to supply positive. At this point the scan coils resonate with C5 to produce a flyback pulse of some 60-70V peak amplitude. D3 is reverse biased during this period. After a half-cycle of oscillation D3 and Tr4 conduct to clamp the output at the supply rail voltage. As a result, C2 is charged to the full supply voltage – its input plate is effectively earthed by conduction of Tr1. The duration of the flyback is controlled by the time-constants in the oscillator circuit. When the pulse from the oscillator

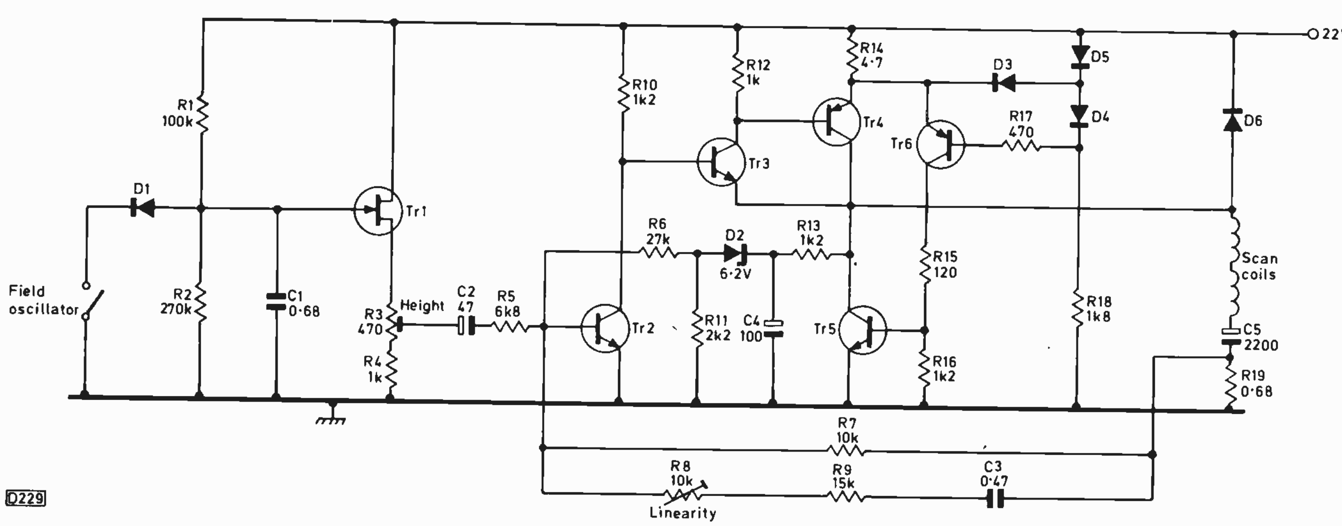


Fig. 9: Field timebase with class A/B output stage, incorporating mid-point voltage and quiescent current stabilisation.

stage (a multivibrator) ends, C2 begins to discharge via R1 and R2. This is the start of the forward stroke. The voltage at C2's output plate falls while that at its input plate rises (driving Tr1 progressively on), the ratio between the two voltages being A, the amplifier's voltage gain. This is the Miller integrator action: both voltages change linearly with time until the output voltage falls to chassis potential at which point, if the circuit is properly adjusted, both voltage changes are abruptly halted by the arrival of the next pulse from the field oscillator.

Mid-Point Voltage Stabilisation

One of the aims in the design of the amplifiers shown in Figs. 5 and 7 is to obtain an output sawtooth with a peak-to-peak amplitude as great as the supply rail voltage permits. To obtain this maximum output, the average voltage at the mid-point must be at half the supply rail voltage and must remain at this value despite any changes in circuit constants caused by temperature change, ageing or any other cause. Accordingly a d.c. feedback loop was introduced in some circuits to stabilise the mid-point voltage. An example, from the Philips 320 chassis, is shown (simplified) in Fig. 8.

The first stage consists of an emitter-follower which also provides scan-correction. C6 couples the output from Tr1 to the base of the driver transistor Tr2 which is directly coupled to the complementary-symmetry output pair Tr3/4. The field scan coils are capacitively coupled to the mid-point of the output stage but the coupling capacitor C9 is included in the earth return path so that a direct-coupled feedback connection can be made via R16 and R11 to the base of Tr2 to stabilise the mid-point voltage. Any rise in the mid-point voltage increases the conduction of Tr2, thus lowering the voltages at the bases of Tr3 and Tr4 to offset the initial rise. R16 is adjusted to set the mid-point voltage at precisely half the supply voltage. The voltage across R21 is proportional to the current flowing in the scan coils and is returned to Tr2's base as a.c. feedback to improve the linearity of the output.

During the forward stroke Tr1 receives a rising sawtooth voltage from C1, C2, C3 as these capacitors charge via R1. This gives a falling sawtooth at the collector of Tr2. During the early part of the forward scan Tr2's collector voltage is high: Tr3 conducts while Tr4 is cut off. A falling current flows through the scan coils and charges the high-value capacitor C9 to provide the positive section of the sawtooth current output. At the mid-point of the forward scan the current flowing via Tr3 has fallen to a minimum and Tr4 is about to start to conduct. At this instant there is no current through the coils to C9. During the second half of the forward scan Tr3 is cut off and Tr4 is driven progressively into conduction: C9 discharges via the coils and Tr4 to provide the negative section of the sawtooth current output.

One of the difficulties with a class B output stage is that of choosing and maintaining a suitable value of forward bias. If the bias is set too low there's a risk of crossover distortion which is annoying because it produces vertical linearity anomalies at the centre of the screen, where they are most noticeable. If the bias is set too high the dissipation in the transistors increases and the efficiency of the amplifier is impaired. So a compromise is needed and R15 is adjusted to give this compromise. The negative-temperature coefficient resistor (thermistor) R14 is included in the base circuit to maintain the chosen value of quiescent current as the output transistors warm up.

The forward scan is terminated and the flyback initiated when the field oscillator switches on and discharges C1/2/3 via D1. Tr1 and Tr2 switch off, and as the voltage at the collector of Tr2 rises Tr3 saturates and Tr4 is cut off. The scan coils with their inherent capacitance form a resonant circuit which produces a half-cycle of oscillation, causing the current to reverse. During this period D2 and Tr3 clamp the mid-point to the supply voltage. The bootstrap capacitor C7 ensures that Tr3 remains on and Tr4 remains cut off during the flyback. During the forward scan the bootstrap capacitor provides positive feedback, increasing the circuit efficiency.

Another interesting feature of this amplifier is the method adopted to provide scan correction. Correction at the beginning of the scan is carried out by R6/C3/C2 which integrate the sawtooth waveform at Tr1's emitter and apply the resulting parabola to its base. As we've already seen, this arrangement can be used to give overall linearisation. Here the component values have been chosen to produce a flattening effect at the start of the scan. Correction during the latter part of the scan is provided by the components in Tr1's collector circuit. R8 and C5 partially integrate the falling sawtooth voltage developed across R7, the resulting waveform being divided by R2/R3 and applied to Tr1's base via the bottom linearity preset R4. This circuit has little effect during the first half of the scan, but the low voltage reached towards the end of the scan imposes progressing loading at Tr1's base, thus reducing the drive to give the required flattening effect.

Quiescent Current Stabilisation

The need to maintain the quiescent current of a class B output stage at a value that minimises crossover distortion led to the use of negative d.c. feedback to ensure that the current is kept at the correct value. The final example of a field amplifier in this article is one that incorporates both quiescent-current and mid-point voltage stabilisation. Several manufacturers including Rank (Z718, T20 and T22 chassis) and Thorn (9000 chassis) used versions of the circuit. That shown in Fig. 9 is a simplified version of the circuit used in the Thorn 9000 chassis.

Tr4 and Tr5 are the output transistors, Tr3 and Tr6 the drivers. Tr2 is an amplifier that also looks after linearity and scan-correction and mid-point voltage stabilisation. Tr1 is a source-follower that isolates the charging circuit R1/R2/C1 from Tr2 and provides Tr2 with a low source impedance. Stabilisation of the mid-point voltage is achieved by R6, D2 and R13 which provide Tr2 with a forward base bias dependent on the mid-point voltage. Diodes D4 and D5 are used to stabilise the quiescent current. They are forward biased via R18 and thus apply a reference voltage to the base of Tr6 via R17. The quiescent output stage current flows via R14 and the voltage across this is applied to Tr6's emitter. Tr6 thus compares the two voltages. If the quiescent current increases, the voltage at Tr6's emitter falls causing Tr6's collector current to decrease. This reduces the voltage across R16 and hence the voltage at Tr5's base. The quiescent current is thus reduced to offset the initial rise.

The charging circuit incorporates a potential divider (R1/2) that limits the voltage to which C1 can charge to about 15V. The voltage rise across C1 (used to provide the forward scan) thus starts linearly and becomes progressively curved towards the end of the charging period. This curvature provides scan-correction during the second half of the scan. Scan correction during the first half of the scan is provided by the feedback network C3/R9/R8. The voltage developed across R19 is proportional to the current flowing through the scan coils. This is fed back to the base of Tr2 via R7 to provide general control of the linearity. The feedback loop is modified by the parallel path that C3/R9/R8 provide. This network's time-constant averages 10ms (half the field period) so that it has maximum effect during the first half of the scan to provide the required form of scan correction.

The operation of this amplifier is somewhat different from those so far encountered since Tr4 remains conductive throughout the forward scan, thus working as a class A amplifier, while Tr5 helps out during the second half of the scan and thus operates as a class B amplifier. The positive-going sawtooth voltage waveform generated across C1 is applied to the base of Tr2 via Tr1. Tr2 and Tr3 both provide signal inversion so that a positive-going drive waveform appears at the base of Tr4. Since this is a pnp transistor it's driven progressively towards cut off. The biasing arrangements ensure that Tr4 conducts hard at the beginning of the scan. The large scan-coupling capacitor C5 then charges via the scan coils and Tr4. Tr4's emitter current, flowing via R14, generates sufficient voltage to maintain D3 in conduction, thus short-circuiting Tr6's input (Tr6 is emitter driven) so that both Tr6 and Tr5 are cut off. As the scan proceeds the voltage at Tr4's base rises and its emitter current decreases. The current flowing through the coils and R14 thus decreases and, just before the mid-point of the scan, the voltage at Tr4's emitter rises to a value at which D3 becomes reverse biased and Tr6 starts to conduct, thus bringing Tr5 into operation. At mid-scan the currents flowing through Tr4 and Tr5 are equal and zero current flows through the scan coils. Thereafter Tr4 is driven towards cut-off while Tr6 and Tr5 are driven to increasing conduction. During this second half of the scan the current flowing in the scan coils reverses as C5 discharges via Tr5.

The field oscillator discharges C1 to initiate the flyback. This produces a negative-going excursion at the base of Tr4 as a result of which Tr4 saturates and Tr6/Tr5 cut off. The coils then produce a half-cycle of oscillation to return the beam to the top of the screen, the positive-going flyback pulse being prevented from exceeding the supply rail voltage by D6 – the clamping action of this diode is included to protect the output transistors.

To Follow

Next month's instalment takes us from discrete transistor field timebase circuits to the use of i.c.s.

Teletopics

8mm NOW FULL VIDEO SYSTEM

Sony's view that 8mm will become a full video system competing with Beta and VHS in its own right, not just a system for camcorder use, is confirmed by Sony's launch of six new 8mm video products including two non-portable, mains only 8mm VCRs. Sony now offer a comprehensive range of 8mm video equipment to cater for a variety of user preferences.

Sony's original CCDV8 camcorder (see Teletopics May) has been replaced by the CCDV8AF which incorporates autofocusing. The suggested price is £1,150. The new CCDM8 Handycam is described as the world's smallest and lightest camcorder and has a suggested price of £800. It's been designed for simplicity in use, with a fixed lens, three focus settings and record-only facilities. The weight is 1·4kg with the battery and cassette fitted and the size is such that it can easily be held with one hand. Both camcorders feature dual-speed operation.

The two non-portable VCRs are the EVA300 which has a suggested price of £480 and the full-specification EVS700 whose suggested price is £750. The EVA300 is a basic machine with built-in tuner/timer, a three-week, four-event program and infra-red remote control. It can be up-graded to provide stereo digital sound by adding the PCMEV10 PCM processor unit which comes at £200. The EVS700's specification includes a three-week, six-event timer which can also be used to control a separate f.m. tuner for simulcast or mono sound, noiseless slow motion, freeze frame, a time-remaining indicator, insert editing, an auto editor (optional) and PCM digital stereo sound facilities. Both machines have a SCART socket and dual-speed operation, giving up to three hours record/playback with a P590 cassette.

The EVC8 compact portable VCR weighs 1·5kg including an NP22 ni-cad battery and has a suggested price of £500. It can be used with the previously announced TTV8 tuner/timer unit.

The new P590 cassette gives 90 or 180 minutes' record/playback time depending on the speed used and has a suggested price of £11.

One major question of interest to prospective users will be the availability of prerecorded tapes. Sony are encouraging this and report that most major video software firms have now installed 8mm duplicating equipment.

CABLE STARTS

Coventry Cable has now been "formally launched" with over 500 subscribers – several hundred were connected on an experimental basis in the early summer and according to John Ross-Barnard, the chief executive, all have signed one-year contracts.

Croydon Cable Television is also now providing services, following three years of planning.

Thus four of the original eleven broadband cable franchisees are now in operation (the other two are Swindon and Aberdeen). While the new broadband services are now getting under way it seems that most of the older Pay-TV networks are losing subscribers.

SATELLITE TV LATEST

At the government's request the IBA has called for approaches from organisations that would be interested in providing one or more DBS TV channels for the UK. The IBA hopes to be able to report to the Home Secretary by about the turn of the year. Submissions are also being invited from any organisations that might wish to provide relevant evidence on the circumstances necessary to establish and run successful DBS services. Detailed guidelines have been issued and include the comment that a foreign satellite could be used provided the supplier didn't quote a price less than the cost. It's assumed that the IBA's C-MAC (packet) standard would be used, with satellite channel powers of up to 230W in accordance with the provisions agreed at the WARC held in 1977. Those wishing to express an interest in providing services or to provide evidence are asked to contact Kenneth Blyth, Chief Assistant to the Director General, IBA, 70 Brompton Road, London SW3 1EY by the end of October. Contractors appointed by the IBA would be responsible for the provision of the transponder(s) while the IBA would be responsible for provision of the uplink.

