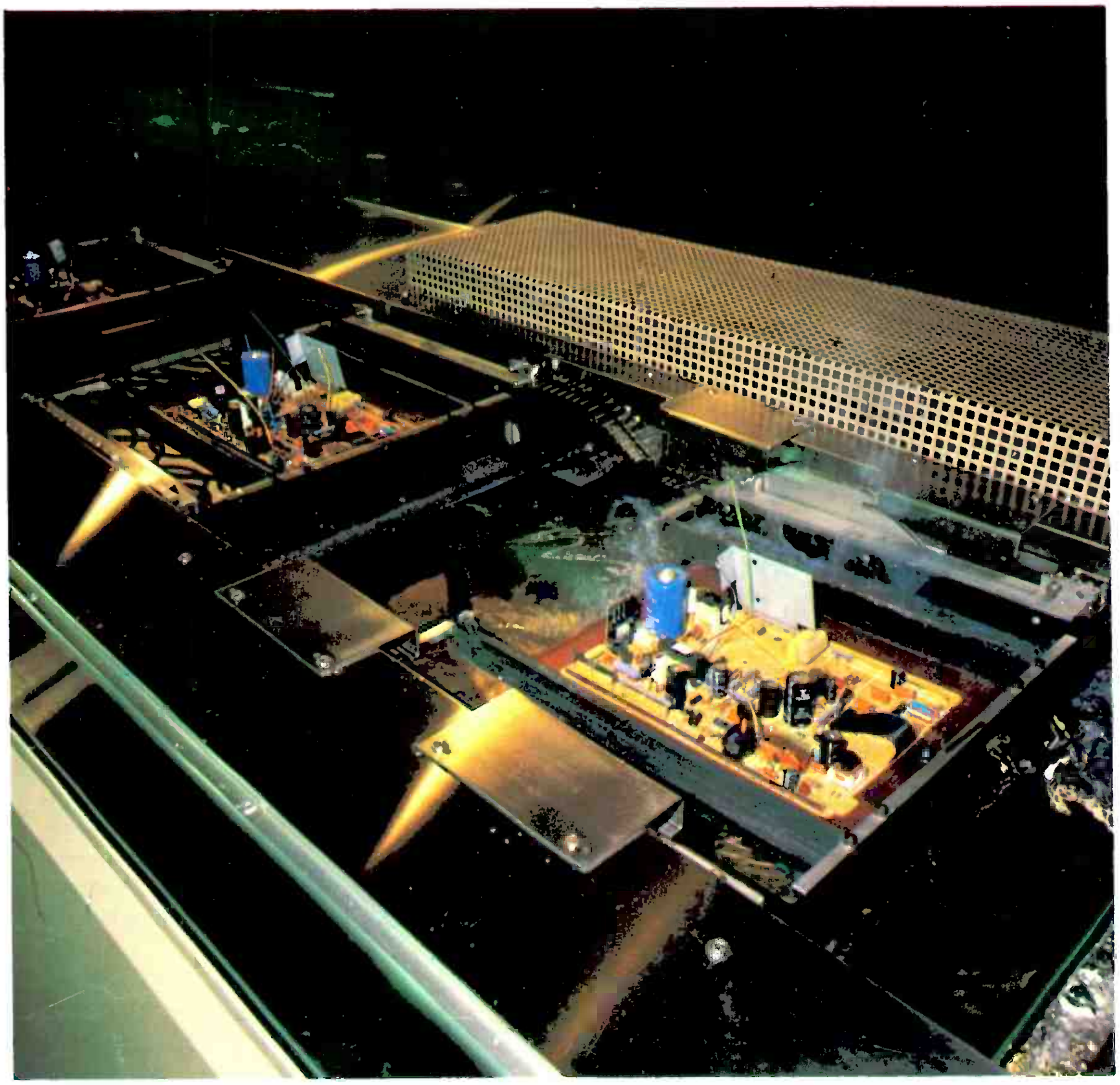
DECEMBER 1982 Australia $1.74; New Zealand $2.00; Malaysia $5.50; I.R. £1.19 (inc. VAT) 80p

TELEVISION

SERVICING·VIDEO·CONSTRUCTION·DEVELOPMENTS



SOME RECENT TV CHASSIS FAULTS

A VINTAGE TV RENOVATION

TEST AND FAULT REPORTS

QUICK CHECKS-PYE 725 SERIES

MILLER ON WORKSHOPS

Interested in Television Servicing?

Try a ZED Pack. Effect Repairs at Minimum Cost.

Z1	300 mixed $\frac{1}{4}$ and $\frac{1}{2}$ watt and miniature resistors	£1.95
Z2	150 mixed 1 and 2 watt resistors	£1.95
Z3	300 mixed capacitors, most types amazing value	£3.95
Z4	100 mixed electrolytics	£2.20
Z5	100 mixed Polystyrene Capacitors	£2.20
Z6	300 mixed Printed Circuit Components	£1.95
Z7	300 mixed Printed Circuit resistors	£1.45
Z8	100 mixed High Wattage Resistors, wirewounds etc.	£2.95
Z9	100 mixed Miniature Ceramic and Plate caps	£1.50
Z10	25 Assorted Potentiometers	£1.50
Z11	25 Assorted Presets, Skeleton etc.	£1.00
Z12	20 Assorted VDR's and Thermistors	£1.20
Z13	1 lb Mixed Hardware, Nuts, Bolts, Selftappers, "P" clips etc.	£1.20
Z14	100 mixed New and marked transistors, all full spec. includes: PBC108, BC148, BF154, BF274, BC212L, BC238, BC184L and/or Lots of similar types	ONLY £4.95
(Z14A)	200 Transistors as above but including power types like BD131, 2N3055, AC128, BFY50 etc.	£9.95
Z15	100 Mixed Diodes including: Zener, Power, Bridge, Signal, Germanium, Silicon etc. All full spec.	£4.95
Z16	20 IN4148 Gen Purpose Diodes	£1.00
Z17	20 IN4003/10D2	£1.00
Z18	20 Assorted Zeners. 1 watt and 400 mw	£1.50
Z20	10 Assorted switches including: Pushbutton, Slide, Multipole, Miniature etc. Fantastic Value	£1.20
Z21	100 Assorted Silver Mica caps	£2.20
Z22	10 Mixed TV convergence Pots	£1.00
Z23	20 Assorted TV Knobs including: Push Button, Aluminium and Control types	£1.20
Z24	10 Assorted Valve bases B9A, EHT, etc.	£1.00
Z25	10 Spark Gaps	£1.00
Z26	20 Assorted Sync Diode Blocks	£1.00
Z27	12 Assorted IC Sockets	£1.00
Z28	20 General Purpose Germanium Diodes	£1.00
Z29	20 Assorted Miniature Tantalum Capacitors. Superb Buy at	£1.20
Z30	40 Miniature Terry clips, ideal for small Tools etc.	£1.00
Z31	5 CTV Tube Bases	£1.00
Z32	10 EY87/DY87 EHT bases	£1.00
Z33	20×PP3 Battery Connectors	£1.00
Z34	6×Miniature "Press to Make" Switches, Red Knob	£1.00
Z35	12 Sub Min S.P.C.O. Slide Switches	£1.00
Z36	12 Min D.P.C.O. Slide Switches	£1.00
Z37	8 Standard 2 Pole 3 Pos Switches	£1.00
Z38	4×HP11 Batt Holders (2×2 Flat type)	4 for £1.00
Z39	3.5mm Jack Sockets, switched, enclosed Type	8 for £1.00
Z40	100 Miniature Reed Switches	£2.30
Z41	100 Subminiature Reed Switches	£4.20
Z42	20 Miniature Reed Switches	£1.00
Z43	12 Subminiature Reed Switches	£1.00
Z44	TO3 Mounting kits (BU208)	8 for 60p
Z45	TO220 Mounting kits (TIP33)	10 for 60p
Z46	TO126 Mounting kits (BD131)	12 for 60p
Z47	Pack of each Mounting kit. All include insulators and washers	£1.50
Z48	3a 1000v Diodes (IN5408 type)	8 for £1.00
Z49	Brushed Aluminium Push Button Knobs, 15mm long × 11mm Diam. Fit standard $3\frac{1}{2}$mm square shafts	10 for £1.00
Z50	Chrome finish 10mm × 10mm Diam as above	10 for £1.00
Z51	Aluminium Finish. Standard Fitting Slider Knobs. (Decca)	10 for £1.00
Z52	Decca "Bradford" Control Knobs Black and Chrome. $\frac{1}{4}$" Shaft	8 for £1.00
Z53	Tuner P/B Knobs, Black and Chrome. Fit most small Diam Shafts, ITT, THORN, GEC etc.	8 for £1.00
Z54	Spun Aluminium Control Knobs (ITT) $\frac{1}{4}$" Shaft, suitable for most sets with recessed spindles	8 for £1.00
Z55	14 Pin DIL I.C. Sockets	12 for £1.00
Z56	16 Pin Quil I.C. Sockets	12 for £1.00
Z57	16 Pin DIL TO QUIL I.C. Sockets	10 for £1.00
Z58	22 Pin DIL I.C. Sockets	10 for £1.00
Z59	B9A Valve Bases P.C. Type	20 for £1.00
Z60	0.47Ω $\frac{1}{2}$ Watt Emitter Resistors	40 for £1.00

V.C.R. BATTERY PACKS.

HITACHI PORTABLE V.C.R. Nicad pack. Type VTBP60E **£20 each.** Brand New and Boxed **3 for £50**

THORN "VIDEOSTAR" 3V25/26 Nicad pack. Type VA214. Also suitable for J.V.C. etc. **£20 each.**

These are untested units which contain **10× "C" size (HP11) Nicads,** which alone would cost in excess of **£20.** A Real Bargain at **£10 each 3 for £25**

SPECIAL OFFER

Etch Kit with Instructions, 150 sq ins Paxolin Board, 1 Nylon Etch Resist Tray, Set of 3 Etch Pens, Tweezers, Abrasive Cleaner, Thermometer, 1lb Ferric Chloride. **ONLY £5.95.**

ELECTROLYTIC

1µf 63v	20 for £1.00
1µf 350v	10 for £1.00
2.2µf 63v	20 for £1.00
4µf 350v*	10 for £1.00
22µf 16v	20 for £1.00
100µf 25v	20 for £1.20
160µf 25v*	20 for £1.50
330µf 25v	10 for £1.00
400µf 40v*	8 for £1.00
470µf 25v	10 for £1.00
470µf 35v	8 for £1.00
1000µf 16v	10 for £1.00
1000µf 25v*	8 for £1.00
1000µf 35v	6 for £1.00

*Axial. All others are Radial.

CAN TYPES

100+200 350v	£1.00
2000µf 100v	£1.00
1000µf 100v	60p
2,200µf 40v	60p
2,200µf 63v	70p
3,500µf 35v	50p
4,500µf 35v	60p
220µf 400v ITT/RBM	£1.00

EHT DIODES

Very small. 20kV 2.5ma. 30ma peak **50p ea. 3 for £1.00**

R.B.M. USERS LOOK!

No more messy soldering. 24 pin I.C. sockets for **SL901** etc.
SPECIAL OFFER: 5 for £1.00
100 for £12.50.

SPECIAL OFFERS

100 Assorted Polyester Capacitors. Mullard C296's and others 160v-400v only	£2.00
100 Assorted Mullard C280's Cosmetic imperfects etc.	£2.00
200 Mullard Miniature Electrolytics Cosmetic imperfects etc.	£2.00
PACK OF EACH	£5.00

TRANSISTORS

BC154, BC149, BC157, BF195, PBC108, BF393S 2N3702, BC148B, BC159, ZTX107, ME8001, BC651, BF324

12 of one type	£1.00
Any 6 packs of 12	£5
2N3055H	60p each
BD181	50p each
BD131	4 for £1.00
BD132	4 for £1.00

ZENER DIODES

0v7, 2v7, 4v3, 4v7, 5v6, 6v2, 6v8, 7v5, 27v, 30v. ALL 400mw.

10 of one value	80p
10 of each	£6.60

1.3 watt, 12v, 13v, 18v

10 of one value	£1.00
10 of each	£2.50

DIODES

25 × IN4002	£1
	100 for £2.50
20 × IN4003	£1.00
	100 for £3.00
20 × IN4005	£1.50
	100 for £5.00
20 × IN4148	£1.00
	100 for £2.50
25 × IN4002	£1.00
10 × SKE 4F2/06 (600v 2a fast switching)	£1.00
12 × BY127	£1.00
8 × BY255 (3A 1000V)	£1
10 × BA158 (600v 400ma)	£1.00
IN5402 3a 200v	8 for £1.00
6A. 100V. Bridge Recifier. Very small.	80p ea. 3 for £2.00

I.C.'s

CA270AE £1.00	6 for £5.00
MC1327P £1.00	6 for £5.00
TBA810P £1.00	6 for £5.00
555 Timer 30p	4 for £1.00
TAA 661B £1.00	6 for £5.00
SN76660N 50p	5 for £2.00

LEDS

TIL209 3mm Red	12 for £1.00
5mm Red	10 for £1.00
Infra Red. LED Transmitter. Til 38. Hi-Power.	50p each. 3 for £1.00

THEY'RE BACK

We can now again offer our special **TV BARGAIN PARCELS.** These contain all manner of useful bits and pieces. Components, semiconductors, videogame boards etc, which we have accumulated over the past year and must clear as we need the space.

1kg £3.95
5kg £9.95 **10kg £14.95**

THORN SPARES

"3500" Transductor	£1.20, 3 for £3.00
"3500" Focus Assembly with VDR	£1.50
"8500" Focus Assembly. Rotary type	£1.50, 3 for £4.00
"8500" .0022 2000v Line Capacitor	10 for £1.00
"1590/91" Portable metal boost Diode (W11)	5 for £1.00
"1500" Bias Caps 160µf 25v	20 for £1.50
"1500" Jellypot. L.O.P.T. Pinkspot	£3.50
"900/950" 3 stick triplers	£1.00, 3 for £2.50
"1600" Dropper 18 + 320 + 70 + 39Ω	3 for £1.50
"950" Can. 100 + 300 + 100 + 16µf	£1.00

MISCELLANEOUS

BG100 tripler for CVC45 etc.	only £3.50
Line output transformer for RBM 823A	£4.25 each, 3 for £10.00
ITT VC200 4P/B Transistor Tuner. Suitable for some Pye and Philips sets. 3 hole fixing	£2.75 each
Decca Bradford Tuners. 5 button type	£3.00 each, 5 for £12.50
UHF Modulator UHF out Video in. Ch. 36. $2\frac{1}{2}$" × 2" × $\frac{1}{2}$" complete with 9 foot coaxial lead and plug. With connection data	£3.00 each, 2 for £5.00
GEC Hybrid 2040 series Focus Assembly with lead and VDR rod	£2.00 each, 3 for £5.00
Convergence Panel for above. Brand new leads and plug.	£3.00 each
GEC 2010 Transistor Rotary Tuner with AE. SKT. and leads	£1.95 each, 3 for £5.00
Bush CTV 25 Quadrupler type Q25B equivalent to ITT TU25 3QK	£3.00 each, 2 for £5.00
PYE 697 Line and power Panel, damaged with some components missing but ideal for spares	£2.20 each, 3 for £6.00
Grundig UHF/VHF Varicap Tuner for 1500 GB, 3010 GB	£12.50 each, 3 for £30.00
EHT Lead with Anode cap (CTV) suitable for split Diodes sets 1m long	60p each, 3 for £1.50
EHT Cable	30p per metre, 10 metres £2.50
Anti Corona Caps	3 for £1.00
4.433 Mhz CTV Crystals	£1.00 each, 3 for £2.50
Cassette Mains Leads. 7ft with fig 8 plug	60p each, 3 for £1.50
6 MHZ sound filters, ceramic 3 pin "TAIYO" type	50p each, 3 for £1.00
10.7 MHz Ceramic Filters "Vernitron" FM4	50p each, 3 for £1.00
PYE CT200 Control Knobs	8 for £1.00
High quality Metal Coax Plug. Grub screw fixing	5 for £1.00, 100 for £12.50
Cassette/Calc Leads. 2m long, figure 8 skt. to flat pin. American plug	60p each, 3 for £1.50
3.5mm Jack Plug on 2m of screened lead	5 for £1.00
Mains Neons	10 for £1.00
2k2 Screenfeed Resistors. White ceramic, 9 watt, with fusible link.	
Phillips G8 Transductor.	8 for £1.00
E.H.T. Discharge probe, with heavily insulated handle, with lead and chassis connector.	£1.20 each. 3 for £3.00
	60p each. 3 for £1.50

THYRISTOR

SS106 (BT106) **65p each**
3 for **£1.50**, 10 for **£4.50**

CONVERGENCE POTS

5Ω, 10Ω, 20Ω, 30Ω, 50Ω, 100Ω, 200Ω, 1K. **8 of one type £1.00. 8 of each type £6.00.**

GEMINI ELECTRONIC COMPONENTS

Dept. TV, The Warehouse, Speedwell Street, London S.E.8.

Please quote ZED code where shown. Send cheque* or Postal Order. Add 60p P&P and 15% VAT.

***Schools etc. SEND OFFICIAL ORDER. Allow up to 28 days for delivery. Most orders despatched same day.**

ZED PACKS now available for CALLERS at 50 Deptford Broadway, London, S.E.8.

Send Large S.A.E. for list of Quantity, Prices and Clearance Lines etc.

TELEVISION

December 1982

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Issue 386

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., Lavington House, 25 Lavington Street, London SE1 0PF.

SUBSCRIPTIONS
An annual subscription costs £10 in the UK, £11 overseas ($24.20 Canada or USA). Send orders with payment to IPC Services, Oakfield House, Perrymount Road, Haywards Heath, Sussex.

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Binders (£4.50) and Indexes (45p) can be supplied by the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF. Prices include postage and VAT. In the case of overseas orders, add 60p.

BACK NUMBERS
Some back issues are available from the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF at 85p 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 in 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").

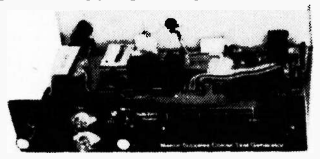
this month

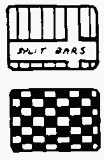
OUR NEXT ISSUE DATED JANUARY WILL BE PUBLISHED ON DECEMBER 15

MANOR SUPPLIES

NEW MKV CHEQUERBOARD & PAL COLOUR TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE





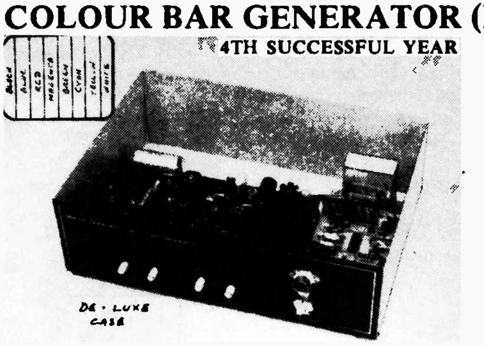
- ★ 40 different patterns and variations.
- ★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- ★ 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. 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	**£80.50**
Standard Case (10½″×6½″×2¼″)	**£5.50**
De Luxe Case (10″×6″×2¼″)	**£8.50**
Optional Sound Module (6MHz or 5.5MHz)	**£4.50**
Built & Tested in De Luxe Case including Sound Module	**£115.00**

Post/Packing £2.00.
All above prices include VAT 15%

PAL COLOUR BAR GENERATOR (Mk 4)

4TH SUCCESSFUL YEAR



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

PRICE OF MK4 COLOUR BAR & CROSS HATCH KIT £40.25 P&P £1.20. DE-LUXE CASE £8.50. ALUMINIUM CASE £3.30, P&P £1.20, BATT HOLDERS £1.70 P&P 85p, ALTERNATIVE STAB. MAINS SUPPLY KIT £5.55 (Combined P&P £1.80).

MK 4 DE LUXE (BATTERY) BUILT & TESTED £66.70 + £1.80 P & P.
MK 4 DE LUXE (MAINS) BUILT & TESTED £80.50 + £1.80 P & P.
VHF MODULATOR (CH1 to 4) FOR OVERSEAS £4.60.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

(ALL PRICES INCLUDE 15% VAT)

MANOR SUPPLIES TELETEXT ADAPTOR KITS

MK 1 (Texas XMII) Cable remote control **£170.20** p.p. £2.80
MK 2 (Philips/Mullard) Infra-red remote control **£227.70** p.p. £2.80.
Further details on request.

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

TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

SPECIAL OFFER THORN 8000A, 8500 Power & Sound Panels (new and boxed) **£5.75** p.p. £1.25.

TELEVISION MAGAZINE PROJECT PARTS
NEW COLOUR PORTABLE TV
TV PATTERN GENERATOR — SMALL SCREEN MONITOR
MONO PORTABLE TV — LARGE SCREEN COLOUR TV
PHONE, CALL, OR SEND FOR LISTS
WORKING MODELS & PANEL TEST SERVICE AT
172 WEST END LANE.

SPECIAL OFFER Leading makers Tuner-Timer in De Luxe Case. 12 station touch tune UHF-VHF + IF amp. Video Audio Outputs, Digital Clock etc. Less than half original trade price **£74.75** p-p £3.50.
TV SOUND IF PANELS, FULLY TESTED **£7.82** p.p. £1.00.
SAW FILTER IF AMPLIFIER PLUS TUNER COMPLETE AND tested for T.V. SOUND & VISION **£32.80** p.p. £1.20 (SUITABLE FOR USE WITH TELEVISION SIGNAL BOARDS).
SPECIAL OFFER TEXAS XMII TELETEXT MODULE NEW & TESTED, AT REDUCED PRICE **£57.50** p.p. £1.60.
TELETEXT 23 BUTTON DE-LUXE HANDSET WITH 5 YDS. CABLE **£7.80** p.p. £1.20. XMII INTERFACE PANEL (THORN) **£2.10** p.p. 75p.
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 **£12.65** p.p. 60p. (ALUM CASE **£2.60** DE LUXE CASE **£5.50** p.p. £1.20.)
ADDITIONAL GREY SCALE KIT **£3.35** p.p. 45p.
UHF SIGNAL STRENGTH METER KIT £21.60 (VHF version also available). ALUM CASE **£2.00** DE LUXE CASE **£8.50** p.p. £1.80.
CRT TESTER & REACTIVATOR PROJECT KIT FOR COLOUR & MONO **£29.40** p.p. £2.00.
BUSH Z718 BC6100 SERIES IF PANEL **£5.75** p.p. 90p.
BUSH A816 IF PANEL (SURPLUS) **£1.90** p.p. 90p.
DECCA "Bradford" IF T.B. POWER ex rental **£5.75 each** p.p. £1.40.
DECCA 80, 100 SERIES, IF, FRAME T.B. **£5.75 each** p.p. £1.40.
GEC SERIES I MONO PANELS **£2.10** p.p. £1.30.
GEC 2110 Decoder, RGB panels (ex rental) **£5.75 each** p.p. £1.00.
GEC 2040 DECODER PANEL **£2.88** p.p. £1.60.
GEC 2040 IF PANEL **£3.22** p.p. £1.40.
GEC 2040 (SERIES) CDA PANEL **£2.88** p.p. £1.40.
THORN TX9 PANELS ex factory for small spares. Includes I.C.s & Semiconductors etc. **£5.75** p.p. £2.00
THORN 3000 LINE T.B., POWER PCB **£5.75 each** p.p. £1.30.
THORN 3000 CONVERGENCE PANEL **£5.75** p.p. £1.80.
THORN 3000 VID, IF, DEC, Ex Rental **£3.70 each** p.p. £1.30.
THORN 8800 Varicap channel selector & front control unit **£4.37** p.p. £1.80.
THORN 8000/8500 IF/DECODER PANELS salvaged **£3.70** p.p. £1.80.
THORN 8000/8500 FRAME T.B. PANELS salvaged **£2.88** p.p. £1.40.
THORN 9000 LINE T.B. (incl. Lopt etc.), Salv., spares **£8.62** p.p. £2.00.
THORN 9000 SERIES TOUCH TUNE REMOTE CONTROL UNIT PLUS ULTRASONIC TRANSMITTER HANDSET **£19.32** p.p. £1.84.
THORN 9000 IF/DECODER PANELS Salvaged **£5.75** p.p. £1.60.
PHILIPS 210, 300 Series Frame T.B. Panels **£1.15** p.p. 80p.
PHILIPS G8/G9 IF/DECODER Panels for small spares **£2.88** p.p. £1.40.
G8 IF Panels for small spares **£1.75** p.p. 95p.
G8 Decoder panels salvaged **£4.25.** Decoder panels for spares **£2.00** p.p. £1.40.
VARICAP, U321, U322, ELC 1043/06 ELC 1043/05 **£7.82** p.p. 80p; G.I. type (equiv. 1043/05) **£4.00** p.p. 60p. Control units, 3PSN **£1.40,** 4PSN **£1.75,** 5PSN **£2.00,** 6PSN **£4.00** p.p. 60p. Makers special types available.
SPECIAL OFFER ELEVEN POSITION VARICAP CONTROL UNIT UHF/VHF **£2.10** p.p. £1.00.
BUSH "Touch Tune" Varicap Control Z179, Z718 types **£4.40** p.p. 95p.
VARICAP UHF-VHF ELC 2000S **£9.80.** BUSH TYPE **£7.82** p.p. 85p.
VARICAP VHF MULLARD ELC 1042 **£7.95** p.p. 80p.
UHF/625 Tuners, many different types in stock. **UHF** tuners transisted. incl. s/m drive, Mullard 4 position push button **£4.80** p.p. £1.50.
LOPTS NEW & GUAR. P/P Mono **£1.35p,** Colour **£1.45p,** Bobbins **80p.**

BUSH 161 to 186S	**£6.80**	**R.B.M.** A823	**£5.60**
BUSH, MURPHY 774 series	**£9.80**	**R.B.M.** Z179	**£6.70**
BUSH, MURPHY A816 series	**£9.80**	**R.B.M.** T20, T22	**£11.30**
DECCA 20/24, 1700, 2000, 2401	**£8.80**	**R.B.M.** T20, T22 Bobbin	**£6.44**
FERG., HMV, MARCONI, ULTRA 950 to 1580	**£6.80**	**DECCA** Bradford (state Mod No.)	**£10.15**
THORN 1600, 1615, 1690, 1691	**£10.50**	**DECCA** 80, 100	**£10.15**
GEC 2000 to 2038 series	**£7.80**	**GEC** 2028	**£5.60**
GEC series 1 & 2	**£9.20**	**GEC** 2040	**£6.70**
INDESIT 20/24EGB	**£8.80**	**GEC** 2110 Series	**£12.20**
ITT/KB VC1 200, 300	**£8.80**	**ITT** CVC 5 to 9	**£11.30**
MURPHY 1910 to 2414 series	**£6.80**	**ITT** CVC 20	**£11.30**
PHILIPS 19TG 170, 210, 300	**£8.80**	**ITT** CVC25, CVC30 series	**£10.15**
PYE, INVICTA, EKCO, FERR. 368, 169, 569, 769 series	**£8.80**	**PYE** 691-697	**£14.80**
SPECIAL OFFER		**PYE** 713, 715, 731 to 741	**£7.85**
GEC 2114J/Junior Fineline	**£3.25**	**PYE** 725 (90°)	**£10.60**
PYE 40, 67	**£2.00**	**PHILIPS** G8, G9	**£10.15**
THORN 1590/1591	**£5.50**	**PHILIPS** 570	**£7.85**
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AN240	3.84
AN214Q	3.91
AN7150	3.97
CA555	46
CA741	25
CA748	45
CA3065	1.80
LA4031P	3.21
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1303N	2.63
HA1151	3.89
MC1307	1.00
MC1310P	1.60
MC1327	1.70
MC1351P	1.50
MC1330P	90
MC1349	1.20
MC1350	96
MC1352	1.00
MC1358P	1.50
MC1495L	3.00
MC14011BCP	42
MC14049UB	43
ML231/ETTR6016	2.20
ML232	2.20
ML236	5.35
ML237	1.95
ML238	4.20
ML239	2.50
ML920	4.12
ML922	3.29
ML926	2.18
ML928	2.18
MRF475	2.50
MRF477	10.00
MSN5807	7.87
PLL02AG	9.89
MS1513L	2.80
MS1515L	3.28
SAS560S	1.80
SAS570S	1.80
SAS580	2.90
SAS590	2.90
SL901B	4.45
SL917B	6.25
SL1310	1.80
SL1327Q	1.20
SL76544	2.05
SN76003N	1.75
=SN76013N	
SN76013ND	1.65
SN76023N	1.65
SN76110N	89
SN76115N	2.27
SN76131N	1.30
SN76226(DN)	1.55
SN76227N	1.18
SN76532N	1.50
SN76533N	1.38
SN76033N	1.65
SN76544N	1.35
SN76650N	1.05
SN76660N	80
SN76666N	80
SW153	2.74
TA7050P	95
TA7051P	95
TA7074P	1.00
TA7108P	3.43
TA7120P	2.43
TA7130P	1.93
TA7141P	95
TA7193P	5.67
TA7171P	1.85
TA7172P	1.85
TA7173P	1.85
TA7176P	2.50
TA7193P	5.67
TA7204P	3.77
TA7205AP	3.72
TA7222	1.80
TA7310P	2.78
TA7609P	4.39
TAA300	58
TAA310	2.83
TAA320	2.00
TAA350A	60
TAA550	28
TAA570	1.80
TAA630	3.15
TAA621-AX1	3.00
TAA840/S1	1.96
TAA700B	1.70
TAA700	1.70
TAA661B	1.20
TBA120A	70
TBA120S	70
TBA120SA	70
TBA120AS	70
TBA120B	1.30
TBA120SB	1.30
TBA120U	1.00
TBA395	2.20
TBA396	80
TBA440N (TBA1441)	2.75
TBA440P	2.50
TBA480(Q)	1.20
TBA510	3.00
TBA520Q	1.20
TBA530(Q)	1.28
TBA540	1.49
TBA550(Q)	1.58
TBA560Q	1.59
TBA570	1.00
TBA690	1.50
TBA641BX1	3.50
TBA673	2.45
TBA700	2.12
TBA720A	2.45
TBA720Q	2.12
TBA750	2.05
TBA800	99
TBA810AS	1.35
TBA820	1.70
TBA890	3.94
TBA920(Q)	1.80
TBA950(2X)	2.40
TBA970	4.09
TBA990	1.49
TBA1441	2.75
TCA160	1.20
TCA760	2.30
TCA270SQ	1.25
TCA800	2.15
TCA940	1.65
TDA440	2.20
TDA1002	1.95
TDA1003A	5.50
TDA1004A	2.95
TDA1006A	2.50
TDA1035	4.70
TDA1044	4.37
TDA1170	1.99
TDA1190	2.60
TDA1200	2.95
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	1.20
TDA2002	2.50
TDA2140	5.95
TDA2190	4.70
TDA2020	4.66
TDA2030	2.80
TDA2521	4.17
TDA2522	2.40
TDA2523	2.20
TDA2530	2.70
TDA2532	2.45
TDA2524	2.25
TDA2540	3.84
TDA2541	2.65
TDA2560	2.15
TDA2581	2.25
TDA2590	3.25
TDA2591	2.95
TDA2593	2.95
TDA2600	3.25
TDA2611A	1.95
TDA2640	2.60
TDA2680	3.15
TDA2690	1.35
TDA3560	6.00
TDA3561	6.00
TDA3950	2.50
TDA3960	2.95
UPC566H	2.95
UPC575C2	3.40
UPC1025H	2.95
UPC1182H	2.95
UPC1156H	4.26
UPC1350C	4.15
UPC1185H	3.86

VOLTAGE REG. I.C.