Rupert Murdoch's Sky Channel is setting up a joint company with Groupe Bruxelles Lambert, the main shareholders in RTL (Radio-Tele Luxembourg), "to study and develop projects in the fields of terrestrial and satellite broadcasting, including DBS". It will also consider the feasibility of programme production. As mentioned in Teletopics last month, RTL is expected to run two of the channels broadcast by the French DBS satellite TDF-1 which is due to be launched next July. Granada Television has held talks with the European Space Agency on the prospects of providing DBS services covering most of western Europe. Granada considers that a single satellite covering the UK, France and W. Germany and providing up to ten channels would be commercially viable. Granada director Andrew Quinn, who co-ordinated the ill-fated consortium of 21, now believes that only a Europe-wide consumer market would be large enough to cover the costs of launching high-power DBS satellites and that the WARC decision in 1977 to give each European country five channels for single-nation DBS services appears to have been mistaken.

The Irish government has decided "in principle" to accept a proposal by the Irish company Atlantic Satellite to provide a DBS service which would be receivable throughout the UK and in parts of Northern Europe as well as Ireland. The satellite would be supplied by the US firm Hughes Communications: the cost is expected to be around £80 million and it's hoped that the satellite would be operational in just over three years' time.

It's thought that the SPACE/STTI Nashville Show '85, held in early September, was the largest satellite TV trade show ever. There were over 400 operating aerials in the outdoor display area and over 75 exhibition booths indoors. A convention co-sponsored by SPACE, a trade organisation, and STTI, which produces trade shows for the industry, was held at the same time. STTI's president Rick Schneringer pointed out that in its first five years the satellite TVRO industry in the USA has reached a turnover of $1 billion annually, with over a million TVRO systems sold prior to 1985 and expectations of a further half million system sales this year. He added that much of the growth can be credited to the deregulation that occurred in 1984.

Peter Gray, chairman of Satellite TV Antenna Systems Ltd. of Staines, Middlesex reports that his company, which has been working on the development of satellite TV consumer electronics for four years, has "achieved a major breakthrough in being able to reduce the cost of receiving equipment from the current price of £2,000 to under £1,000 – complete systems to retail at as low as £995 can now be offered". He points out that the 50,000 TVRO systems being sold each month in the USA at present are much larger than those necessary in Europe, whose later entry into the satellite age has enabled more sophisticated technology to be employed, and believes that the market for low-cost earth stations will now expand rapidly throughout Europe.

The European Telecommunications Satellite Organisation Eutelsat has now achieved "definitive status", its Convention and Operating Agreement having come into force. Twenty five European countries are members of Eutelsat. Unfortunately Eutelsat's ECS-3 satellite, which was insured for $80m, was lost when the fifteenth Ariane rocket was destroyed. Eutelsat has held talks with the European Space Agency with a view to bringing forward the launch of ECS-4, which is currently scheduled for 1987.

As a start to W. German satellite TV broadcasting the Bundespost is now using two transponders on ECS-1 to transmit programmes receivable throughout Germany, giving viewers up to seven additional channels. The Bundespost has also leased three transponders, each with two channels, on an Intelsat satellite for broadcast use.

The DTI reports that over 400 applications for satellite TV receiving licences have been received and that applications are arriving at the rate of about twenty a week.

LARGE AND SMALL TVs

Mitsubishi have started to sell a 35in. colour set in Japan. The fine-pitch, square tube has a horizontal resolution of 560 lines and a tinted faceplate. Amongst the set's features are video input/output terminals and terminals for connecting a VCR, video disc player, audio equipment, a tuner, a videotex system and a home computer.

At the other extreme, Sanyo and Casio showed small-screen' sets at the recent Berlin Radio and TV Fair. Sanyo's 3in. colour set (a working prototype) used a flat tube which employs the beam-indexing principle with sequential RGB input to a single gun. Casio's 5in. monochrome set was announced at around £80 (in Germany) and incorporates an a.m./f.m. radio. It uses a liquid-crystal display device.

Philips are working on a flat c.r.t. at their Redhill, Surrey research laboratories. The problem of bending the beam has been overcome by using a very low beam current (less than 1μA) and an electron multiplier array which is positioned behind the 12in. screen and provides a gain of several hundred. In the colour version the single gun is sequentially driven by RGB signals. Line deflection is provided by plates close to the gun while field deflection is provided by plates behind the electron multiplier array. Several types of colour screen have been tried. The one that seems to be favoured uses a striped phosphor screen in conjunction with deflection electrodes between the electron multiplier and the screen. See Fig. 1.

VIDEO MATTERS

Two particularly interesting video items were on show at the recent Berlin Radio and TV Fair. Toshiba showed a VHS machine incorporating a digital field store. In addition to providing freeze-frame and picture-within-a-picture features the field store can be used to improve the display by eliminating line jitter. Hitachi showed a video disc system that provides once-only recording. The scanning laser operates in two modes to provide recording or playback.

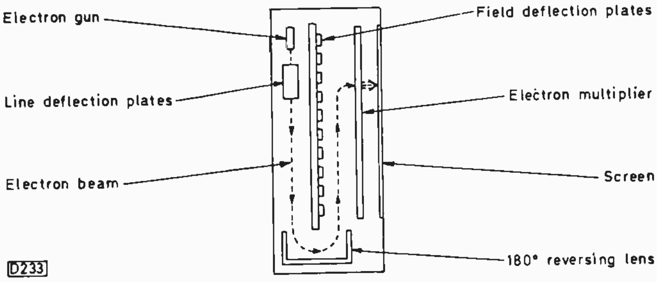
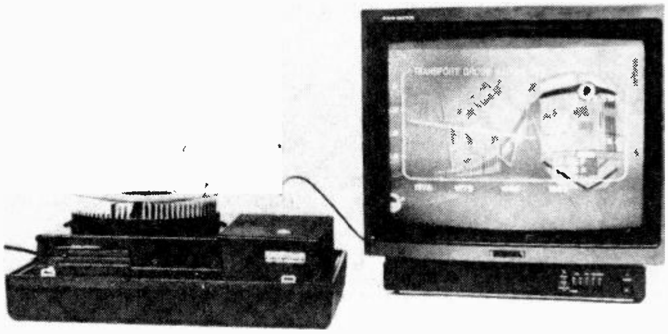


Fig. 1: Internal arrangements of the Philips flat c.r.t.



The Kindermann Dia-video 8320 slide viewer.

The first S. Korean manufactured VHS VCR has now been introduced in the UK, the Samsung V1510T. The suggested price is £350.

A recent report finds that many households are becoming "lapsed VCR users". It appears that in the year to July 1985 1·2 million UK households got rid of their VCRs, twenty per cent more than in the previous year. Most of the machines were rented.

TV SLIDE VIEWER

J. J. Silber Ltd., Engineers Way, Wembley, Middx HA9 0EB (01-903 8081) have introduced in the UK the Kindermann Dia-video system which enables colour slides to be viewed on the screen of a TV receiver. The units (there are two models) incorporate a MOS camera to convert the slide to a video signal that can be plugged into any TV set equipped with a standard video input socket. Model 8300 has a built-in tray for the slides while Model 8320 has an 80-slide carousel.

NEW VCR PLANTS

A jointly operated plant for the production of VHS VCRs is to be set up in Japan by Philips and Marantz (which is in turn half owned by Philips). Production is expected to start next year at the rate of 100,000 machines annually. Philips is already building a VCR plant with a capacity of 400-500,000 machines a year in South Korea. It's expected that most of the machines produced in the two plants will be to the NTSC standard for sale in the Far East and N. America.

ITT's W. German subsidiary SEL (Standard Elektrik Lorenz) has set up a joint venture with the Italian state-owned group REL (Ristrutturazione Elettronica) to build Italy's first VCR plant. Production is expected to start next year and to rise to a capacity of 200-250,000 machines annually. The joint venture will be called Vidital and will produce a mid-range machine, the Eurocorder 3946.

SECURITY TV WITH NO CABLES

Modular Technology Ltd. of Zygal House, Telford Road, Bicester, Oxford OX6 0XB (0869 253361) has introduced a security TV system, called the Interlaser Free-Space System, that uses either infra-red or laser beams to link security and surveillance video cameras to video recorders and monitors at a distance of up to 1km. Expensive cabling is made unnecessary by wiring the cameras to a duplex optoelectronic transceiver. Infra-red LEDs are used for distances of up to 200m and low-power, solid-state lasers for distances up to 1km. Video, audio and data signals can be handled by the system. The 5·5MHz bandwidth allows for colour or monochrome operation while the bi-directional link provides camera control and talkback. A typical video link for colour use at up to 0·5km costs around £3,000.

EPROM MICRO PROGRAMMER

Cambridge Microelectronics Ltd. of 1 Milton Road, Cambridge CB4 1UY (0223 314 814), who pioneered the use of EPROMs and CMOS RAMs in low-cost home microcomputers, have introduced an EPROM programmer for use with the BBC microcomputer. In use the programmer, type BB-PROM, requires a BBC-B micro and disc drive: it plugs into the micro's user port by means of the cable and connector provided. The driver program for the programmer is supplied on an EPROM for use as a sideways ROM in the BBC micro. Use of the BB-PROM enables frequently used programs to be readily accessible with the speed and reliability of ROMs. Price in the UK is £34·44 including VAT, post and packing. Slightly lower prices apply for overseas orders (no VAT).

Cambridge Microelectronics have also introduced a compact, economical EPROM eraser.

TV LICENCE DEFAULTERS

In a report on the control of broadcast receiving licence revenue the Commons Public Accounts Committee says that revenue of at least £65 million a year is being lost due to defaulters and that the figure is rising sharply. It feels that the fines at present being imposed on defaulters are not a sufficient deterrent and has asked the Home Office to convey its views to the courts. It also calls for fixed fines to be considered. The 18·6 million licences issued during the year 1983-4 produced revenue of £763 million.

CUT-BACKS

GEC has announced that its GEC McMichael subsidiary at Slough will be closed by the end of next March. One contributory factor mentioned is the slow growth of cable TV in the UK. Production of GEC McMichael's cable TV and videoconferencing equipment is being transferred to GEC's main communications subsidiary at Coventry while production of satellite news gathering equipment, studio and broadcasting products will move to Marconi, Chelmsford.

Rediffusion Consumer Manufacturing has now sent redundancy notices to nearly all its employees (see Teletopics last month). Two overseas companies that had expressed an interest in buying the RCM plants withdrew in September but talks with a further company continue.

Matsushita Electric has announced a 30 per cent cut in colour set production at its Japanese plants, which had been turning out 2·2 million sets annually. The cause of the cut is reduced exports to China, which until recently had been the biggest importer of Japanese colour receivers.

IN BRIEF

We have been asked by TV panel suppliers Argo Services of Birmingham to draw attention to their recent move to 53 Lawley Street, Birmingham 4, just round the corner from HRS. It seems that many customers are still turning up at the old premises . . . The venue for next year's Consumer Electronics Show has been changed from Earls Court to Olympia-2 . . . Michael Boyle is the 1985 Pye Young Technician of the Year. He works as a service engineer for Martin Dawes, a major retailer in the north of England.

Quick Checks: Hybrid CTV Chassis

S. Simon

There are still plenty of hybrid colour sets around. For some reason they seem to confuse the more up-to-date service engineer. We hope that the following notes will help to clear away any such confusion. The hybrid chassis that have proved to be most reliable from the long-term point of view are the Decca Bradford and the ITT CVC5-CVC9 series, so these are the ones we'll deal with. The Decca models are still in the majority of cases capable of giving a fine picture.

DECCA BRADFORD CHASSIS

Dead Set

In the event of a dead set, appreciating one or two facts will make the approach easier. First, the tube's heaters are fed from a secondary winding on the mains transformer while the series-connected valve heaters are fed from a tap on the transformer's primary winding. Secondly most models have a series thermal cutout in the live mains supply connection. Remove the rear cover and observe the tube's heaters and the valves. Are they alight? If not, check the thermal cutout and the mains supply, on/off switch, etc. If the valves are alight, assume that the h.t. supply is faulty. The first thing to check is the 3·9Ω surge limiter resistor R603 – the large wirewound resistor in the supply to the BY127 h.t. rectifier. These items are at the front left-hand side, near the PCL82 audio output valve. Access may be easier if the bottom left i.f. panel is removed. The main frame can be withdrawn, riding on the bottom rollers, when the screws on each side at the top have been removed. With the main frame in a secure position the set can if necessary be turned on its side – the frame can easily break free of the bottom runners, causing damage, if security is not ensured. It's quite common to find the 3·9Ω resistor open-circuit. This may be due to the BY127 having gone short-circuit but is more often the result of sheer weariness. In any event the diode should be checked: red probe to the cathode, black to the anode, a low reading; red to anode and black to cathode no reading. If the 3·9Ω resistor is intact there will be a reading this latter way round due to the circuit: if there's doubt, disconnect one end of the diode. With this no h.t. voltage condition a whisper of sound may still be heard even though there's no supply to the PCL82.

Valves Out

Tube heaters alight, valves out implies that there's a break in the heater chain (one out all out, unless one is cracked). In this event start at pins 4 and 5 of the first valve in the chain, the PY500A. If there's voltage at one pin but not the other the heater is open-circuit and the valve must be replaced – but not until possible causes have been investigated. These include a heater-cathode short in say the PL509. If the PY500A's heater is intact check at pins 4 and 5 of the PL509. If both valves record the same voltage at all heater pins move along the chain, checking the PL508, PCF80, PCL82 and PCF802 in that order. With these it's easier to remove each valve in turn and check the resistance between pins 4 and 5, discarding whichever one is found to have an open-circuit heater. You'll usually find the PY500A or the PL509 at fault however – or sometimes you'll find that both are defective.

No Sound

The picture but no sound symptom may still leave you with a whisper of audio though this may be difficult to hear. There are two items to check first. One is the PCL82 audio output valve, the other the 12kΩ wirewound resistor that supplies the screen grid of the output section of the valve and the anode of the triode section. In later models this resistor also supplies the anode of the output section and its value is much lower (1·8kΩ). Check the marked value before fitting a replacement, though this may not be necessary as it may only be sprung to denote an overload. In this event check the PCL82 and if necessary the coupling capacitor C82 and cathode decoupler C81. If all seems well around the PCL82 and there is hum from the speaker check back to the intercarrier sound i.c. on the lower left i.f. panel. The type of i.c. used varies with different versions of the chassis. It's marked IC1.

Sound, No Raster

In the event of sound but no raster, allow time for the set to warm up then note the appearance of the PL509 line output valve. If there's no sign of overheating, hold a neon screwdriver close to this valve's glass – it must not touch the top cap. If the neon lights, the line output stage is probably in order and voltage checks should be made at the tube's base socket – for first anode supplies and normal cathode voltages. Around 400V is to be expected at the three first anodes and around 120V at the three cathodes. If the first anode supplies are missing check back to the convergence panel where the three presets are mounted and if there's nothing here check R475 (220kΩ) on the timebase board, lower right. If the cathode voltages are high check on the upper left side decoder panel to find out why the RGB output transistors are not being turned on. This could be due to the l.t. feed resistor R298 (39Ω) being open-circuit (10 series chassis with no chip on the decoder panel). This is not a common fault.

Insufficient Width

Insufficient width is a very common fault and although it could be due to several things the most mundane is probably the most common cause. The width control is of the slider type, at the bottom right. A mere touch here could be all that's required to restore normal conditions. If moving this control produces no improvement, check the nearby high-value resistors – R452 (1·5MΩ) and R450 (5·6MΩ). R453 (330kΩ) is also suspect. A word of caution: the width control is connected directly to the line output stage and is very much alive, i.e. move it with an insulated tool. If all seems well in this area try a new PL509, or possibly a new PY500A. If the PL509 is overheating check the PCF802 and its associated resistors, particularly R440 (33kΩ) – this often changes value and causes the PL509 to overheat.

Back to No Raster

Mention of the PL509 overheating brings us back to the sound but no raster symptom. Various other things can cause the PL509 to overheat when this symptom is present. The tripler (doubler in the small-screen versions), the capacitors associated with the line output transformer and the transformer itself for example. Most often however a fault in one of these items will blow the 500mA fuse, thus removing the strain from the valves.

HT Fuse Blown

If the fuse has blown, first check the 0·22μF, 1kV capacitor C436 on the lower right side (the boost capacitor). It is white or blue and white and is very likely to be the culprit. If this is not at fault look at the top of the transformer to find the tuning capacitor C435 (150pF, disc type). This is also likely to short and blow the fuse. If a short is indicated by the meter, remove the PY500A's top cap to clear this valve of suspicion – it's often guilty.

Field Faults

By lack of height we mean that the field timebase is working but there's a gap at the top and bottom of the screen. Quite often a touch on the height control will prove that this is the culprit: it probably only requires a clean. If this control has already been moved to its maximum setting check whether R402 (820kΩ) has gone high in value. If necessary go on to check R405 (270kΩ).

In stubborn cases of field collapse check the voltage at the screen grid of the PL508 field output valve: the feed resistor R415 (3·9kΩ) often goes open-circuit, robbing pin 3 of its supply. The associated decoupler C406 (32μF) can short to damage this resistor. It can also become open-circuit to produce lack of height.

The PL508 itself is often the cause of reduced height or no field scan at all, either losing emission or suffering from loss of vacuum due to a crack in the glass. The PL508 also acts as part of the field oscillator, in conjunction with the triode section of the PCF80.

Poor Sync

The pentode section of the PCF80 is the second sync separator (there's also a transistor sync separator stage on the decoder panel). The 100kΩ resistor R419 (screen grid feed) can go high in value to cause poor field and line sync.

The Decoder

The decoder is the upper left side panel, the design of which was altered in later models – the ones that have an MC1327P i.c. The main problems in this area relate to the RGB output stages: the transistors are suspect, as also are the presets which give a good deal of trouble, suffering from poor contact etc. A design fault in the earlier version of the decoder placed the blue signal coupling capacitor C214 (5μF) too close to a heat dissipating component. So this capacitor will often be found faulty, having been subjected to local heat over an extended period. The symptoms can be blue smearing or loss of blue drive.

So there we have the items to check in the event of the usual faults experienced with the Decca Bradford chassis.

ITT CVC5-CVC9 SERIES

If there's one thing that can be said for the ITT CVC5-CVC9 series of colour sets it's that they are very kind to their tubes. The author has still never had to replace one, though the 26in. versions are now showing signs of wear. The 20 and 22in. versions seem to have as good a picture as when they were made. This long life effect is no doubt due to the moderate cathode drive: the heaters are supplied in the usual way and the first anodes are operated at approximately 400V, as in other ranges whose tubes (same make) have a much shorter life. Tubes apart however these sets do have their failings, which seem to follow a common pattern.

No Results

In the event of no results, first note, as with the Decca Bradford chassis, whether the valves are heating up. If they aren't, look to the left side front control panel where the mains and transformer fuses live. F1 is the mains supply fuse which may be 4A or 3·15A anti-surge. F3 is the 315mA fuse in the live supply to the transformer. If either has gone open-circuit there'll be no valve or tube heater supply. It's F1 that is far more likely to be found open-circuit and the cause may not be far away. Several versions of the chassis use a mains filter capacitor that's rated at 200V a.c. It's coloured yellow. This type is likely to burn up without blowing the fuse, i.e. clouds of grey smoke are given off while the picture and sound remain normal. Often however the capacitor goes short-circuit, blasting the mains fuse and possibly the plug fuse as well. This type should be replaced with the 250V a.c. type, usually grey. On the original models (early CVC5 chassis) a different type altogether was used – the more familiar 0·1μF, 600V d.c. type which has a well-known tendency to go short-circuit. It's not common for the h.t. rectifier diode(s) to go short-circuit, but this is a possibility to bear in mind. In later models with only one h.t. rectifier diode you may find a thermal link on the mains transformer: we mention this since the transformer may not be operating though F3 is intact, hence no valve or tube heaters glowing. Don't worry about this however: the thermal link seldom goes open-circuit.

If there are no results when the set has had time to warm up don't jump to the conclusion that the trouble must be in the h.t. supply. It could be, but more often than not it's the line output stage that's at fault. Why no sound? Because the set has a sound muting circuit linked to the line output stage. The thing to do is to switch off and check the 400mA (could be 640mA) fuse in the supply to the line output stage. If it hasn't blown, check the wirewound resistors at the top centre: R380 (56Ω) may have sprung open due to excessive current flow. If the fuse has blown or R380 is open-circuit check for shorts across the boost capacitor C310 which is half way down the right side. Its value is 0·47μF (1kV) and it's immediately under the line output transformer: it goes short to break the circuit more often than any other item. The fuse and resistor mentioned are situated on the power board at the top centre position: the fuse is the right side one. If the fuse is rated at 400mA a short in the capacitor will have blown it. If it's a 630mA fuse the resistor is more likely to have gone open-circuit.

If the boost capacitor is not at fault check the PY500A for shorts, also the condition of the capacitors on the line output transformer subpanel: the 210pF and 330pF capacitors are both suspect. Whilst on the subject of the subpanel, here's one tip that may save you hours of torment. When you are faced with a weird fault such as narrow spikes vertically across the screen, look at this panel and resolder any suspect joints. If in doubt resolder them all – to save yourself a lot of trouble later.

Poor Focus

Poor focus is a common complaint with these sets. First check the focus voltage feed resistor on the tube base – simply because this is the easiest course to take. If it's intact at 2·2MΩ, remove the screen from the line output stage and note the focus control slider. There's a 4·7MΩ resistor from the tripler to the top of the focus element and another from the bottom to chassis. Check the value of these two resistors. If they are correct, note that a lead from the slider is connected to a 210pF disc capacitor. This often leaks to completely upset the focus control's operation. Disconnect it as a test.

Back to No Results

Back to no results with the heaters alight. If the PL509 line output valve is overheating, check the voltage at pin 1 of the valve's base, i.e. the line drive. The voltage here should be heavily negative to indicate that the PCF802 line oscillator is supplying the drive waveform. If the PCF802 isn't working properly there will be no or severely reduced line drive and the PL509 will overheat. If the PCF802 itself isn't responsible, i.e. a new valve produces no improvement, check the voltages at pins 1, 3 and 6. There should be 215V at pin 1, 220V at pin 3 and 165V at pin 6. Check the feed resistors as necessary – note that R403 (180kΩ) in the feed to pin 6 can be overlooked and can give trouble. If necessary check the polystyrene capacitors (the silver see-through types).

If line drive is present, disconnect the tripler to see whether this relieves the PL509's distress.

No or Very Dim Picture

If the line timebase is working but there's no or a very dim picture, check the voltages at the tube's base. If the first anode supplies are missing move down to the lower right side of centre to locate the decoupling capacitor C311 (0·01μF, 1kV). Disconnect it to see whether the first anode voltages are then restored. This is a frequent offender and its location should be established at an early stage. Also check the cathode voltages to ensure that they are not too high. About 120V is correct – 400V for the first anodes.

Field Faults

Rather unusually a PCL805 is used as the field oscillator and output valve. We say unusually because most hybrid CTV chassis use the more robust PL508 in conjunction with another valve. The choice of the small PCL805 has proved to be justified however, though the valve is suspect if field hold takes too long to lock, the height is insufficient mainly at the bottom or there's total field collapse. The presence of a diode in series with the cathode of the triode section of the valve should be appreciated since this is often the cause of field timebase troubles, i.e. loss of lock or field collapse. It's an OA91 but it's better to use a more substantial diode for replacement purposes. It's numbered D46f.

Bottom cramping should direct attention to the PCL805: if the condition is severe, check the pentode section's cathode decoupler C247f (250μF).

Sync Faults

The sync separator transistor T42f (BF117) lives over to the left of this same panel. Its base bias resistor R330f (3·3MΩ) tends to go high in value, thus upsetting the line and field sync. We must point out however that later versions of the chassis have a centre supporting strut, and it's often the case that when the chassis has been lowered for servicing reasons the strut is out of alignment and doesn't settle between the panels after the chassis has been swung back up again. It tends to swing sideways and touch the sync separator, thus shorting out the sync pulses. Note this point on models that have a centre strut.

Wrong Colours

The three colour output stages, identified by the leads coming from the tube's base, are just to the left of the tube. The usual faults here are defective transistors (BD115), poor soldered contacts in this area and faulty lead contacts (white plug and socket connectors in later models). The contacts to the right of the transistors are the main cause of trouble, requiring resoldering to restore normal colour.

Loss of Colour

In the event of loss of colour concentrate on the top left side, carefully checking the transistors – particularly T34, T27 and T28, also the associated capacitors.

Hum Bar

Another of the habits of these sets is for a fault in the l.t. supply to give the effect of deficient h.t. smoothing, a check on the h.t. smoothing electrolytics and their earthing producing no results as the hum bar continues to climb up or travel down the screen, kinking the sides as it does so and probably tripping the field. There are several causes to be investigated: the AD161 series regulator transistor, the l.t. bridge rectifier (the most likely suspect), the electrolytics in this area (C262, C263 and C265) and D11. This latter item is a zener diode (or i.c.) which stabilises the tuning voltage as well as providing the reference voltage for the l.t. regulator: it's located on the bottom left side and is linked to the base of the regulator driver transistor T45d via a 36kΩ resistor. Check these various items and your hum bar should go. Perhaps you are puzzled by our mention of a zener diode or i.c.: though a zener diode (LZ36B) is usually fitted you may find a TAA550 (two pins). As well as causing these mysterious conditions it will of course cause loss of signals when it goes short-circuit. In these models however the tuner selectors are more likely to be the cause of tuning troubles, particularly in later models (with square buttons).

Commissioning TVRO Systems

Geoff Lewis

Radio and TV engineers have a long history of adapting to technological change. In fact continuing improvement in the reliability of domestic electronic equipment means that their very existence has come to depend on this adaptability. A recent example has been the appearance of VCRs on the scene. They came at a very convenient time, as much improved reliability reduced the CTV workload considerably. The next technological leap for the trade could well lie in satellite TV reception.

Though it will probably be some years before there's a full UK Direct Broadcasting by Satellite (DBS) service, it appears that the French TDF-1 satellite will start such a service sometime next year. The transmissions will be receiveable in the southern part of the UK at least. Apart from this there are already available in the UK pseudo-DBS signals that are provided by Eutelsat and Intelsat satellites. These are primarily intended for cable systems, but with the deregulation that came into effect in May this year they have become available legally to the single-site user. Officially, only services provided by a satellite using an orbital position, power, frequency and footprint as laid down by the WARC 1977 conference are known as DBS services: TV transmissions from low-power satellites such as Eutelsat and Intelsat are referred to as Fixed Satellite Services (FSS).

Much has been written about the technological aspects of satellite TV but to date little has been said to assist service engineers in selecting, installing and commissioning Television Receive Only (TVRO) systems – as satellite TV receiving systems are known. The following report is an attempt to redress the balance and provide some practical guidance.

Which satellites are of particular interest in the UK?

Two satellites, ECS-1 (Eutelsat I-F1) and Intelsat VA F11, currently radiate six English language channels in the Ku Band (11GHz). They also provide some Continental channels. See Table 1.

What polarisations are used?

Both these satellites use linear polarisation, either vertical or horizontal, to allow frequencies to be used twice and minimise interference. Thus some form of polarity switching may be necessary.

How are azimuth and elevation angles calculated?

The bore sights or "look angles" for the required satellites have to be calculated from the latitude and longitude of the proposed site. An Ordnance Survey map will provide you with the latitude and longitude. The site should also be surveyed to ensure that there's a clear line-of-sight path to the satellite – beware of future building development plans and future tree growth.

Many programs have been written to enable azimuth and elevation angles to be calculated using a home computer. They are just as easy to calculate using a pocket calculator and the following furmulae:

Azimuth angle = Arc tan (tan A/sin B), where A is the longitudinal difference and B the latitudinal difference – add 180° if the satellite is west of the receiving site.

Elevation angle = Arc tan [(cos C – 0·151269)/sin C] where C = Arc cos (cos A × cos B).

These calculations simplify because, the satellite being in equatorial orbit, the latitude difference is the actual site latitude.

What type of aerial mount should be used?

If the aerial is to be used to receive signals from more than one satellite the bore sight angles will need to be changed. How this is done controls to some extent the type of mount used. With remote control of this operation a polar mount is more convenient since it requires only one drive system. The azimuth/elevation type of mount is more suitable where manual adjustment is acceptable. With a polar mount it's necessary to calculate only the offset angle when the dish is pointed due south. This angle can be calculated from the formula:

Arc cos [1·81 × sin latitude/(3·36 – cos latitude) $^{0.5}$].

What type and size of dish will be required?

The most common arrangement in current use is a parabolic dish with a prime-focus feedhorn. Offset feed dishes (see Fig. 1) are more efficient: in general an 1·2 or 1·8m diameter dish of the latter type will provide good signals, particularly in southern England.

Glass fibre dishes are cheapest, spun aluminium dishes are more expensive and the petallized or sectioned type is most easy to assemble on site. Because of surface errors, the gain of the latter type is generally 2-3dB less than that of the other types. It's important to remember that both

Table 1: Main FSS channels available in the UK.

Channel	*Polarisation*	*Language/ Country*	*Satellite*
Music Box	Vertical	English	Eutelsat I-F1
Sky Channel	Horizontal	English	Eutelsat I-F1
PKS/Sat-1	Vertical	W. Germany	Eutelsat I-F1
TV-5	Horizontal	France	Eutelsat I-F1
Olympus TV	Horizontal	Holland	Eutelsat I-F1
Teleclub	Vertical	Switzerland	Eutelsat I-F1
RAI	Horizontal	Italy	Eutelsat I-F1
Mirrorvision	Horizontal	English	Intelsat VA F11
Premiere	Horizontal	English	Intelsat VA F11
Screen Sport	Horizontal	English	Intelsat VA F11
Children's Channel	Horizontal	English	Intelsat VA F11

Note: Eutelsat I-F1 (ECS-1) is at 13°E, Intelsat VA F11 is at 27·5°W.

the dish and its mount must be capable of withstanding the elements.