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

T.T.L. 74LS SERIES

74LS00	19	74LS37	19	74LS92	35	74LS160	60	74LS251	54
74LS02	19	74LS38	20	74LS93	35	74LS161	60	74LS253	1.00
74LS03	19	74LS40	20	74LS107	46	74LS162	85	74LS257	53
74LS04	20	74LS42	36	74LS109	27	74LS163	60	74LS258	67
74LS05	19	74LS47	80	74LS112	27	74LS164	65	74LS259	74
74LS08	19	74LS48	80	74LS113	27	74LS165	65	74LS273	80
74LS09	19	74LS49	80	74LS114	27	74LS174	57	74LS283	50
74LS10	19	74LS51	19	74LS123	52	74LS175	47	74LS293	70
74LS11	19	74LS54	19	74LS125	46	74LS191	66	74LS352	1.54
74LS13	37	74LS55	19	74LS126	46	74LS192	65	74LS353	1.10
74LS14	46	74LS73	28	74LS132	46	74LS193	66	74LS365	36
74LS15	19	74LS74	26	74LS138	48	74LS194A	69	74LS366	36
74LS20	19	74LS75	46	74LS139	48	74LS197	80	74LS367	36
74LS21	19	74LS76	22	74LS151	44	74LS240	80	74LS368	36
74LS22	19	74LS78	22	74LS153	44	74LS241	80	74LS373	99
74LS26	19	74LS83A	60	74LS155	44	74LS242	76	74LS374	99
74LS27	19	74LS86	26	74LS156	44	74LS243	76	74LS393	80
74LS30	19	74LS85	62	74LS157	44	74LS244	80	74LS670	1.20
74LS32	20	74LS90	35	74LS158	44	74LS245	1.18		

'4000 B' SERIES CMOS

4001B	21	4027B	39	4069B	22	4511B	76	4539B	77
4002B	21	4028B	64	4070B	22	4512B	72	4541B	96
4008B	72	4029B	90	4071B	22	4513B	1.68	4543B	1.12
4011B	21	4032B	1.04	4072B	22	4514B	1.88	4551B	96
4012B	21	4035B	80	4073B	22	4515B	1.88	4553B	2.40
4013B	30	4038B	99	4075B	22	4516B	76	4554B	1.20
4014B	74	4040B	72	4076B	80	4518B	76	4556B	48
4015B	76	4042B	58	4077B	22	4519B	64	4560B	1.76
4016B	31	4043B	71	4078B	22	4520B	76	4561B	74
4017B	66	4044B	71	4081B	22	4521B	1.68	4566B	1.20
4018B	72	4046B	96	4093B	43	4522B	88	4580B	3.60
4020B	76	4047B	70	4094B	1.56	4526B	88	4581B	1.84
4021B	70	4049UB	32	4099B	1.20	4527B	1.20	4582B	80
4022B	70	4050B	32	4160B	72	4528B	88	4583B	1.00
4023B	21	4051B	72	4161B	72	4529B	1.04	4584B	40
4024B	50	4052B	72	4162B	72	4530B	62	4585B	88
4025B	21	4053B	72	4163B	72	4531B	72	4597B	1.84
		4060B	96	4502B	72	4532B	1.00	4598B	2.40
		4066B	43	4505B	1.88	4536B	2.64	4599B	2.00
		4068B	22	4510B	76	4538B	1.04		

SEMICONDUCTORS

AC107	35
AC126	22
AC127	22
AC128	20
AC128K	32
AC141K	34
AC142K	30
AC176	25
AC176K	32
AC186	41
AC187	26
AC187K	28
AC188	25
AC188K	37
AD143	82
AD149	79
AD161	42
AD161/2	1.15
AD162	42
AF106	49
AF114	89
AF118	62
AF121	56
AF124	34
AF125	35
AF126	34
AF127	32
AF139	42
AF178	1.54
AF239	45
AF279	97
AL102	2.00
AU106	2.50
AU107	2.00
AU110	2.00
AU113	1.40
BC107	20
BC107A	20
BC107B	20
BC108	20
BC108A	20
BC108B	20
BC108C	20
BC109	20
BC109B	20
BC109C	20
BC114	12
BC115	17
BC116A	12
BC117	20
BC118	24
BC119	36
BC139	26
BC140	32
BC141	26
BC142	21
BC143	24
BC147	9
BC148	9
BC149	10
BC157	11
BC158	10
BC159	10
BC160	25
BC161	28
BC170B	15
BC171	9
BC171A	10
BC171B	10
BC172	9
BC172B	10
BC172C	10
BC173C	12
BC174A/B	10
BC177	27
BC178	26
BC182	9
BC182LB	10
BC183LB	10
BC184L/B/C	10
BC204	10
BC208	13
BC209	10
BC212	9
BC212L	9
BC213	9
BC213B	10
BC213L	9
BC214	9
BC214L	10
BC237B	12
BC238A/B/C	8
BC251A	12
BC252A	12
BC252B	12
BC261A	18
BC261B	15
BC262A	15
BC262B	15
BC300	33
BC301	28
BC303	28
BC307	10
BC308A/B	17
BC327	11
BC328	9
BC337	11
BC338	9
BC461	30
BC547	10
BC548	10
BC549	8
BC550	7
BC557	8
BC558	9
BCX34	27
BCY72	13
BD115	32
BD116A	65
BD124P	60
BD131	33
BD132	35
BD133	40
BD135	26
BD136	27
BD137	26
BD138	23
BD139	28
BD140	31
BD144	1.20
BD159	65
BD160	1.30
BD166	52
BD179	52
BD182	72
BD183	75
BD201	85
BD202	80
BD203	80
BD204	84
BD222	46
BD223	56
BD225	47
BD232	45
BD233	35
BD234	37
BD235	33
BD236	40
BD237	33
BD238	35
BD410	55
BD434	55
BD437	86
BD438	94
BD507	52
BD508	55
BD509	56
BD510	60
BD517	60
BD520	75
BD526	62
BD696A	1.49
BD707	95
BDX32	1.50
BF115	35
BF117	36
BF125	28
BF127	26
BF154	12
BF158	18
BF160	27
BF167	24
BF173	22
BF177	35
BF178	26
BF179	28
BF180	36
BF181	36
BF182	30
BF183	29
BF184	30
BF185	30
BF194/394	11
BF195	11
BF196	10
BF197	11
BF198	18
BF199	15
BF200	30
BF224	18
BF225	20
BF241	15
BF256LC	28
BF256	28
BF257	28
BF258	25
BF259	24
BF262	84
BF263	50
BF271	24
BF273	12
BF274	24
BF310	30
BF311	30
BF336	36
BF337	30
BF338	34
BF355	37
BF362	37
BF363	33
BF371	30
BF457	35
BF458	28
BF459	35
BFR39	27
BFR90	1.74
BFT42	28
BFT43	28
BFW10	60
BFX29	30
BFX84	27
BFX85	28
BFX86	30
BFX88	25
BFY50	20
BFY51	22
BFY52	20
BFY90	75
BR100	17
BR101	30
BR103	59
BRC4443	80
BRX46	40
BRY39	30
BRY56	57
BT100/02	92
BT101	1.20
BT102/500R	1.20
BT106	1.00
BT107	1.69
BT108	1.69
BT116	1.21
BT119	3.66
BT120	3.66
BT151/800R	1.20
BU104	2.00
BU105	1.25
BU108	1.80
BU124	1.30
BU126	1.49
BU204	1.50
BU205	1.34
BU206	1.80
BU208	1.60
BU208A	1.65
BU208/02	2.10
BU326A	1.42
BU407	1.25
BU500	1.95
BU526	2.46
BU807	2.94
BUW81A	3.84
E1222	28
MJE340	40
MJ3000	1.98
OT112	1.91
OT121	1.91
SW150	3.90
SW153A	2.74
BU105/02	1.58
OC71	27
OC79	20
R2008B	1.80
R2010B	1.80
R2265	1.40
R2322	58
R2323	67
R2461	1.50
R2540	2.80
RCA16334	90
RCA16335	80
TIP29C	43
TIP30A	47
TIP30C	43
TIP31C	55
TIP32C	42
TIP33B	75
TIP41C	46
TIP42C	47
TIP47	70
TIP120	65
TIP2955	90
TIP3055	63
TIS91	21
TV106/02	1.55
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3054	60
2N3055	60
2N3702	11
2N3703	10
2N3705	10
2N3706	10
2N3708	17
2N2904	30
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.50
2SC1096	1.72
2SC1172Y	2.20
2SC1173Y	1.69
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

I.C. SOCKETS

DIL to DIL

8 way	22
14 way	29
16 way	32
18 way	32
20 way	32
22 way	34
24 way	36

DIL to QUIL

14 way	32
16 way	34
18 way	37

QUIL to QUIL

14 way	32
16 way	36

CERAMIC FILTERS

6Mhz	74
5.5Mhz	74

THERMISTORS

VA1104	75
VA1040	
VA8650	55
VA1039	35
GEC Dual Posistor	1.50
GEC Dual 2040 (CK1)	1.50

CRYSTALS

4.3Mhz	1.30
8.8Mhz	1.30
10.692Mhz	6.00

NEW VALVES

30FL2	1.60	EZ80/1	56	PD500	2.93
DY802	72	GY501	1.45	PFL200	1.35
DY86/7	66	GZ34	1.56	PL36	1.15
ECC81	60	KT66	7.00	PL81	94
ECC82	68	KT88	8.00	PL82	46
ECC83	60	PC86	81	PL83	1.43
ECC84	80	PC88	81	PL84	84
ECC85	98	PC92	90	PL95	1.00
ECC88	1.35	PC97	1.14	PL504	1.50
ECF80	80	PC900	80	PL508	2.90
ECF82	88	PCC84	70	PL509/19	4.50
ECF86	1.50	PCC85	85	PL802	3.25
ECH81	1.04	PCC88	82	PY33	61
ECH84	1.13	PCC89	79	PY88	81
ECL80	84	PCC189	1.02	PY500A	1.90
ECL82	77	PCC805	1.40	PY800/1	69
ECL86	84	PCF80	75	UCF80	67
EF80	68	PCF86	1.13	UCH81	1.43
EF85	68	PCF200	1.35	UCL82	84
EF86	1.19	PCF800	1.38	UCL83	94
EF89	1.43	PCF801	1.13	UL84	1.02
EF183	68	PCF802	86	U26	1.30
EF184	68	PCF805	1.80	U191	95
EH90	1.02	PCF806	1.30	6F23	85
EL34	3.50	PCF808	1.63	UY85	80
EL81	2.05	PCH200	1.45	PL802T	3.00
EL84	68	PCL82	78	40KD6	5.30
EL90	82	PCL84	81	21LU8	3.00
EL509	4.50	PCL85/805	90	17DW4A	1.60
EY86/7	68	PCL86	81	3AT2B	2.25
EY500A	1.50			12BY7A	3.75

LINE OUTPUT TRANS.

R.B.M. T20A	13.95
R.B.M. A774 Mono	11.74
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PHILIPS 320	8.70
PHILIPS 210/300 Mono	10.00
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PHILIPS G9	7.75
PHILIPS G11	13.50
PYE 691/3	17.75
PYE 697 (Printed)	14.50
PYE 713/731	10.00
PYE 725 90°	10.50
PYE 169	10.00
DECCA 80/100	8.58
DECCA 1700	9.00
DECCA 1730	8.58
DECCA 2230	8.58
GEC 2110	9.45
GEC 2040	9.50
GEC 2200	6.65
ITT CVC 1-9	9.60
ITT CVC 25/30/32	8.00
ITT CVC 20	7.75
THORN 3000 EHT	6.90
THORN 3000 SCAN	6.90
THORN 8000	11.33
THORN 8500	11.33
THORN9000	10.65
THORN 3000/3500 Mains	10.00
THORN 1591	8.68
THORN 1691	9.68
THORN 9800	18.00
THORN TX10	12.50
THORN	16.15
LOPT	9.75

L.E.D.'s

5mm T1¾ PACKAGE

Red	12
Green	14
Yellow	14
Amber	22

T1 PACKAGE 3mm

Red	12
Green	14
Yellow	14

FLASHING L.E.D.

CQX21	62
CQX22	66

RED ONLY

THREE COLOUR L.E.D.

3 Colour options Red/Green/Yellow
V518P 76

PANEL CLIPS

For stnd. range L.E.D. as above

3mm	4
5mm	4

REBUILT COLOUR TUBES

ALL AVAILABLE EX-STOCK ON GLASS FOR GLASS EXCHANGE BASIS FROM TRADE COUNTER

17" A44/271X	30.00
18" A47/343X (Stnd Focus)	30.00
18" A47/342X (Low Focus)	30.00
19" A49/120X	30.00
20" A51/110X	30.00
22" A56/120X	30.00
22" A55/14X	30.00
25" A63/200X	34.00
26" A66/120X	34.00
26" A67/120X	34.00
22" A56/140X (400) 110°	36.00
26" A66/140X (410) 110°	36.00
26" A51/161X	50.00
22" A56/510X	50.00

P.I.L. TUBES – we can rebuild your own glass – please ring for quotes.

NB Mail Order supplies of tubes. We will send 12" + 14" portable for **£5 carriage.** For 20" + 24" Mono and **all** Colour tubes please ring for quotes on next day delivery service and quotes for the return of old glass. Certain tube types can be supplied without a glass exchange with a basic glass charge incurred. Please ask – we will try to help.

*CARBON RESISTORS

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

WIREWOUND RESISTORS*

(Preferred Values)*

4W	1R-10K	20p each
7W	1R-22K	21p each
11W	1R-22K	24p each
17W	1R-22K	28p each

MULLARD COLOUREX/NEW LIFE

18" A47/343X	59.00
19" A49/120X	53.00
20" A51/110X	53.00
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Video Commentary

Over ten per cent of households in the UK now have the use of a VCR. It's been an extraordinary marketing achievement in just four years. There's still enormous market potential however, and one can't help but wonder as to which of the various competing systems will gain most in the long run. Concern is being expressed in Europe about the flood of Japanese VCRs – the VHS and Beta systems between them have 80 per cent of the European market at present. Calls for import controls are to be heard, but the French have come up with a rather more subtle arrangement. Imports of VCRs are to be channelled through Poitiers, a small inland town about as far as it's possible to be from the main centres of population and with a complement of five customs officers. There's creative use of red tape for you!

Though the European V2000 system is technically excellent, the problem is that the Japanese VCR industry has already established a position of overwhelming dominance. Japanese VCR manufacturing capacity is at present of the order of 17 million machines a year. Between them, Grundig and Philips seem to be able to turn out some 1·5 million machines a year. The difference of scale, with all this means in terms of efficient production and reduced costs, is plain to see.

One striking thing is the confidence the Japanese had from the start in the VCR as an item of mass consumer appeal. Whilst European producers were undecided as to whether the VCR was perhaps mainly a tool for educational and industrial use, the Japanese saw it as a domestic item and invested accordingly. Success in their home market was quickly followed by success in the USA, where the consumer electronics industry had been slow to invest in new technology. This in turn led to world dominance.

The other end of the video market, the software, is curious indeed. According to Thorn EMI Video Programmes Ltd., video piracy of one sort or another currently accounts for some 70 per cent of the video software market. Since the market has such a large illegal element it's difficult to put a figure on its value, but most estimates put this at around £300 million a year, revenue from rental transactions accounting for a good 90 per cent of the market, cassette sales the remainder.

Part of the illegality problem must be due to the ease with with tapes can be duplicated. Duplicating legitimate tapes and passing them off as the genuine thing is known as counterfeiting, piracy proper being the distribution of programme material that has not been released for the purpose by the owners of the material. The latter is simple for those knowledgeable in the matter to spot, though not for the public. The former can be tricky even for those familiar with tape catalogues and ownership rights. Steps are being taken to solve this problem however. All Thorn EMI tapes for example now carry a special Polaproof security label. When held in the light, this reflects an imprint of the Thorn EMI logo and the word "genuine". The library box also has the logo moulded to it. It's thought that pirates will find these features expensive and difficult to copy.

Whilst some distributors of illegal tapes may be making good profits, it's hard to see that many renters/retailers can be doing well. It's been suggested that the average annual turnover per shop could be as low as £7,200. Turnover, not profit! It would be difficult even to cover expenses at that level of business. The fact is however that most VCR users don't want to spend the £40 or so it costs to buy a prerecorded tape of a feature film, while the acceptable lending rate seems to be around £1 or so a night for cassettes at the cheaper end of the market. Users will pay that – it's a cheap night's entertainment compared to almost anything else – but the renter is going to have to wait a long time before he sees any profit, and by that time the tape could well be showing signs of wear. Nevertheless this cheap tape rental business is now an established part of the industry, and along with the activities of illegal distributors has put great pressure on the legitimate distributors and better known outlets. There have been bankruptcies, one or two quite substantial, amongst distributors whilst well known high street names such as W.H. Smith and Woolworths have pulled out of tape rental.

It's going to be a lengthy business ridding the industry of illegal operators. For one thing the cost of tracing and then taking action against them is considerable – an estimate (from the British Video Association) is around £10,000 for a major case. The effort is nevertheless required, in order to secure funds for programme making and legal production/distribution quite apart from the moral aspect that piracy is stealing others' work. The public can, and is being encouraged to, play a part in this. Warner Home Video for example are advertising a Freefone number (2681) through which people can report on possible illegal activities, whether the titles involved are Warner ones or not. The service operates on a 24-hour basis. Thorn EMI Video Programmes Ltd. advise the public to report suspicions to the local Trading Standards Officer at the town hall or to the local police station. Things that should give rise to suspicion include poor packaging, very low prices and poor picture quality. Advice can also be obtained from the Video Trade Association (01-464 8833).

COVER PHOTO

Our cover photo this month shows soldering operations on the Fidelity 20in. colour chassis at Fidelity's NW London plant. New solder cut machinery has been installed. Our thanks to Fidelity Radio PLC for their co-operation.

Long-distance Television

Roger Bunney

SEPTEMBER exceeded all expectations. There was in particular a really incredible tropospheric opening mid-month, reported by several enthusiasts – it seems that records have again been broken. Sporadic E reception has occurred on several occasions, F2/TE activity is on the increase, and there were three auroral events.

The mid-month tropospheric opening peaked on September 14th/15th. Earlier, signals via tropospheric propagation had been received on the 3rd, 4th, 10th and 11th. Here at Romsey for example DFF (E. Germany) was received on the 4th. Signals mainly from W. Germany and the low countries were received in most parts of the south and east on the 3rd/4th, signals from TDF (France) and W. Germany arriving in central UK on the 10th/11th. The high pressure system present on the 13th really started things going, with many E. and W. German signals. By the 14th Scandinavian signals were arriving. Hugh Cocks (E. Sussex) logged several Band III/u.h.f. Swedish/Norwegian outlets that day, plus TVP (Poland) chs. R7, 10 and 12. At Torpoint in the south west Reg Roper received the Spanish RTVE-2 ch. E39 outlet (Gamoniteiro at 158kW e.r.p.) whilst at Ely Cyril Willis logged twelve Swedish Band I/III/u.h.f. transmitters and, unusually, Denmark ch. E3. DFF ch. E34 reached as far as Wigan (Arthur Milliken). Here at Romsey I was fortunate in receiving a ducted signal from Grunten on ch. E43 (Grunten is usually seen on ch. E2 via SpE!) in addition to DFF chs. E5, 6, 10 and 34. For Romsey, which is similar to DXing down a well, that *is* good going!

The 15th continued to give further periods of enhanced tropospheric propagation. BFBS (British Forces Broadcasting Service) chs. 41 and 48 were received at fair strength in E. Anglia, also NRK (Norway) chs. E7 and 9 and, unusually, W. Germany ch. E2. Perhaps the most dramatic reception was of TSS (USSR) chs. R8 and 9 by Cyril Willis. Iain Menzies in Aberdeen also experienced excellent conditions during the period, including reception of many southern UK u.h.f. stations and NOS (Holland). Ray Davies (Norwich) logged TSS chs. 21-29 inclusive at 0400 on the 15th, while Clive Athowe (also at Norwich) apparently received Yugoslavia during the opening.

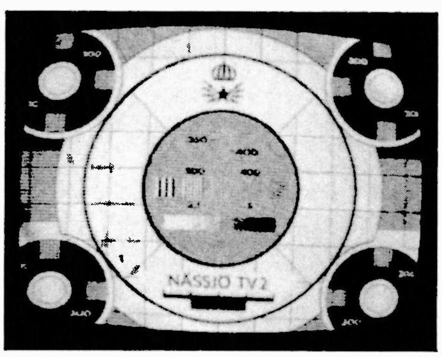
An unusual signal was received by Robin Crossley (St. Albans) on the 14th – suspected Antiope tests with colour bars on system B, ch. E11. From the west Ryn Muntjewerff (Holland) logged RTE (Eire) chs. 40/43 and Divis N. Ireland group A signals on the 13th. On the 14th he received thirty Swedish Band III/u.h.f. outlets, CST (Czechoslovakia) chs. 26/36/38, TVP chs. R27/29 and TSS chs. R6/8/9/10/11/29/30/34. Many signals were also received on the 15th, perhaps the most interesting one being from Lietovos on ch. R8 – Vilnius area, with positive station identification and clock.

The auroral events occurred on the 6th, 22nd and 26th. The 6th was perhaps the most active, with both Hugh and Cyril reporting reflected TV signals. Hugh had CST and TVP in Band I while Cyril noted signals on chs. E2/3/4, R1/2 and A2/3/4 (N. American system M). The event on the 22nd was logged only by Iain Menzies in Aberdeen. He observed the usual humming and "lines" characteristic of an aurora. Pictures couldn't be locked, but chs. A2 and 3 did produce recognisable American programme sound. The event of the 26th was extremely strong during the afternoon and was present throughout the UK: again chs. E2/3/4, R1/2 and A2/3 were noted, with generally dreadful quality.

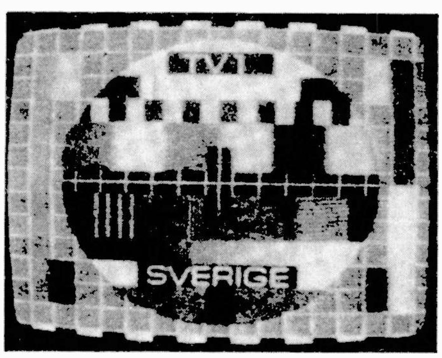
The approach of winter has brought increased F2/TE activity, Gwelo Zimbabwe ch. E2 being seen on good days with at times Ghana on the same channel. At the end of September the daytime MUF reached 44MHz. Gwelo was seen on the 6th-8th either via daytime F2 or evening TE.

There were several excellent SpE openings, which is unusual so late in the year. The following were widely reported:

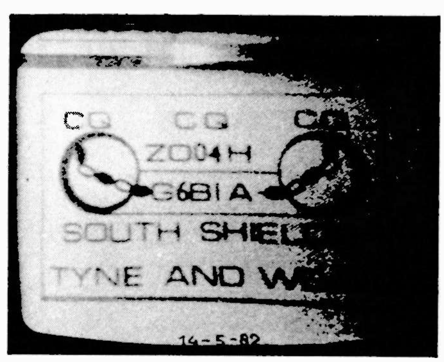
4/9/82	RTVE chs. E2, 3, 4; RAI (Italy) IA, B.
6/9/82	Mixed with an aurora! RAI IA, B; JRT (Yugoslavia) E3; TVR (Rumania) R2, 3; ORF (Austria) E2a; CST R1; RTVE E3.
8/9/82	RTVE E2-4; RAI IA, B; JRT E3; MTV (Hungary) R1, 2.
14/9/82	RAI IA; RTVE E2-4; SR (Sweden) E2; TSS R1; MTV R1.
15/9/82	RAI IA, B; JRT E3, 4; RTVE E3, 4; MTV R1, 2; TSS R2; RTVE E2; ORF E2a. French ch. F2 and 4 819-line signals from Corsica were received in Wigan.
16/9/82	TSS R1, 2; TVP R1, 2; RAI IA; CST R1; RTVE E4.



An interesting vintage monochrome test card received from Sweden by Trevor Rose during the recent enhanced tropospheric conditions.



Sweden's second PM5544 test pattern, noted by Trevor Rose recently. Photo courtesy of the BDX club journal. TV1 Sverige identification.



Call sign of the amateur TV station G6BIA, South Shields, Tyne and Wear. Received in Holland earlier this year by Ryn Muntjewerff.

So there we have it. A very full month with reception via all modes of propagation.

With the decline in the solar cycle we shall probably see the last of F2 layer reception for many years during the coming months. So it will be worth being vigilant! With plans to use Band I for other purposes, the situation may be very different when the next sunspot cycle peak arrives – perhaps by then we'll all be DXing at 4GHz!

My thanks to the following for sending in reports: Cyril Willis, Reg Roper, Hugh Cocks, Iain Menzies, Mark Baldwin (Rugby), Ian Johnson (Bromsgrove), Simon Hamer (New Radnor), Trevor Rose (Lowestoft), Arthur Milliken, Robin Crossley and Ryn Muntjewerff.

Ryn Muntjewerff has now received written confirmation of his reception of signals from TV2 Guaiba, Brazil on ch. A2 (see October column). The programme he received was "Guaiba Feminina", which is for women. Our congratulations once again.

Arthur Milliken has received a letter from RUV, Reykjavik, Iceland saying that the mystery "Gothab TV" transmitter he received was a "News Mirror" programme transmitted by RUV on 23/2/82 at 2250. Part of the programme related to the EEC voting in Greenland, the shots including the local TV station "Godthaab Lokal TV".

Finally during the recent improved conditions Trevor Rose noted a variation on the Swedish PM5544 test pattern. Colour sections within it have changed and these are very obvious in monochrome.

News from Abroad

Australia: The multi-culture TV service at present being transmitted on chs. 0/28 in Sydney/Melbourne is to be extended to ten other areas during the next three years. Canberra is expected to be on air by mid-1983, followed by Hobart, Perth and Darwin in 1984/5 and Newcastle, Wollongong, Adelaide and Brisbane later.

India: AIR-TV is to go commercial on an indpendent TV channel for some eight hours daily, with a separate rural service. The revenue earned will be used to expand the service overall. Problems with the INSAT-1A satellite, due to failure of one of the solar sails, has curtailed the output to thirty minutes daily.

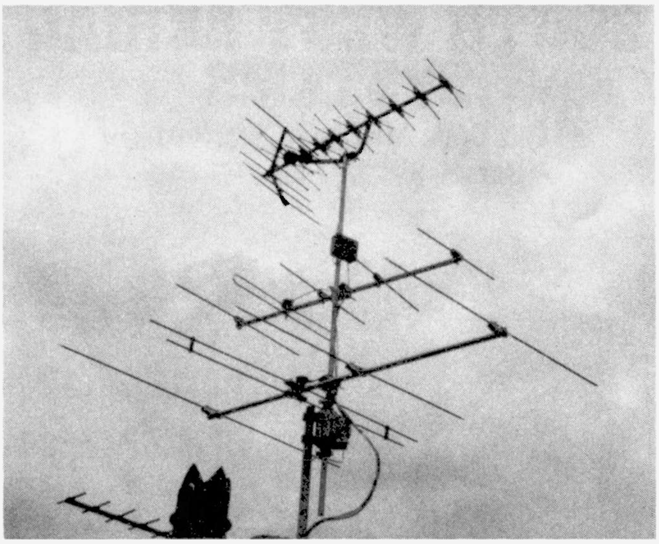
N. Africa: Egypt is to start a third channel and Tunisia a second channel. The use of French for the second Tunisian channel will enable the first one to be Arabic only.