Is planning permission necessary?

Planning permission is generally not required provided the height of the aerial structure is not more than three metres (four metres in some areas) as this comes within permitted domestic development. There are some restrictions however. The aerial should be placed at the rear of the dwelling so as not to be seen from the roadway, while planning permission will be required if the site is a Listed Building or within a Conservation Area.

Has a licence been obtained?

A once only £10 fee has to be paid for a satellite TV receiving licence. This is in addition to the normal TV licence and can be obtained from the Department of Trade and Industry, Room 513, Waterloo Bridge House, Waterloo Bridge Road, London SE1 8UA.

Has an agreement been made with the programme provider?

At present only one of the English language channels has been scrambled and all are currently described as being temporarily clear. This implies that scrambling is envisaged at some future date. In the interests of copyright preservation a fee has to be paid to the programme company concerned. For the English language channels these are as follows.

For Premiere/Children's Channel/Screen Sport/Music Box apply to Galaxy Television Ltd., Thorn EMI, Central Cross House, 2 Stephen Street, London W1A 4PL. For Sky Channel apply to Satellite Television plc, 31-36 Foley Street, London W1P 7LB. For Mirrorvision apply to United Cable Programmes Ltd., 48 Leicester Square, London WC2H 7LZ.

What are the main site requirements for an installation?

The aerial mount will almost certainly have to be set in concrete. The distance between the head unit at the aerial and the indoor unit should be kept to the minimum possible. Since the link between these typically carries signals with frequencies between 900MHz and 1·7GHz very low-loss cable should be used. The aim should be to keep the separation less than about thirty metres. For greater distances it might be necessary to incorporate a line amplifier.

How is the aerial aligned?

Provided its limitations are kept in mind a magnetic compass can be used to obtain the approximate azimuth angle. Errors of 20° can however easily result if there's a steel-framed building or something similar close to the installation. Alternatively reference to the Ordnance Survey Map will provide a bearing – it will also give a figure for the correction needed to take into account the differences between true north and magnetic north. This is typically of the order of 8°, with magnetic north being at 352° relative to true north.

Elevation adjustments can be made to within about 0·5° by using an inclinometer on the vertical edge of the dish's rim. With an offset feed type aerial this angle needs to be about 28° less than that calculated.

Final adjustments should be made using a signal strength meter driven by the indoor unit's a.g.c. system.

What sort of cost is to be expected?

Cost variation for a single-site TVRO system lies between about £1,400 and £3,000 depending largely on the size of the dish, the complexity of the mount and whether remote control is used. Several good systems are available for single-satellite operation at a price to the end user of about £1,400-£1,500.

What are the advantages and disadvantages?

The growth in satellite delivered TV material in the UK is likely to be slow at first. After all we already have four good channels and the VCR enables a wide range of material to be viewed. At present a single satellite will provide only an additional two-three English-language channels.

The main argument against installing private TVROs on the present basis lies in the changes that will occur as satellite TV develops. For a start, true DBS signals will be in the 11·7-12·5GHz band while the current FSS systems use the 10·9-11·7GHz band. Thus change from FSS to DBS reception, for which five channels have been assigned for UK use, would mean a change of head end. If UK DBS transmissions employ the MAC system of vision encoding the indoor unit will also need to be changed.

Satellite Master Antenna TV (SMATV) is another area TV dealers might like to consider. This basically means small cable systems feeding a limited number of receivers, and deregulation also applied to this type of installation. We are preparing a further report on this aspect of satellite TV.

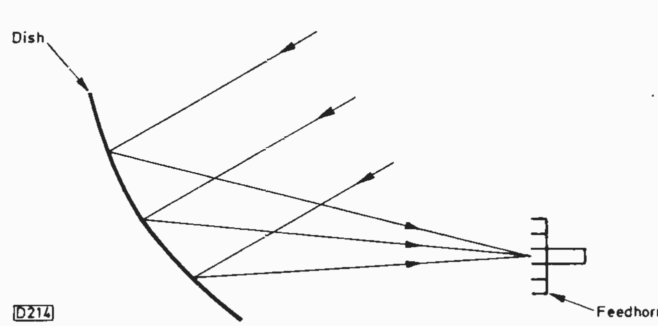


Fig. 1: The offset feed system.

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.

FERGUSON 3V24

Every time I start to record with a camera there's interference in the form of horizontal white lines and specks that vary from short to long, lasting for a fraction of a second. The tape then runs clear. This happens at switch on and also whenever the trigger is used.

A small amount of noise for only a fraction of a second means that the 3V24's edit start is not functioning perfectly. Check that in record pause the pinch roller does not move more than 1·5mm away from the capstan and that it's perfectly free to move. If this is o.k. adjust the edit-1 and edit-2 presets on the front panel, near the camera sockets. Start off with both midway: adjust either one by trial and error for a clean start to each take on playback.

SONY KV2022UB

At switch on this set can be heard to start up but it then shuts down again. The semiconductor devices in the power supply seem to be o.k.

C514 smooths the supply to the line output stage. From its positive terminal to chassis a reading of about 1kΩ should be obtained, a high and rising reading the other way. If these readings are low, suspect the line output transistor Q503 and the efficiency diode D503. If the resistance readings are normal the protection circuit may be operating due to an overvoltage or excess current. For the former check the setting of RV603, zener diode D603 etc. For the latter check the value of the current sensing resistor R651 then disconnect the base of the line driver transistor to remove the load on the power supply. If this brings up a steady 105V line suspect the line output transformer, choke L502 etc.

THORN TX9 CHASSIS

The fault on this set (main panel type PC1040) appears to be temperature sensitive. It can work normally for up to two days then wavering verticals occur and after a few minutes the picture breaks into two horizontally. This is followed by loss of line hold.

The TDA9503 sync/line generator chip is suspect but before condemning it check the supply decoupler C168 (220μF) and the time-constant capacitors C164 (22μF) and C166 (4·7μF). On one occasion we found that the cause of this trouble was the line driver transistor.

AKAI VS10

This machine is similar to the JVC HR7700. The fault is in the display section. With the front panel switching at off the word "prog" is illuminated (in addition to the word "clock" and the time digits). With the switching at on "prog" remains illuminated and in addition the lower right-hand segment of the left-hand digit and the lower right-hand segment of the right-hand digit are illuminated at all times.

This type of fault is generally due to one or other of the microcomputer chips involved. If it's an earlier machine with i.c. holders, swap over IC1 and IC2 on the display PCB. If the fault changes, IC1 is probably faulty. Note whether the dim button alters the spurious digits: if not there's probably a leak in the display itself. A last resort is IC2 on the tuner/timer board – this is not an easy item to change. The best approach would be to borrow a display panel to ascertain whether the fault is here as a storage scope is needed to look at the waveforms.

MITSUBISHI CT200B

Following what sounded like an e.h.t. flashover there appeared on the picture seven dark vertical bars. They are faint, one inch wide, two inches apart and extend right across the screen. The picture is otherwise normal.

We suggest you check R581 on the e.h.t. tripler panel, the efficiency diode D556 on the deflection panel, D535/C536 (main panel) which provide the h.t. supply for the luminance output transistor and if necessary C581 (across R581) and C534.

GRUNDIG 5010

Channels 1, 2, 4 and 6 can be selected at switch on but any attempt to select channel 3, 5 or 7 results in all the neons lighting cyclically with failure to lock to the required channel. The problem clears after about half an hour but use of freezer hasn't helped to isolate the cause. The channel selector i.c.s have been replaced.

Neons get to be very unpredictable in their old age. We'd tackle the fault by replacing the lot then thoroughly cleaning and degreasing the touch pads. In the unlikely event that the fault persists, check the 3·3MΩ resistors associated with pads 3/5/7.

DECCA 100 CHASSIS

The picture goes grainy with blotches of colour or no colour and loss of definition, also reduced sound with high background noise. The fault is intermittent but is getting worse.

First check carefully for dry-joints or imperfect plug/socket connections on the tuner and i.f. panels. If these are all o.k., apply an external source of 3V to the tuner's a.g.c. input pin (pin 2). If this clears the fault, check IC102 (TCA270S) and the condition and setting of the tuner a.g.c. preset VR127. If the fault remains, replace the tuner – assuming that the aerial and its plug/socket are in order.

SONY KV2204UB

The contrast is always too great when the set is switched on but there doesn't seem to be a preset contrast control. Do you know of a modification that can be carried out to reduce the effects of secondary emission in the tube due to the teletext lines?

Slight adjustment of RV202, labelled "det out", on board A should provide the contrast level required. For the teletext reflections, increase the value of C518 on board D until the text lines are blanked – too high a value will cause loss of the top of the picture itself.

TEST CASE

275

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

Our sales manager John was having a bad day – a bad week in fact. "I've got technofear, that's what I'm suffering from" he complained. How can a laid-back top-of-the-heap salesman be troubled with technofear we wondered? "It's people" said John. "They ring up to know whether their Sony video will interface at baseband with their Hitachi TV, and with what leads; or ask what Secam L is and whether a modified Salora will be able to receive it; or do I know the video bandwidth of a Ferguson video monitor for RGB. One man said he wanted a set only if it could receive Perry Television, and neither he nor I knew that he meant a SCART-equipped set till we'd made some phone calls."

It transpired that the main contributory factor to John's Bad Day was the Mitsubishi colour set he'd brought to the workshop in his car. It was a CT2627TX with remote control, self-seek tuning and teletext. It had run in the showroom for weeks without trouble, but when he took it to a customer's house to give a demonstration he came back with his tail between his legs. The set had refused to work in the self-seek mode, ignoring all the TV stations its green line encountered on its left-to-right sweep across the screen. It was soon hooked up in the workshop and sure enough it would search and seek like a lost soul in the wilderness, without ever latching on to any of the local TV transmitters or even giving the signals a chance to sync up as it swept on towards a hopeless end at channel 68 and a weary restart at channel 21.

Since the set was wanted urgently it was investigated right away. The self-seek magic is performed on the ETS panel, which provides the varicap tuning voltage by a means that's far from clear – there's no circuit description in the manual. On this panel were discerned a microcomputer i.c., a memory chip, a display driver and a sweep-drive chip. The latter (type M51251P) was jumped on as being the most likely culprit – certainly it took a sync feed from the main panel to monitor signal conditions and a pulse feed from the blanking line. Having confirmed that both sets of pulses were getting through, those involved came to the conclusion that the i.c. was indeed faulty – but there wasn't one in the stores. There wouldn't be, would there? Back to test equipment then. The 12V line was present and correct, also the 20V line. A can of freezer was used to cool the suspect chip: no change. A hairdryer was used instead: again no change.

What next? In the absence of a replacement i.c. a whole ETS (electronic tuning search?) panel was sought – and found in a new CT2230TX in a sealed carton in the stores. To secure his sale for John it was proposed to cannibalise this set and storeman Reg was suitably bribed. As the packing was being removed from the sacrificial victim a Real Technician (RT) came on the scene. He took one look at the symptom on the screen of the afflicted set and told his colleagues to repack the 22in. set. RT took a grub screwdriver from his pocket and in two seconds had the ailing CT2627 working again.

What did he do? What had the others missed? The same symptom could easily occur on other makes and models with self-seek tuning, so don't get too bogged down in the Mitsubishi circuit diagram before you get next month's issue for the solution . . .

ANSWER TO TEST CASE 274
– page 708 last month –

A Sony C7 VCR was the subject of last month's teaser. Its malady was an intermittent failure to rewind – not for the usual mechanical reasons but because the rewind-sensor's oscillator was coughing and dying at random intervals. We'd exonerated the sensor chip IC9, and had observed on an oscilloscope display the faltering oscillations just prior to deck shutdown. There's little to go wrong in this type of circuit and we were very suspicious of the rewind-sensor coil itself, despite the fact that it looked all right.

As a check we interchanged the two sensor coils by crossing over the connections to pin 2 of CN4007 and pin 5 of CN4013 on board SY11. Since this would have led to certain destruction of the tape-spool anchorage in the cassette, we loaded an empty shell in the machine for test purposes and taped back the slack-sensor lever to enable all deck functions to operate. Thus fooled the machine responded happily to all the control buttons – except, after a while, forward commands. The faulty rewind sensor coil L9501 was now messing up the forward-sensor operation.

What could have happened to the coil? Maybe a shorted turn or two in the winding, or a microcrack in the ferrite core?

QUERY COUPON

Available until 20th November 1985. One coupon, plus a £1·50 (inc. VAT) cheque or postal order, must accompany EACH PROBLEM sent in accordance with the notice on page 46.

TELEVISION NOVEMBER 1985

Published on approximately the 22nd of each month by IPC Magazines Limited, King's Reach Tower, Stamford Street, London SE1 9LS. Filmsetting by Trutape Setting Systems, 220-228 Northdown Road, Margate, Kent. Printed in England by The Riverside Press Ltd., Thanet Way, Whitstable, Kent. Distributed by IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF. Sole Agents for Australia and New Zealand – Gordon and Gotch (A/sia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions: Inland £13, overseas (surface mail) £15 per annum, payable to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH. "Television" is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever. ISSN 0032-647X.

TRAINING COURSES

TELEVISION & VIDEO SERVICING

THESE FULL-TIME COURSES INCLUDE A HIGH PERCENTAGE OF COLLEGE BASED PRACTICAL WORK TO ENHANCE FUTURE EMPLOYMENT PROSPECTS

VIDEO CASSETTE RECORDER SERVICING

3 WEEKS FULL-TIME
(January 6th to 24th)

Intensive course intended for qualified television service engineers or applicants with similar background.
The course combines the advantages of industrial and academic training and includes a high percentage of practical work.

6 MONTHS
LEC DIPLOMA
TELEVISION & VIDEO SERVICING
(Suitable for applicants with previous electronics training – e.g. BSC, HND, CGLI, B/TEC, etc.)
(Course commences on Jan. 6th)

ADDITIONAL FULL-TIME COURSES APPROVED BY THE BUSINESS & TECHNICIAN EDUCATION COUNCIL
(These courses commence on Jan. 6th – HNC Sept. '86 only).

2 YEAR
BTEC National Diploma (OND)
ELECTRONIC & COMMUNICATIONS ENGINEERING
(Electronics, Computing, Television, Video, Testing & Fault Diagnosis)

15 MONTHS
BTEC National Certificate (ONC)
ELECTRONIC EQUIPMENT SERVICING
(Electronics, Television, Video Cassette Recorders, CCTV, Testing & Fault Diagnosis)

15 MONTHS
BTEC National Certificate (ONC)
COMPUTING TECHNOLOGY
(Electronics, Computing Software/Hardware, Microelectronic Testing Methods)

9 MONTHS
BTEC Higher National Certificate (HNC)
COMPUTING TECHNOLOGY & ROBOTICS
(Microprocessors, Microcomputer Fault Diagnosis, Robotics & Control Systems, CADCAM & CAE Principles).