USA: Medium wave stations in Texas and Pennsylvania have commenced a.m. stereo transmissions using the Kahn coding system. The Harris Corporation, which has an alternative system, has equipped fifteen stations and is awaiting FCC approval to commence transmissions. There are five such systems in all.

Satellite TV

The FCC has come to certain decisions on DBS (direct broadcasting via satellite) in the USA. A 500MHz bandwidth in the 12GHz band is to be used for the downlinks, with a similar 500MHz in the 17GHz band for the uplinks; licences will be initially for five years; but there are no recommendations on transmission/technical standards. Nine applications are awaiting approval and transmissions are expected to start in 1986.

RTL-Luxembourg has received approval from stockholders for the start of a DBS service. France and W. Germany are attempting to regulate the commercial basis



Robin Crossley's aerials at St. Albans, Herts.

of the service before its commencement. The manufacturing contract for the French/W. German DBS has now been signed.

Reg Horne (Sydney), managing director of Telecraft Pty., has sent an interesting brochure illustrating and describing the Hills Industries system for reception of the ABC TV National programme at 4GHz. The aerial consists of a 6-7m high reflector panel which converges the signal at a feedhorn/amplifier/down converter mounted on a lattice mast 7-10m from the panel. Signals are received from the Intelsat IV satellite and the system is capable of modification for use with the Australian DBS Domsat which is due to come into operation in late 1985.

From our Correspondents . . .

We've received a log covering the SpE season from an unknown Sheffield lady DXer who signs herself "Angel"! Apparently she moved to a position on high ground in late July and erected aerials on August 10th – including a Band III system for RTE ch. F reception. Angel is clearly experienced with SpE, MS and tropospheric DX-TV reception and one phrase suggests she's a CB enthusiast. Could this lady breaker advise her home 20 please?

Chris Wilson is receiving improved signals at 12GHz, but Satellite Television Ltd. London presents a problem since the scrambling seems to involve positive and negative video jumping. The other channel has line delay scrambling, resulting in overlapping video. The IBA have been seen testing scrambled and unscrambled signals. We'd naturally be interested in any information on scrambling systems. Apparently decoders are being sold under licence, with the critical sections encapsulated in potting compound . . .

Ian Johnson (Bromsgrove) started DXing after a motor cycle accident put him in hospital. His initial equipment consisted of a WB1 wideband Band I dipole atop a 30ft mast with rotor, feeding a dual-standard GEC monochrome set via the BFY90 preamplifier described in the May 1982 issue. Many stations from most parts of Europe were received in Band I between May 9th this year and two months later when the GEC set finally expired. A Bush Ranger u.h.f. monochrome portable is now in use with a Labgear upconverter. This illustrates that successful DX-TV reception can be achieved using a very basic installation. More recently changes have been made, with a MOSFET amplifier and upconverter from Hugh Cocks.

Simon Hamer (New Radnor) uses a Triax bowtie u.h.f. aerial, two-element Band II aerial, Jostykit 395 amplifier, upconverter and Bush TV176 receiver. His site is 500ft a.s.l. but screened to the north east. His long list of successes includes several low-power W. German BFBS Band II transmitters. During the recent tropospheric openings he logged several W. German/Dutch/Belgian stations including Saarbrucken. Despite the screening to the north east, he's found that reception is possible by pointing an aerial at a hill in the opposite direction – this gives a clean, reflected signal! His SpE reception covers most of Europe apart from Eire, Norway and Finland.

Swiss Radio/TV Fair

Alexander Wiese

The Swiss radio and TV fair "FERA" is held every two years at Zurich. It was interesting to visit this and compare the situation with last year's Berlin show, which is also biennial.

Perhaps the most striking feature was the number of stereo TV sets on show. The W. German second channel ZDF now transmits a few stereo music programmes and bilingual films/news programmes, but none of the Swiss networks have plans to introduce stereo TV in the near future. The fact is however that much of Switzerland is within reach of ZDF, either directly or via cable TV. According to dealers some 50 per cent of large-screen TV sets now being sold are stereo models.

Rediffusion serves Zurich and the surrounding area. Their network is the first German-language one to offer, since July 15th, the Satellite TV Ltd. programmes via the OTS satellite. They also have a teletext system called Teleziitig (Tele-newspaper) which offers thirty pages of local news, and since April 30th a Pay-TV system called Teleclub. Subscribers to the latter pay 28 Franken per month and receive a decoder to unscramble the Pay-TV programmes. These consist of twenty recent films per month, with ten changed each month.

Satellite TV was represented by TelSat and SatCom. The TelSat project aimed to provide the first DBS service for the mid-European area but was cancelled by the Swiss parliament shortly before the opening of the fair. The US SatCom company offered the "first private satellite reception dishes" for the 12GHz band. Unfortunately no prices were mentioned.

Independent local f.m. radio is at present being tested in Switzerland, with the first stations due to commence operations next year. As a consequence, f.m. transmitters were being offered at the fair – by an Italian manufacturer (who else!). One wonders whether such local radio, and perhaps TV, will eventually start in W. Germany and Austria, the only countries in this part of Europe not at present served by illegal local stations. It's interesting to note the number of car stickers put out by the official broadcasters. In W. Germany only WDR, which is in direct competition with the Radio Luxembourg German-language service, issues such stickers.

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AU106	1.000	BU205	0.750	7905	0.350	7413	0.190
AU110	1.100	BU208	0.800	78L05	0.300	7414	0.260
BC107	0.070	BU208A	0.850	78L12	0.300	7425	0.110
BC108	0.070	BU326	0.850	78L18	0.300	7441	0.300
BC109	0.070	BU407	0.750	78L24	0.300	7442	0.300
BC147	0.055	BU526	0.800	2SC495	0.700	7447	0.400
BC148	0.055	BY127	0.080	2SC1306	1.000	7473	0.190
BC149	0.055	BY133	0.080	2SC1969	1.300	7474	0.180
BC157	0.055	BY164	0.220	2SC2029	1.200	7475	0.150
BC159	0.055	OA47	0.060	2SC2078	1.200	7485	0.300
BD131	0.250	OC28	1.000	MB3712	1.500	7486	0.160
BD132	0.250	OC29	0.800	TA7205	1.500	7489	1.100
BD135	0.200	OC35	1.000	UPC575	1.000	7490	0.220
BD136	0.200	R2008B	0.800	LM380	0.500	7493	0.250
BD137	0.200	R2010B	0.800	LM381A	0.600	74123	0.160
BD138	0.200	TBA520	0.750			74141	0.250
BD139	0.200	TBA530	0.750			74393	0.500
BD140	0.200	TBA540	0.750			74LS09	0.120
BD144	1.100	TBA550	0.750	**VALVES**		74LS164	0.300
BD150	0.300	TBA560	0.700	DY802	0.450	74LS197	0.350
BD157	0.380	TBA800	0.350	ECC82	0.400	74LS221	0.420
BD158	0.380	TBA810S	0.600	ECC83	0.430	74LS240	0.580
BD159	0.400	TBA820	0.750	ECC84	0.400	74LS244	0.580
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BD536	0.400	TDA2530	0.800	ECL86	0.490	22 PIN	0.160
BD537	0.420	TDA2532	0.750	EF80	0.310	24 PIN	0.180
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VCRs for Secam

David K. Matthewson, B.Sc., Ph.D.

IN the SECAM colour system the two transmitted colour-difference signals frequency modulate carriers at 4·25MHz (B − Y) and 4·40625MHz (R − Y). The signal on each transmitted line consists of the luminance signal plus one of the colour-difference signals, a 64μsec delay line being used in the receiver so that both colour demodulators get a chroma signal on each line – the f.m. colour demodulators receive direct and delayed signals on alternate lines. Switching is required for this purpose, and the switching must be synchronised so that each demodulator receives the correct signal. One of the advantages of using f.m. for the chroma signals instead of phase/amplitude modulation of a single subcarrier, as in the NTSC and PAL systems, is that a phase-locked loop to generate an accurate reference signal is not required in the decoder.

In the original SECAM transmission system colour sync signals were included in the field blanking periods – on lines 7-15 and 320-328. This is known as vertical SECAM. Most countries that use SECAM now include a burst of unmodulated subcarrier on the back porch of the line sync pulse for colour sync purposes – horizontal SECAM.

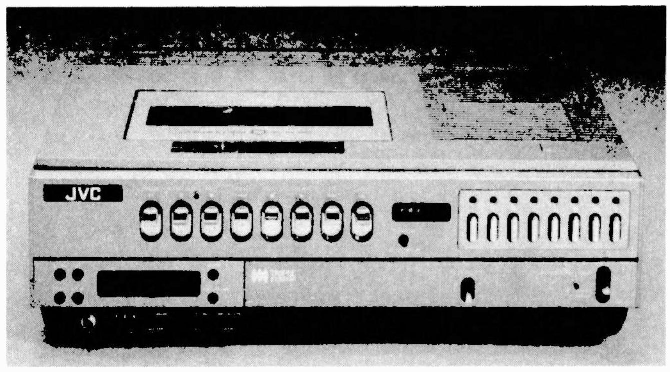
In a PAL or NTSC VCR the chrominance signal is down-converted to around 650kHz and recorded under the accompanying luminance signal. Hence the term "colour under". Since these two systems rely on the phase of the chroma signal to convey colour information, a lot of circuitry is required in a PAL or NTSC VCR to ensure that the phase conditions of the chroma signal are maintained during the record and playback processes. This brings us to another advantage of SECAM – much simpler chroma circuitry can be used in a VCR.

As an example, in the JVC Model HR4110S the luminance signal frequency modulates a 3·8MHz carrier – as in a PAL VHS machine – but the chroma signal is down-converted to about 1·1MHz using a simple circuit consisting of a pair of D-type bistables to give division by four. For up-conversion a pair of two-diode multipliers is used. All very neat and simple, maintaining the frequency of the chroma information with no problems.

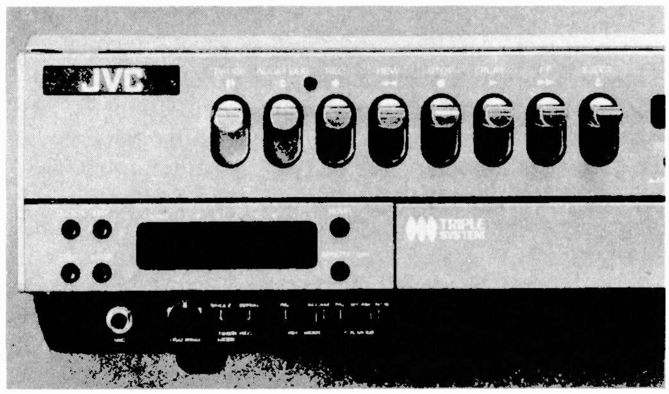
The HR4110S is intended for use in France. For use in the Middle East however JVC produce machines that will record and play back both PAL and SECAM signals, the chroma signal in both cases being converted down to 627kHz on record. As a result, SECAM tapes recorded on French and Middle Eastern machines are not compatible.

If you get a VHS tape from someone living in France and play it back on a PAL VCR connected to a PAL receiver you'll get a perfect monochrome picture. If you substitute a SECAM receiver for the PAL one you'll get colour – of sorts! This is because the PAL VHS machine is looking for a 627kHz chroma signal to convert to 4·43MHz. What it finds is junk which gives a silly picture: the 1·1MHz SECAM colour signal on the tape is ignored. Try the same thing with a SECAM tape recorded in Saudi Arabia and you'll probably get a true colour picture via your PAL machine on your SECAM receiver. Try this tape in a French VHS VCR and you'll get silly colours! This is because of the two incompatible standards for 625-line SECAM VHS machines – one for France itself and the other for countries in the Middle East using the SECAM system.

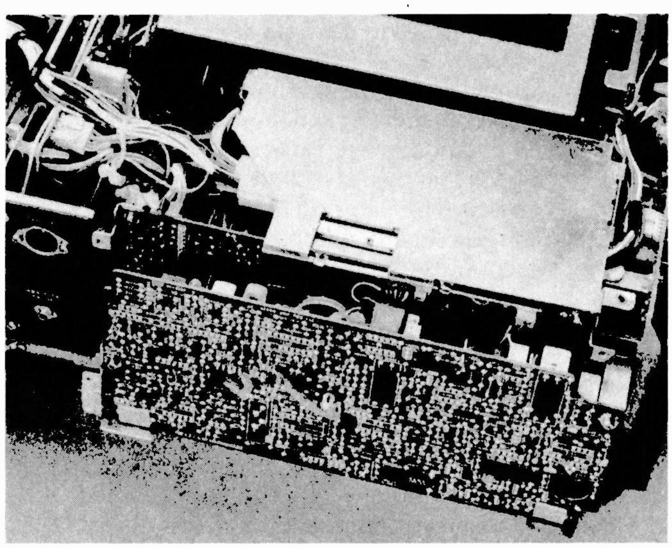
The interesting JVC triple-standard HR3330TS will handle PAL and SECAM signals in the record mode and will play back PAL and SECAM tapes of both types, also NTSC tapes with the chroma converting to 4·43MHz (i.e. not standard 3·58MHz NTSC). For SECAM recording, the PAL/SECAM switch is placed in the PAL position to produce tapes compatible with Middle Eastern SECAM machines and in the SECAM position for French use. In the playback mode, PAL/SECAM selection is automatic, with a slide switch giving NTSC-4·43 operation.



The JVC triple-standard HR3330TS VCR.



Close-up showing the system selection switches.


The extra circuitry for handling SECAM signals is on a separate panel mounted at the rear of the machine.

Faults in Recent TV Chassis

John Bourne

RECENT TV chassis have established a high degree of reliability. Nevertheless if you deal with them in sufficient numbers you acquire a certain amount of fault know-how. The following notes relate mainly to the Thorn TX9 and Hitachi NP8CQ chassis.

THORN TX9 CHASSIS

There have been several versions of the TX9 chassis. The original one used main panel PC1002 which featured a μPC1365C colour decoder i.c. The subsequent PC1040 main panel version has a TDA3560 colour decoder i.c. More recently main panel PC1044 has been introduced, featuring a chopper switch-mode power supply. There is also a version of this latest variant featuring stereo sound.

Beware of plugging in the field and line scan coil connector plugs the wrong way round with the original PC1002 panel. There was a production error in that the connector locating holes were incorrectly arranged. To overcome this, Thorn cut the location lug off each connector. Inserting the line scan plug PL9 the wrong way round will simply result in a "mirror image" picture with no damage to the circuitry. In the case of 18/20/22in. models however inserting the field scan plug PL14 incorrectly will destroy the TDA1170S field timebase i.c., since the beam current limiter link will short-circuit its output pin. On smaller screen models the link is not fitted and no circuit damage is caused.

Fig. 1 shows the power supply circuit used in the PC1002 version. The later PC1040 version is almost identical, though a slightly different component reference lettering system is used – the diodes have D instead of W letters, i.e. W67 = D67, the transistors have the letters TR instead of VT and the thyristors CSR instead of SCR.

No Results

Intermittent blowing of the 1·6A delay mains fuse FS1 every two days or so, the fuse having a jet black appearance, indicates that the crowbar trip has operated. If no obvious fault is found, the following are suspect: the 130V zener diode W85, the 5·6V zener diode W83, the BF435 transistor VT66 and the crowbar thyristor itself, SCR2 (Y1043 or T9054V). Just to fill in the details, W85 provides over-voltage sensing, conducting and thus firing SCR2 in the event of the h.t. rising above 130V; VT66 provides excess current protection by sensing the voltage developed across R197, conducting and firing SCR2 when its base voltage falls sufficiently below the emitter voltage set by W83.

If FS1 has blown as a result of a permanent fault condition the usual cause is a defective h.t. regulating thyristor (SCR1). Note that it will not necessarily be short-circuit. Alternatively the crowbar trip circuitry previously mentioned is often responsible.

A word of warning. If SCR1 goes short-circuit the h.t. may briefly rise to an abnormally high level before FS1 blows. The resultant damage is usually as follows: BU500 line output transistor short-circuit or leaky collector-to-emitter; 24V rectifier W94 (BY210-400) short-circuit; field flyback diode W103 (1N4001) short-circuit; TDA1170S field timebase i.c. faulty. In addition, when you're brave enough to switch the receiver on the picture may black out from the left-hand side of the screen as the sound level is increased. In this event, check the 15V supply reservoir capacitor C193 (4·7μF) and the 12V regulator i.c. (IC56, type LM7812 or LM340T).

Always ensure that the h.t. is correctly adjusted – for 115V at the cathode of W85, measured with respect to chassis. Incorrect adjustment (h.t. too high) sometimes results in the crowbar trip doing its job.

No results with the 115V supply present at the cathode of W85 usually means that a defective line driver transistor (VT67, type BD150 or T9057V) is failing to provide the 12V start-up supply to the line oscillator i.c. If this transistor is short-circuit, R223 in its collector circuit will probably be open-circuit – the value of this resistor was changed from 220Ω to 470Ω.

Miscellaneous Faults

As with other chassis, tuning drift is usually due to the 33V stabiliser i.c. It's mounted on the relevant tuner drawer assembly, according to model. No colour with little luminance content has been traced to a faulty 12V regulator i.c. (IC56) giving reduced output.

A rather unusual one we had was when the picture was well over to the right with slight foldover. R212 (220kΩ) which couples the reference pulse from the line output transformer to the line generator i.c. had gone open-circuit.

The three-key ultrasonic remote control transmitter handset used with Ferguson Models 3756 and 3769 can give trouble – the three pressure disc switches tend to go short-circuit. The switch part number is 06E2-032-002, which is not mentioned in the service manual.

THORN TX10 CHASSIS

We've had very little trouble with the excellent Thorn TX10 chassis. The following notes may help some readers however.

(1) A.F.C. pulls set off tune. Careful, slight adjustment of the a.f.c. coil L36 on the i.f. module required, with the tuning preset drawer closed, i.e. the a.f.c. on. Open and close draw to test for correct operation. The i.f. module is the same as that used in the TX9 chassis.

(2) If the varicap tuner is suspect/faulty, a Mullard ELC1043/05 is a suitable replacement.

(3) No results has in some cases been due to the thermal fuse on the l.t. mains transformer T702 going open-circuit for no apparent reason. T702 can also be responsible for lamination buzz.

(4) Random function changes on sets with infra-red remote control is mainly the result of pulse interference produced by the focus unit, no symptoms being evident on the screen. Alternatively check the c.r.t. earthing and the SAA5010 remote control decoder i.c.

(5) Finally, correct grey scale adjustment is very important. To achieve optimum results, proceed as follows.

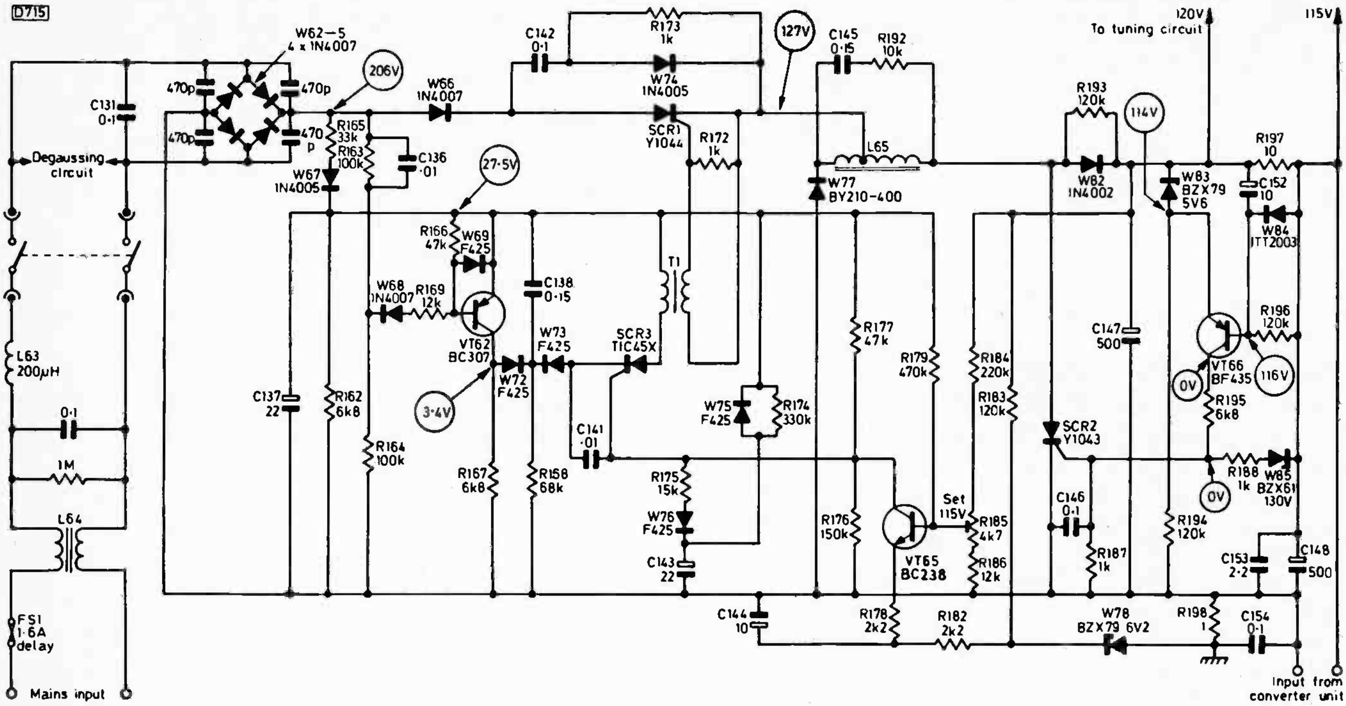


Fig. 1: Regulated power supply circuit used in the Thorn TX9 chassis (early version).

Leave the set running for fifteen minutes.

Disconnect RGB drive plug PL11.

Set the colour control to minimum, the brightness control to midway and the contrast control to maximum.

Link the black level check pins together.

Set the first anode preset control RV831 fully anticlockwise.

Set the RGB gain presets RV654/5/6 fully anticlockwise.

Set the c.r.t. black-level presets RV651/2/3 for 150V at each cathode.

Reconnect plug PL11 and adjust the preset brightness control RV601 for 155V at the green cathode (c.r.t. pin 2).

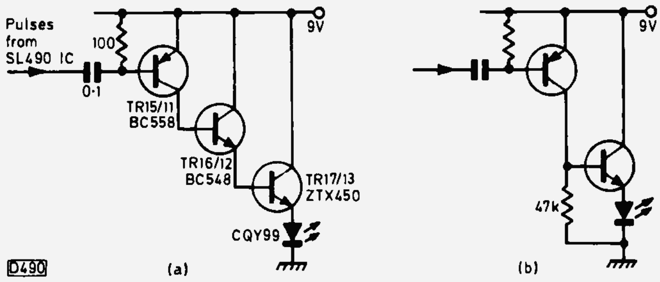


Fig. 2: Fidelity remote control unit modification.

Disconnect the field scan output plug PL15.

Slowly advance the first anode preset RV831 until a line, e.g. red, just appears, then adjust the black-level presets for the missing colours, e.g. blue and green, so that all three colours appear with equal intensity.

Reconnect field scan plug PL15.

Remove the shorting link and with a suitable test pattern displayed inspect the highlights for colouration. Use the appropriate gain preset to reduce the offending colour if necessary. At least one gain preset must be left undisturbed, i.e. at maximum gain.

FIDELITY REMOTE CONTROL

The remote control handset used with the Fidelity CTV14R 14in. colour receiver and the TVR120 monochrome portable is inclined to give trouble. If the problem is no results, first check the condition of the PP3 battery and if necessary replace it. Monitor the current drawn by the handset. A correctly working unit should draw about 14mA whilst transmitting and a few μA in the quiescent state. Full current drawn continuously is usually due to a duff i.c. (type SL490), though any of the three transistors in the unit could be responsible.

Battery life is improved by carrying out the following Fidelity modification (see Fig. 2). Remove the middle transistor (TR12 or TR16 depending on unit) and the 100kΩ resistor if fitted on the print side of the board. Connect the collector of the first transistor TR11/15 to the base of the third transistor TR13/17 and add a 47kΩ resistor from this point to chassis.

HITACHI NP8CQ CHASSIS

Tube Types

One of the first Hitachi models we began to stock, some three years ago, was the CBP220 (NP8CQ chassis). A novel feature is the instant picture at switch on (approximately one second) due to the use of a tube (type 560DZB22) with directly heated cathodes (Fig. 3). Tube life with some of these sets seems to be on the short side however – the tube can be completely low emission after only eighteen months in the field. Hitachi now provide a quick-start tube, type H0433/560DZB22, as a replacement. This is a more conventional tube with indirectly heated cathodes and a warm-up time of about five seconds. The following modifications to the tube base panel are required when this tube is used as a replacement.

(1) Remove the heater voltage set-up coil L852.

(2) Remove heater transformer T850 – or alternatively cut its three secondary windings.

(3) Fit a link between input terminal T1 and pin 10 (TP855) of the c.r.t.

(4) Fit the coil supplied with the tube between terminal T2 and pin 7 (TP853) of the c.r.t.

(5) Fit the silicone rubber spacer supplied to the c.r.t.'s focus pin, with larger diameter hole on the c.r.t. side.

Note that the replacement tube does not come with bonded deflection coils, so these must be removed from the old tube and fitted to the new one. Hitachi suggest changing the value of R305 from 270Ω to 150Ω and replacing R326 with a wire link to give improved picture sharpness. These components are in the luminance circuit. This modification applies only to earlier sets as it was incorporated in later ones. As with any c.r.t. replacement, the set should be left to warm up for twenty minutes before carrying out adjustments, and soak tested for a further three hours before final grey scale, purity etc. adjustments are carried out.

Most other sets fitted with the NP8CQ chassis incorporate conventional quick-heat tubes.

No Results

Now to some general problems with this chassis. No results or intermittent no results should lead to a visual inspection of the panel, as there are many areas where thin print coincides with mechanical stress. Check particularly around the line output transformer and the power supply. Remember that pressing down on the panel gently from the component side will open any hidden breaks or cracks whilst pressing down from the print side will close them.

No results with a high-pitched squealing may be due to R717 being open-circuit. This resistor acts as a fuse (part no. 0119512). It's in series with the 12V line that supplies

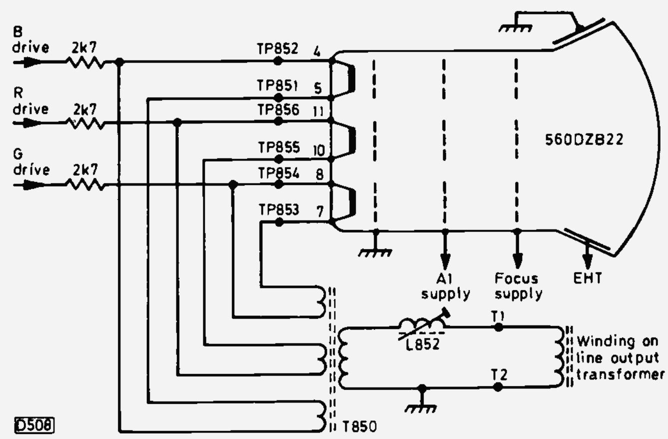


Fig. 3: The c.r.t. used in the Hitachi Model CBP220 has directly heated cathodes, producing a picture in one second after switching on.

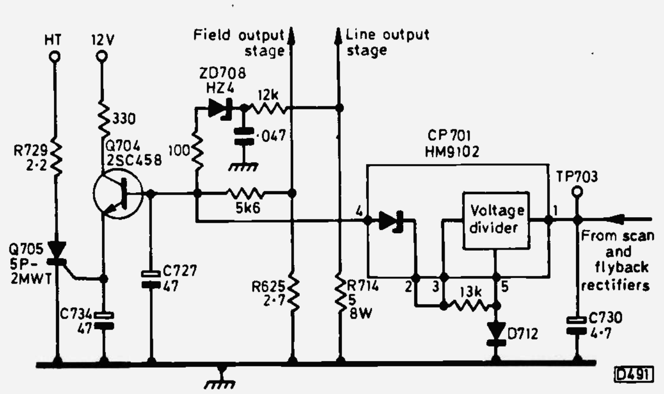


Fig. 4: Trip circuit used in the Hitachi NP8CQ chassis.