OVERSEAS STUDENTS ARE CHARGED THE SAME TUITION FEES AS UK STUDENTS

Full Prospectus from:

LONDON ELECTRONICS COLLEGE (Dept TF)
20 PENYWERN ROAD, EARLS COURT,
LONDON SW5 9SU. Tel: 01-373 8721

V.H.S. VIDEOS

PIANO KEY & ELECTRONIC

COLOUR T.V.s

WORKERS OR NON-WORKERS

DECCA
THORN
SALORA
DORIC
G.E.C.
BUSH
PHILLIPS

PANELS AND VALVES ALSO AVAILABLE

SOUTHPARK DISTRIBUTORS
Unit 4 Rubastic Road
Brent Park Industrial Estate
Southall, Middlesex UB2 5LL
01-574 4631 Ext. 28

TVS TRADE SERVICES BROMSGROVE

Large selection of quality clean TV & Video always in stock, including:

BUSH T20/24 — DECCA 80/100
GEC STARLINE
HITACHI — ITT (full remote)
PHILIPS G8
PHILIPS GII — PHILIPS KT3
THORN 9600 including TELETEXT
THORN 8800 (remote) — THORN 9000 (remote)
THORN TX

VHS VIDEO from £85 (working)

We specialise in working sets, fully serviced and ready to deliver to your customer's home. Spares back up service available to customers. You've seen the junk, so why not now come and pay us a visit – we think you will be pleasantly surprised by our prices and the quality of our equipment. Delivery service available.

For further details phone:
COLIN BROOMFIELD,
UNIT 7, STATION STREET,
BROMSGROVE, WORCS.
(0527) 37037

Access — BARCLAYCARD VISA

UNTESTED EX-RENTAL CTVs

OVER 1500 WEEKLY

WITH THIS QUANTITY WE DO NOT HAVE TIME TO PLAY ABOUT.

NO BUMPED TUBES

BEST SOURCE IN U.K.

COLOUR TVs FROM £3

VIDEO RECORDERS FROM £60

TANDBURG S/S CTVs
DUAL TUNERS IDEAL FOR EXPORT
VIDEO RECORDERS FROM £50:
SONY C5: C6: C7 & C9
PANASONIC : SHARP
FERGUSON : GRUNDIG ETC.

CALL & SEE OUR SELECTION
DELIVERY ARRANGED FOR BULK PURCHASES
LOAD DIRECT FROM SOURCE AT VERY KEEN PRICES

22"/26" TELETEXT VIEWDATA COLOUR IN STOCK NOW

CASH ONLY

FRANK FORD

(TV TRADE DISPOSALS)
SCHOOL LANE
GUIDE
BLACKBURN, LANCS
TEL: 0254 64489

UED

Universal Electronic Distributors

119 JARROM STREET, LEICESTER LE2 7DX
Telephone: (0533) 544849

VIDEO SPARES
Video Cassette Recorder Heads.

AKAI
VS9300, VS9500, VS9700, VS9800 £39.95

FERGUSON
3V00, 3V16, 3V22, 3V23, 3V24, 1V29, 3V30, 3V31 £39.95

HITACHI
VT4000, VT4200, VT5000, VT5500 £42.50
VT6500, VT7000, VT8000, VT8500, VT9300, VT9500, VT9700 £43.95

JVC
HR3300, HR3320, HR3330, HR3660, HR4100, HR7200, HR7600, HR7650, HR7700 £39.95

SHARP
VC2300, VC3300, VC6000, VC6300, VC7300, VC7700, VC8300, VC9300, VC9500, VC9700 £53.95

SANYO
VTC5000, VTC5300, VTC5350, VTC5400, VTC5500, VTC9300, VTC9350, VTC9500 £51.95

SONY
SL8000, SL8080, SL8500, SL8600, SLC5, SLC6, SLC7 £42.95

VIDEO DRIVE BELT KITS
Akai VS9300, VS9500, VS9800. **JVC** HR3300, HR3320, HR3330, HR3360. **Ferguson** 3V00, 3V16, 3V22. **Panasonic** NV7000B, NV7200B, NV2000B, NV3000B, NV8600B, NV8610B. **Sharp** VC6300, VC6600, VC9300, VC9500, VC7300, VC8300. **Sony** SLC5, SLC7, SL8000, SL8080. **Sanyo** VTC5000, VTC5300, VTC5500, VTC9100, VTC9300. **Toshiba** V8600 £3.99 per kit

SPECIAL OFFER. UNIVERSAL TRIPLER ONLY £4.25

SEMICONDUCTORS

AD161	£0.35
AD162	£0.35
BC107	£0.09
BC108C	£0.09
BC109C	£0.10
BC147	£0.08
BC148	£0.08
BC149	£0.08
BC157	£0.09
BC159	£0.09
BC168C	£0.06
BC183B	£0.07
BC207B	£0.09
BC213A	£0.07
BC237B	£0.07
BC238C	£0.08
BC258A	£0.07
BC318	£0.09
BC337	£0.09
BC351	£0.07
BC546A	£0.07
BC547	£0.05
BC549C	£0.08
BD131	£0.29
BD132	£0.29
BD135	£0.20
BD136	£0.20
BD137	£0.21
BD138	£0.21
BD139	£0.25
BD140	£0.25
BD166	£0.29
BD175	£0.29
BD201	£0.45
BD202	£0.45
BD203	£0.45
BD204	£0.45
BD237	£0.32
BD238	£0.29
BD243AX	£0.35
BD433	£0.25
BD439	£0.29
BD675	£0.45
BD676	£0.45
BD677	£0.45
BD678	£0.45
BD679	£0.45
BD680	£0.45
BF244B	£0.20
BF246	£0.25
BF595	£0.07
BFR52	£0.10
BFY51	£0.17
BSW75	£0.10
BSY78	£0.12
BT106	£0.95
BT116	£0.95
BT151/800R	£0.75
BU126	£0.75
BU205	£0.75
BU208	£0.80
BU208A	£0.85
BU326	£0.90
BU406	£0.75
BU407	£0.70
BU500	£1.10
BUY69B	£0.90
BY127	£0.08
BY133	£0.08
BY164	£0.25
E5316 .	£0.07
E5318	£0.08
E5482	£0.09
E9003	£0.08
E9004	£0.08
E9005	£0.08
R2010	£0.85
TIP31A	£0.25
TIP32A	£0.25
TIP41C	£0.32
TIP42C	£0.32
2N2904	£0.17
2N3055	£0.45
2SB178M	£0.29
2SB405	£0.30
2SC710	£0.35
2SC940	£0.90
2SC1417	£0.50
1N4001	£0.04
1N4002	£0.04
1N4003	£0.04
1N4004	£0.05
1N4006	£0.05
1N4007	£0.05
1N4148	£0.02
1N5401	£0.08
1N5402	£0.09
1N5403	£0.10
1N5404	£0.11
1N5405	£0.11
1N5406	£0.12
1N5407	£0.12
1N5408	£0.13

ZENER DIODES
BZY88 Series 400mW 2v7 to 33v £0.60
BZX61 Series 1 3 watt. 4v7 to 150v £0.12

FUSES
20mm QUICK BLOW PKS of 10 800mA to 5Amp £0.45 pk
200mm ANTISURGE PKS of 10 315mA to 6.3Amp £0.85 pk
KIT OF 20mm ANTISURGE FUSES, Total 260 pcs £21.50

ICs

TBA120B	£0.55
TBA520	£0.99
TBA520Q	£1.00
TBA530	£1.00
TBA530Q	£1.00
TBA540	£1.20
TBA540Q	£1 25
TBA560C	£1.10
TBA560CQ	£1.30
TBA570	£1.45
TBA800	£0.60
TBA810S	£0.85
TBA810AS	£0.90
TBA820	£0.65
TBA820M	£0.65
TBA920	£1.63
TBA950/2	£1.65
TBA990	£1.70
TCA800	£1.90
TCA940	£0.85
TDA1170S	£1.56
TDA2002	£0.75
TDA2020	£1.69
TDA2030	£1.40
TDA2522	£1.45
TDA2532	£1.00
TDA2540	£1.00
TDA2541	£1.69
TDA2560	£1.67
TDA440	£1.50
TA7205AP	£0.85
LA1201	£0.90
MB3712	£0.95
MC1310P	£0.90
UPC575C2	£0.90
UPC1156H	£1.75
UPC1181H	£0.99
UPC1182H	£0.99
UPC1185H	£2.60

PLEASE ADD 90p P&P and 15% VAT. All COMPONENTS BRAND NEW.
Please allow up to 7 days for delivery

SUMMER BARGAINS

10 BUSH 2 CHIP	£50
10 PHILIPS G8 550	£150
10 DECCA 6-BUTTON 20"	£70
10 REDIFFUSION MARK 1 REVAMP	£120
10 THORN 8000 17"	£150

ALSO BUSH T20, G11, 9000, 9600, 9800, GEC STARLINES

PL509 **£1.50,** PY500 **£1**
ELC 1043 Tuners Ex-panel **£2.50**
RING FOR QUOTE

ALL + VAT

TELETRADERS

Forde Road, Brunel Industrial Estate, Newton Abbot, Devon
Telephone: (0626) 60154
THE NO. 1 WHOLESALER IN THE SOUTH

CentreVision

TEL: 0222-44754
SLOPER ROAD
LECKWITH
CARDIFF CF1 8AB

OPPOSITE CITY FOOTBALL GROUND
5 MINS FROM M4

TELEVISION/VIDEO
(VHS + BETA)
FROM £85

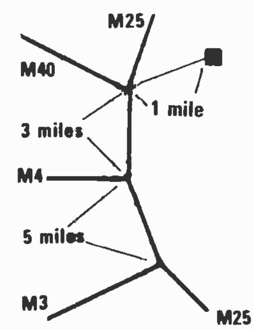
- ★ ITT CD752 REMOTE WORKING **£90**
- ★ PHILIPS G11 FROM **£40**
- ★ GEC STARLINE 22-20 (Remote) **£35**
- ★ PYE CHELSEA **£25**
- ★ THORN 9000 20″ **£35**
- ★ DECCA 22″ BLACK FRONT VERICAP **£15**
- ★ RANK T20 REMOTE **£48**
- ★ PHILIPS 550 IN 10's **£18**

PRICES SUBJECT TO VAT

OPENING HOURS:
MONDAY - FRIDAY 9.00 - 5.30
SATURDAY 9.00 - 1.00

REBUILT TUBES?

Come to one of the most experienced firms in the business. We have been rebuilding cathode ray tubes for industry, broadcasting authorities, major airlines, M.O.D. universities, and, of course, the TV trade in general since the '60's.



WE ARE LOCATED IN
◄ UXBRIDGE

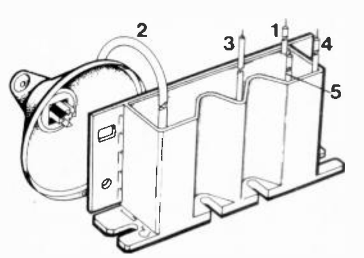
At probably the most accessible part of S.E. England. The nearest junction of the M25 is only about 1 mile away and we are less than 10 minutes from the interchanges on the M25/M3, M25/M4, M25/M40. The Poyle/Colnbrook section of the M25 was completed in September with the exception of the M25/M4 interchange which will be completed soon.

LOCAL AREA MAP AND PRICE LIST AVAILABLE ON REQUEST

DISPLAY ELECTRONICS LTD.

UNIT 4, SWAN WHARF,
WATERLOO ROAD,
UXBRIDGE, MIDDLESEX.
UXBRIDGE (0895) 55800.

UK 'Universal' TRIPLER from £5.00 inc post & VAT



BEWARE IMITATIONS

- 1×10 (£5.00 each) **£50.00**
- 1× 5 (£5.50 each) **£27.50**
- 1× 3 (£5.75 each) **£17.25**
- 1× 2 (£5.95 each) **£11.90**

NB: Includes Post & VAT

1. Input 200mm. 2. Output 780mm. 3. Focus 390mm. 4. Pulse 390mm. 5. Earth 390mm.
Instruction sheet available on request

Strictly cash with order.
Goods despatched by return.
Access Barclaycard accepted

TELEPART 32 TEMPLE STREET WOLVERHAMPTON WV2 4LJ PHONE (0902) 773122

APOLLO MANCHESTER

FAST MA L ORDER GB 3-4 DAYS ALL AREAS PLEASE PHONE FOR COST
FREE LOCAL DELIVERY SAME DAY ● FITTING SERVICE £20
2 YR GUARANTEE - QUANTITY DISCOUNTS - PILL GLASS BOUGHT

A47 342/343X–470 BCB22/CTB22/BGB22/DHB22	£39
470-ESB22/EFB22/ERB22/FTB22	£49
A51-220X/192X	£39
A51-161X/162/163/168	£49
510-JKB22/JEB22/JDB22/JGB22/ALB22/GLB22	£49
510-VLB22(£53) DTB22/001/RFB22/RCB22/SFB22	£49
A51-590 New	£55
A51-570X/580/001/210/241	£49
A56-120X/123/140/410	£39
560-DZB22(£53)/HB22/AKB22/TB22/AWB22	£49
560-ETB22/DTB22/CSB22/DMB22/DNB22	£49
A56-611X/615X	£49
A66-120X/A67-120X/140/150/200/410	£39
20AX–A56-500X/510X–A66-500X/510X	£49
30AX–A56-540X–A66-540X	£53

If your tube type is not in stock we can arrange collection – rebuilding + redeliver

PLEASE PHONE BEFORE CALLING
061-799 0854. 24 hour answering service
43 Clarke Crescent, Little Hulton, Worsley, Nr Manchester M28 6XL

The World of . .
P+P 1 PANEL £1.50
2 PANELS OR MORE £3.00

"TELEPANELS"

WORKING PANELS GALORE!

52 Mount Pleasant Road, Chigwell, Essex. Tel: 01-729 0506.

	IF	TUNER	DECODER	G8/G9 DECODER IF COMBINED	LINE OUTPUT	POWER	CONVERG	FRAME	VIDEO	6 WAY TUNER SWITCH BANK
PHILIPS G.8	5.00	4.50	7.00	15.00	14.00	8.00	5.00	5.00		3.50
THORN 3000/3500	2.00	5.75	4.00		8.00	8.00	5.00	6.00	5.00	1.75
GEC 2110	10.00		5.00		12.00	6.00	5.00	5.00	5.00	5.00
PYE 731			10.00		18.00	10.00	7.00	8.00		4.50
BUSH Z/718	7.50	6.50	14.00		24.00	3.00	5.00	14.00		
BUSH T/20	7.50	6.50	14.00		19.00	19.00	5.00	14.00		
DECCA BRADFORD	3.00		7.00			4.00		4.00		
DECCA 80	12.00	POA	14.00		12.00	10.00		14.00		POA

POST OFF YOUR CHEQUE NOW! AND YOUR PANELS SENT BY RETURN OF POST!!!