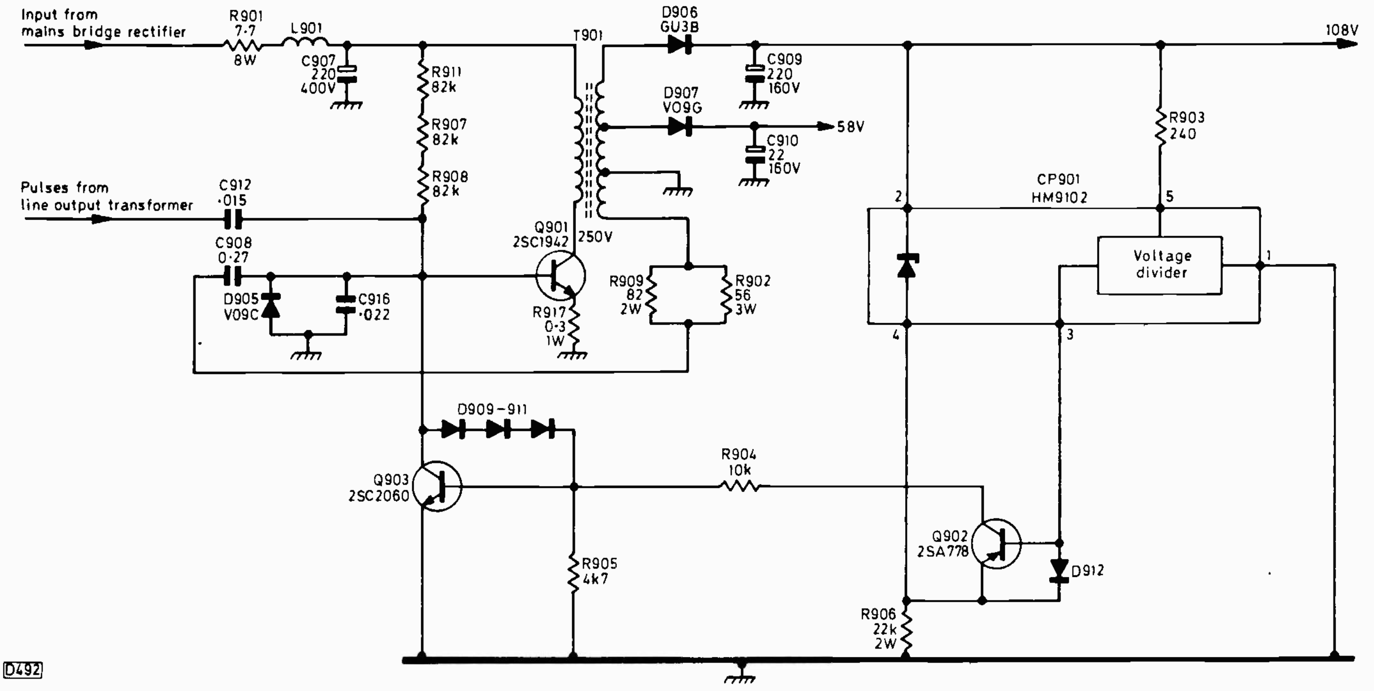


Fig. 5: Simplified circuit of the switch-mode power supply used in the Hitachi NP8CQ chassis.

the signal stages – this supply is derived from the line output transformer. In a few instances the solder blobs beneath the tuner head have intermittently shorted the 12V rail to chassis.

A duff line oscillator i.c. (IC701, type HA11235) may be the cause if the symptom is no results with the set whistling slightly.

A dead set with the 2A delay mains fuse F901 blackened should lead to checks on: the mains filter capacitors C901 and, if fitted, C918; the degaussing thermistor TH901; the mains bridge rectifier diodes D901/2/3/4; the chopper transistor Q901; the chopper control transistor Q903. It's extremely likely that the culprits will be Q901 and Q903, and the use of a variac when making initial tests is strongly recommended – from bitter experience, a fault that results in high (almost double) h.t. does the line output stage no good at all . . .

Assuming that the mains fuse holds but the set remains inactive, check for h.t. from the bridge rectifier – there should be about 340V across C907. Then check the regulated h.t. rail – there should be 108V ± 3V across C909. If the voltage is low at about 8V the crowbar thyristor Q705 may be conducting, in which case its gate should be at 0·7V. The protection circuit (see Fig. 4) is designed to operate in the event of excessive h.t. or excessive current in the line or field output stages. Things to check in the line output stage are the output transistor Q702 (2SC1942) and the efficiency diode D702 (type GH3S). The crowbar thyristor can be overridden by disconnecting R729, but if you do this you must monitor the 108V h.t. rail and/or the e.h.t. (25kV maximum). If the h.t. supply returns to normal when the crowbar thyristor is overridden, it's likely that the sensing module CP701 is faulty.

As shown in Fig. 4, the crowbar thyristor is driven by Q704. When triggered, it shorts the h.t. line without fuse blowing. Module CP701 senses the voltages developed in the line output stage. The line output stage current is sensed as the voltage developed across R714 to which zener diode ZD708 is connected. A voltage proportional to the current flowing in the field output stage is developed across R625.

A simplified circuit of the switch-mode power supply is shown in Fig. 5. The chopper transistor Q901 operates as a blocking oscillator, with feedback to its base via R902/9 and C908 from a winding on the chopper transformer T901. At switch on, the voltage applied to the base of Q901 via R911/7/8 causes it to conduct. Positive feedback then drives it to saturation. Q901's base current charges C908 negatively, with the result that Q901 switches off. C908 then discharges via R911/7/8. Regulation is provided by the h.t. sensing module CP901, the error amplifier transistor Q902, and the control transistor Q903 which acts on Q901's base circuit. If the h.t. rises, Q902's emitter voltage rises and the drive to Q903 is increased. The voltage at the base of Q901 is thus reduced, C908 takes longer to discharge and Q901's switch on is delayed, reducing the h.t. to compensate. C912 feeds a pulse from the line output stage to the base of Q901 to synchronise and stabilise the circuit.

With the remote control sets (Models CBP222 and CTP208), if the set appears to be dead check whether the standby indicator is illuminated – this proves, without removing the back cover, that the mains supply is reaching the set. Again, if a squealing noise is heard R717 is probably open-circuit.

The following GEC models use the NP8CQ chassis: C1650H, C2055H, C2057H, C2255H and C2257H.

TELETEXT MODELS

The following points relating to the teletext Model CPT2218 (NP81CQ chassis) are worth noting. To cure slight picture ringing, change R315 from 2·2kΩ to 3·9kΩ and remove C308 (if fitted). The suggested cure for a severe ringing effect in the mixed mode, resulting in almost unreadable teletext (picture otherwise o.k.), is to disable the mixed mode blanking circuit by connecting a link from the base of transistor Q2109 to chassis. This removes the "black hole" characters, leaving the text superimposed on the picture.

Teletopics

STEREO TV SOUND TESTS

The BBC has been carrying out experimental stereo TV sound transmissions to test the feasibility of adopting the W. German two-carrier, two-channel sound system for UK use. The initial tests were done at low power, and indicated that it will be difficult to establish a standard that will provide an acceptable compromise between achieving an adequate stereo service in difficult reception areas and avoiding interference to existing mono-only receivers (W. Germany and the UK use different TV systems – G and I respectively). More recent tests, from the BBC-2 Crystal Palace transmitter (and the associated repeater stations), have been carried out at full power. The BBC emphasizes that the tests are aimed at investigating the basic feasibility of the system, and that there is at present no commitment to start regular stereo transmissions or to adopt any particular system. The expectation however is that success with the tests will result in a specification being issued to setmakers some time next year.

HI-FI SOUND FOR BETA SYSTEM

One problem with present VCR standards is the limitation on sound performance due to the narrow sound track and slow longitudinal tape speed. To overcome this, Sony have proposed and produced prototype machines using a "Beta Hi-Fi" system. The idea is to record the sound – stereo at that – on a low-frequency f.m. carrier in the same helically-scanned tracks as the video signal. On playback the signals are separated by filtering. The improved performance is quite dramatic – frequency range increased from 50-10,000Hz to 20-20,000Hz at 0·3 per cent distortion and the dynamic range increased from 40 to 80dB. Recording sound on the present longitudinal track as well makes the system compatible with present machines.

US SCENE

Two of the three main US TV networks, CBS and NBC, are planning an early start to teletext transmissions using the North American Broadcast Teletext Standard, which is based on the French Antiope teletext system. This follows a successful year-long trial by both networks in the Los Angeles area.

Cable operators are not having it all their own way. In fact CBS has decided to close its cable operation: despite obtaining 5,200,000 subscribers in less than a year of operation, the system lost over $30 million and showed no signs of making a profit. One of the problems is that to become profitable cable operators have to attract a certain amount of advertising. This has increased substantially but major advertisers prefer to stay with the national networks and their much larger audiences.

ORACLE SERVICES EXPAND

The area covered by Thames and London Weekend Television is the third region to have a local Oracle teletext service – following Scottish Television in October 1981 and Channel Television in February 1982. One hundred teletext pages are being devoted to London news, events and information – the nationally networked Oracle service currently provides some 400 pages of editorial and advertising news and information. Present plans are to offer a local Oracle service in every ITV region by the end of 1984. Channel 4 is also carrying an Oracle service, which effectively halves the access time.

BANDS I/III

In its interim report to the Home Secretary the Merriman committee has recommended that Bands I/III should no longer be used for broadcasting once the 405-line service has been phased out, and that the close down should be completed by the end of 1984 instead of 1986. The committee's final report is due by June 1st next year.

The IBA has expressed the hope that land mobile services can be accommodated without Bands I/III being completely lost to broadcasting at a time when so many new developments are in prospect. These bands are used internationally for TV purposes and would be suitable for services such as regional television that could not be broadcast via satellite and could not be economically extended to small towns and villages on cable. The IBA calls for "a broad and comprehensive view of all the new developments rather than piecemeal action."

HI-FI TV SOUND TUNER

Those who want to make the most of the TV sound channel might consider the VT1000 Tele-Video tuner from Kingsbrook Marketing (29 Heathfield, Stacey Bushes, Milton Keynes, Bucks MK12 6HR). The idea is that you plug the aerial into the tuner, which has six preset tuning buttons. The output to the TV set is at u.h.f., on channel 36: the 300mV r.m.s. per channel audio output is fed to the domestic hi-fi system. By positioning the tuner adjacent to the armchair, remote channel selection is achieved. The unit can also be used with a VCR, and includes various features such as a stereo-wide system and dynamic noise reduction to eliminate background noise and tape hiss. The suggested retail price is £99·50, including VAT.

ITT's MOVE

ITT have commenced relocation of their service headquarters from Paddock Wood, Kent to Basildon, Essex. The move will be phased over a period of time, the first department to be relocated being Technical Liaison. Correspondence on technical matters should now be addressed to ITT Consumer Products Services, Chester Hall Lane, Basildon, Essex SS14 3BW – telephone 0268 3040, extensions 312/363/622/217. Orders for spares should for the time being continue to be sent to the Paddock Wood address.

VIDEO PHOTOGRAPHY

Olympus, well known for their still film cameras and dictation machines, have introduced a portable VHS VCR system. Of particular interest is the camera, which has been designed to appeal to experienced camera users. Amongst the many features are manual override of all automatic controls and a positive/negative facility for special effects or showing film negatives on TV and recording them. The suggested retail price of the complete system – camera, recorder and tuner/timer – is around £1,500.

SELECTAVISION FOR EUROPE?

It seems that RCA's video disc system could be launched in Europe some time next year. Talks between RCA and various European setmakers are under way and the system was demonstrated at the recent Cannes video conference to prove its compatibility with the PAL and SECAM colour systems. It's significant that Hitachi and Toshiba, who make the players under licence in Japan, took part in the demonstrations, along with several software producers. The system is understood to be now reaching target sales levels in the USA, following substantial reductions in the prices of the players, the introduction of stereo versions, and a much expanded catalogue of discs.

TRANSMITTER NEWS

The following relay stations have or will shortly come into operation (for exact opening dates see Ceefax page 196).

Abercynon, mid-Glamorgan Sianel 4 Cymru ch. 54, HTV Wales ch. 58, BBC Wales ch. 64, BBC-2 ch. 66. Horizontal polarisation.

Alexandra Palace TV4 ch. 54, BBC-1 ch. 58, Thames/London Weekend Television ch. 61, BBC-2 ch. 64. Horizontal polarisation. Welcome back Ally Pally! The new aerials are atop the same mast that was used for the world's first regular high-definition TV service, which was started by the BBC on November 2nd, 1936.

Andoversford, Gloucestershire BBC-1 (Midlands) ch. 55, Central Independent Television ch. 59, BBC-2 ch. 62, TV4 (late 1983) ch. 65.

Buckna, Co. Antrim Ulster Television ch. 41, BBC-2 ch. 44, TV4 (late 1983) ch. 47, BBC-1 (Northern Ireland) ch. 51.

Caterham, Surrey BBC-1 ch. 55, Thames/London Weekend Television ch. 59, BBC-2 ch. 62, TV4 ch. 65.

Chiseldon, Wiltshire BBC-1 (West) ch. 30, HTV West ch. 34, BBC-2 ch. 49, TV4 ch. 67. Wideband aerials (group E or W) will be required.

Kenley, Surrey BBC-1 ch. 40, Thames/London Weekend Television ch. 43, BBC-2 ch. 46, TV4 ch. 50.

Melling, Lancashire TV4 (late 1983) ch. 53, BBC-1 (North West) ch. 57, Granada Television ch. 60, BBC-2 ch. 63.

Penryn, Cornwall BBC-1 (South West) ch. 55, Television South West ch. 59, BBC-2 ch. 62, TV4 ch. 65.

Twechar, Strathclyde BBC-1 (Scotland) ch. 22, Scottish Television ch. 25, BBC-2 ch. 28, TV4 ch. 32.

The above transmissions are vertically polarised unless otherwise stated.

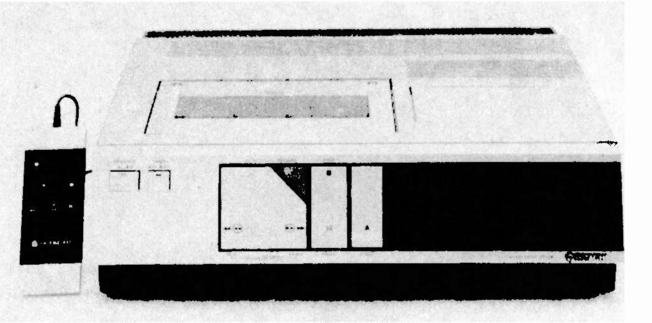
The IBA comment that completion of the TV4 network should be achieved in roughly a third of the time it took to build the existing u.h.f. networks. An extensive programme of aerial maintenance has been undertaken during the past few months at the high-power transmitters to ensure that the aerials will cope with the added power.

AMSTRAD VIDEO AND TV

Amstrad is to introduce a VCR and a 22in. colour set next year – the TV set will be produced at Amstrad's new Shoeburyness factory, which is at present under construction. The "very competitively priced" VHS VCR will be released early in the year. Amstrad currently reckon to have over 25 per cent of the racked hi-fi market.

THORN ENTER RECONDITIONED TV MARKET

One of the strengths of Thorn has always been their involvement in the various branches of domestic TV – rental, retailing and setmaking. More recently there's been the video software tie-up through the acquisition of EMI. Thorn have now entered a field they previously left



Announced as we go to press, the new award winning Hitachi Model VT11E, a budget VCR (suggested retail price £399) with many features, including full-function remote control, and distinctive styling. The streamlined facia has large, multi-function control buttons.

alone, the sale of reconditioned sets through a new subsidiary, Re-View. Well why not? – they must have a lot of ex-rental sets and the facilities to recondition them. It seems that some very good bargains are to be had. One of the main aims is to go after the second-set market which, with Channel 4 and breakfast TV, is expected to increase demand for TV sets.

VCR LATEST

According to an estimate in a recent Key Note report (Key Note Publications Ltd., 28-42 Banner Street, London EC1Y 8QE) the number of VCRs in use in the UK will have risen to 2·2 million by the end of this year, an increase of 1 million during the year. This will represent a market penetration of 10·2 per cent of all households.

Several new models have been released. Of particular interest is the first VHS machine in the UK from Sanyo – under the Fisher brand name. Model FVHP530 is aimed at the middle section of the market with a suggested retail price of £550. Mitsubishi have introduced a "budget" machine, Model HS303, with a suggested retail price of £450. The other two new machines are top of the range models. The Hitachi VT9700 (suggested retail price £599) features a 26-function infra-red remote control system, Dolby noise reduction and tape indexing for locating programmes on a recorded tape. The Telefunken VR530SA from Paul Spring Electronics (suggested retail price £600) is unusual in being designed to record and playback both PAL and SECAM signals. It's equipped with v.h.f./u.h.f. tuners.

Philips are hoping to reach an agreement with the French Thomson-Brandt group for the manufacture of V2000 type VCRs – Thomson-Brandt are being offered a stake in Grundig which is now part owned by Philips. The aim is to increase the V2000 system's share of the European market. Philips also hope that Telefunken will become a partner in the European V2000 VCR project.

PRESTEL'S MICRONET

The latest Prestel marketing ploy is aimed at users of microcomputers. For a fee of £1 a week, microcomputer users would have exclusive access to a substantial data base held in the BT central computer. The data would include telesoftware programming, news and information on microcomputers and their use, hundreds of on-screen games, a buyers guide, a section for members and so on. An adaptor for Prestel-microcomputer interfacing would be required – it's hoped that these will be available for £50 upwards. Data access charges would not be made at off-peak hours.

VCR Clinic

Reports from Steve Beeching, T.Eng. (C.E.I.), Michael J. Cousins, T.Eng. (C.E.I.) and Derek Snelling

Sony C7

A new head drum was fitted to a Sony C7 and after setting up the various switching points, the tape path and the signal levels we carried out a general check on the operation of the machine. To our amazement, we discovered that channel selection was impossible. Switching off and on had no effect, but unplugging the machine from the mains supply for a short time restored channel selection. If record was then selected, followed by pause or stop, channel selection was again not possible. It seemed reasonable to assume that the fault lay in the circuitry that inhibits channel selection during record – see Fig. 1.

When a channel selection button is pressed with the machine in the stop mode, the 34V present at the appropriate pin of the channel decoder IC1 will be reduced to about 12V by the potential divider R13/R2 and will be applied to pin 1 of IC7 as a "high" signal. Pin 2 is also high, and as this is an AND gate pin 3 will be high. The "enable" output thus produced goes to pin 37 of the programme timer i.c., which starts a channel count, providing a BCD (binary-coded-digital) output at pins 38-41. These are fed back to the channel decoder i.c. whose channel output pins 1-12 will each go "low" in turn. This all occurs very quickly and the user's finger will still be on the channel selector button. Hence a low will appear at pin 1 of IC7 when the counting reaches the selected channel. Pin 3 will then go low and, via pin 37, the counting in the programme timer i.c. will stop.

In the stop mode there are no Rec 12V and Pause 12V inputs. Thus pin 5 of IC7 is low while pin 6 is high because of the action of the inverter (IC9 pins 5-6). This is another AND gate, so pin 4 is low. Following a second inverter (IC9 pins 3-4) pin 2 of IC7 will be high.

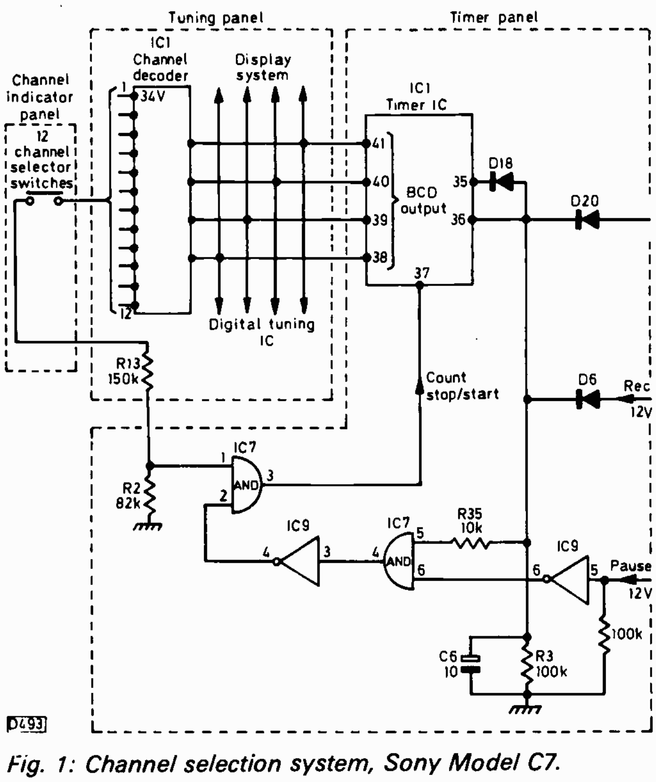


Fig. 1: Channel selection system, Sony Model C7.

During record pins 5 and 6 of IC7 will both be high (Rec 12V present). Pin 4 will be high while, via IC9, pin 2 will be low. This inhibits channel selection by preventing pin 3 from going high. A similar action occurs during pause.

Our first step was to check at pin 2 of IC7. As expected, this was found to be low during the fault condition, thus preventing channel selection. Checking back we found that pin 5 of IC7 was "highish" when it should have been low. We next monitored the conditions at pin 5 after the action that restored normal operation had been taken, i.e. unplugging the mains.

During normal operation in the stop mode there was the correct "low", i.e. zero voltage, at pin 5. Select record and the voltage rises to the correct 12V. Change back to stop and the voltage falls as C6 discharges – but the voltage levels off at 2-3V, enough to operate the gate, instead of falling to zero. Where was this voltage coming from?

The Rec 12V input was at zero as it should be, and the anode of D20 was low while the cathode of D18 was high. D18 could have been leaky, but no. This left two possible sources, IC7 pin 5 or IC1 pin 36 – assuming that R3 was not open-circuit. Shunting R3 with a 100kΩ resistor had no effect; shunting it with a 10kΩ resistor restored normal operation. To check IC7 we disconnected R35. Pin 5 read low so IC7 was ruled out. Turn attention to pin 36 of IC1 and find 2-3V. Fit new MB8841-180 i.c. and finally clear fault. **S.B.**

Sanyo VTC9300

We had a very tricky fault with a Sanyo VTC9300 which was sent to us by another dealer – it could not be set to make a timed recording. When you set the clock for a timed recording you put the on/off switch in the timer position (see Fig. 2). In this position the timer circuit sends a signal to the power supply switching to turn off the 12V regulator. A cassette is inserted, the record button is pressed, but as there is no 12V supply the machine enters a waiting period. When the timed recording is due to start, the timer circuit switches the power supply on again and the machine does its stuff.

With the faulty machine normal recording and playback were possible but not timed recordings. When the on/off switch was switched to "timer" the power supply stayed on and sometimes the deck solenoid played a tune. What then happened was that the timer circuit switched the power supply off but as the voltage fell the timer changed state and switched the power supply back on again: the result was very low-frequency oscillations between the timer circuit and the power supply, with the main deck solenoid switching on and off in sympathy with the power supply!

I was fairly sure that my friend (maybe now ex-friend) mentioned that he'd tried a substitute timer board from a known good machine with the same results, but when I checked around the TMS1070 timer i.c. I found that the voltage at the output pin 28 was high instead of low. No amount of on/off switching made any difference so the

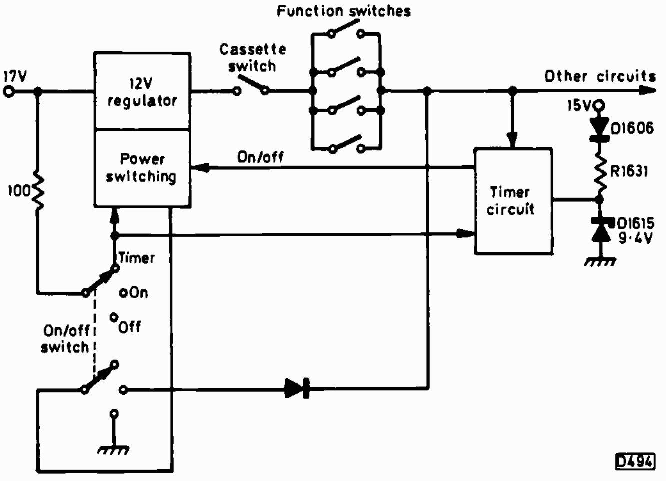


Fig. 2: Timer-power supply arrangement, Sanyo VTC9300.

chip was changed. Still the same result, output permanently high unless the machine was in one of its oscillating moods.

I was by now reasonably sure that the fundamental problem was not on the timer board at all. I did discover that by disconnecting the mains supply and then reconnecting it pin 28 of the timer i.c. would set to low, as required for a timed recording. But if the on/off function switch was operated in any way the i.c.'s output pin went high and stayed there. Why?

The timer i.c.'s power supply is stabilised by a 9·4V zener diode (D1615). Whilst fault finding we checked this with the scope. We also made a more accurate measurement using a digital voltmeter: 9·77V, not far off and within the expected tolerance. This was the mistake that led to a further hour's pondering and cross checking.

Note that apart from this timer business the machine worked normally in every way. There were *no* other problems.

Well, the fault was eventually traced to the 7815M 15V regulator on the power supply board. The 9·4V zener diode on the timer board receives its supply from this regulator, via D1606 and R1631. The 15V regulator was short-circuit, with the result that its output was nearly 20V, increasing the voltage across the zener to the 9·77V measured. The timer i.c. didn't appreciate this increase, giving the curious conditions described. **S.B.**

Ferguson 3V30

The recent weather conditions – with thunder and lightning – have produced a number of timer display faults, presumably by confusing the timer i.c.s. Luckily the cure has usually been to switch off at the mains and then reset the clock. A Ferguson 3V30 with an incorrect clock display failed to respond to these tactics however. Observations then revealed that not only was it impossible to reset the clock, but timer set and channel change were also inoperative. These symptoms led us straight to the culprit, the μPD553-100 microprocessor i.c. on the presetter/timer board. **M.J.C.**

JVC HR7300

A JVC HR7300 worked perfectly in the play and record modes. When the machine was set for a timed recording however the tape would lace up but then stay in the pause mode. The machine should lace up ten seconds before the set time, and at the set time go into record. Both the prestart and record start signals from the presetter/timer board were present at the mechacon (mechanism control) board, but the enable output from the TMS1024 multiplexer i.c. was missing. A squirt of freezer on this i.c. brought the machine into action, and no further trouble was experienced after fitting a replacement. **M.J.C.**

Ferguson 3V30

The complaint with a Ferguson 3V30 was damage to the tape when ejected. When play was selected the tape laced up and normal tape transportation took place. When the machine was stopped, the loading motor unlaced but the reel motor failed to rewind the surplus tape back on to the supply spool. As a result, when the tape was ejected the cassette flap creased the spilled tape. Further investigation showed that the reel motor didn't work in the fast forward, rewind or search modes. The culprit was the 10Ω power feed resistor to the reel motor. On earlier machines this is R48, in later production it's a protective device in a transistor encapsulation. **M.J.C.**

Ferguson 3V29

The complaint with a Ferguson 3V29 was a rolling picture with the sound out of sync with the vision – sure enough when we got there we found that the sound was coming about one and a half seconds before the appropriate bit of picture on previous recordings. Now this can happen only if the distance between the audio and the video heads alters. Full of trepidation, I opened the machine – and found that there was a simple explanation. A half penny piece had been dropped into the machine and was preventing the loading arm going fully home, thus shortening the tape path between the two heads. **D.S.**

Ferguson 3292

I always thought that the early Ferguson 3292, their first VCR, gave better pictures than any of the later machines – even comparing the results obtained from a three-year old machine and nearly new 3V22s. We had a 3292 in the other day with a reasonable picture though it was rather poor near the top of the screen and a lot of odd lines dropped out. We thought that as the machine was over three years old the heads might be a bit worn, but when I checked I found that part of one head was completely missing. Now on any other machine the picture would have been unviewable, but this one just had the defects mentioned – this must say something for the design.

The need to replace the head drum brought us up against an unexpected problem however. If you send for a head drum for a 3292, 3V22 or 3V29/30 you will receive the same one, which should be interchangeable on all these machines. We couldn't get the drum to fit properly though, and after comparing the machine with a stock 3V22 we found that there was a difference in the design of the lower drum assembly. It appears that this applies only to some early 3292s. Ferguson were able to help us on this occasion, but the old type of head is no longer officially stocked. As a result, when you replace the head drum you'll have to replace the lower drum assembly as well. It must be stressed that this problem arises only with some early 3292s, but as the lower drum assemblies cost up to £50 this is just as well. **D.S.**

Spider Walk

Les Lawry-Johns

ONCE upon a time we would carefully unpack new sets, run them up and align the channels as soon as they were delivered. Having satisfied ourselves that all was well we would return them to their boxes until needed. Until recently, that is. Of late we've become lax and left them in their boxes – simply because their track record has been so good.

So in came a couple we knew quite well. They wanted to buy a new set but hadn't quite made up their minds. They said a plain 22in. set would do. So I showed them a Pye set fitted with the K30 chassis and they were quite happy with it. I then put my foot in it by suggesting one with remote control, to save them jumping up every time they wanted a different channel or wanted to alter the volume etc.

They said this was a good idea so I unpacked a nice new 1042T and put it up on the bench. The little light came on to say that all was ready, but when I pressed channel one the light went out and the set was stubbornly dead. It remained so even after I'd switched off and on again. Even the little light now remained out.

That's funny I thought, and then noticed that the front panel was loose. Off with the back cover, revealing little bits of plastic on the floor of the cabinet. It had apparently sustained a mortal blow somewhere along the line, and I cursed myself for not having checked it earlier. The couple settled for the one without remote control however, and departed quitely happily whilst I repacked the damaged set for return to the wholesalers. During this procedure H.B. came downstairs and stood beside me.

"I think you should go to the bathroom" she said.

I sniffed but found that I was still my usual pleasant self. H.B. sighed. "I don't mean you need a wash you fool. There's an enormous spider in the bath and I can't get it out."

So after I'd packed the set I went up to the bathroom to carry out a rescue operation. The usual process is to drape a towel over the side so that the spider can climb out. Must help them otherwise we'd be knee-deep in other insects. When I saw the size of this one however I was quite amazed: it's body was the size of a peanut, with legs sticking out three inches on either side. When I say a peanut I mean a pair in the shell, not one of your shucked variety. No indeed there was nothing small about this fellow (or girl) and it refused the invitation when I slid a towel down towards it. So I moved the towel round to the other side and tried to drive the ungrateful beast on to it.

It didn't want to know, so I left it too take its time. A while later I found that it was still there. Maybe it was tired out after trying to climb the sides of the bath unaided. I pondered: should I insist on it going up the towel and possibly hurt it, pick it up and risk it hurting me, or feed it some dead flies to give it strength? I decided to pick it up and risk instant death. Up by the legs and out on to the window sill. It would have to take its chance, jumping or climbing down the wall. Shut window and put towel back.

What's this? Three tiny specks scurrying around in the bath. Looking for mother? Now what had I done? Something had to be done about this and quickly. Fortunately mother spider hadn't made her departure, and with the aid of a piece of toilet paper I was able to get her back into the bath.

I expected the little ones to rush towards their mum, but they didn't. In fact they scooted as far away as they could get. Then another thought hit me. Maybe it was dad. Do the fathers eat their young? Were these the final survivors? There was only one solution, to rescue them all but separately. This was easy enough with the big one, but the others scampered about everywhere. I eventually got them all out, but what subsequently befell them I shall never know.

The White GEC

After this harrowing encounter with the animal world I staggered down to the shop to harrow with humanity again. I didn't have long to wait. In came a young chap carrying a monochrome GEC set in a white cabinet – a Series One type.

"The tube's knackered" he informed me.

"Oh, ah" I said for want of anything better to say whilst removing the back.

"Yes indeed" he babbled on. "When it's going there's a blue light in the back of the tube."

I asked him if it was in the tube's neck and he said it wasn't. It was up the front where the scan coils meet the tube bowl.

I switched on and after the line timebase had warmed up I noticed that a raster appeared. "There it is, just above the coils" he said. It was a reflection from the screen through a section of the bowl with no coating of course. So I turned the brightness down and the glow vanished. "It's gone" he said.

Connect aerial and turn brightness up again. The line hold was way out, but trying to correct this by adjusting the line oscillator coil pulled the picture sideways in fine lines, with the hold still poor. Time to check likely components. The sync separator's 47kΩ screen grid feed resistor was o.k., as were the flywheel line sync discriminator diodes and the 100kΩ reference pulse feedback/integrating resistor. The PCF802 perhaps? What's this – a PCF80!

"Who put that in?" I demanded. Said he didn't know. Anyway a new PCF802 and adjustment of the coil set things to right, and the young man departed still wondering where the blue glow had gone.

The White Murphy

The owner of a white Murphy complained that the fuse must have gone because it didn't do anything. Also that the Channel 4 button wouldn't get Channel 4. It was a standard A823 chassis.

The tube heaters glowed and there was h.t. at the top fuse which was intact. The l.t. fuse was also intact, but there seemed precious little l.t. from the bridge rectifier, suggesting either that the bridge was at fault or that the reservoir capacitor wasn't reservoiring. The bridge (a BY164) measured o.k. when checked with the meter, so we removed the top plug and checked the reservoir capacitor via pin 5. It too read right so we decided that the bridge wasn't telling the truth. We fitted a BY225 in preference to four separate diodes – because the BY225 is quite adequate for the job and is easier to fit. The l.t.

was then correct, but as there was a suspicious and leaky bulge in the centre of the double smoother another one went in.

We could tune in three buttons, but the bottom one seemed too free, leading us to believe that it had shed its collar. Removing the tuner revealed that this was so, and that the three spindles that did work didn't have collars that fitted snugly – there were fine hair cracks in them. So we removed the front plate and fitted four nice new blue collars, assembling the spindles so that the springs didn't get caught in the rear holes.

The set was then ready for use, complete with a Channel 4 button. The owner was quite pleased with our efforts, and rounded up the bill by an extra 51p to prove it.

An offer we couldn't refuse

A well known motoring organisation regularly circulates its members with offers of publications, accompanied by various enticements. Some of the publications are well worth having, and on this occasion the book was one I'd have ordered without the added inducement of a Ford Granada to a lucky person plus thousands of pounds if an early order was received. This suited me down to the ground, because we badly needed a new car and the money would come in handy to buy petrol for it. So I sent off for the book without delay and told Honey Bunch that our days of running around in a rusty old car were over.

Time went by and we received a card saying that there was a slight delay in sending out the book but to be patient. So patient I was and the book finally arrived. Very good it was, picturing and describing most parts of the country worth picturing and describing. There was no mention at all of our locality therefore, and I wondered about that.

I was still agog about the opportunity of that top of the range Granada. As the weeks went by however I was forced to the conclusion that I'd been forgotten, and when my foot went through the bottom of our car I was reluctantly forced to buy another one – with a bit of help from the bank.

A few more weeks went by and I received a letter to remind me that I'd not paid for the book. This was quite true: in the excitement of waiting for them to send me the car and a lot of money I'd quite forgotten to send them a cheque for the book. So I wrote and told them that I'd forgotten but so had they, and that I was quite upset because I had needed the car quite badly. I haven't heard from them yet, but I really will send them a cheque in due course to further increase the overdraft. I wonder if someone else got the car and money? Something else we shall never know.

FIELD OUTPUT TRANSISTORS

In S. Simon's article on the GEC C2110 series solid-state colour receivers (July issue) the BD203 was suggested as a suitable replacement transistor for use in the field output stage. In the original circuit two different types of transistor (generally ON447 and ON448) were used, and it should have been made clear that the BD203 can be used in either position. In fact the BD203 can be used generally as a reliable replacement in this type of two-transistor class A field output stage provided the mounting arrangements are suitable.

next month in

TELEVISION

● **THE PHILIPS CTX CHASSIS**
Models fitted with the new Philips CTX colour chassis are now being released. The chassis was developed at the Philips research and development headquarters in Eindhoven to take advantage of the latest TV technology. The single board is about the size of a sheet of A4 paper and the component count is down to 386 – a third less than previous Philips sets. Next month we review the technical features of the chassis.

● **TV COMPONENT DISTRIBUTION DIRECTORY**
Our first tabulated directory of TV component suppliers. Provides a quick reference to sources of the components you need.

● **VCR SERVICING**
So far we've been dealing mainly with the original basic JVC machine. Next month we go on to the JVC/Ferguson HR3660/3V16 to see the changes required to provide extra features – still pictures, slow motion and double-speed playback. Amongst other things, the off-tape reference pulses control the capstan instead of the drum servo.

● **ROUTINE TV RECEIVER TESTS**
S. Simon on the 18in. Pye/Philips colour chassis – the 713/570 series.

● **THE FINISHING TOUCH**
An otherwise sound set can be let down by the condition of its cabinet. Tony Thompson on simple, practical methods of enhancing the appearance of sets.

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Letters

ASPERSIONS ON TUBES

It was with some concern about my eyesight and also a perhaps more critical than average approach to the images we view on the box that I made a small survey of the current TV sets on display in my local high street – and the nearest C***t branch.

Without ascertaining exactly which type of tube was used in each particular model it nevertheless became apparent, to me at any rate, that the usually good definition of the transmitted signal is seldom if ever to be seen on (a) sets fitted with in-line gun tubes requiring no EW or NS correction and (b) sets fitted with 30AX tubes.

It's possible to regain some definition in peak white areas by reducing the settings of the contrast and brightness controls, but this makes a "hi-bri" tube a "lo-bri" one. There is also the problem that the slot mask, striped phosphor configuration gets in the way of the image. Delta-gun tubes were much better, as are some Hitachi tubes.

I understand that higher definition tubes are now available. Can't the public be offered sets using these?
G. Beard,
London SW18.

Editorial note: This is a very complex subject on which we intend to publish an article in the near future. More important points to bear in mind are as follows. (1) Use of a pincushion distortion free yoke leads to spot distortion, so the focus performance is worse. This is compensated for to some extent by using a longer focus electrode operated at a higher voltage. (2) The distance between identical colour phosphor stripes (i.e. the pitch) for these tubes is 0.65mm for a 14in. tube, 0.7in. for the 16in. size and 0.8mm at 20in. Obviously the resolution is not going to be particularly good, but the *apparent* image sharpness is acceptable to most viewers – at a reasonable viewing distance of course. (3) Advantages associated with modern tubes include lower cost, a lower component count, lower deflection power requirements, fewer adjustments etc., giving better value, less power consumption and greater reliability.

IN-SITU TRANSISTOR TESTER

A correction is necessary to my letter (May 1982) on the in-situ transistor tester modification. It was not necessary to add a 20 plus 20 winding to the small transformer I initially used. It was approximately 1 7/16 × 1 11/16 × 1 3/8in., with a 240V primary winding having a d.c. resistance of around 1·3kΩ and a 12V secondary whose d.c. resistance was about 2·75Ω. Any type of small transformer can be tried, but make sure that the secondary has a d.c. resistance of at least a few ohms and a centre tap. I found that the best value for C1 is 0·22μF and agree with Victor Rizzo (June issue) that finding the exact coil originally suggested or winding one from scratch would not be easy. A ready made transformer solves the problem – my latest find is a small vertical feedback transformer from an old valve TV set. After testing this out I found that it works very well.

To give an idea of what to look for, this latest transformer has a primary winding with a d.c. resistance of about 450Ω and a centre-tapped secondary with a d.c. resistance of about 5Ω. It's not as small as the original one, but that's no problem. I made a wooden case about 6 × 4 × 1 7/8in. with an aluminium lid that has a small hole for the window. The probe is separate, linked by a plug and socket. I'm now using a 330Ω resistor in the R1 position as originally suggested.

I would like to mention that a mA meter should not be connected to the circuit to measure current drain. This was the cause of the problems I experienced – and you could damage the meter.
Walter Spencer,
Brisbane, Australia.

WORKSHOP GADGETS

Here are one or two more gadgets I've devised to save time and frustration.

First a dentist's mirror (see Fig. 1) that gives you a glimpse of the other side of the chassis/board, sometimes avoiding the need for any dismantling. The mirror I adopted was taken from a Chinese pencil sharpener that's widely used here – all that's required is a small circular mirror of about 2·5-3cm diameter. This is held by a holder made from 2mm thick mild steel wire bent to fit. Paste a piece of stiff paper to the back of the mirror to protect it from scratches, using water soluble glue. Fix the mirror to the holder with contact adhesive. When this has hardened, bend the mirror at an angle to facilitate viewing and add a wooden handle.

The socket shutter openers shown in Fig. 2 are made of plastic with a brass ring at the end – the rings should be as small as practical. For the 5A opener I used a length of sawn off plastic volume control spindle of suitable thickness. The openers are very handy for outside work.

The versatile hanger shown in Fig. 3 is especially useful for the small workshop since it helps to keep the bench clear while wanted items remain in view. Fix it to the wall above the bench with an eye hook at each end and use it to hang soldering irons (with the lead rolled up), small

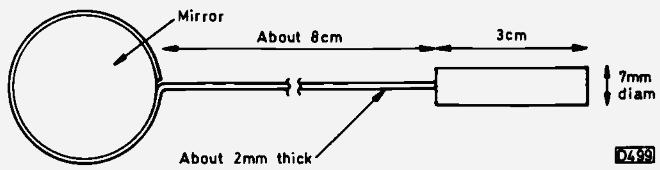


Fig. 1: DIY dentist's mirror.

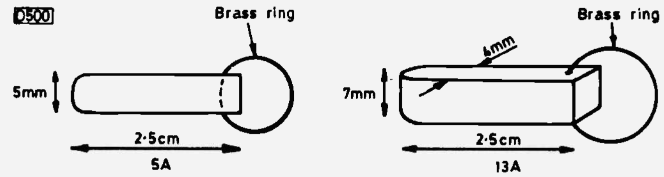


Fig. 2: Socket shutter openers — 5A and 13A.

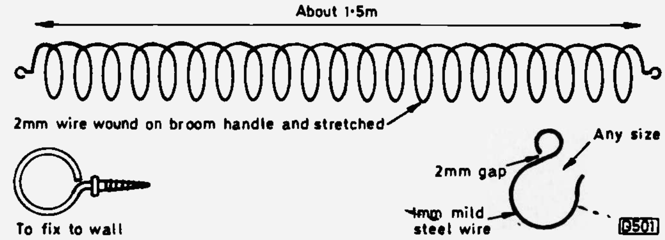


Fig. 3: A versatile hanger for small tools etc.

tools etc. Old copper or mild steel wire of 2mm thickness is suitable, wound tightly on a broom stick and then stretched (don't overdo this). The hooks can be made of 1mm mild steel wire, of different sizes to suit whatever is being suspended: leave the eye, which is at right angles to the rest, open so that it will pass through the loops of the hanger. A loaded hanger will sag somewhat in middle, so hang heavy objects at the ends, leaving the middle for lighter items.
Victor Rizzo,
Msida, Malta.

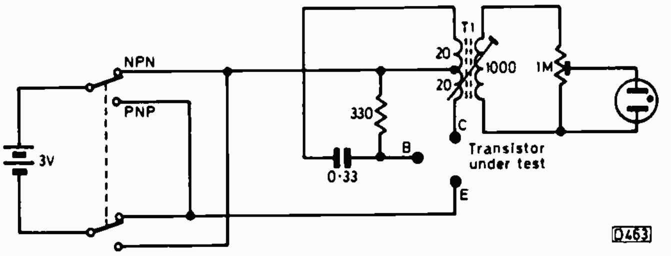


Fig. 4: In-situ transistor tester circuit.

TRANSISTOR TESTER – PRACTICAL DETAILS

I built Mike Phelan's in-situ transistor tester (March 1981) and have found a suitable case that results in a very handy unit. The circuit is shown in Fig. 4. I used the suggested transformer (from the Rank Z918 remote control transmitter unit) but found that I had to rewind it with 20 + 20 turns on the primary to get it to work. It was then found that the unit didn't work with certain low-gain types of transistor, so the number of turns used for the secondary winding was increased to 1,000. To get the turns on, plastic shoulders made from washing up liquid bottles were fitted to the former. These were glued on with Araldite, the extended former just comfortably holding the 1,000 turns.

The resultant tester might be over sensitive, passing very low-gain transistors as o.k. I've had this trouble with other in-situ designs. To overcome this I added a 1MΩ potentiometer across the transformer's secondary winding as shown in the circuit.

The unit will fit neatly into an RS 508-217 probe case (see Fig. 5 and accompanying photo). The collector-emitter probe is the one used in the Datong Datest-2 transistor tester and was obtained from Datong Ltd., Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE. The neons are miniature RS type 586-015 and are held by a clip made from thin sheet aluminium. The HP16 batteries are held by clips made by bending the brass connectors from 1289 (4·5V) batteries. The switch is a Maplin subminiature slide type FH35Q, and the base probe heat shrink Maplin type CP32 (catalogue no. BF88V). 8BA and M2 countersunk head screws are also required.

It was found advisable to insulate the switch body with tape to avoid shorting out the batteries. The slots in the case were made by drilling and then using needle files. The coil former shoulders were cut using draughtman's dividers. Rubber sleeves on the c-e probe wire will grip in the case and form a grommet.

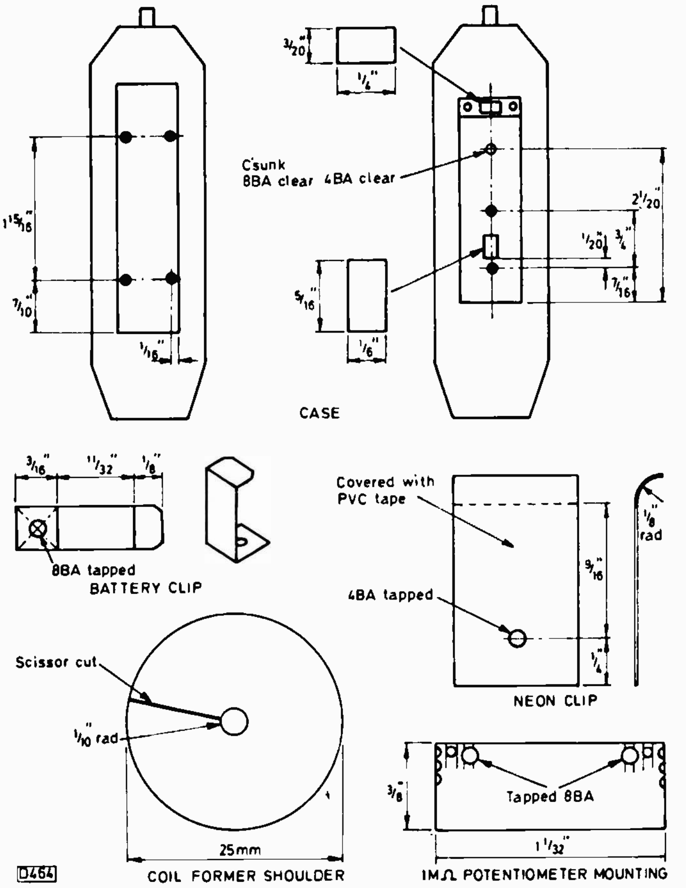
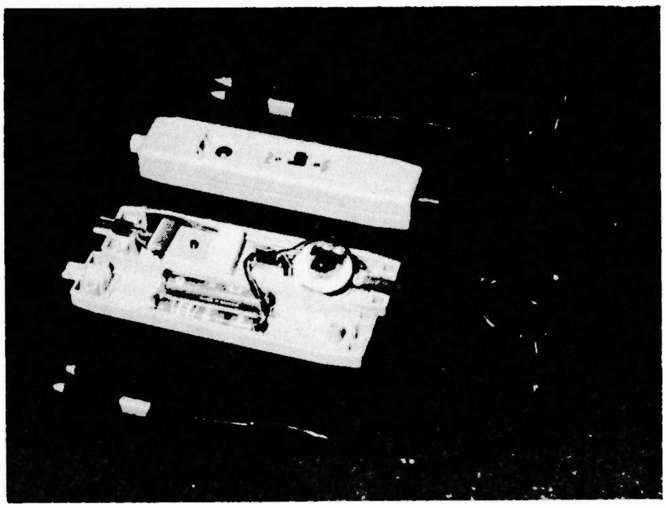


Fig. 5: Transistor tester — constructional details.


R. A. Gibson's version of the in-situ transistor tester.

The 1MΩ potentiometer was added afterwards, mounted on a small piece of Veroboard. Drill 8BA clearance holes in the probe end of the battery clips and fit the board flat between the probe and the batteries. Solder the vertical type preset to the board and drill a suitable hole in the case for adjustment.
R. A. Gibson,
Farndon, Chester.

VIDEOTAPE DEVELOPMENTS

Fuji Photo Film Co., Ltd. have developed two new types of videotape, a metal videotape and a vacuum evaporated tape. They are claimed to be the first to achieve recording at wavelengths below the 1μ range. The metal tape requires the use of special heads but gives a higher recording density. The vacuum evaporated tape can be used with conventional heads and has a higher sensitivity for recording wavelengths under 8μ. Both types of tape will enable more advanced recording systems to be developed.

Routine TV Receiver Tests: Pye 725 Series Chassis

S. Simon

THE Pye 725 chassis is very similar to the 110° 731/735/737/741 chassis but is simplified somewhat for 90° scanning. It uses the same arrangement of vertically mounted panels, with the power supply and field timebase to the right of the tube. The field timebase is at the top and the power supply at the bottom. Also on the right-hand side is the convergence panel, which is clearly marked for easy adjustment.

To the centre and under the tube is a resistive assembly and an 800mA fuse (F971) which feeds h.t. to the line output stage – the mains fuse (F913) is on the power supply panel. It's essential to understand the function of the centre resistive assembly in order to locate faults quickly and also to avoid the risk of quite a severe shock. The latter possibility arises when one section of the resistive assembly goes open-circuit, leaving the h.t. electrolytics fully charged until the circuit is completed by an unwary hand or tool.

Two different types of assembly were used. The first had two sections with a separate 3·3Ω resistor mounted on top. In the later version, the 3·3Ω resistor was incorporated into the unit. The resistors fulfil the following functions: R972 27Ω line timbase anti-breathing; R973 56Ω h.t. smoothing; R978 3·3Ω surge limiting. See Fig. 1.

It may be thought that if the 3·3Ω section is open-circuit there'll be h.t. at one end but not at the other. This is not so. If the 3·3Ω resistor is open-circuit there'll be no h.t. at either end, because the h.t. reservoir capacitor C880 comes after this section and won't be charged.

If there's no h.t., switch the set off and check the continuity of the 3·3Ω resistor before investigating the power supply panel. If one of the other sections of the resistive assembly is open-circuit, switch the set off and shunt a resistor across the suspect section to discharge the h.t. electrolytics before taking any further action – these capacitors can retain a hefty charge long after the set has been switched off.

The vertical panel immediately to the left of the tube houses the complete line timebase, including the output transformer, tripler, focus unit and first anode supplies, also the field oscillator and the l.t. supplies (12V, 25V and 28V).

The panel on the far left side contains the entire signals circuitry from the tuner, i.f. stages and audio department at the bottom to the decoder and RGB output stages at the top.

Set dead: Initial tests

In the event of a dead set, bear in mind that the tube's heaters are supplied from the line output transformer. Thus a dead set can mean many things. So it pays to be cautious and methodical.

Inevitably the first thing to check is the condition of the mains fuse on the right-hand power supply panel. It's a 3·15A anti-surge type. If the set has not received much attention from servicepersons, the top straps may still be in position on the panels. These must be removed in order to withdraw and turn the panel. With the strap off, lift the bottom latch and withdraw the panel, lifting the top slightly to clear. It can then be rotated to expose the fuse, which tends to hide behind the centre section (the panel layout varies slightly on some sets).

If the fuse is blackened, the mains filter capacitor C915 (0·22μF) is the prime suspect – but not the only one since a short-circuit thyristor rectifier (D888, BT116) is not uncommon and flashovers have been known to happen across the rear of the panel, particularly on the lower part where the soldering around the lugs of the input choke L909 and the main electrolytics C880 and C877 is suspect. The filter capacitor is the most frequent offender however and one normally doesn't have to look farther than this.

If the fuse is intact and is live but most other parts appear to be dead, inspect the lower part of the panel on the print side and if necessary renew the soldering of the input choke lugs – it doesn't take much vibration to loosen the lug connections of this heavy choke.

If there is plenty of a.c. up to the thyristor, remember what we said at the beginning about the 3·3Ω resistor at the centre. If this is intact, return to the power supply panel and carefully check the high-value resistors, the three small BC147 transistors and in particular the two 7·5V zener diodes.

Fluttering

One condition you may encounter is fluttering, i.e. rapid variation in picture size. This usually means that the over-voltage protection circuit is coming in. The over-voltage preset control RV879 is on the right of the panel when viewed from the print side, roughly in line with the thyristor. The coarse h.t. preset RV917 is towards the top left, whilst the fine h.t. preset RV916 is roughly at the top centre. Reduce the h.t. to stop the flutter, then measure the h.t. voltage at the rear, centre h.t. fuse.

If the h.t. is now 170V or just over (full width), it was previously excessive and the protection circuit had been doing its job. What this usually means is that the thyristor is starting to leak. Replace it.

If the h.t. cannot be regulated, the thyristor could again be at fault but there may be a more obscure cause which will involve a more detailed investigation of the resistors, transistors and zener diodes as previously mentioned.

If the h.t. voltage is now low, the protection circuit may need a close check (VT881, D884 etc.), particularly if the preset RV879 has little or no effect.

Blown HT Fuse

If there is h.t. at the centre section and the resistors here are intact, the 800mA h.t. fuse may well have failed

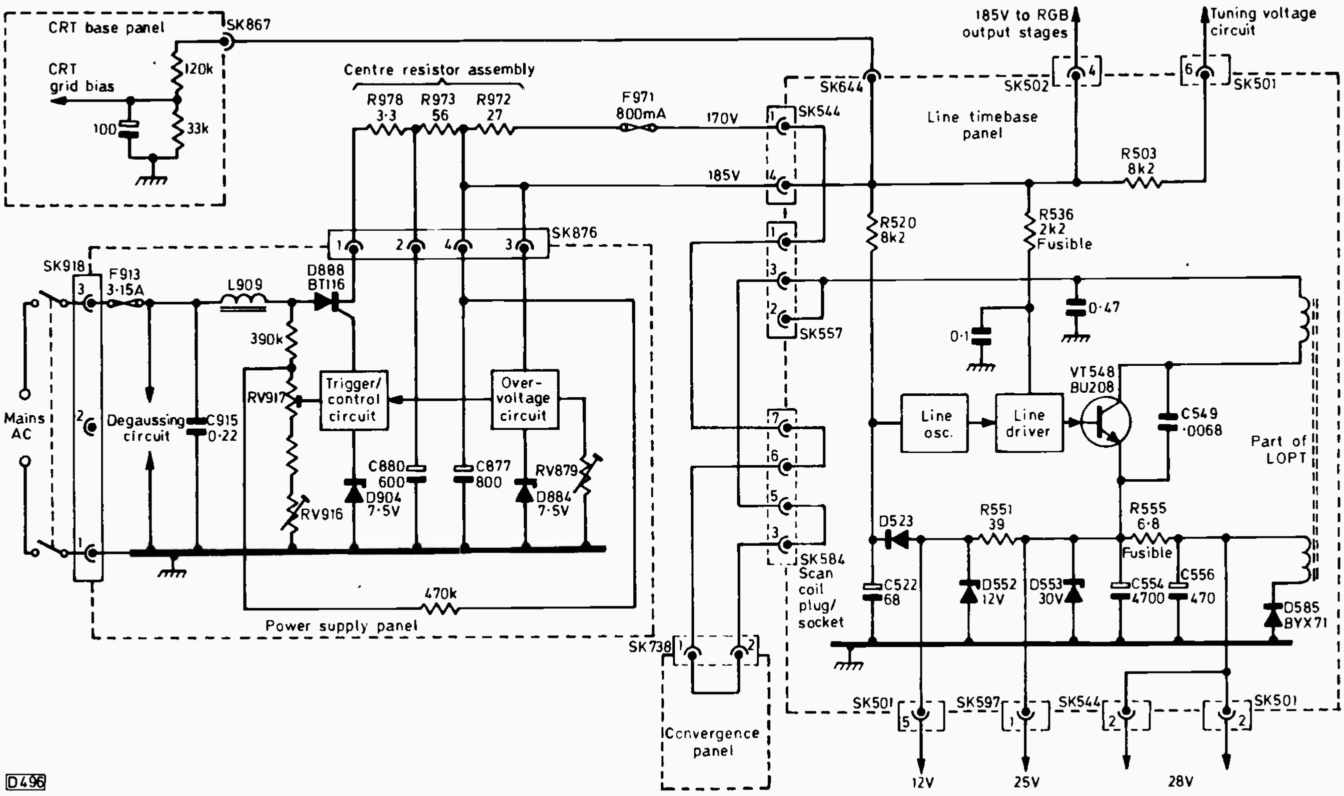


Fig. 1: Power supply arrangements in the Pye 725 and related chassis.

and the question is what blew it? With the set switched off, check the resistance from the fuseholder to chassis. If the reading is low, check the BU208 line output transistor which could well be short-circuit. Replacement is sometimes easy and sometimes most difficult. Not complicated, just difficult.

If the reading is high with the black probe to the fuseholder and the red probe to chassis, suspect a short-circuit capacitor. If you are not familiar with this type of set, proceed as follows. Shine a light into the top of the screened line output stage section in the area of the focus control. Locate the horizontal 0·1μF capacitor (C563) just under the top housing. Note where its end connections come through to the print, then measure the resistance across these two ends. If a short is indicated, remove the capacitor and replace it with one rated at 1·25kV or higher. A rating of 1kV will not do as this is the first anode supply reservoir capacitor, which is charged by the clipper diode inside the tripler. This explains why a resistance check at the fuseholder will not reveal a short, and why disconnecting the tripler will stop the fuse blowing, leading one to suspect the tripler – which could be at fault though the culprit is more likely to be the capacitor.

Unfortunately the capacitor can ruin the tripler and indeed the BU208 line output transistor, but usually the fuse will have blown to prevent these nasty things happening – provided the fuse is of the correct value that is. Do not replace it with one that has a higher rating.

Set dead: HT present

If h.t. is present at the fuse and is reaching the BU208 line output transistor (the route is rather roundabout, via various plugs and sockets, so it could get lost), it's likely that the line oscillator is not oscillating or the line driver is not driving.

The line driver is supplied from the 185V h.t. line, i.e. the junction of R972/3. The line oscillator also receives its start-up supply from this line, via R520 (8·2kΩ). When the line timebase gets going, the oscillator receives its supply via D523 from the line output stage.

Check R520, then check the fusible resistor R536 (2·2kΩ) which feeds the line driver transistor VT541 (BF355). If VT541 is short-circuit, R536 will have sprung. If VT541 is open-circuit, R536 will be cold with the same voltage at each side.

Field Timebase

We have had very little trouble with the field timebase, apart from the occasional need to set the field hold control which is at the bottom centre of the line timebase panel – the oscillator is on the line timebase panel while the rest of the field timebase is on the board at the top right, above the power supply panel.

The Decoder

The decoder is not so reliable, and we could go on about it quite a bit. The object of this series however is not to go into detail on less usual faults but to stick to the general handling of sets and servicing hints. So we'll confine ourselves to the commonplace and immediately point a finger at the thick-film video load unit at the top of the board.

These resistive units are rather fragile and can give rise to several sometimes confusing fault symptoms. This is because the units contain not only the three 5·1kΩ load resistors for the RGB output transistors but also three 27kΩ resistors that provide feedback. So if the grey-scale is affected and the voltages around the BF336 RGB output transistors are not quite right (or maybe hideously wrong), the thick-film unit must loom large on the suspect list, together with the output transistors themselves, the preceding TBA530Q matrixing i.c. (to which the feedback goes) coming farther down the list.

The TBA990Q demodulator/PAL switch i.c. should not be overlooked if one is searching in vain for a missing primary colour.

To be fair, the majority of the colour faults we've experienced have had their cause at the top end of the panel, and it pays to linger a little in the area where the heat is.

The IF Strip

The i.f. strip is the source of a large percentage of the complaints with these and certain other chassis that have sections in common, i.e. the 18in. Pye 713 and Philips 570 chassis. The complaint is that the picture becomes very noisy (grainy), which at first sight looks like a tuner or a.g.c. fault. In the majority of cases however the trouble is due to a poor connection in the i.f. gain and filter unit, which is on the lower part of the left side panel.