SETS & COMPONENTS

THORN GEC Deccas stripped for spares. Panels, tuners from £2.50, phone for prices. WELLINGTON, Dartford 0322 337212.

HITACHI, Mitsubishi, Panasonic, Sony, Toshiba, JVC, Sharp. Sharp fully refurbished. PEARSON TELEVISION. 0484 863489. Delivery arranged.

OCHRE MILL TECHNICAL for GRUNDIG sets, moduales, manuals. TELEQUIPMENT OSCILLOSCOPES spares, manuals. Assorted items RECONDITIONED TEST EQUIPMENT. 0785 814643.

TURN YOUR SURPLUS capacitors, transistors, etc., into cash. Contact COLES-HARDING & CO, 103 South Brink, Wisbech, Cambs. 0945 584188. Immediate settlement.

BIRMINGHAM AREA-TRADE. Service workshop, all makes Video-Audio T.V. Free warranty repairs for Sony, Sharp, Ferguson, Sanyo. Two minutes from H.R.S. ARGO SERVICES (B'HAM), B.HAM 4. 021-359-3753.

QUALITY SETS FROM CORNWALL. Workers/non workers. Spares. Panels. etc. Details ring 0726-81-5389.

OSCILLOSCOPE TELEQUIPMENT S54A. Good working order, £85. No probes. Northallerton (0609) 3406.

PHILIPS G11 AND BUSH T20 regular supplies. For prices phone 01-845-2036.

WOODSDALE COMPONENTS
RANK BUSH MURPHY

TRANSFORMERS

Line Ouput
Z718 (T703A, T706A)

New (Complete)	£19.00
Less Focus Module and Rectifier	£10.50
T20, T22 (T705A)	£11.00
T26 (T705B)	£11.00
TDA2190 Plug-in Replacement module suitable for Bush T22/26 and any set using same device	£6.00
Switch Mode T114A	£6.00

Genuine RBM Units.
Prompt Postal Service P&P Paid.
Add 15% VAT to all prices.
DISCOUNT for QUANTITIES.

34 Field End Road, Eastcote, Pinner, Middlesex. HA5-2QT.
Tel: 01-868 5580.
N. Skehan
Agents Office. Callers by appointment only.

VIDEO & HI-FI ELECTRONICS
379 EDGWARE ROAD
LONDON W2
TEL. 01-258 0328

ALL VHS PARTS AVAILABLE. EXAMPLES:

VIDEO HEADS	
JVC, Ferguson, Akai, Saba, Telefunken	£35.00
Sony (Betamax)	£45.00
National Panasonic	£45.00
All Hitachi heads from	£42.00
INTEGRATED CIRCUITS	
UPC 1365C	£6.30
UPD 553C	£10.20
UPD 552C	£9.56
HA 11711	£10.50

All makes of idlers, pressure rollers, clutch assembly and motors in stock.
Many other parts available. Send SAE for list.
ALL PRICES INCLUSIVE OF VAT
ADD £2.00 FOR P&P

TELEVISION

No other consumer magazine in the country can reach so effectively those readers who are wholly engaged in the television and affiliated electronic industries. They have a need to know of your products and services.

The prepaid rate for semi display setting £6.78 per single column centimetre (minimum 2.5 cms). Classified advertisements 40p per word

NOW OPEN
FOR THE BEST QUALITY AND BEST PRICES IN BIRMINGHAM.

TESTED AND UNTESTED
TV's AND VIDEO's

RING – 021-772 2733

WILTSGROVE LIMITED
(Next Door to UNCLE'S DISCOUNT STORE)

128-130 Ladypool Road, Sparkbrook, Birmingham B12 8JA.

LOOK HEAR TV

NOW OPEN. Our new trade warehouse. For the best service and quality in the East Midlands.

* Good quality working TV's
* Off the pile also available
* Low prices
* *No minimum quantity*
* Limited number of VHS videos
* Lots of TV panels for sale

Open Mon.-Fri. 10 - 5.30, Sunday 10 - 1.00
CASH ONLY
UNIT 4, KING STREET BUILDINGS, KING STREET, ENDERBY, LEICESTER.
Only 5 mins. from Junction 21, M1.
Ring Adrian on Leicester (0533) 867530.
MR. A. L. BALMER

Thorn 3000/3500
Thorn 9000
UNIVERSAL
1 year guarantee
TRIPLERS £4.95 inc. p&p

The UNIVERSAL TRIPLERcan be used in most G.E.C., I.T.T., Pye, Rank, Decca & Continental sets.

WING ELECTRONICS
15 Waylands, off Tudor Rd, Hayes End, Middlesex

HALTON TV TRADE DISPOSAL

Wide range of TVs available.
Working and non-working.
TRADE ONLY
(We have NO retail outlet)
St Michaels Industrial Estate, Widnes
Tel. 051 423 1577

BRISTOL TELEVISION TRADE DISTRIBUTORS (BTTD)

4 Victoria Street
(Bristol Bridge) BS1 6BN

Ex-rental/trade in TV sets, supplier to trade only, wide range, large quantity, right price, regular supply.

Tel: (0272) 25266

SERVICE PAGES

(minimum 12 words), box number 70p extra. All prices plus 15% VAT. All cheques, postal orders etc., to be made payable to Television, and crossed "Lloyds Bank PLC". Treasury notes should always be sent registered post. Advertisements, together with remittance, should be sent to the Classified Advertisement Dept., Television Room 2612, IPC Magazines Limited, Kings Reach Tower, Stamford Street, London SE1 9LS. (Telephone 01-261 5942).

BOLTON T/V

WHOLESALE

NEW BUSINESS NO RIP OFFS

PHILIPS G11	£40
PHILIPS G8	£12
THORN 8800	£15
THORN 9000	£20
THORN 9600	£30
GEC 2111	£15
VIDEO 2020	£30
VIDEO FERGUSON from	£50

Good Tubes Tested on Rig from **£10**

Many more makes in stock

Discount on quantity

Lorry loads direct from source

BOLTON T/V

FLASH STREET MILLS, BOLTON.

TEL: (0204) 22592

BOURNEMOUTH

LARGE STOCKS OF WORKING NON-WORKING SETS, MOST MAKES AND SIZES.

FAIR PRICES – TRADE ONLY

WAREHOUSE OPEN:
Mon-Fri 9-1, 2-5; Sat 9-1

HILLIER'S, UNIT 2A, 11-15 FRANCIS AVENUE, WALLISDOWN. TEL: 0202 581932

PLEASE MENTION TELEVISION WHEN REPLYING TO ADVERTISEMENTS

T.V. SPARES, PANELS AND MANUALS

PHILIPS · GRUNDIG

TELEVIEW 01-994 5537

194, Acton Lane, London W.4.

C.T.V. PANEL SERVICE

Exch/repair & sales – chemically cleaned – no burned or damaged print. 3 months g'tee, large range incl. Decca 80 & 100, G11, G8, ITT, GEC, Rank, TCE, Jap & euro models, despatched same day.

Send S.A.E. for lists or ring with your requirements:

Please note new address:

Argo Services (Birmingham),
53 Lawley Street, Birmingham B4 7XH.
Tel. 021 359 3753

Telephone orders accepted using Access/Mastercard/Visa
CALLERS RING FIRST

TELFORD ELECTRICAL SPARES & SERVICE

GENUINE SONY SPARES

VIDEO HEADS

TRANS-FORMERS

E.H.T. TRAYS

AUDIO PRODUCTS

CAPACITORS

TUNERS
Varicap & Push Button

SEMI-CONDUCTORS
Diode

SOLDERING IRONS

TESS SERVICE

UNIT 42,
HEATH HILL
INDUSTRIAL
ESTATE,
DAWLEY, TELFORD,
SHROPSHIRE
TF4 2RH.
Telephone:
Telford (0952) 501618

TRADE COUNTER OPEN 6 DAYS EACH WEEK
Television
Video
Audio
Microwave

NEW – GENUINE FERGUSON SPARES

SINCLAIR COMPUTER PRODUCTS

Beswick FUSES

INSTRUMENTS

AERIAL PRODUCTS

RESISTORS

VALVES

SEMI-CONDUCTORS
Integrated Circuit & Socket

TUBES
Monochrome & Regunned Colour

SOLDER & ACCESSORIES

S.A.E. FOR FREE CATALOGUE. A4 SIZE

Try Us.
We endeavour to provide a fast delivery of top quality components for the keenest price.

GEMINI TUBES

THE PRICE IS RIGHT
FOR QUALITY REBUILDS
ALL WITH 2 YEAR WARRANTY

Phone now on St. Helens 37672
Or call at Unit 3,
Delphwood Drive,
Sherdley Road Ind. Estate,
St. Helens.

EAST ANGLIA SUPPLIES

For your fully serviced colour televisions ready for sale or rent at realistic prices with free delivery (just petrol charged) anywhere for sensible sized orders.

G11s from **£70** + VAT
KT3s from **£85** + VAT
K30s from **£95** + VAT
ITTs from **£50** + VAT
Decca from **£50** + VAT
T20s from **£50** + VAT
9000s from **£35** + VAT
VHS Videos.
Ferg 3V29, 3V30
NatPan NV2000, NV2010

MANY OTHER MAKES REGULARLY STOCKED AND CHEAPIES FROM ONLY £25 + VAT FULLY SERVICED.

Contact John, Dave or Steve for personal friendly attention on
0223 69215 or **0353 61462**

TRADE TVs

Yorkshire New Outlet
Ex-Rental & Reposses TVs
Colour From £10
Mono From £2
TRADE REPAIRS AND SPARES

TELEFIX
Ellingthorpe Street,
Wakefield Road, Bradford 4.
Phone: 0274 480281 or 733373.

N.W. ELECTRONICS

25 YEARS SUPPLYING THE TRADE

COLOUR TV'S AND VIDEOS
H.P. REPOS AND EX. RENTALS

ANNUAL CLEARANCE
ROCK BOTTOM PRICES

PYE G11 EXC CAB............£40
BUSH T20/26 CH................£35
HITACHI 191.....................£20
FERGUSON TX
(NOT D.E.R. Etc.)...........£65
GEC 2010..........................£20
PYE 222............................£20
PHILIPS 550......................£15
BUSH 718........................£20
BUSH 2 CHIP.....................£8
GRUNDIG 5010...............£10
PYE KT3.........................£50
GEC 2213........................£30
THORN 3000.....................£7
GRUNDIG G415/4206

Best Stock in the Country — over 2000 in stock (90% of our TV's Switch on)

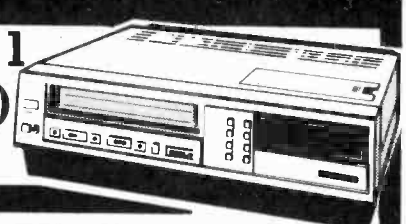
Special Price Quoted For Bulk Purchases From Source.

REFURBISHED TV'S

BUSH T20/T26......£45, G11......£50,
PYE KT3......£70, Others done to order.
DISCOUNT FOR QUANTITY

VIDEO

SHARPS 7300,8300,9300,HITACHI,VT11
FERGUSON 3V29 (Not Ex D.E.R. etc.)
SANYO, SONY, BETA



100's PX **HOOVER JUNIOR VACS**
— All models in stock
Fully reconditioned HOOVER JUNIORS (Like new)£27

CASH ONLY

TEL. 0274 688458
UNIT 12, Wharfedale Rd
M606 Euroway Estate
Bradford

OPEN 6 DAYS
SAT 9-5.30

WIZARD DISTRIBUTORS MANCHESTER
TV & VIDEO SPARES

We stock spares for THORN, PHILIPS, PYE, RANK, GEC, SHARP, SONY, DECCA, ITT and now also FIDELITY.

Did you know we also stock

FUSES	I.Cs
TUBES	TOOLS
AERIALS	VIDEO LEADS
AEROSOLS	AUDIO LEADS
RESISTORS	SEMICONDUCTORS
CAPACITORS	SERVICE MANUALS
VALVES	TEST EQUIPMENT
HANDSETS	TV/VIDEO TROLLEYS

AND MUCH MORE

Counter open Monday-Friday 9am-4.45pm

TRADE ONLY

EMPRESS STREET WORKS, EMPRESS STREET, MANCHESTER M16 9EN.
Tel: 061-872 5438; 061-848 0060.

Trent Tubes

31 RADCLIFFE ROAD, WEST BRIDGFORD, NOTTINGHAM
PHONE: (0602) 813329

ALL tubes guaranteed for **2 YEARS**
EXTENDABLE TO **4 YEARS**

THE PROFESSIONAL REBUILDER

All STANDARD DELTAS (A56, A66/120 etc.) **ONE PRICE £30.00**

A51-161 – A51-163 **£43.00**

A51-A56-A66/500/510 **(20AX)** One price **£43.00**

A56-A66/540 **(30AX) £49.00**

560DZB22, 510VLB22 **£46.00**

SONY TYPES FROM £55.00
SPECIALIST SONY SERVICE

1000's more types available. VDUs, MONOs, Industrials etc.

Suppliers to **Broadcasting Authorities** & National Companies

ALL PRICES EX WORKS + VAT & EXCHANGE

WE SPECIALISE IN JAPANESE TYPES

DELIVERY SERVICE AVAILABLE

QUANTITY DISCOUNTS

TECHNICAL ADVICE SERVICE AVAILABLE

NORMAN ENTERPRISES LTD
Weston-Super-Mare, Avon.
Tel: 413991/418545

Colour TVs fully engineered with a special care on tubes

Hitachi 217 Remote Control	£95
Thorne 9000 Remote Control	£37.50
Pye G11	£47.50
Rank T20	£37.50
Pye Chelsea 6 Button	£27.50
Pye 725	£37.50
Pye 721	£27.50
Thorne 9600	£45
Thorne 9200	£42.50
Bush T20 Remote Control	£45
Bush T24	£55.50

All above prices include hand sets and VAT.
Ready for sale.

Phone now, limited number each month. All the above off the pile, less a 3rd

WORKING CTVs
THE BEST & CHEAPEST IN LANCASHIRE
SPECIAL OFFER

Working Decca Bradford Including Black Fronts
18" 20" 22" 26" **ONLY £20.00 each** in 6 units

Working GEC Plastic & Wooden. All models 20" 22" 26" **ONLY £22.00 each** in 6 units

Working Bush 20" 22" 26"
ONLY £15.00 each

Philips G8 (520) 22" & 26"
ONLY £20.00 each

Plus many more makes & sizes in stock, inc. Tanburg, Nordmende, Thorn.