To overcome this problem unsolder the several connections and remove the complete unit. Ignore the side containing the three i.f. transistors and concentrate on the filter side, where the input from the tuner comes in. Note the printed coils and the several small capacitors – particularly those which have connections to both sides of the panel. Carefully resolder the coil ends with a small iron: repeat with the capacitors, gently easing these up slightly to ensure that the solder makes good contact with the wire legs. Coils L101 and L109 are suspect, together with capacitors C106, C113, C117 and C120. It may be necessary to repeat the operation because the dry-joint has not been dealt with and it was only the disturbance of the unit that apparently cleared the fault.

General Notes

Do not remove the vertical panels unless this is really necessary – replacement can be tedious even though the correct exit and entrance channels are known. Note also that due to the absence of a metal main frame the earthing of the separate panels is important. This accounts for the multi-earth plugs and lugs which must all be in position when the panels are replaced.

As a final point, one might wonder what a 30V zener diode (D553) is doing connected across the line output stage derived 25V rail? It's there to provide protection in the event of the line output transistor or the flyback tuning capacitor C549 going short-circuit: the idea is that it goes short-circuit when the voltage across it rises much above 30V. It doesn't usually do this for the simple reason that the 800mA fuse blows first.

Miller's Miscellany

Chas E. Miller

WORKSHOPS have been on my mind lately for a variety of reasons. Whilst writing for another magazine on setting one up my thoughts inevitably turned to the various places in which I've had to work.

When I was very young I treasured a book called simply *Radio Engineering*. It was published by Odhams Press (now part of IPC) who published a great deal of this sort of literature. It contained an illustration of a "typical workshop" which had spacious, uncluttered benches and was staffed by several white coated engineers of irreproachably sober, honest and earnest appearance. Many years on, I've yet to see this "typical" arrangement in practice. Not, I hasten to add, that my many friends are habitually sloshed: I was referring to sobriety of thought – have you ever met an engineer who didn't have a lunatic sense of humour? I'm not going to say that such a typical workshop doesn't exist: only that if it does it's well hidden.

Some Practical Examples

The trouble is that so many workshops have been improvised using premises quite unsuited to the purpose. My personal top award in this category goes to one in which I had to perform trade work in the Potteries. It appeared to have been a scullery initially, and was still furnished with a large sink. There was no proper door, merely an old blanket slung on a cord as a half-hearted attempt at keeping out draughts. It failed! Because of its situation, no daylight ever reached this room directly, and consequently no heat from the sun. Admittedly this made for a pleasant temperature during high summer, but at any other time the place was as cold as charity, even with an electric fire. People wouldn't believe me when I told them that I had to go out into the street for a warm up now and again – until they sampled it for themselves!

Runner up to this delightful place was another never to be forgotten establishment, once more located at the rear of old premises but this time above the scullery. It appeared that a bedroom had been partitioned off in a rough and ready manner to form the workshop on the one side and a toilet on the other. I never actually saw what lay behind the new wall, but its complete lack of soundproofing qualities made speculation quite unnecessary! These alterations having removed the normal means of access, the convertor had hacked a trap-door into the floor of the workshop and fitted a spiral staircase removed from an antique double-decker bus. This might have looked picturesque, but was murder to negotiate when one was burdened with a large piece of domestic equipment. It also provided a splendid upward draught that went straight up the trouser legs. The management had thoughtfully provided an electric fire of incredible age and personal habits. It was a one-bar affair and had long since burnt out its element which had been repaired on numerous occasions. This had rendered it so short of ohms that it dissipated about twice as many watts as it should have and glowed nearly white hot: at intervals one of the many joints would give up and shoot showers of sparks and a molten element across the room. How on earth the place never caught fire I shall never know. I wonder if there are still workshops like that? (All replies will be treated in confidence!)

Mental Block

Whilst slaving away in someone else's workshop recently I happened to glance upwards and see on a high shelf a box marked "channel blocks". I couldn't for the life of me think what they could be: some type of filter unit perhaps, to block out a certain channel in difficult reception areas? It being too much trouble to climb up and see, I resolved to ask one of the resident engineers later. When one did put in an appearance I quizzed him but he was as perplexed as I. "Don't remember noticing them" he said, "maybe one of the others ordered them."

We continued to speculate on what they might be for and eventually, just before going home time, curiosity got the better of me and I dragged over a tall stool to enable me to take a look inside the mysterious box. Inside were a dozen highly scented chemical blocks of the sort intended for use in gents toilets . . .

ITT Bonding Problems

The CVC32 and related ITT chassis seem to be developing a similar problem to that experienced with certain Bush/Murphy monochrome sets some ten years ago, i.e. poor contacts between the main printed board and the metal framework on which it's mounted. Intermittent field faults such as rolling and loss of height can be tracked down to this problem on these ITT sets. The solution is to bond the various lugs positively with fairly heavy gauge wire – as we used to do with those Rank sets.

Thorn Tuner Problems

The vagaries of certain Thorn u.h.f. tuners are well known. Just lately I've been encountering some variations on the usual theme. In a number of cases the fault was a curious lack of gain on certain channels rather than the familiar drifting off channel. In no instance was the r.f. amplifier transistor faulty. It was usually found that the low channels were reasonably good, and perhaps those around 50-55, but between channel 35 and 50 the gain was sharply reduced. Two 1500s displayed this fault within minutes of each other. The same thing was experienced in sets fitted with the 3500 and 8500 chassis, giving the impression that some channels were working with reduced power – a suspicion immediately eliminated by checking with other sets.

The catch about this problem is that in my area, where the low channel Wrekin mast is visible to the naked eye, almost anything will give good pictures. If one just happens to forget to check the performance on the Sutton Coldfield channels as well it can lead to red faces when the set is delivered over the border, where most of my customers live!

Singular Sounds

I've long suspected that some customers buy equipment because their friends have persuaded them they ought to have it rather than because they actually want it. This view was reinforced recently when I collected an expensive stereo music centre for repair. "Do you want to take the speaker as well?" the young lady asked. No, she didn't mean "speakers". "We've only ever used the one. It sounds as good to us." Bring back the horn gramophone, all is forgiven!

On the Grand Scale

And so back to workshops. This time for servicing on the grand scale. My wife and I recently had an opportunity to look around the Radio Rentals factory at Bristol. Our guide was the genial manager Jim Broadhurst, who explained how they thoroughly recondition TV receivers from various branches.

Jim is himself responsible for some of the ingenious and efficient layout of the plant. On arrival, each set is allocated a repair ticket which identifies it positively during its trip through the factory – cabinets and chassis, when separated, must eventually be mated up again. The former are passed to a room where a giant band sander restores the smoothness of the woodwork. This achieved, the cabinet goes to the spraying department where a good as new (or better) finish is imparted. A special ventilation system keeps the atmosphere pure for the operatives.

Meanwhile the chassis are inspected and repaired by a team of engineers. Rows of benches incorporate a first class idea for easy and rapid handling. In the centre of each bench there's a cut out section which exactly accommodates a trolley of the same height. When this is in position it's almost indistinguishable from the rest of the bench, but the engineer has only to disengage it and move it once the job is completed and then wheel another into position. Like most excellent ideas, it has the quality of simplicity and inspires the thought "why did I never think of that?"

There's a special bay for tuner repairs. The young ladies who carry out this work are equipped with purpose-built oscilloscopes which enable precise alignment to be achieved. The display units are designed around redundant dual-standard monochrome TV sets, still in their original cabinets but mounted on one end. As a confirmed believer in making the most of what's available, I was impressed by this. To my mind it reflects credit on its designer John Wood and on the company as a whole, since this sort of cost effectiveness can only be of benefit to customers.

Again typical of the care exercised during the repair process is the meticulous testing of the c.r.t.s. Colour tubes are plugged into another special scope which resembles a console colour TV built into a metal cabinet. The three guns have their performances displayed visually on the scope's screen so that they can be compared with the strict standards laid down. Any tubes showing discrepancies are weeded out and sent for reconditioning.

The completed repair jobs are performance tested by a team of inspectors under the watchful eye of quality controller Archie Sandford and are then packed for despatch. The system gets my highest praise. My wife and I were also struck by the happy atmosphere of the factory. Jim would probably wish me to say no more than that this sort of thing doesn't happen by accident but is the result of the concern for their employees shown by Radio Rentals top management at the Swindon head office.

And Now . . .

If anyone is wondering what I was doing in Bristol, well it was for the purpose of acquiring some rather special though redundant test equipment, to wit a closed-circuit TV transmitter which generates a 405-line test card C on any of channels 1-13. I'm told that the example I now have is the only one outside the South Kensington Science Museum (confirmation of this would be welcomed), and without a doubt it's going to be invaluable for testing and demonstrating vintage sets once the BBC/IBA 405-line service finally closes down. Perhaps the editor will permit me to make a Vintage Spot of it in a future issue (why not? – editor).

A Vintage TV Renovation

John Narborough

THE HMV Model 905 and its Marconiphone equivalent, the 707, were first revealed to the public at Radiolympia, 1938 – just two years after the start of the BBC's high-definition television service. They were table models, described as "television/all-wave radio receivers", with seven-inch tubes. The price was an attractive 39 guineas. There were also a couple of five-inch versions (Models 904/706) which cost only 29 guineas (or 6s 4d weekly!). The introduction of small-screen television receivers was part of an effort by the industry to increase sales – the larger-screen sets of the time sold at prices in the 60-100 guinea range. As a contemporary advertisement for the 904 proclaimed, "now at last, combined radio and television at radiogram prices!"

Some months ago I was fortunate enough to acquire a 905, through my hobby interest in vintage radio. It was in long-disused condition, but complete and showing minimal signs of having been interfered with – except for the removal of one of the h.t. smoothing chokes and the wartime replacement of several smoothing electrolytics, the radio side of the set presumably having been used at the time though TV transmissions had been suspended. As I was living close to the Crystal Palace 405-line transmitter and was aware that the virtually obsolete Channel 1 transmissions to which the receiver's TV circuits were permanently tuned must soon come to an end I decided to restore the set – now 44 years old – to working order without delay. Armed with a copy of the original EMI service manual, courtesy of Gerald Wells' ever-helpful Dulwich wireless museum, I embarked on a task that was to occupy several weeks' of spare evenings.

General Description

Although described as a table model the 905 is neither small nor light. It weighs just over 100lb, the cabinet measuring 26 × 19 × 14in. deep. A sturdy instrument table was available for an extra three guineas – surely a wise investment, considering the damage a toppling set could cause! The receiver's sixteen valves, two mains transformers and all the circuitry are mounted on a single steel chassis which almost fills the cabinet's floor area: a false cardboard base gives access to the many components mounted beneath the chassis. When this unit is removed from the cabinet, only the loudspeaker (a six-inch type almost as large as the tube) and the type 3/2 Emiscope tube, hanging with its focus and scan coils from a bracket attached to the top of the cabinet, are left behind.

The tube is a triode type with an unusual six-contact base that includes the 2·4kV e.h.t. connection. It projects some two inches at the rear, the cardboard back requiring a small "bulge" to accommodate it. A useful feature from the servicing angle (quite literally!) is that the flare of the Pyrex glass tube is completely clear, enabling the picture to be seen from behind whilst making adjustments.

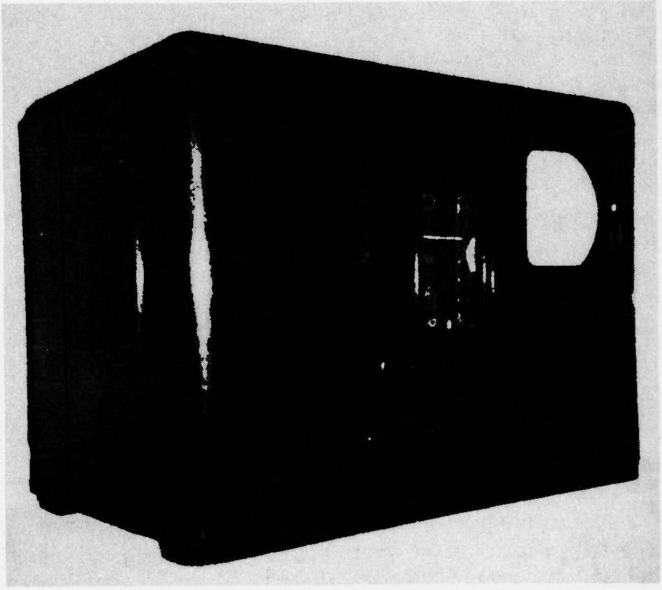
The illuminated tuning scale (long, medium and 52-16·5m short-wave ranges) on the front includes a 0-100 semicircular logging dial. The front controls are as follows: volume-on/off; slow-motion tuning; wavechange switch which operates a pointer indicator on the dial and has gram and TV at the extreme positions; focus control; and concentric knobs for contrast/brightness and line/field hold. The only preset controls at the rear are for width, height and, curiously, tone (top cut).

Circuitry

Marconi valves are used thoughout. A simplified block diagram of the set is shown in Fig. 1. The "front end" – r.f. amplifier, frequency changer and first i.f. stage – is used for both radio and TV reception. On TV and SW the r.f. amplifier's cathode bias is altered, by means of the wavechange switching, to give increased gain: the frequency changer has a ceramic base to minimise losses at h.f. For radio reception the i.f. is 465kHz: for TV the i.f.s are 8MHz vision and 4·5MHz sound – stagger tuning is used to get adequate vision i.f. bandwidth.

The power supply is shown in Fig. 2. On switching to television a second mains transformer is brought into operation to provide the heater current for the tube and the additional valves and to energise a 1·8kV winding which feeds the U17 e.h.t. rectifier. In addition, the h.t. supply is boosted for television by bringing an extra 16μF reservoir capacitor (C64) into operation – this is kept polarised on radio via the 15kΩ series resistor R66.

The final, MS4B, vision valve provides anode bend detection and some amplification. On the sync side there's an unusual arrangement with a D42 diode which operates in conjunction with a KTZ63 tetrode limiter valve. For a detailed description of these circuits, see Chas E. Miller's article last February. The timebases are very straightforward. In each case there's a KTZ63 blocking oscillator. The KT63 output tetrode in the field timebase is triode connected and a.c. coupled to the field scan coils. In the line timebase another KT63 is transformer coupled to the line scan coils.



The HMV Model 905 after renovation.

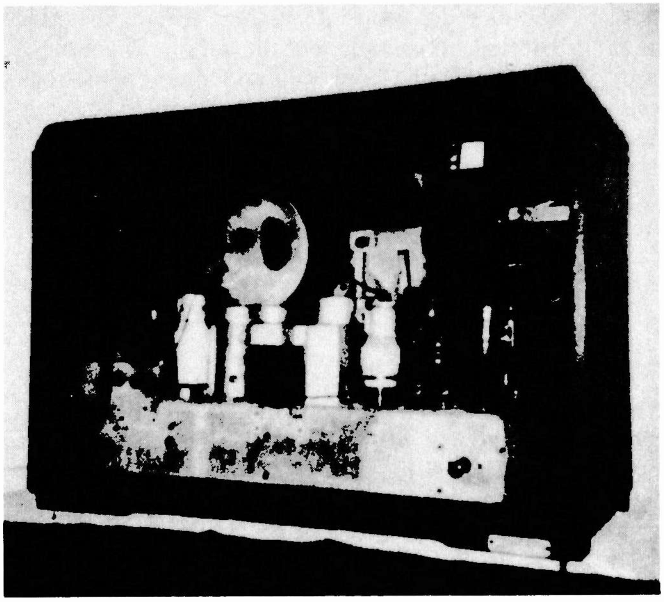
The whole style of circuit design and construction is typical of pre-war practice, though very similar arrangements were found in some immediately post-war models such as the HMV 1803, which had the same two-transformer power supply (but with 4kV produced from a 3kV secondary winding) together with a triode tube and many of the same valve types used in the old familiar circuits.

Work on the Power Supplies

My first task (after removing the chassis and blowing out a large quantity of dust) was to ensure that the power supplies were safe and working efficiently. The mains input comes via a 1·6A heat coil fuse of the type familiar to telephone engineers. For those who've not seen one, it consists of a small coil of resistance wire wound over a thin metal tube about ⅜in. long, housed in a "cartridge" rather like a conventional fuse. The electrical contact at one end is made via a pin held within the metal tube by low melting point solder, the whole unit being clipped into a pair of springy forks that tend to pull the fuse apart. Should excess current overheat the tube, the solder melts and the pin flies out, interrupting the circuit. If the pin can be found after this, the fuse can be reset simply by heating the pin with a soldering iron and persuading it to go back down the tube – though complete replacement was no doubt advocated by the manufacturers! Inevitably the pin was missing, and an ordinary 2A fuse had been clumsily soldered across the holder, making an intermittent contact.

Having tidied up this bodge I found that although the mains transformer windings all measured correctly with an ohmmeter the two toggle switches controlling the primaries were reluctant to operate: a squirt of switch cleaner soon remedied this however. On the secondary side the h.t. arrangements are a bit unusual, with three smoothing chokes and the extra switched reservoir capacitor C64 which augments C65 on television. Choke Ck1, which feeds the vision and timebase valves and also the focus coil, was missing, so I had to improvise a replacement from a scrap radio chassis, the main criterion being that it had to fit into the small space available for it beneath the chassis. Luckily the inductance value does not seem to have been too far wrong, since the correct voltage readings were obtained when I was finally able to test the set.

The remaining chokes gave the correct resistance readings, but all the electrolytics in the power supply were



A view of the innards.

leaky and of low capacitance, so I was forced to replace both the previous wartime substitutes and the original upright can types (held to the chassis by a large nut) with modern 450V types. These were wired in as neatly as possible where space permitted.

On the e.h.t. side, ohmmeter tests revealed that the 1·8kV transformer winding, the two 0·1μF reservoir/smoothing capacitors (sealed together in a large can) and the network of smoothing and bleeder resistors all seemed to be in very good condition, the only action required initially being to replace the perished rubber-covered lead carrying the 2·4kV to the tube base. I used a length of solid-core car ignition lead.

Component Condition

Having cleaned up the tuning dial and the tube face, which although inside the cabinet behind glass windows had become rather dirty, I was able to replace the chassis and carry out all further work with the set standing on end and the base and rear covers removed. Many of the original paper decoupling capacitors and some of the other electrolytics were in poor condition: discretion being the better part of valour, I replaced all the remaining capacitors that were subject to h.t. voltage. The presence of a well cooked h.t. feed resistor in the audio circuit, with

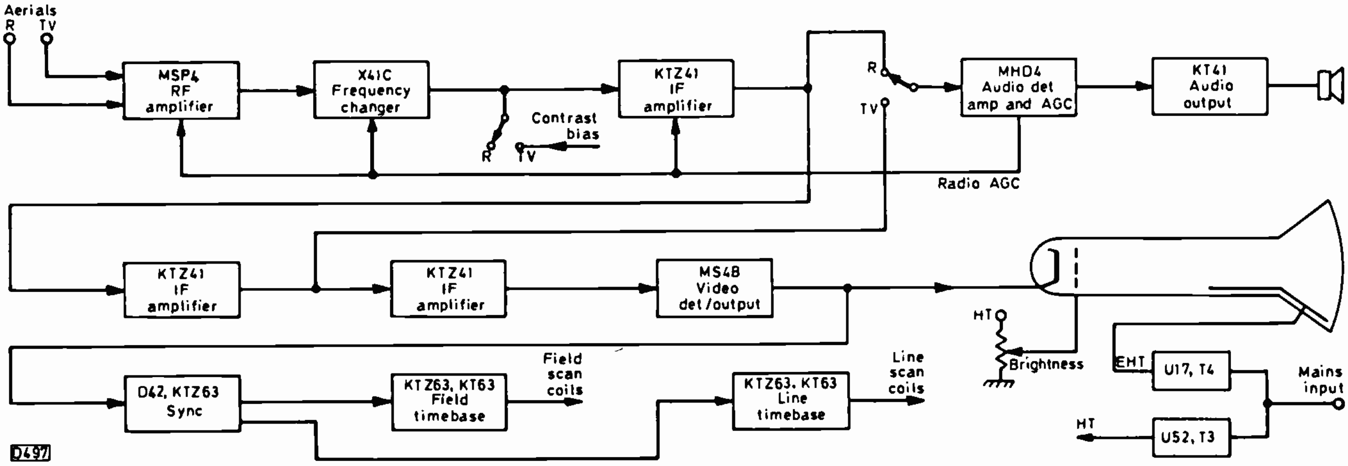


Fig. 1: Block diagram of the HMV Model 905 radio/TV receiver.

its associated 4μF decoupler dead short-circuit, revealed the fault that had presumably put the set out of action so many year ago. Apart from this and one open-circuit resistor, all the other resistors in the set proved to be up to scratch – these types, with a paint-coded ceramic body and a blob of moulded solder to hold the leadout wire at each end, always seem to have been very reliable. Having checked the various coils, transformers, and the tube's scan and focus coils for continuity, the moment of truth finally arrived and I was ready to switch on.

Running the Set Up

Being something of a coward when it comes to e.h.t., I initially removed the U17 rectifier valve and tried the receiver on radio. After a brief warm up period I was rewarded with a hum from the loudspeaker and a good loud buzz when I applied by finger to the gramophone pickup input socket, proving that the audio stages were working. Despite a good long aerial however there was no trace of any signals, though loud clicks were present when the wavechange switch was operated. Moving the aerial plug across to the top cap (anode) of the MSP4 r.f. amplifier valve brought in some strong signals, and a new MSP4 (obtained along with a complete set of spare valves from a well-known advertiser in London) restored normal radio operation.

The set was now working well on all three broadcast wavebands, so with the e.h.t. rectifier still removed I switched over to television and attached a few feet of wire to the television aerial input socket. There was an immediate loud mechanical buzz from the second mains transformer, but this was not a destructive sort of noise and after a minute or so faint BBC-1 sound came through. Adjusting the oscillator trimmer brought up the signal strength, but there was no sign of activity from either of the timebases – judged by ear and the temperature (cold) of the timebase valves.

Having nothing better to do, I switched off and exchanged the two pairs of timebase valves. When I switched on again there was a definite but hesitant line whistle and some low-pitched ticking from the field scan coils. After switching off I refitted the e.h.t. rectifier valve, but on reconnecting the set there was no e.h.t. After some head scratching I noticed that the U17's heater was not alight, and when I eventually detached the base from the valve's envelope I found that one of the wires had broken off close to the glass. The spare valve was fitted (how do they manage to supply these brand new valves – no request for a pre-war valve ever seems to beat the people at Streatham!) and I tried again. Since my multimeter reads only 1kV maximum, I attached the leads two-fifths of the way up the e.h.t. bleeder resistance chain (i.e. across two of the five 1MΩ resistors). On switching the set on a healthy 900V reading was obtained, making the e.h.t. around 2·3kV. The television sound was still present and the timebases were apparently working, but as yet nothing on the screen.

Getting a Picture

Removing the aerial plug and reinserting it produced a brief, defocused blob, but even with the brightness control fully advanced the screen was otherwise dark. Then, after a few minutes, shadowy signs of a picture appeared, and following careful adjustment of both hold controls, with the brightness and contrast controls at maximum, a stable but very dark picture was obtained. The height and width controls were also at the ends of their ranges, and the picture was a very odd 2½in. wide by 3½in. high instead of approximately 6 by 4½in.

Ignoring the picture shape for the moment, I set about investigating the low brightness and found that the tube's grid bias was excessive even with the slider of the brightness control potentiometer at the "high" end of its track. As a temporary expedient I added an extra resistor in series with the earthy end of the control. I now had a bright raster with a good range of control, and could set up the focus properly. Replacing the output valves in the timebases increased the scan amplitudes enough to fill the screen, and I was beginning to congratulate myself on the outcome of all this slow restoration work.

Trouble with the EHT

We all know what happens when we tempt Providence in this way – it happened with a vengeance to my 905! After an hour or so in use there was a sudden crackling noise, the picture disappeared, and a small plume of smoke issued from the burning insulation of the e.h.t.winding on the second mains transformer. The winding had developed shorted turns of course, not only robbing the set of e.h.t. but also depriving the television valves and the tube of their various heater supplies. Using five separate new transformers was out of the question since the corner of the chassis underside where this transformer is fitted is very cramped and there's little spare space anywhere else.

I knew that rewinding the transformer was just about out of the question as well, not only because of the cost but because the physical size of the core was so small that proper insulation levels would be as hard to maintain today as they had evidently been when the set was produced. The designer seemed to have used a very small safety factor in putting a 1·8kV winding on to a small low-voltage transformer almost as an afterthought! I considered cutting the faulty winding off the transformer, hoping that the fault might be in the outermost layers, but when I'd overcome my disgust enough to look more closely I saw that the primary winding was nearest the core with the e.h.t. winding sandwiched between it and the outer heater windings – the whole thing being impregnated in hardened black pitch. I was not going to give up now however, and my eventual solution must rank amongst the bodges of the century!

I carefully unsoldered and removed the transformer, and found that the windings had warped on the core just enough for faint glimmers of light to pass here and there between adjacent layers of paper separating the e.h.t. and the other windings. So I heated up two narrow strips of thin sheet metal (from some phosphor-bronze draught proofing strip) and managed to push these through the gaps between the windings, melting the pitch as they went. As a result I eventually had a section of the shorted winding between these two strips, which protected the other layers from my next rather drastic course of action. Using a ⅛in. twist drill, I made a hole right through the edge of the winding and out at the other side. I then used a thin file to make the hole into a clear slot, the faulty winding thus becoming hundreds of open-circuit turns which could do no harm whatsoever even if they were all touching. After melting out the metal strips and blowing away the copper dust, I filled the slot with wax and replaced the transformer. A surplus mains transformer

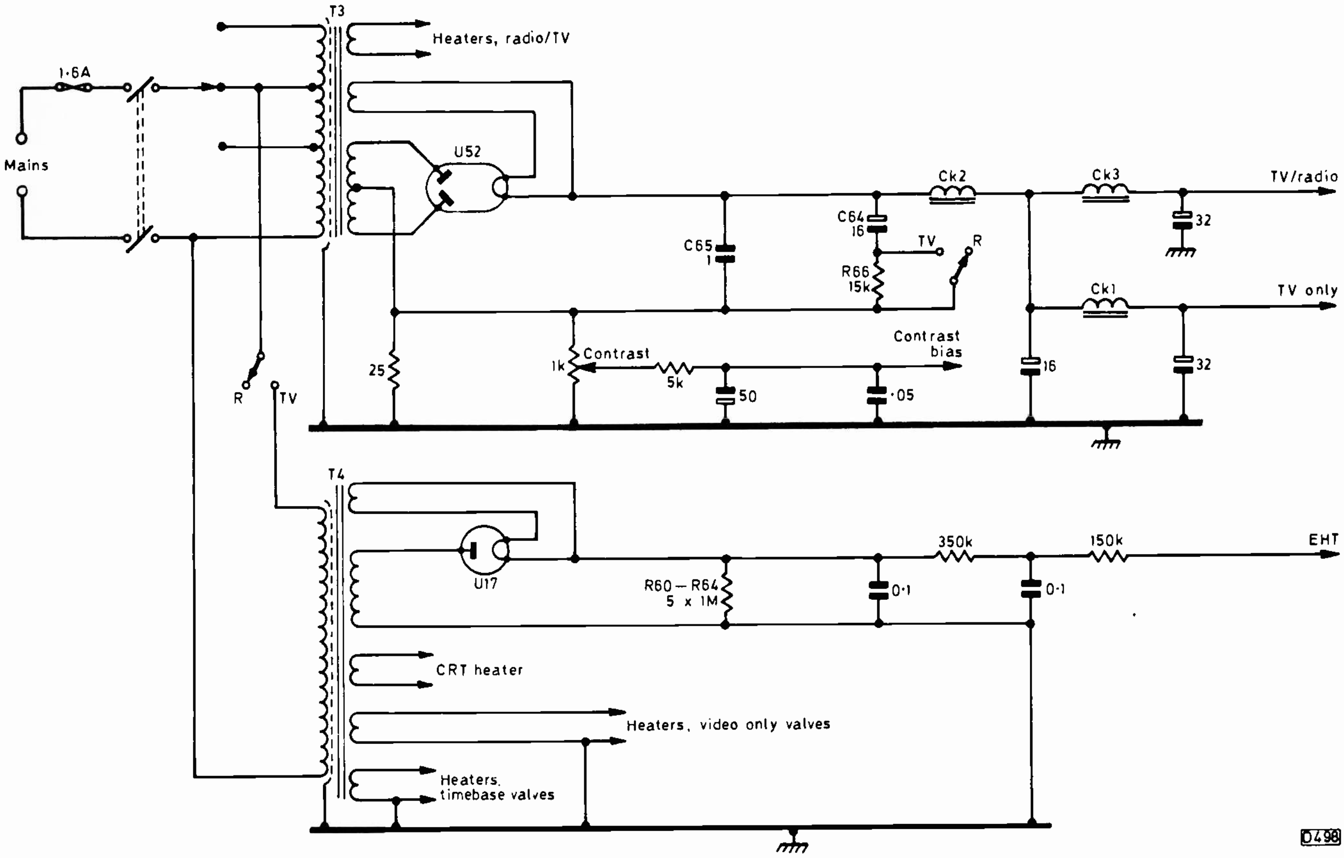


Fig. 2: Power supply circuitry, 1938 style.

with a 1·8kV secondary winding was then obtained and mounted on the side of the cabinet above the U17 valve. This restored operation, and the 905 has been working in this modified form ever since.