1st COME 1st SERVED

ALL SETS TESTED & WORKING

CALL
JOHN POWNEY
TRADE TV SALES & SERVICE
Unit 31 Progress Industrial Estate, Kirkham, nr Preston
(0772) 683392

UNTESTED PANELS FOR ALL MAKES OF TV
***£1.25 per panel** plus post & packing*

IRISH T.V. DEALERS

Brand new re-gunning plant operating.
— TOP CLASS TUBES —
B/W – Delta – In-Line – P.I.L.

CHRIS KELLEHER'S T.V.
Kanturk, Co. Cork
Store open 9 to 8 pm. Sunday 10-1 pm.
029-50046 – Wanted 300 VHS video tapes

STARLITE ELECTRONICS

WILLOWS FARM,
A13 RAINHAM, ESSEX.
Rainham 23225 also Hornchurch 50238.

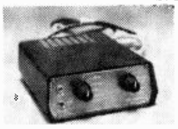
EX RENTAL TVs
UNTESTED FROM £15.00
WORKING TVs £20.00

2 year guarantee
Most types available including Sony

COLOUR BAR GENERATOR

Pal Colour Generator with 11 patterns plus sound. Grey scale, Colour Bars, Red, Green & Blue Raster, Cross-hatch, Dots, Chequer Board, Black Raster, White Raster, Half Black & White, Mains Powered. £75.90

OUTPUTS PROVIDED
UHF OUTPUT
VIDEO OUTPUT
SOUND OUTPUT
LINE PULSE
FIELD PULSE



Same as above plus RGB output	£81.50
Line Output Transformer Tester	£11.50
B/W Generator, Crosshatch, Peak White, Dots, Half Black & White and Grey Scale UHF output	£18.50
Same as above but with Video Output	£20.50
Capacitance Meter measures 10pF to 1µF complete with moving coil meter	£14.75
Car Alarm with built in Siren	£20.50

S.A.E. for details. – Prices include P&P & VAT.

C.M.J. ELECTRONICS
Unit 8, 16 Union Mill Street, Horseley Fields, Wolverhampton WV1 3DW.
Tel: (0902) 871563

NORTHERN IRELAND DEALERS

COME AND SEE OUR LARGE RANGE OF S/H COLOUR TVs AT LOWEST PRICES EVER

CONTACT:

S. M. ELECTRONICS

11 SANDHOLES ROAD, COOKSTOWN, CO. TYRONE
Telephone: Cookstown 06487/64277
Open: Mon.-Sat. 9.00 am-6.00 pm (Closed Wednesday)

SITS VACANT

TELEVISION ENGINEER

Experienced T.V. engineer required by independent EXETER T.V. dealers. Good salary, pension scheme, company car.

Applications to:
Mr P. I. Howarth F.C.A.,
HOWARD'S (Exeter) Ltd.,
90 Sidwell Street,
Exeter.

BOOKS AND PUBLICATIONS

A-Z LIST OF MANUFACTURERS ADDRESSES. All major TV, audio etc plus many hard to get ones. Send cheque/PO for £3.75 to DOWNS ELECT, 79 High Street, Dalkeith, Midlothian.

MACDONALDS R & TV BOOKS. New 74/75 £15. 75/76, 76/77, 77/78, 78/79, 79/80, 80/81, 82/83, 83/84, 84/85 £22.50. Free delivery. U-VIEW, 29 Warmsworth Road, Doncaster. 0302 855017.

"RADIO AND TELEVISION SERVICING" books, new editions for the last 6 years usually in stock. Prices on request. BELLS TELEVISION SERVICES, 190 Kings Road, Harrogate, N. Yorkshire. Tel. 0423 55885.

BUSINESS OPPORTUNITES

LEASEHOLD FOR SALE Outlet for T.V. Video, Hi Fi & Domestic Appliances retail & repairs on busy main road, Sutton area. Established 25 years, big workshop turnover 50k plus 5 year lease remaining (renewable) £15,000. Tel. 01-979 7380 before 9am or after 6pm.

T.V. VIDEO & HI-FI REPAIR & RECON SALES BUSINESS
Ilford area.
Established 9 years. Long lease. Large fully equipped workshop. Shop showroom. Great potential.
Capital investment needed.
Would consider partnership or for sale £20,000.
BOX No. TV 196

WELL ESTABLISHED TV VIDEO-AUDIO SALES AND SERVICE BUSINESS FOR SALE
Modern premises shop and workshop. Good class North London area. Ideal for ambitious engineer.
T/O £65,000.
New 12 year lease.
PRICE £18,500 + S.A.V.
Details: Box 201

WANTED

WE PURCHASE UNDAMAGED old T.V. tubes of types A67-150X A66-500X or equivalents. Good prices paid. Phone 052 785 2639.

WANTED: 3V24. Price condition. HENNIKER, 44 Ashley Terrace, Edinburgh EH11 1RY. 031-337 3441.

WANTED, EX RENTAL colour TVs. Any quantity. Prompt collection, cash paid. Sheffield 754865.

METERS

METERS. Reconditioned 10p/50p available from stock. Contact THE METER CO. (Poole) LTD. (0202) 683498.

AVON METERS
We buy and sell and repair TV coinmeter.
Reasonable prices, one year guarantee.
213 Cheltenham Road,
Redland, Bristol.
0272-425281

MISCELLANEOUS

GET
SHARP *PARTS FAST*
TELEPHONE
0734 - 876444
TELEX 848953
SHARP
Main U.K. Spare Parts Distributor
WVE
Audio-TV-Video ★ Microwave ★ Photo-copier ★ Typewriter
All U.K. model spares available. Same day despatch of orders received before 1pm.
Microwave, photocopier and typewriter spares to authorised service dealers/centres only.
WILLOW VALE ELECTRONICS LTD.,
11 Arkwright Road, Reading, Berks.

SOLE SUPPLIERS TV/VIDEO Repair manuals/circuits, 1000s s/manuals supplied by return. S/sheets £2.50 except CTV/m.centres/stereos £3.50. LSAE with every order/query please brings free price list/magazine inc s/sheet – or phone 0698 884585 (883334 outside business hours) TIST, 76 Church Street, Larkhall, Lanarkshire.

The Theory and Practice of PAL Colour Television in three important Video Cassette Programmes
Part 1.
The Colour Signal
Part 2.
The Receiver Decoder
Part 3.
Receiver Installation
VHS★★★V2000★★★
BETAMAX★★★UMATIC
BARCLAYCARD VISA
For full details telephone
0253 725499 (Day)
0253 712769 (Night)
Or send for precis details
FLINTDOWN CHANNEL 5
339 CLIFTON DRIVE SOUTH,
LYTHAM ST ANNES FY8 1LP
(enclosing this advert)
NAME ....
ADDRESS ....
.... TEL: ....

BURGLAR ALARM EQUIPMENT. Latest discount catalogue out now. Phone C.W.A.S. ALARM 0274 731532.

REPAIR SERVICE

PRINTED PANEL REPAIR SERVICE
Printed panels and remote control handsets repaired. Most makes and models serviced.
RING 0934 418545
for Price List or Quotation.

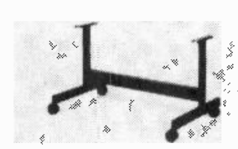
VIDEO

VHS VIDEOS
NON-WORKING **£78 inclusive**
WORKING **£112 inclusive**
PORTLAND VIDEO
843 9942

V.H.S. VIDEO'S
100's IN STOCK
Famous brands:
JVC · PANASONIC · FERGUSON
Also stockists of Grade B Units, Microwaves, Hi-Fi, Radio/Cassettes etc. etc.
CONTACT MICK ON:
021-772 1591

STANDS

T.V. VIDEO STANDS from £2.50



Direct from manufacturer, slight seconds, ends of runs and current models.
For details . . **TELEPHONE: 0422 240011;** or write: **ACRE PRODUCTS LIMITED**
Jumples – Mixenden – Halifax – W. Yorks HX2 8UD

FOR SALE

Sabaco

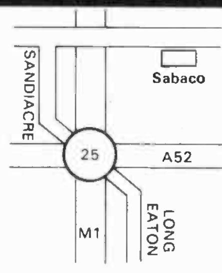
For a great deal!

VAN LOAD DIRECT FROM SOURCES

ALL SETS OFF THE PILE

Large selection of Ferguson TX 9600/9200/9000/8800/4000 mainly teletext with remote control at best prices in UK

VHS VIDEOS
Good working order
3V22 £95
Non-working
3V23/3V24
£100
Any quantity



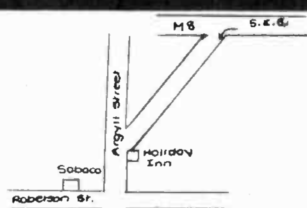
Only 2 minutes Junction 25 M1

ANNOUNCEMENT TO SCOTTISH TRADERS
TOP QUALITY OF VHS VIDEO'S & TV'S

Large selection of VHS Video's and TV's in quantities of 2's or 100's at very competitive prices.

OPEN 6 DAYS A WEEK
9.30 am to 5.45 pm

For further details telephone:



Sabaco
75 Robertson Street, Glasgow.
Glasgow. 041-221 2146.
(2 minutes from M8).

Sabaco
46A Derby Road,
Sandiacre,
Nottingham. (0602) 397555.

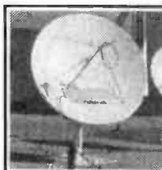
To Advertise on this page
Phone Pat Bunce
01 - 261 5942

AERIALS

AERIAL BOOSTERS

B45-UHF TV next to the set fitting. Gain 10dbs (trebles gain), works off PP3 type battery or 8V to 14V working. **Price complete (excluding battery) £5.00.**
Video Transmitter. This will transmit good quality pictures and sound more than 30ft. **Price £8.90** (S.A.E. for more details).
We also make aerial boosters for VHF/FM radio £7.70, and VHF television, prices £7.70 & £8.70. p&p 50p per order.

ELECTRONIC MAILORDER,
62 Bridge Street, Ramsbottom,
Lancashire, BL0 9AGT.
Tel: Ramsbottom (070 682) 3036.
S.A.E. leaflets. Access/Visa Welcome.



Euro–Sat

Parabolic Dish Antennas
(Parent company est. in TV communications since 1969)
SATELLITE TVRO ANTENNAS
TOP QUALITY SOLID GLASSFIBRE DISH ANTENNAS
TRADE PRICES

1M. DIA 11-12-4 GHZ BANDS	£77.00
1.2M. DIA 11-12-4 GHZ BANDS	£93.00
2M. DIA. 11-12-4 GHZ BANDS	£215.10
3M. DIA 11-12-4 GHZ BANDS	£437.00

Trade & Export Enquiries Welcome
Prices do not include delivery
Euro–Sat
107 Cross Street, Sale, Cheshire, England.
Tel. 061-437 2631 061-881 4249

CLEARVIEW AERIALS

Tunable masthead amplifiers for FM and Band 3 (mosfet) gain 30dB. NF 0, 7dB and UHF incl. amateur band gain 30dB NF. 1, 6dB. 15dB and 26dB masthead ampl. WB, grouped NF 2dB splitters, combiners, notchfilters, diplexers etc. Trade and retail.

Send large SAE for our comprehensive catalogue

CLEARVIEW AERIALS,
173 Kings Road,
Kingston Upon Thames, Surrey.

DX

SATELLITE T.V. RECEPTION EQUIPMENT

10.9-11.7 GHz low noise block downconverters 2-way and 4-way power dividers/2m dia GRP dishes and polar mounts/Brass scalar feedhorns and feed supports/indoor demodulators and in-set demodulators, Mitsubishi Microwave Modules for the constructor.

SAE for details to:

KESH ELECTRICS LTD
MAIN ST, KESH, CO FERMANAGH, N. IRELAND
PHONE KESH (03656) 31449

EVERYTHING NECESSARY for multi-outlet and high gain installations. Cables, outlets, splitters, channelpass filters, diplexers, masthead amplifiers, distribution amplifiers, brackets, masts, aerials, etc. Use trade gear and save pounds. Catalogue 75p (refundable). Professional advice. WRIGHTS AERIALS, 43 Greaves Sike Lane, Micklebring, Rotherham.

DEVONICS

Quality Rebuilt Tubes

2 YEAR WARRANTY

470 ERB22	£43
510 KCB22	£45
A51-161/500/510/570/580/590X	£45
560 AKB/DZB/TB22	£45
A56-500/510X	£45
A56-540X	£53
A66-500/510X	£46
A66-540X	£53
670 XB22	£46

Deltas from **£30**
Plus carriage and VAT
2A BARTON HILL ROAD,
TORQUAY TQ2 8JH
0803 - 33035

SERVICE SHEETS

TELEVISION SERVICE SHEET SPECIALISTS

Thousands of British, European and Japanese models in stock.

Colour £3.00 Mono £2.00

Manual prices on request.
All our prices include post and packing costs.
Send stamped envelope for free catalogue and any enquiries.

SANDHURST TV SERVICES (MAIL ORDER)
49C Yorktown Road, Sandhurst, Camberley, Surrey GU17 8DU.

BELL'S TELEVISION SERVICES for service sheets on Radio, TV, etc. £1.50 plus S.A.E. Service manuals on colour TV and Video Recorders, prices on request. S.A.E. with enquiries to B.T.S., 190 Kings Road, Harrogate, N. Yorkshire. Tel. (0423) 55885.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★
SERVICE PAGES **SERVICE PAGES**
PLEASE MENTION TELEVISION WHEN REPLYING TO ADVERTISEMENTS
SERVICE PAGES **SERVICE PAGES**
★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Thousands of service sheets in stock not listed here. Tape recorders, TV, radio, record players, transistors, amplifiers. All main chassis sheets @ £3.00 each. Manuals @ £6.00/£11.00 each plus large stamped addressed envelope. Please mention name of model when ordering. All orders received 8 am any morning, posted off by 9 am-1 o/clock same day. Please pass on to a friend, if not wanted. Free fault finding chart if wanted.

CAR RADIOS: PHILIPS, MOTOROLA, RADIO MOBILE, HITACHI ETC.
C. CARANNA 71 BEAUFORT PARK, LONDON NW11.