Final Touches

There were just a few minor tasks to do to complete the job. Replacing the vision detector valve improved the tube bias problem, and repositioning the sound output transformer got rid of some annoying mains hum which was being picked up from the adjacent mains transformer. The set has since been completely realigned, with the aid of a digital frequency meter (apologies to those purists who use only vintage test equipment). The cross-banded figured-walnut veneered cabinet has responded well to a clean and polish and the picture, once correctly adjusted, is now very acceptable with only a trace of ion burn at the centre of the screen, suggesting infrequent use in the past. I wonder what the original owner, who first gazed in awe at the miracle of television 44 years ago, would say if he or she could see the set today?

Using UHF tuners for hi-fi at VHF

William Harrison

Advertisements have appeared from time to time offering u.h.f. tuners for use with a v.h.f. radio tuner/receiver to give hi-fi TV sound. Readers may wonder how this is done. An enquiring friend plus curiosity and a handy music centre prompted this investigation, which showed that good results can be obtained with pre-varicap tuners with little effort. Similar treatment was given to a Hopt rotary tuner as used in GEC sets from around 1965 onwards and to a push-button tuner as used in Philips sets fitted with the 170 chassis. In its new role the tuner becomes a converter, the i.f. being raised so that it falls within the v.h.f. Band II.

If you look at the mixer circuit you'll see that the output is tapped from a chain of components that form the transistor's collector load. Two coils only concern us: the main i.f. coil with dust core, and a small air-cored coil which is connected directly to the transistor's collector. Short out the main i.f. coil, and connect the tuner's output to the receiver's dipole sockets, with a 9-12V d.c. supply to the tuner, negative to chassis. When this has been done a strong carrier should be found on the receiver's v.h.f. band. Move the small coil carefully in its compartment so that this carrier is placed in a signal-free upper part of the band.

Now try the tuner. As we've raised the i.f., the oscillator must also generate a higher frequency. To correct the oscillator tracking, gently spread the outer moving vanes of the oscillator section of the tuning capacitor away from the fixed vanes.

Direct connection of the tuner to the receiver is not essential – a few inches of wire from the output placed near the receiver's aerial sockets will give good signals. Note that some tuners may need a voltage at their a.g.c. input.

Test Report

Eugene Trundle

A WIDE selection of small colour pattern generators is at present available. Each new one that appears reflects current technology, and the price/performance ratio gets better all the time. This time the spotlight is on the latest instrument from Manor Supplies, their Mk. V pattern generator. Its design is based on two i.c.s, both of recent vintage, the Ferranti ZNA234 and the Mullard TEA1002.

The Ferranti chip generates all the basic monochrome patterns – dots, vertical and horizontal lines, luminance staircase and crosshatch. The sync and blanking pulse trains are also generated within this device, all these waveforms being tied to an on-chip 2·5MHz oscillator which operates in conjunction with an external crystal. The sync and blanking waveforms are to CCIR standard, which means that the patterns are fully interlaced and have broadcast-standard equalizing pulses, with precise pulse timings. The chip is in this respect similar to the earlier ZNA134 sync pulse generator i.c., from which it was developed.

For colour operation the Mullard TEA1002 comes into play. This is an 18-pin purpose-designed chip for colour encoding and summation. It takes binary RGB inputs and encodes them to the PAL specification, providing a composite video output based on the incoming sync pulses. The 4·43MHz signal is generated in conjunction with an external 8·86MHz crystal. As in TV receiver applications, i.e. modern decoders, this doubled frequency technique ensures correct phasing of the B − Y and R − Y signals without any need for preset adjustments.

The external component count with the Ferranti and Mullard devices is very low. In addition to these two special chips the instrument uses a further sixteen i.c.s. Of these, two are simple voltage regulators providing 5V and 12V rails, the remainder being standard 14- and 16-pin logic and timing chips, mostly CMOS types, which are used for function switching, chequerboard gating, ident processing and so on. All the pattern switching and colour selection is carried out by d.c. control lines, which simplifies the control arrangements and confines all the video waveforms to the printed panel.

The final video output is passed to a front panel mounted socket and to a u.h.f. modulator – this is a standard module as used in some home computers. An interesting feature is the audio tone generator which uses a CMOS counter to produce a 1kHz tone by division of the conveniently available 7·8kHz ident signal.

Construction

There is a choice of cases, standard or de luxe. The review unit was housed in the de luxe case, which is of two-piece construction in sheet steel, finished in black leather effect with silk screen printing. All the controls are at the front, along with the coaxial video and u.h.f. output sockets and a LED "on" indicator. Mains switching and pattern selection are by rotary switches, with push-button switches for colour selection and audio on/off. The phono audio output socket is at the back, along with the mains cable entry and the mains fuseholder.

Inside, a single double-sided fibreglass panel holds the entire pattern generator circuit, with all the i.c.s in holders. The power supply and miniature u.h.f. modulator also live on this panel, along with the plug-in sound carrier generator module. This leaves only the mains transformer, output sockets and controls mounted on the metal case: all connections to the main panel are made via plugs and sockets. An auxilliary fibreglass panel supports the push buttons and the leads to the pattern switch. In all, a neat and tidy layout.

The Kit

Having read through the kit assembly instructions I'd not envisage anyone having difficulty in making up the kit and getting it going. The double-sided print makes it important to fit the right components the first time, and the usual precautions regarding static charges must of course be taken with the CMOS chips. As with any kit, assembly should be done methodically and not in too much of a hurry. Testing and setting up consist of checking two voltages and adjusting two preset trimmers, using an ordinary colour set as a reference.

Outputs

The Mk. V generates six monochrome patterns: step wedge (grey scale), vertical lines, horizontal lines, dots, crosshatch and chequerboard. All but the first of these have border castellations for picture centring checks. The colour bars are available in two forms, EBU (75 per cent amplitude, 100 per cent saturation) and BBC (100 per cent amplitude, 95 per cent saturation) – see Fig. 1. A further colour pattern, in the form of split bars, is primarily intended for VCR work. It consists of the standard colour bar pattern with a broad, horizontal insert band

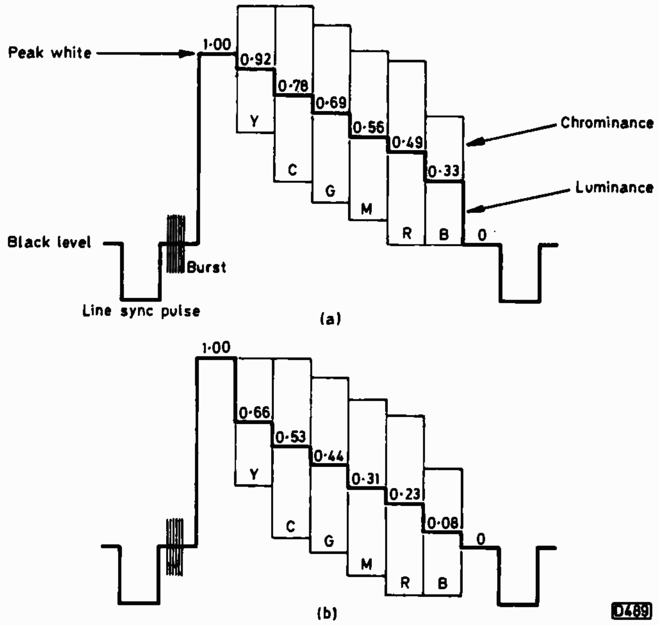


Fig. 1: Colour bars. (a) BBC version, with normal luminance levels and superimposed bars at 95% saturation. The peak subcarrier level on the first three bars exceeds peak white. (b) EBU version, with 25% of peak white level subtracted from the luminance signal on bars where colour is present. This brings the total subcarrier excursion (now at 100% saturation) within the amplitude limits of the composite luminance signal.

which can be filled with any of the three primary colours by push-button selection. With all three primary colours present the band becomes peak white. The third colour pattern appears at the rotary switch's raster setting. As with the split-field display, push-button selection in the raster mode gives the three primaries, their complementaries yellow, cyan or magenta, plus black or white.

The sound modulation is at 1kHz, with other frequencies available by changing an internal link. The intercarrier generator frequency modulates this on to a 6MHz carrier (5·5MHz type available for overseas requirements). The audio tone is available at the rear mounted phono socket. Standard 2V peak-to-peak composite video is brought out to a coaxial socket as well as being applied to the u.h.f. modulator (v.h.f. type available on request) whose output appears at a little under 1mV amplitude on approximately channel 36.

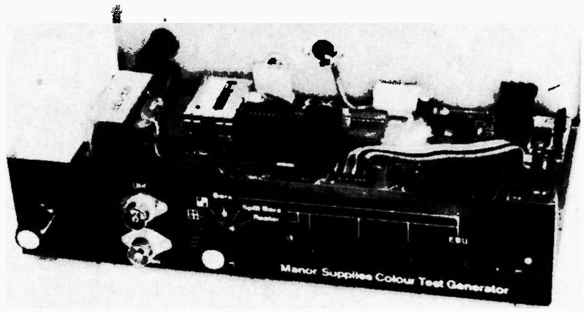
Bench Test

I used the Mk. V for some weeks for all bench TV and video servicing. One of the first checks I made was for the truth of the border castellations on the monochrome patterns. I found that the outer edges of the castellations correspond exactly with the limits of the BBC test card F, the TV scan amplitude being correct when the inner edges are just visible.

The step-wedge pattern (for grey-scale tracking) suffers a little from crosstalk from the border signal, giving rise to vertical rows of faint "phantom" castellations. I found this annoying but in no way detrimental to the purpose of the pattern – apparently it's inherent in the design and to eliminate it would increase the instrument's cost and complexity to an unjustifiable extent. A "clean" step wedge is available by selecting colour bars and killing the chroma by one means or another, but the luminance steps are in this case not linear and I prefer the monochrome grey-scale signal. The other monochrome patterns are flawless. The crosshatch and dot matrixes are 16 × 18 lines, and the lines and dots are very narrow – this is important for setting up modern tubes and high-definition types.

There were no problems with the colour bars. The phase angles are all within 2°, and the availability of both BBC and EBU bars could be useful – the EBU bars are used in Europe and by the IBA. The split-bar pattern offers a white reference at field rate, which I found useful for setting modulator deviation and checking signal processing in VCRs. The EBU/BBC selector works on this pattern too, so that where VCR setting up procedures based on the European standard are encountered these can be carried out easily. The raster facility is useful for checking purity (few sets these days seem to have gun switches), and with all three rasters on the bright white field enabled me to set up beam current limiting circuits with ease.

I found the video output useful when investigating TV and video circuits. The video output is at 2V peak-to-peak and a 6dB coaxial attenuator will bring this down to the standard 1V level if required. Apart from direct injection of video signals into equipment, e.g. E-E level in VCRs, I found this output useful for triggering the oscilloscope at line or field rate. Careful examination of the video waveform at the output socket showed an exactly correct 7:3 picture:sync ratio, with the burst amplitude precisely equal to the sync pulse height, just as it should be. The field equalizing pulses and blanking periods were also checked and found to be to broadcast standard. A



Inside the Manor Supplies Mk. V pattern generator.

quick check for this on the TV screen is to look for the black 'pip' half-way along the bottom of the raster – you will see it on broadcast and the Mk. V's pictures, but rarely on the pattern from other vision sources. The burst is not blanked in the Mk. V, and appears on all lines throughout the field blanking interval.

The sound facility is very good, with minimal breakthrough of the vision signal in spite of the fast rise times of the video signals – just a little hash appeared on the sound with the crosshatch signal. Very good indeed! I found that the degree of vision-on-sound experienced depends almost entirely on the condition and alignment of the TV set in use. The a.f. signal from the rear socket is a squarewave of about 400mV peak-to-peak.

The u.h.f. modulator's performance is highly commendable. I searched in vain for any trace of spurious outputs or harmonics. The vision and sound modulation are clean and linear, with no trace of sound-on-vision. There was no tuning drift with time or temperature, and no sign of microphony – magic!

Conclusion

This little pattern generator is incredibly good value for money, its performance being almost impeccable. At the time I had it for test several other colour bar generators were available for comparison, ranging from relative cheapies to £700 wunderbars. In no way was the Mk.V's performance inferior to any of them on similar functions. In some respects, such as u.h.f. modulator performance, provision of border castellations and the EBU/BBC colour bar facility, it beat the lot of them. I feel that if the unit was housed in a fancy cabinet and carried a well-known test equipment manufacturer's badge on the front it would sell at, and justify, a price of around £200.

The case's appearance belies the performance and specification of the unit. One technician of my acquaintance condemned it out of hand on the basis of its price and look. But don't be fooled! I can thoroughly recommend this instrument, not only for technicians and service departments but also for demonstrations and teaching. Its performance is well up to detailed analysis, and it lends itself well to colour matrixing demonstrations and so on.

The kit costs £80·50, to which should be added £5·50 for the standard case and £8·50 for the de luxe one. The optional 6 or 5·5MHz sound module is £4·50. Specify u.h.f. or v.h.f. modulator when ordering. These prices include VAT, but post and packing costs £2 extra. The instrument as reviewed is available built and tested, in the de luxe case and with the sound module, at £115. Available from: Manor Supplies, 172 West End Lane, London NW6.

Fault Report

John Coombes

Decca 70/71/90/91 Series

The Decca 70/71/90/91 series chassis features a Darlington transistor (BUW81A) chopper power supply and a BU500 line output transistor. It's intended to drive 90° tubes, 14in. in the case of the 70 series and 20/22in. in the case of the 90 series. Fig. 1 shows the basic power supply arrangements used. The h.t. to the line output stage is 121V for the 70 series and 150V for the 90 series. Basic faults are as follows.

No results: First check the mains fuses F701/2 (2A delay). If blown, check the 0·001μF mains filter capacitors C701 and C703 and the bridge rectifier DB601 (KBF08). If the mains fuses are o.k., check the power supply fuse F601 (1A delay). If this has blown, suspect the Darlington chopper transistor Tr605. Check by replacement – if it's short-circuit, Tr604 (BSR59) in the driver circuit must also be replaced before switching on. Other things to check are the 195V supply rectifier D614 (RGP01-14) and the 18V supply rectifier D616 (RGP30K).

Power supply tripping: There is probably an overload. Remove plug PL401 to check whether this is in the line output stage, then if necessary open test link TL203 to check the load on the 195V supply (RGB output stages), TL102 to check the sound department and TL204 to check the 12V regulator and the circuits this supplies. If these steps fail to stop the tripping, turn down the set h.t. control VR618 and if the tripping stops set the h.t. to 121V or 150V as appropriate. If the set still trips, check the following components in the power supply: the 6·8V zener diode D601 (BZX79-B6V8), D608 and D610 (both type 1N4003GP), D613 (RGP10M) and C627 (10μF).

No picture or low brightness: Check the line output stage h.t. supply at PL401/5. This should be 121V or 150V according to model. If low, check the setting of the set h.t. control VR618. Then if necessary check by replacement D611 (BA157) which provides the reference feedback supply for the "set h.t." circuit and the values of the two resistors R617 (5·6kΩ) and R614 (100Ω) associated with the control. A less obvious cause of this fault is C617 (0·0068μF) which can be leaky or intermittently short-circuit.

Incorrect field lock: Check the sync i.c. (IC301) by replacement then if necessary C308 (10μF) which can go open-circuit. It should be noted that the i.c. is a TDA2571A in later chassis and a TDA2571 in earlier production. These i.c.s are not interchangeable – if the wrong type is fitted the result will be half field lock.

GEC

The more recent GEC chassis have received little attention in these pages. We've had the following fault experiences.

20AX chassis: In the event of no sound or raster, check the h.t. fuse FS503 (2A). If this has blown, check the BU126 chopper transistor TR502 and the two associated BY210-800 diodes D514 and D515. In the event of hiss on sound but no raster the 160V supply to the line timebase is probably missing. Check the h.t. rectifier diode D513 (BYX71-600) for being open-circuit. Alternatively the supply to the c.r.t.'s first anodes could be missing. Check R606 (150kΩ) for being open circuit. When R604 (150kΩ) goes open-circuit the first anode supply is high and the symptom is a bright picture with flyback lines. These two resistors are on the PC687 line output panel. Models involved include the C2215, C2217, C2218, C2623, C2624, C2627 and C2628.

PIL tube chassis: In the event of field collapse, check that the 33V supply is present at pin 6 of the field timebase panel. If missing, check the relevant rectifier diode and reservoir capacitor in the line timebase – D602 (BY210-600) and C607 (330μF) respectively. If the fusible resistor R369 is open-circuit, the TDA1170 field timebase i.c. is probably faulty.

Hitachi

Sets fitted with the NP81C chassis, e.g. Model CPT2016, have given us a bit of trouble with dry-joints around the line output transformer T702. Intermittent field jump and no raster due to the tube's heaters going out are a couple of examples. Picture jumping can also be due to a dry-joint on the 12V rectifier diode D703 (V09C) in the line output stage. Note that one or two GEC sets are fitted with this chassis, e.g. Models C2065 and C2265.

ITT

CVC20 chassis: In the event of tripping, first check the setting of the chopper output preset R808. Check the operation of the control and the condition of its track. If the tripping persists, the line timebase can be disabled by opening the fusible resistor R92 which feeds the line driver transistor. If this stops the tripping the tripler and/or line output transformer are probably at fault. Unfortunately these components tend to damage each other, and the BU208 line output transistor could also be short-

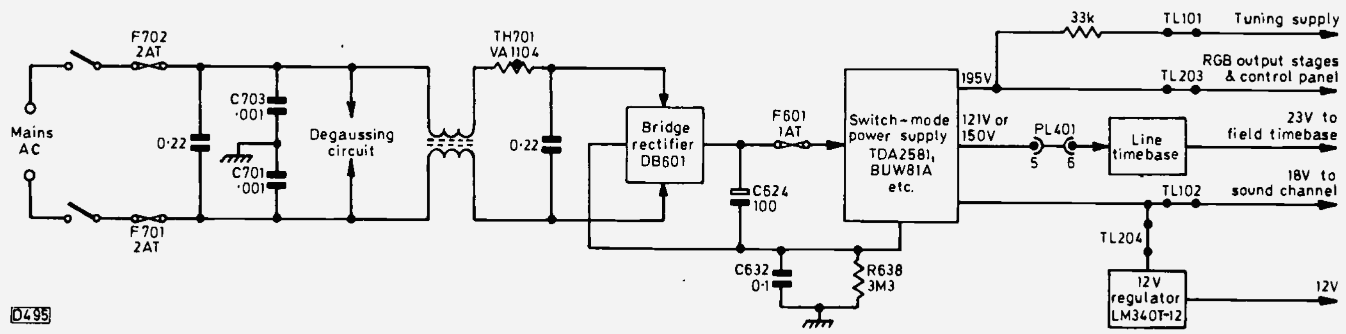


Fig. 1: Power supply arrangements in the Decca 70/71/90/91 series chassis.

circuit. If these items are in order, check the scan coupling capacitor C67 (2·2μF) for being short-circuit. The field timebase could be loading the line output stage – to check, open the fusible resistor R68. If this stops the tripping, suspect the field output transistors T9 (TIP31) and T10 (TIP33).

Rolling only on bright screens should lead to a check on the line output stage derived 12V supply. If this voltage drops by about 2V when the setting of the brightness control is increased, suspect the tripler.

Field collapse or variation in height can be due to the field output transistors T9/10 or a defective height control. Another cause worth checking is the metal bonding down the centre of the chassis. You will often find that the problem is caused by the top lug being cracked: connecting an insulated lead from the top lug to the bottom will eliminate this trouble.

Körting Hybrid Chassis

A fault that seems to be occurring more often as these sets get older is loss of, or very little of, one colour due to reduced first anode voltage. There's a tag strip beneath the line output stage can, and the problem is tracking between the various pins. The tag strip must be kept clean.

Mitsubishi CT186B

The customer's complaint was of a dull picture, and on examination we found that the width was also excessive. The e.h.t. was way down at only 12kV. The fault was eventually traced to C571 (0·0056μF) being short-circuit – it's one of a group of capacitors in the flyback tuning/ diode modulator circuit.

National Panasonic

Model TC2201: We've had a couple of interesting faults on this model. The problem with the first, no sound or raster, was eventually traced to a leaky capacitor (C537, 1,000pF) in the line output stage – it forms part of the clipper diode's load. The problem with the second one was sound plopping and cutting in and out intermittently. The cause was a dry-joint on the audio output transistor TR251 (2SC1929) – TR251 can also cause the same problems due to an intermittent base-emitter open-circuit.

Model TC2203: In the event of random channel changing, first clean the sensor panel. If this doesn't cure the problem, remove the panel and ensure that none of the neons touches the contact plates – remove and reassemble if necessary. If still no improvement, change R1010 from 9·1kΩ to 6·8kΩ. If you remove the tuning panel, make sure you reassemble it correctly beneath the plastic lugs, also that R1001-8 and C1001-8 don't rest on any other components.

If the magic line stays on the screen, first check the fine tuning. If there is no variation of the line, check C903 (100μF) and C915 (1pF) for being short-circuit. If the magic line does vary, check switch SW1101 and transistor Q1004 (BC307B).

The most common cause of field collapse in these sets is failure of D403 (SV02). The safety resistor R442 (1Ω) will usually be found open-circuit as well. Other things to check are the 37V supply rectifier D406 (BY299) and R433 (4·7Ω) which is in series with R442.

In the event of reduced height and bottom foldover, check the voltages around Q401 (2SC1685) in the field oscillator circuit. There should be 4·8V at its collector, 0·6V at its base and 0V at its emitter. If the transistor is all right, check diode D405 (RH1M). Other items to check if necessary are R431 (33kΩ), R432 (100Ω), C414 (2,200μF), C410 (330μF) and C419 (1μF).

Philips

G8 chassis: The fault on a set fitted with the later version of the chassis (550 series) was a dark picture. A check at the 12V regulator output (TP97) produced a reading of 15V which could not be adjusted by means of R3396. The lower of the two 5·1V reference zener diodes D3412 turned out to be open-circuit.

G11 chassis: In the event of no sound or raster the procedure we adopt is as follows. First check for h.t. at fuse FS4037 on the power supply panel. If present, check the voltage across R3106 on the line timebase panel. This resistor feeds the line driver transistor. If the voltage is 15-30V, the driver stage is working. Move on to the line output stage and check the voltage at the collector of the line output transistor. If there's no voltage here, check R3120 for being open-circuit, check the continuity of winding 13-15 on the line output transformer, then if necessary check for dry-joints at connectors 15A15 and 15A16 on the convergence panel.

The TDA1412 12V stabiliser i.c. seems to cause quite a few faults. Examples are no colour with a dark picture and violent h.t. pulsating at a high brightness level. Both faults are due to low output from the i.c.

Field collapse is usually due to the TDA2600 field timebase i.c. Obvious enough but worth remembering when ordering spares.

In the event of a slight hum bar with the h.t. correct or high, check the d.c. conditions around the transistors (T4032/3) in the active filter circuit. If the voltages at the collector and emitter of the filter transistor T4032 are the same, either this transistor or its driver T4033 is short-circuit. If the transistors are in order, check C4034 (10μF) for being open-circuit.

Thorn

9000 chassis: In the event of tripping, first remove the tripler lead from the line output transformer. If the set still trips, check the thick film unit (in the trip circuit) by replacement. If the tripping continues, the line output transformer is suspect for shorted turns.

For field roll, check C406 (47μF). If the field roll is intermittent, becoming continuous, check the linearity transistor VT404 (BC182LB).

Toshiba

Model C800B: Loss of one colour is a common fault on this set. There are three basic causes. The most common is dry-joints on the RGB output module, usually where a wire goes through the panel to link the print on both sides. Other causes are edge connectors making poor contact and dry-joints beneath the RGB module on the main panel.

Model C2090B: We've had trouble with mains fuse blowing due to tracking in the mains on/off switch. Fitting a replacement overcomes the problem.

The TA7193P colour decoder chip can be responsible for no colour, loss of one colour or floating colours. Some Hitachi and Rank sets also use this i.c.

Focus on Portables

Part 2

George Wilding

THE video circuitry extends from the vision detector to the c.r.t.'s driven electrode, which is usually the cathode, sometimes the grid.

Detection

When it comes to detection, there are three possible approaches: the latest, using a synchronous detector within an i.c.; the conventional diode detector; or the use of a transistor as a collector bend detector.

The diode detector is simple, inexpensive and reliable. The problem is that the values of the few peripheral components needed have to be a compromise between the conflicting requirements of efficiency, good h.f. response and effective i.f. filtering.

When the diode conducts for example its forward resistance is in series with the load resistor. Thus to obtain maximum output voltage the value of the latter should be relatively high. On the other hand some stray capacitance must be present across the load resistor and will be added to for i.f. filtering and to improve efficiency. If the response is not to show a marked h.f. roll-off, the value of the load resistor should not be higher than the reactance of the total shunt capacitance at the top video frequency. In practice this means that the value of the load resistor is limited to a few kilohms. The shunt capacitor, which often has a very precise value, usually forms part of a pi filter in conjunction with a small series choke and a further shunt capacitor. In some circuits the choke also acts as a peaking coil to boost the h.f. response.

Another disadvantage of a diode detector is that diodes are insensitive to low-amplitude inputs. As a result there will be some cramping of the video highlights, which represent the lowest modulation levels.

To operate as a collector-bend detector, the transistor is biased to the point of maximum curvature on its collector characteristic, i.e. to near cut-off. As a result, positive-going swings of the i.f. input will, assuming the use of an npn transistor as in Fig. 1, produce a negative-going output whilst negative-going signal swings at the input will produce negligible output. The example shown (Fig. 1) is used in the Sony Model TV121. A small, stable base bias is provided by the resistive network R208/9/10 with thermistor TH201, while the potential divider R212/3 stabilises the emitter voltage – for optimum efficiency the transistor's d.c. working point must be closely maintained. The negative-going output is developed across the collector load resistor R211, with filtering by means of the pi network C213/L203/C214.

Such detectors are non-linear – otherwise they couldn't function – but have the advantage of providing a degree of amplification. The synchronous type of detector used in an i.c. on the other hand is highly linear.

Video Driver Stage

Whatever the type of detector, the following stage is always an emitter-follower driver to provide impedance matching. This will be a discrete component stage where the detector is a diode or a transistor but will be within the chip where an i.c. detector is used.

Fig. 2 shows the diode detector/discrete video driver stage circuitry used in the Philips TX chassis. The video driver transistor's base bias is provided by the potential divider R257/8, to which the earthy end of the final i.f. transformer's secondary winding is returned – this point is earthed from the a.c. point of view by C257. The video detector's output, developed across its load resistor R256, is superimposed on this bias.

The circuit is a bit unusual in employing a pnp transistor as the driver. It's interesting to note the result this will have should the driver transistor go open-circuit or base-emitter short-circuit. Assuming d.c. coupling to the output transistor and the cathode of the c.r.t., the output transistor will be saturated (forward biased by R350) and, as its collector voltage will fall to a very low value, the tube will display a bright, unmodulated raster. With the more usual npn type driver transistor, whose emitter load resistor will be returned to chassis, the same fault conditions will leave the output transistor cut off and the tube displaying a blank screen.

Signal Polarity

A brief word about signal polarity. The detectors shown in Figs. 1 and 2 produce a negative-going signal to drive the base of the driver transistor. The signal itself consists of positive-going vision and negative-going sync pulses (with respect to the black level of course). The polarity of this signal will be preserved by the emitter-follower stage and will then be inverted by the common-emitter output transistor. Increased vision signal amplitude will thus drive the tube towards peak white whilst the sync pulses will black out the raster.

The foregoing assumes that the tube is cathode driven, as is usually the case with 12/14in. monochrome portables. When it comes to the small (typically 2-3in.) tubes used in combi (combined TV/radio/clock and maybe cassette recorder) sets however the cathode is generally connected to one side of the heater, so the grid must be driven instead. This implies positive-going vision and negative-going sync pulses at the c.r.t. The required signal polarity can be obtained by taking the output from the cathode instead of the anode of a vision detector diode.

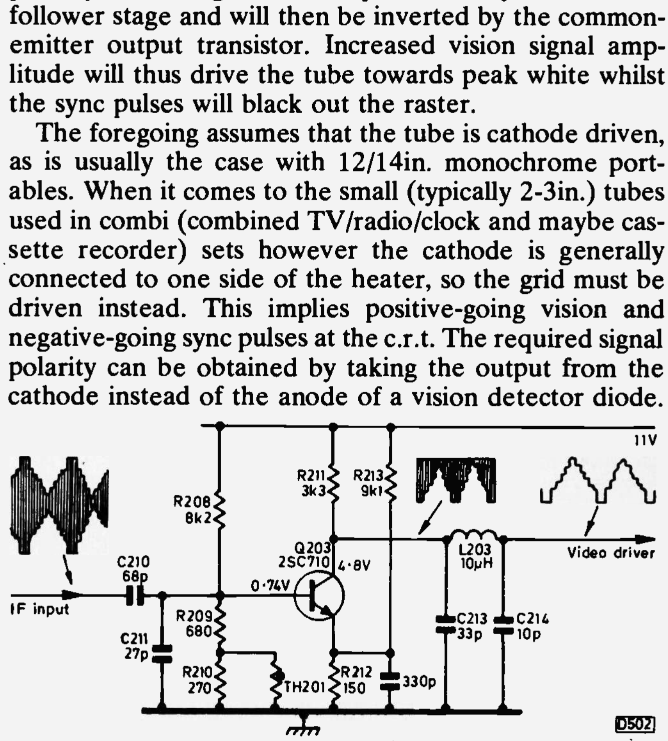


Fig. 1: Collector-bend detector circuit used in the Sony Model TV121. C210/1 provide tuning and matching.

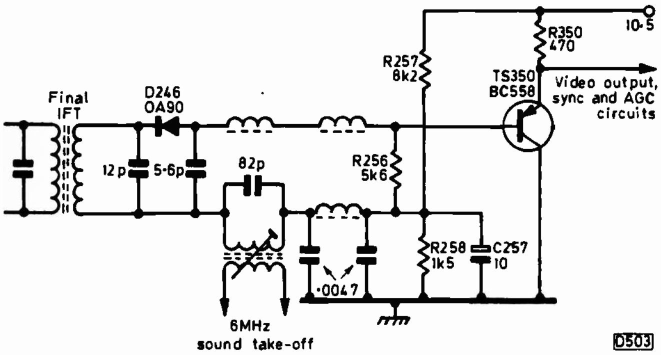


Fig. 2: Diode detector and pnp video driver circuits used in the Philips TX chassis.

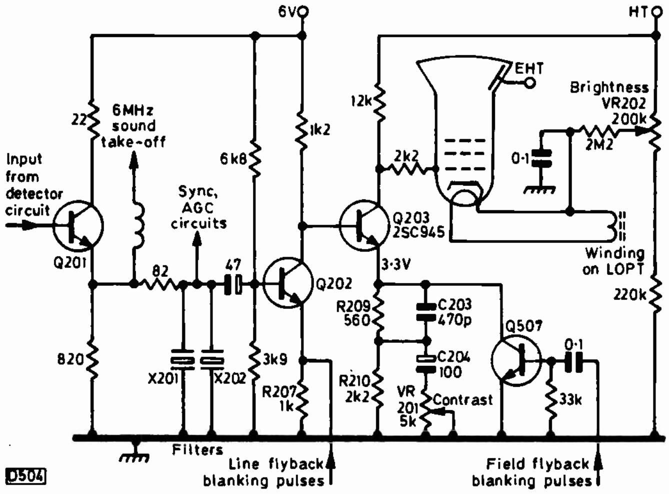


Fig. 3: Post-detector video circuits used in the Sanyo TPM2180 combi receiver.

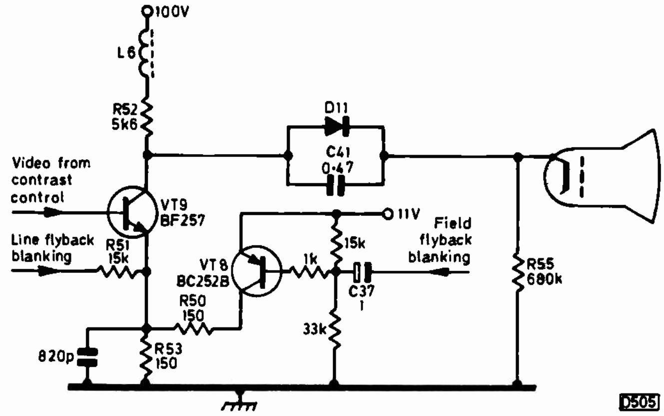


Fig. 4: Line and field flyback blanking arrangements used in the Bush Ranger (T16 chassis).

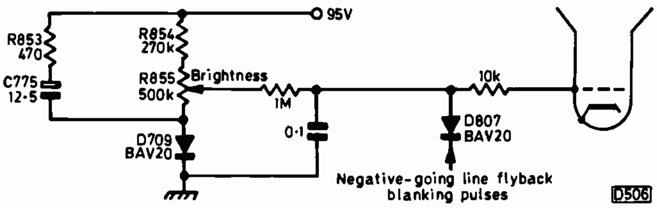


Fig. 5: Brightness control, line flyback blanking and switch-off spot suppression are all carried out at the c.r.t. grid in the Philips T8E chassis.

Because of the biasing conditions, an npn collector-bend detector can provide only a negative-going output, so that an additional phase-inverting stage is required. As an example, the Sanyo Model TPM2180 uses a collector-bend detector followed by an emitter-follower, an inverter/amplifier and finally the output transistor (see Fig. 3).

The fourth transistor Q507 is used to provide field flyback blanking. When the field flyback blanking pulse arrives at its base Q507 switches on, shorting Q203's emitter to chassis. Q203's emitter voltage falls from 3·3V to almost zero and in consequence it's driven hard on and its collector voltage is sharply reduced. The positive-going line flyback pulses are applied to the emitter of Q202, switching it off. Its high collector voltage is inverted by Q203, thus once more blanking the tube.

Flyback Blanking

Where the c.r.t.'s cathode is driven the video output transistor must be cut off to effect blanking. Fig. 4 shows the arrangements used in the Bush Ranger Model BM6514. Positive-going line flyback pulses are applied to the video output transistor's emitter via R51, while the pnp transistor VT8 is used to effect field flyback blanking. The negative-going field flyback pulses saturate VT8 whose collector current, flowing via R50 and R53, raises VT9's emitter voltage. The 200V peak-to-peak flyback pulses at the collector of the line output transistor are used for line flyback blanking, reduced to a suitable value by the potential divider action of R51 with R53. D11 provides beam limiting in conjunction with C41 and R55. During normal operation D11 is conductive, providing d.c. coupling to the c.r.t.'s cathode. With excessive video drive the voltage at VT9's collector will fall below the voltage developed across R55. D11 then cuts off and C41 provides a.c. coupling, removing the d.c. component and thus reducing the brightness.

In most portables flyback blanking is carried out by applying positive-going pulses to the emitter of the video output transistor. In some Philips models however a negative-going pulse is applied to the base, whilst a few models use high-amplitude negative-going pulses fed to the c.r.t.'s grid. As an example of the latter arrangement, Fig. 5 shows the circuit used in the Philips T8E chassis. This is of interest in that switch-off spot suppression is also carried out at the grid. Whilst the set is on D709 is forward biased via R854 and the brightness control, thus linking the earthy end of the brightness control and the negative plate of C775 to chassis. The electrolytic will charge to 95V via R853. At switch off the 95V rail rapidly falls to chassis potential so that D709 is no longer held conductive, thus isolating the electrolytic's negative plate from chassis. With the capacitor's positive plate now at chassis potential, the negative plate discharges slowly via R855 and R854, thus applying a negative potential to the tube's grid to bias it off.

Contrast Control

Contrast control can be effected in several ways. The most common arrangement is that shown in Fig. 3, where the contrast control VR201 is connected in series with C204. From the a.c. point of view VR201 is in parallel with Q203's emitter bias resistor R210. Thus as its value is varied so the overall negative feedback and thus the a.c. stage gain is altered. This arrangement will alter the input impedance and bandwidth of the stage, but this is of no great consequence in practice. The only real disadvantage is that even when the control's track is made to minimise the effect the action is non-linear, especially

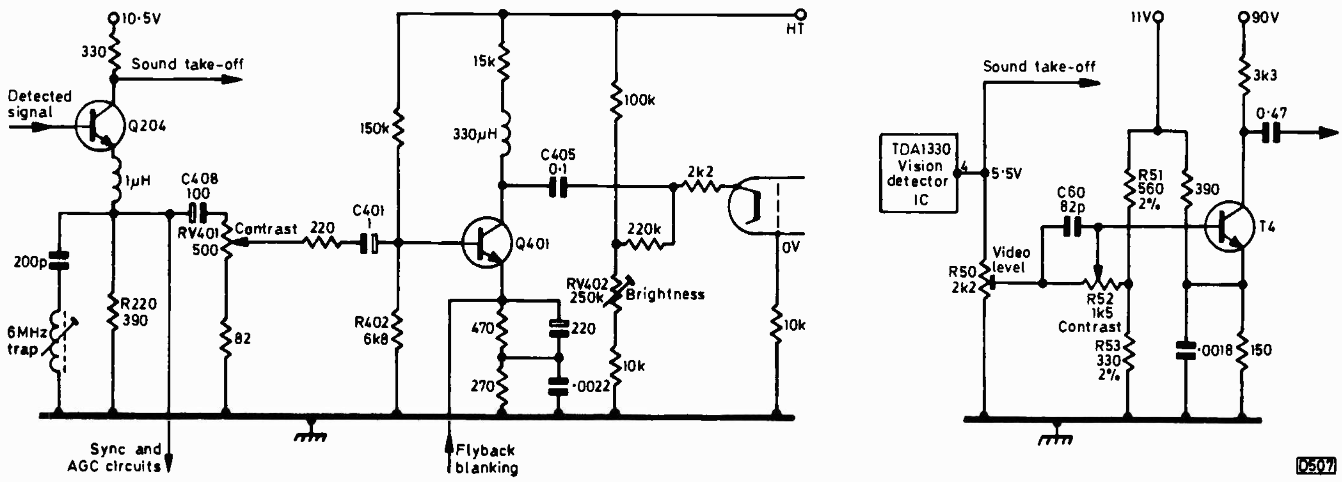


Fig. 6: Two approaches to contrast control. (a) The Sony TV511 uses a.c. coupling to the contrast control via C408 and C401 — also a.c. coupling to the c.r.t. via C405. (b) Contrast control and video output circuits used in the ITT VC301 chassis.

when the slider approaches the minimum resistance end of the track. Note that the other emitter bias resistor R209 is decoupled at medium and high frequencies only, by C203, thus increasing the l.f. negative feedback and increasing the h.f. stage gain.

Other approaches to contrast control are shown in Fig. 6. In both cases the required amount of video drive is tapped from a potentiometer in the video output transistor's base circuit: to avoid this affecting the transistor's d.c. conditions and thus the brightness level, the control is either d.c. isolated or connected across points that are at the same d.c. voltage at black level.

Fig. 6(a) shows the circuit used in the 5in. Sony Model TV511UK. The two electrolytics C408 and C401 provide d.c. isolation and since adjustment of the control does not affect the circuit impedances its operation is quite linear. The video signal is a.c. coupled to the c.r.t. by C405, with the brightness control acting on the tube's cathode.

The circuit shown in Fig. 6(b) is used in the ITT VC300 chassis. Here the video level control R50 sets the d.c. level at the input end of the contrast control R52, whose other end is connected to the potential divider R51/53. R50 is set so that at black level the voltages at each end of R52 are equal. C60 bypasses R52 at h.f. to maintain the h.f. response.

In Conclusion

This concludes our review of techniques used in monochrome portables. Power supply arrangements have been dealt with in previous articles – see the December 1978 and August 1981 issues. Line timebase circuitry is conventional though operating at around 11V or less in combi sets. Class B field output circuits are generally used, though some earlier models employed a class A output stage.

Twelve-hour Clock Conversions

Derek Snelling

WITH the exception of Hitachi machines, nearly all the VCRs sold in the UK come with a 24-hour clock. This may be the accepted standard on the continent and elsewhere, but if the customers I come across are anything to go by the 12-hour clock is still preferred in Britain – hands up all those who've set the timer on their VCR for 10 o'clock instead of 22·00 hours! The problem is not difficult to overcome however since the clock i.c.s used in most machines can be set for either 12- or 24-hour operation – in some machines the display even has an a.m./p.m. indicator which is not used. For those of you who, like me, are old fashioned enough to prefer a 12-hour clock, here's how to convert some of the more popular machines.

The Sanyo VTC9300P uses a TMS1070NLL clock i.c. To gain access, remove the top and loosen the bottom – this will enable you to remove the front. Take out the two screws that secure the clock panel to the front and locate the clock i.c. (Q1617). Then open-circuit the link marked 12/24Hr adjacent to pin 1. Reassemble and the clock will then work on a 12-hour cycle, with a.m./p.m. appearing as appropriate in the display.

The earlier JVC/Ferguson machines (HR3330, HR3660, HR3320, 3V00, 3V16 and 3V22) use an SC3044 clock i.c. To gain access, loosen the bottom and, by inserting a small screwdriver into the two slots under the clock, release the clock module. Remove the cover and earth pin 33 of the clock i.c. – pin 5 of the connector is a suitable point. Reassemble. The clock will now operate as a 12-hour one and you will notice the appearance of a colon in the top or bottom left of the clock display, indicating a.m. and p.m. respectively.

The original JVC HR3300 and Ferguson 3292 machines use a CK3300 clock i.c. Proceed as with the HR3330 etc. but earth pin 18 of the i.c. to convert to 12-hour operation. A colon at the top left of the display indicates a.m., a colon at the centre right indicates p.m.

The JVC HR7200/Ferguson 3V29 uses a μPD552C-060 clock i.c. To gain access, remove the top and bottom and unclip the front. Undo the four screws that hold the clock panel and remove this to the extent of the leads. The clock i.c. is IC401: to convert it to 12-hour operation, open-circuit pin 34 by cutting the print or lifting the pin clear of the print. The outputs for a.m./p.m. indication are at pins 18 and 19. The display has two colons that separate the hours and minutes digits, and these can be used to indicate a.m./p.m. They are available at pins 9 (bottom colon) and 20 (top colon) of the display device.

To use these colons, remove link B414 that links pins 16 and 17 of the timer i.c. to pin 29 of the display. Cut the print between pins 9 and 20 of the display and between pin 9 and RA402. Use wire links to connect pin 18 of the i.c. to pin 20 of the display and pin 19 of the i.c. to pin 9 of the display.

Reassemble. The clock now displays 12 hours with the top centre colon indicating a.m. and the bottom colon p.m.

The Ferguson 3V30 uses a μPD552C-068 clock i.c. To remove the clock panel proceed as with the 3V29. Locate IC401 and open-circuit pin 40 by cutting the print or lifting the pin from the board. The clock will now work in the 12-hour mode, with a.m./p.m. being indicated by the first two segments of the first digit of the time display – the upper segment indicates a.m. and the lower segment p.m.

The display used on this machine does have proper a.m. and p.m. symbols however. To use them, proceed as follows. Lift the display end of links B454 and B464 and open-circuit pins 8 and 11 of the display either by cutting the print or lifting from the board. Then connect the free end of link B454 to pin 8 of the display and the free end of link B464 to pin 11.

Other machines using the clock i.c.s mentioned can be converted by taking similar action.

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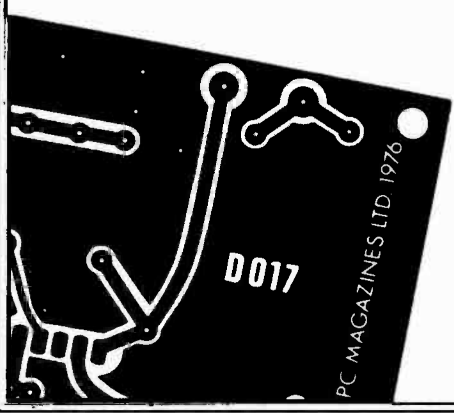

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TYNE 5223

This set needs a new tripler but I'm having difficulty getting any information. Presumably a universal type would do – could you advise on how to wire it in?

The ITT universal tripler will work in this chassis. The grey lead is the input from the line output transformer, the white lead the output to the focus control, the red lead goes to the c.r.t., the black lead to chassis and the blue lead to chassis via a parallel *RC* combination (R502 820kΩ and C508 0·001μF).

RANK A823B CHASSIS

The set developed a focus fault due to 6R10, which is in series with the focus control, going high in value. A replacement resistor and tripler were fitted and the set worked perfectly for a couple of months. Recently however the focus spark gap 4SG3 has started to spark at a rate of some twenty times a second after the set has been on for about half an hour.

It's unlikely that the focus voltage is too high if the picture is correctly focused: we've often come across this effect and found it to be due to no more than a faulty spark gap. If you get the same results after fitting a replacement, the e.h.t. will have to be checked. If this is correct at 25kV or thereabouts the c.r.t. may be sparking over internally.

DECCA 80 SERIES CHASSIS

The problem was an intermittent heater-cathode (red) short. I've overcome it by disconnecting the heater circuit from earth. Are there any drawbacks to doing this?

The heaters are earthed simply to prevent them floating and rising to high potentials. To prevent this happening we suggest you connect one side of the heaters to the red cathode (pin 11) via a 100kΩ, ½W resistor. This will prevent static build up when the fault is not present. Be sure to revert to the normal connections should you replace the tube.

RANK T24E CHASSIS

The picture is good and the set works normally except for the fact that there's not enough horizontal shift to the right. Excessive width is necessary to fill the screen. There is also slight horizontal non-linearity (mostly unnoticeable) at the extreme left-hand side.

Since the tube has a horizontal centring tolerance of 4mm, no centring adjustment is provided. We suggest you check the purity, then the scan-correction capacitors C442/3 which might be slightly leaky. If these points prove to be in order, suspect a phasing error in the horizontal generator. If the line hold is correctly set, the suspects are C402, C401, R402 and R401 – in that order. They form the feedback/integrating network between the line output transformer and the flywheel sync discriminator.

THORN 9800 CHASSIS

The problem is a lazy field timebase. At switch on there's a horizontal white line across the screen. This opens out to give a full-sized, normal picture after ten to fifteen minutes. The two field output transistors have been checked and appear to be o.k.

The best approach is to use a scope to check through the oscillator and driver stages during the presence of the fault. Failing this, the items we suspect are the f.e.t. amplifier VT412 (in our experience the Thorn supplied type is the only suitable replacement) and the 6·8μF electrolytic coupling capacitor C447. A more remote possibility is VT406 in the field oscillator circuit. Careful application of warm air and freezer will narrow the field of search.

LUXOR 90° HYBRID CHASSIS

The picture is very poor and the sound makes all kinds of racket. Any ideas?

If the picture is snowy and the sound hisses, check the setting of the a.g.c. preset R255. If this control has no effect, replace the 18V zener diode D208 which stabilises the a.g.c. amplifier transistor's emitter voltage. If the fault is a weak picture with hum on sound, check the voltage at the collector of the 24V stabiliser transistor Q214 (AD149). If the voltage here is less than 24V, replace the driver/error sensing transistor Q215 (BC142 or BFY50/51 will do). It would also be worthwhile checking the cans that house i.f. coils L222 and L223 – waggle them. They are mounted on a small metal bracket and are prone to damage.

ITT HYBRID COLOUR CHASSIS

An irregular white interference line appears on the right-hand side of the screen a few minutes after switching on. The line gradually gets bigger, changes shape and sometimes forms a circle, distorting the picture. Decreasing the settings of the brightness and contrast controls makes the problem worse.

This sort of effect is normally due to parasitic oscillation in the line output valve. If a new PL519 and/or PY500 does not cure the problem, try fitting small r.f. chokes (e.g. RS 1A type) in the leads to the top caps of both these valves.

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TELEVISION DECEMBER 1982

TEST CASE

240

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

Some years ago, before transistors such as the BU208 and BU500 had been developed for use in colour receiver line output stages, the only courses open to designers were to adopt the low-voltage/high-current approach used for example by Thorn in their 3000/3500 series or to use a pair of relatively low-voltage devices in series to share the flyback voltage. The best known examples of the latter approach are the Rank A823 and Philips G8 chassis, which both use a fairly simple half-wave, thyristor-regulated power supply providing 200V or so. Another variation on this theme was adopted by Rank in their Z718 chassis. In this case the power supply is simple indeed, consisting of little more than a bridge rectifier and reservoir capacitor, stabilisation being achieved via the EW modulator circuit. The h.t. of around 260V is fed to a rather complex, balanced line output stage which is shown in basic form in Fig. 1. The other supply lines used in the set are all derived from the line output stage. Our puzzle this month concerns a Bush Model BC6100 fitted with the Z718 chassis.

The symptom to start with was no results. As expected, the 260V supply was present – it was rather more than 260V in fact, since the dormant line output stage was drawing no current. Our first step was to bypass the two start-up capacitors, 4C18 for the line oscillator and 5C3 for the line driver stage, using a 5·6kΩ, 5W resistor across each. This got things moving, and with line drive present we were rewarded with a picture. It was narrow however, about an inch in at each side, and a check on the e.h.t. showed that more than 25kV was present at the c.r.t.'s final anode connector instead of 21kV! The combination of low width and high e.h.t. suggested that the line output stage was unbalanced, and further checks showed that 5R6 (68Ω), which provides the supply to the line driver stage once the line timebase has got going, was burnt and open-circuit. Plainly the ripple voltage at the junction of the two line output transistors was excessive.

We temporarily wired a 5W, 68Ω resistor in the 5R6 position to withstand the line-rate ripple current while we attempted to balance the line output stage. This is done by monitoring the a.c. (line rate) voltage across 5R6 while adjusting the differential base-drive coils 5L1/2 for a null, when the reading should be less than 1V. We were unable to get below 6V a.c. however at any setting of 5L1/2, and the 5W substitute resistor was getting warm! Time to switch off and check the line output transistors 5VT2/3.

No faults showed up on ohmmeter checks, but we replaced the two transistors nevertheless because we couldn't find anything else wrong by using our ohmmeter – the resistors in the base networks (5R2/3/4/5) and the d.c. resistances of the line output transformer's split primary winding were all correct. We still couldn't balance the stage, and subsequent tests eliminated the scan-correction capacitors 5C14/15. Line output transformer failure was feared, but the transformer turned out to be blameless. So where did the fault lie? See next month.

ANSWER TO TEST CASE 239
– page 44 last month –

The yellow picture displayed by our ITT CVC9 last month was due to the c.r.t.'s blue gun being cut off by excessive voltage at its cathode. We'd established that the blue output transistor T33d was not responsible, and found that its base voltage was low due to a base current of some 10mA. The enigma was resolved when we finally got around to measuring the voltage at the transistor's collector leadout. We found no voltage here, and quickly saw that the h.f. peaking coil L73d was open-circuit. With no collector current flowing, the output transistor's forward-biased base-emitter junction was simply placing R246d and R247d across the driver transistor T32d, giving the strange voltage readings quoted last month.

Where did the owner's family and cat come into it? Well, close inspection of the offending coil showed that its failure was due to a "green spot" of corrosion and there were signs of a noxious liquid having entered the set. Nobody would admit anything, but when we got into the car to drive away we noticed that the cat was crouching beneath it, apparently full of remorse and intent on ending it all . . .

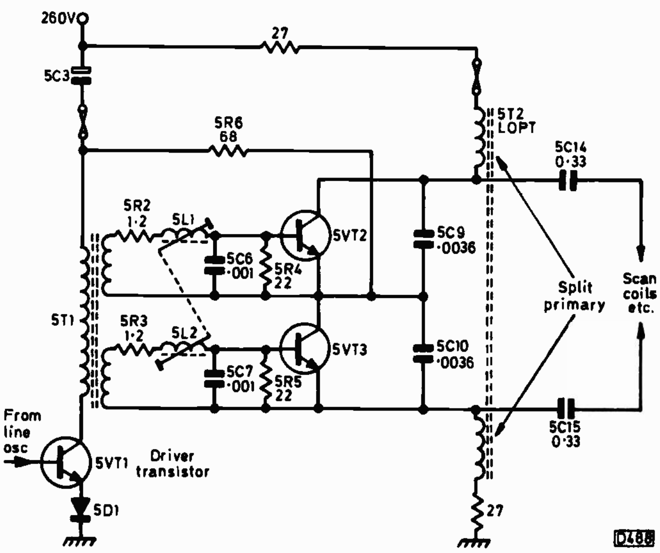

Fig. 1: Line output stage circuit (simplified) used in the Rank Z718 chassis.

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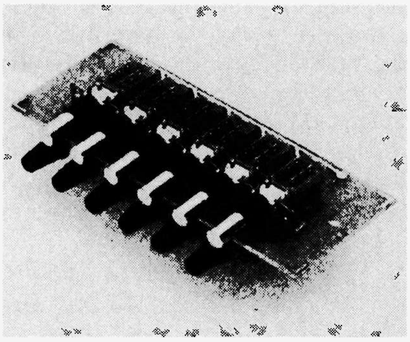

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Type 30-80	Replaces 7 piano-key unit as fitted to Decca/Telefunken 30 and 80 chassis
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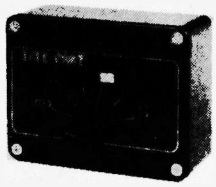

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* *Exceptionally light and durable*
* *Pocket size for outside service*
* *PP3 battery power source*
* *Five different test patterns for colour and mono TV*
* *Cross hatch grid*
* *Dot matrix*
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(1) You have not received the goods or had your money returned; and
(2) You write to the Publisher of Television summarising the situation not earlier than 28 days from the day you sent your order and not later than two months from that day.

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We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the Advertiser has been declared bankrupt or insolvent.

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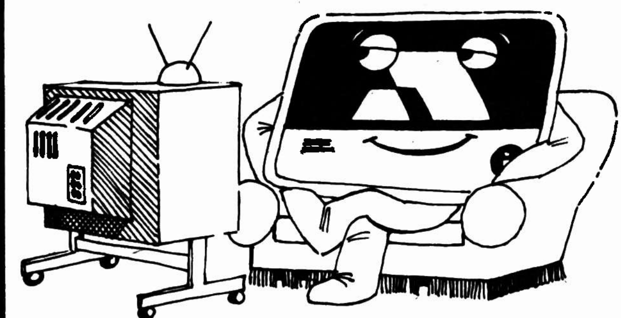

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Visit our massive ultra modern premises. Tea, coffee, snacks available.

Whatever your needs we are in the lead. Ring today.
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All Parts available all sets.

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SETS & COMPONENTS

SERVICE PAGES

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20" 22" 26"

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Add £2 Gun surcharge for 20AX Types.
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23"/24" **£14**

GREEN LABEL COLOUR TUBES

12 MONTHS GUARANTEE

90° up to 19" **£28**
90° up to 22" **£31**
90° up to 26" **£34**

Green Label Prices apply only to standard 38mm Delta Gun Types. They will be of particular interest to customers refurbishing ex-rental sets.

BUDGET CORNER

Buy any 5 mixed types Cash 'n Collect – Take 20% discount. The mix can include Green Label Tubes if required.

PRICES EXCLUDE V.A.T.

CALLERS WELCOME

Late night Thursdays until 8 p.m.
Saturdays until Midday

N.B. Customers intending to collect orders are requested to telephone in advance:- even popular types may be out of stock for short periods.

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MARDAVE MODEL RACING CARS
Nickel Cadmium Battery driven
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CMP30	£2
CMF40	£2
CMC56	£4
CMC16	£4
CMC67/2	£4
VMC44	£4
CMC15	£10
CMH10	£2
CMC54	£10
CVC20/3 Chassis	£30
75v W/W 25 watt	25p
140 MFD/100v	25p
Tape Motors Mitsumi	75p
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CMC 56	£5

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D. Whitworth,
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Panels

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U321 Mullard	£6.00
U322 ,,	£4.00
U314 ,,	£5.00
ELC1043/05 Thorn	£5.00
ELC1043/05 Mullard	£6.50
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UHF ,,	£4.00
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ET021 DX	£8.00
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Sylvania VHF	£3.00
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BY206	25 for £1.00
BA158	25 for £1.00
BA159	25 for £1.00
BY210/600	25 for £1.00
BY298 3 amp/fast/R	20 for £1.50
BU126	10 for £6.00
BU208	10 for £10.00
BU204	20 for £8.00
BU205	10 for £8.00
BU105	10 for £8.00
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20 Slider Pots	£1.00
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100 Diodes	£1.00
100 Fuses	£2.00
100 W/W Res.	£1.50
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8 Mixed Gun Switches	50p
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20 Large LED Red	£1.00
20 Small LED Red	£1.00

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Intercom 2 Way Long Lead suitable for Baby Alarm. High quality £5.00

Diodes

1 Amp 1600v	7p
3 Amp 100v	7p
3 Amp 1200v	10p
MR856 3 Amp Diodes	10p
W004 Bridge	15p
W005 Bridge	20p
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LM340T12 Reg	25p
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4.7NF/5KV	10p
180/8KV	10p
270PF/8KV	10p
1000PF/10KV	10p
1200PF/12KV	10p

ITT Spare Panels

CVC9 Power Supply Board	£1.50

Decoder Panel

ITT CVC20-25 30-32-40	£7.50
ITT Control Panel 5 Slider and Main Lead	£1.50
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TA7607	£1.00
TA7609	£1.00
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TAU80	£1.00
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TBA520	£1.00
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TBA540	£1.00
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TBA560C	£1.00
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BU208	60p
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BC250	7p
BC251	7p
BC252	7p
BC257	30p
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BC307	7p
BC308	7p
BC327	7p
BC337	7p
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BD331	20p	BY206	7p	BF423	15p	TIP31A/B	25p
BD332	20p	BY210/400	5p	BF458	12p	TIP32	20p
BD253B	35p	BY210/800	10p	BF468	30p	TIP33B	50p
BD416	25p	BY223	25p	BF457	7p	TIP34	50p
BD509	15p	BY226	15p	BF757	30p	TIP35	50p
BD510	25p	BY227	15p	BF758	30p	TIP36	50p
BD595	35p	BY237	5p	BF761	30p	TIP41	30p
BD596	35p	BY254	10p	BF858	30p	TIP42	30p
BD681	25p	BY255	10p	BFR79	15p	TIP100	30p
BD807	20p	BY296	10p	BFT43	10p	TIP120	30p
BD534	20p	BY298	10p	BFY50	15p	TIP130	30p
BF127	20p	BY299	10p	BFY90	20p	TIP2955S	40p
BF137	20p	BYF3123	40p	BR100	25p	IN60	3p
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T/V 4.433-619KHz	
T/V 8.8867 238KHz	
6 MHX Crystal	
8.8867-238KHz Min	50p

Filters

5-5MHz	15p
6MHz ,,	25p
BFU455K	5p

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BT119	£1.00
BT120	£1.00
2N4444	£1.00
BRC4443	75p
TIC126 12 amp/800v	40p
G11 Thyristor	30p
Decca 80-100	35p
G11 Teletext Decoder Panel Philips	£30.00

Thermistors

VA1104	35p
ITTP7266312	15p
PTH451 AOR	15p
PT37P Fits Pye & Bush	25p

BF324	10p
BF419	30p
Line O/P Driver	
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BLY49	50p
MR501 3 Amp 100v	7p
MR508 3 Amp 800v	10p