Philips small stereo headphones £4
Stereo Philips headphones Electret N6325 £13
Rank UHF 4 push button tuner £4
GRC power supply PC743B £10
Rank front panel Z950 £5
Power panel 8.500 Thorn £5
Fedility mains switch & lead and filter panel £1
Fedility mono lopt with diode FBS1245AE £3
6 TAG print mains switch PREH 1983 ITT 75p
T134A Lopt panel £10
Rank T603A tuner on panel £6
Scan control panel Z544 £3
Rank Z582 IF £3
Rank convergence Z910 £3
GEC IF tuner panel PC786B £12.50
ML 232 I.C. on panel tuch unit Fidelity £3
Hitachi power panel PC036A £1
Rank IF 742 £3
Rank decoder Board MTS 200/1 Tuner & IF £12.
Z733 Rank mains input-panel £1
G11 Chroma Can 3113 108 25300 £3
20AX Line lin coil 50p
GEC switch mode trans 20AX
ITT CVC20 etc mains switch 60p
ITT 2,800 mains remote switch 50p
2110 GEC Power Panel £8.00
Line o/p frame panels GEC 20AX £10.00
GEC 20 AX Transductor £1.00
ITT CVC40 Push Button Unit & Mains Switch £8

Rank Panels
Z904 18" Line Panel £10
Z905B Decoder £10
Z736 Tuner I.F. £10
A805 Conv. 7/8 £2
T136A Scan Drive £10
Z780 Line O/P £10
Z968 £10
Z582 I.F. Panel £5

Rank Power Panel
300+300m with diodes degaussing £3
BA 301 £1
TA 4127 £1
HD 3884 2A23 £3
TA 4184 £1
TA 2125 £1
TA 4190 £1
TA 4138 £1
TA 4196 £1
TA 4174 £1
TA 4139 £1
TA 4198 £1
TA 4167 £1
TA 4199 £1
BA 546 £1
BA 328 £1
TA 4176 £1
TA 4145 £1
TA 4191 £1
HA 11710 £1
TA 4188 £1
TA 4197 £1
TA 4183 £1
TA 4197 £1
TA 4183 £1
TA 4195 £1
TA 4175 £1
TA 4177 £1
TA 4192 £1
TA 4146 £1
The Service Engineers Guide to Teletex £1.50
Teletex Colour Training Manual £3

Mains Trans
C. Core 240v 4v+4v 4v04v 2AMP 12v lamp £2
Mullard split diode AT2076/80 £6
4 Types Fedility front panels with i.c. & pots £2 each
Amstrad TV chassis Complete damaged print £5 + £5 post
BB 103 10p
BB 105A×12 £1
BB 105B×12 £1
BB 105G×12 £1
BB 121a 10p
47 10p each

A 823A chassis
Scan drive £5
IF £3
Scan control panel £3
NEW A31/510 tubes with s/coil £6 + £2 post

1A/1600V 10p
2 amp bridge rec. wire end 15p
CV 8617 10p
Y 716 10p
Y 729 30p
Y 730 10p
Y 827: 6A/1KV 20p
Y 860 30p
Y 933 5p
Y 969 50p
Y 997 30p
Min 12 volt Relays 75p
R 1038 40p
R 1039 40p
R 2009 80p
R 2010b £1
R 2029 50p
R 2210 60p
R 2257 60p
R 2265 50p
R 2305 50p
R 2306 30p
R 2322/2323 pair 80p
R 2323 15p
R 2396 50p
R 2461 80p
R 2030 50p
R 2443=BD124 40p
R2737 40p
R2738=TIP41 30p
R2775=TIP41c 40p
R3129=TIP47 40p
S 2008b 80p
2SD898B £1

Hitachi sets etc.
STR441 £2.50
STR454 £2
2SC940 £1
BU 105/04 80p
BU 108 £1
BU 124 50p
BU 126 80p
BU 180a 65p
BU 204 70p
BU 205 £1
BU 206 £1
BU 207 £1
BU 208 80p
BU 208A £1.10
BU 208D 90p
BU 222 £1
BU 326 £1
BU 407 60p
BU 426V 60p
BU 500 £1.10
BU 508A £1.20
BU 526 75p
BU 807 £1
BU 824 50p
BUW 84 30p
BYW 20-08-9 £1
TIC 106a 30p
TIC 116m 40p
TIC 116n/Y 1003 35p
TIC 126N 40p
TIC 206m 30p
TIC 225S 40p
TIC 226E 40p
TIC 226m 30p
TIC 236m 30p
TICV 106D (T092 case 2A/400V) 10p
TIP 29 20p
TIP 30 35p
TIP 30A 35p
TIP 30B 40p
TIP 30C 45p
TIP 31 30p
TIP 32 25p
TIP 33B 50p
TIP 33C 70p
TIP 34A 50p
TIP 34B 60p
TIP 34C 70p
TIP 35B 50p
TIP 35C 70p
TIP 35D 80p
TIP 36 50p
TIP 36C 70p
TIP 41B 40p
TIP 41D 70p
TIP 42/BRC 6109 30p
TIP 48 40p
TIP 49 30p
TIP 57 30p
TIP 100 30p
TIP 102 30p
TIP 115 50p
TIP 117 50p
TIP 120 30p
TIP 125 35p
TIP 130 30p
TIP 131 25p
TIP 136 30p
TIP 140 50p
TIP 640 50p
TIP 2955 35p
T 6032 30p
T 6036 40p
T 6040 40p
T 6047 40p
T 6049 40p
T 6051 40p
T 6052 40p
T 9004 40p
T 9005 40p
ZTX 107 10p
ZTX 108c 10p
ZTX 109k 5p
ZTX 213 5p
ZTX 341 10p
ZTX 342 10p
ZTX 384 10p
ZTX 451 10p
ZTX 550 10p
MJ 2253 60p
MJE 3040 60p
MJE 2209 10p
SP 8385 50p
SAB 3205 £1.00
SAB 4209 £1.00

G11 condenser £1.75
300M + 700 320V £1.80
200 + 100 + 100 + 50 300V 50p
150 + 200 + 250M 300V 50p
Chassis complete £35
Computer Transformer 20v/2.25A; 20v/1.5A; 17/.5A; 19/.5A; 28/.05A £3
Mains ViewData Torroidals £3.75
240V/240/6V/4 amp/6v 500m/a in / out - - - - - - -
Mains trans 240/12v-0-12v 2 amp £3.50

Voltage Regulators
+5V/UA78PO5SC 30p
-5V/LM79MO5CP 25p
-8V/79M08c 30p
+6V/78M06c 30p
+10v/78LA10 20p
LM 337 30p
LM 342/18 30p
LM 340T 5.0 50p
+12V/LM 340T12 50p
+15V/78M15 15p
+18V/MC78M18 20p
+24V/78M24 30p
MC 7724cp 40p
MC 7824 40p
TIS 90 10p
TIS 91 20p
TIS 92 20p
TIS 93 20p
U 19885 40p
U 3832 15p
U 3845 15p
MR 508 10p
MR 501 10p
MR 502 10p
BCW 71R 30p
BYF 1202 10p
BYF 1204 10p
BYF 3126 40p
BYF 3214 40p
BYX 10 6p
BYX 36/600 35p
BYX 38/300 25p
BYX49/600R 75p
BYX 55/350 10p
BYX 55/600 (Bead) 10p
BYX 71/350 20p
BYX 71/600 50p
BYX 72/300 20p
BYX 36/600 50p
BYV 95B 10p
BVY 95C 12p
BYZ 106 10p
BPW 41 15p
BYW 56 2A/1000v G11 8p
BZU 15/24 54p
BZY 93c75 50p
BZV 15/18 30p
BZV 15/30 30p
BZW 70c6v2 10p
BZX 79.3v 10p
Bush thyristor RCA 76122 £1
Transformer 240v/20v-500Ma 75p
Chassis type Transformer 240v/12 Volts 500m/a 75p
CVC 20 tube base £2
Tube Base Rank & G11 £1.20
6v-9v-13v tape motor 75p
Swiss made 250rpm/240V motor very small 75p
Infra red led LD57CA 15p
Mono scan coil £3
G 8 transductor £1.25
AT 4041/41 transducer £1
VHF 3 Transistor rotary tuner DX-TV £1
15K-20 turn pots 20p
Thorn panel 6×100 pot + changeover switch (Irish) 50p
Battery converter TA 75 for colour TV. 12/24v Thorn 3787 £6
Thorn 3500 2A cut out 50p
Stereo GEC amp 20 watt + pre-amp with 4 pots + mains power unit with circuit £6

SPECIAL OFFER
Decca-TTT etc:-
FEO4/1/250AC/4
Mains filters
(grey type) × 4
80p

BRIDGES
SKB 2/08 L5A 30p
KBL 005 30p
KBL 02 30p
KBP 04 30p
W02 15p
W004 15p
W005 20p
AT 2076/35 £7
AT 2076/55 GEC split diode transformer £10
AT 2048/11 LOPTI Mullard £2.50

HITACHI CPT2225 CHASSIS WITH TELETEX £30

10 Mixed TV & radio speakers £4
Philips car radio speaker door pair £7
2× Hi-Fi Philips car tune up tweeter EN8320 £10
ITT CVC45 8 way resistor unit for v/cap £3
4700/10v × 10 50p
68/16 × 10 50p
150/16 × 10 50p
47/25 × 10 50p
220/25 × 10 50p
1/250 × 10 50p
G8 Speaker £1
8000/30v 50p
470/40v × 10 £1
22/100v × 10 £1
100/350v 70p
400/350v 70p
.47/500v 25p
1/600v 25p
.022/1kv 10p
VIEW DATA PANELS NEW £3

VM6101
MULLARD TELETEX DECODER
With interface panel and data command panel
New £6 Post £2

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

GEC Hitachi
V/Cap tuner, after 1979 Series £8
6 Push Button Unit for GEC 2100 Series
Replacement for Touch Button Unit £8

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

20AX GEC Split Diode lead £1.00

MODEM
Line Terminal Unit
VM6501 £6
Designed to work at 1200/75 or 1200/1200. Diagram and Connection Data Supplies
Indicator Tube ITT 58705 £1
8 Seg Display FND500 20p
Mullarad 12.5V/170 Mc/s 45 watts BLW60C £4.00
Mullard Broadband R.F. power modules UHF. BGY22E £10.00
PT4236C, PT8706C, PT9783 £3
ITT Micro Phone M5 50p with switch
Sub-min Relay low voltage 50p
Mains relay coil 230v 30p
Philip PP3 batterys 10 for £3
12v battery holders A.A. 50p 1.5 battery
T/V 12v 2 pin battery lead 30p

Various Tools and Accessories
T/V V/Aerial 300Ω or 75Ω £1.50
L.C.D. clock display with alarm 75p
* D/P push mains switch 20p each
Mains lead & two pin socket for radio cassette 35p
3 Video Leads £1.00
Xcelitr cutter £3.90
T/V loop aerial 75p
Radio Telescopic Aerial £1.00
Philips Neon Lamps for TV sets 5p
Freeze £1.20
Foam Cleaner £1.20
Contact Cleaner £1.20
Cans of Anti Static, Degrease Cleaner and Anti Corona All at £1.20
Push Button Mains 75p
Lorlin Full Remote Relay Switch fit most T/V sets, mains 4 tag, 2 tag 12 volt £1.00
Mains timer. 13 amp — up to 2 hours: easy to use, plugs into socket £3.00
Sellotape PVC Electric Insulation 50mm × 20M 70p
Screen locking agent, large can £1.50
20 GEC Service Manuals £5.00
Red E.H.T. LAED and Anode Cap £1.00
10 × G11 Cap 470/250 £15.00
Weller solder iron 15 watt/25 watt £5.00
2 way baby alarm/intercom with long leads £5
Phillips universal battery tester/charger, fuse/bulb tester To Clear £4
12V Nicad pack. "AA" £2.50
Hitachi 7.2v/1.8A Nicad pack £6.00
Hitachi TP 007 Battery pack 7.2v/1.6A £7
Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V 60p
70ML Silicone Sealer (clear) £1
100 Coax Plugs £12.00
De-solder pump + 2 nozzels £5.20
Plastic box for i.c.s 6"×3"×½" 50p
Can of handy oil 'mobil' 40p
Flat Red LED 12p
500gm 60/40 solder reel £7
Clearweld glue pack 30p
Dual v/u meter -20 - +10db £1
K30 thermistor 232266298009 75p
GEC Mains Power Supply R.E.G. £3.00
1Kg reel of solder £8.00

75R/25 Watt 25p
18R/11 Watt 25p
Front End Music Center. VHF/MW/LW 13"×3½" £3
Output Stage for music center £5
SONY 1400KV Chroma Panel £6
SONY 1400KV Tuner unit £3.50
SONY 1400KV Touch button unit £3.50
12 Volt Mains Trans 500M/A £1.00
18V or 12 Volt Mains Trans 500M/A 75p
Texas Viewdata Decoder VDP 12/80 Issue 3 with all IC's £10.00

Quantity Reductions
BY204/4 25 for £1.00
BY206 25 for £1.00
W005 bridge 20 for £2
KT3 touch button black 6 for £1
G11 touch button red 6 for £1
K30 full remote Dawer Ass with 3 I.C. £7.00
K30 VHF. UHF Dawer Ass £6.00
BY298 3 amp/fast/R 20 for £1.50
BU126 10 for £6.00
BU205 10 for £8.00
BU105 10 for £6.00
2SC2122A 10 for £8.00
BF458 10 for £1.00
BD136 10 for £1.25
BF224 20 for £1.40
OA90 40 for £1.00
BYX10 100 for £4.00
KT3 multicaps 10 for £7.50
50 Ceramic Condensers £1.50
Mixed Mounting Kit for Power Transistors 50p
300 Condensers £1.50
300 Resistors £1.50
150 Electrolytics £2.00
15 Bulbs 40p
Antistatic Discloth 5 for £1
100 Diodes £1.50

Plastic Boxes 4¾ × 4 × 1 × ¾ 50p
100 Fuses £2.00
100 W/W Res. £1.50
BF 199 20 for £1
10 × 20 Turn 100k pots. Rank £2
Thorn 9 volt power supply regulated £3.00
BF 470 20 for £2
20 Slider Knobs 70p
6 Mixed UHF Aerial Isolating Sockets, some with long leads. Fit ITT, GEC, Philips, Pye £1.00

Mixed Packs
TO66 12 Power Trans RCA 16182 NPN Replacement for BD124 and Mounting Kits £1.00
50 Mixed AC series Transistor £4.50
15 Panel mount rocker switch 250V/10A £1.50
25 Panel Mount Bulbs & Neons £1.50
10A £1.50
25 LED red/yellow/green £1.50
20/C Holders £1.20
20 Large LED Red £1.00
20 Small LED Red £1.00
10×20 Turn 100K Pots £1.00
100 Transistor £2.50
20 Convergence Pots 80p
10 Thermistors 50p
20 Slider Pots £1.00
30 Presets 50p
15 VDR + thermistors, degaussing, HT, etc. £1.00
40 glass reed switch £1
10 press to make switch 70p
40 Pots £1.50
5 Tube Bases £1.00
1,000 Diodes, Condensers, Resistors on Bandolier £2.00
Lucky Dip 600 gram £1.00
Jungle Bag 5Kg £5.00
20 Knobs £1.00
20mm Fuse Holders
Chassis Mount 20 for £1
1N4001/6 100 mixed £2.50
EHT Diodes, small 20 for £1
20 Mixed Switches £1

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE