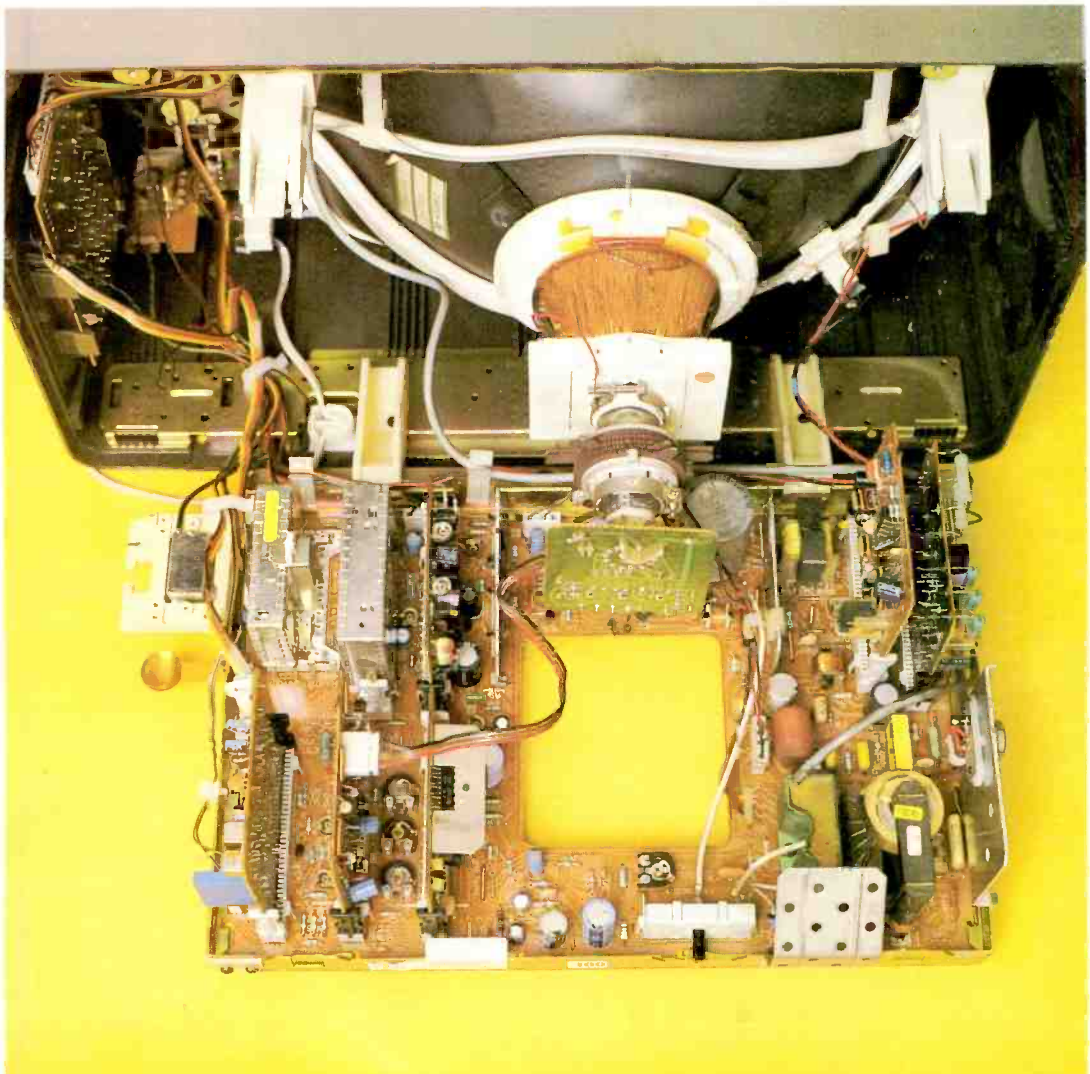
NOVEMBER 1983 Australia $1.80; New Zealand $2.?0; Malaysia $5.50; I.R. £1.15 (inc. VAT) 90p

TELEVISION

SERVICING·VIDEO·CONSTRUCTION·DEVELOPMENTS



SERVICING NOTES ON THE PHILIPS KT3 AND K30 CHASSIS

CHECKING SECOND-HAND VCRs

HEAD TESTER REVIEW

VCR CLINIC

ENERGY DISPERSAL

Interested in Television Servicing?

Try a ZED Pack. Effect Repairs at Minimum Cost.

Z1	300 mixed ½ and ¼ 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, BC154, 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 1N4148 Gen Purpose Diodes	£1.00
Z17	20 1N4003/10D2	£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 (1N5408 type)	8 for £1.00
Z49	Brushed Aluminium Push Button Knobs, 15mm long × 11mm Diam. Fit standard 3½mm 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. ¼" 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) ¼" 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 ¼ Watt Emitter Resistors	40 for £1.00

V.C.R. BATTERY PACKS.

HITACHI PORTABLE V.C.R. Niçad 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. Brand new and boxed. **£20 each, 3 for £50.**

THORN "VIDEOSTAR" Nicad packs. Same as above but secondhand, untested. Contain **10 "C" size Nicads (HP11)** which can be replaced if necessary. **£10 each, 3 for £25.**

High quality **COAX PLUGS,** silver plated pin, grub screw fixing. **5 for £1**
COAX COUPLERS 5 for £1
COAX FLYING SOCKET 3 for £1

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
10μf 25v	20 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 35v	6 for £1.00
1000μf 40v*	5 for £1

*Axial. All others are Radial.

CAN TYPES

22μf 375v (3 pin)	50p
50μf 250v (3 pin)	50p
100+200 350v	£1.00
100μf 350v	80p
2000μf 100v	£1.00
1000μf 100v	60p
2,200μf 40v	60p
2,200μf 63v	70p
3,500μf 35v	50p
220μf 400v ITT/RBM	£1.00
6,800μf 70v	£1.00
10,000μf 40v	£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

12V BULBS on leads. Suitable for most **VIDEO RECORDERS.**
70p each 4 for £2

CAR RADIO SUPPRESSOR KIT

Comprises: in line aerial suppressor, power lead suppressor and clock/accessory suppressor. With leaflet.
£1.95 each, 10 for £1.20
Further Discount on large quantities

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, 47v	
10 of one value	£1.00
10 of each	£3.00

DIODES

25 × IN4002	£1.00 / 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
10 × SKE4F2/06 (600v 2a fast switching)	£1.00
12 × BY127	£1.00
8 × BY255 (3A 1,300V)	£1.00
10 × BA158 (600v 400ma)	£1.00
IN5402 3a 200v	8 for £1.00
6A, 100V, Bridge Rectifier. 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
TBA120SB 50p each,	5 for £2.00
TBA820 £1 each,	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

MISCELLANEOUS

BG100 tripler for CVC45 etc.	only £3.50
Line output transformer for RBM823A	£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 Tuner. 5 button type	£4.00 each, 4 for £12.00
UHF Modulator UHF out Video in. Ch. 36. 2¾"×2"×¾" 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
Focus VDR Rods 2¾"×¼". Suitable for GEC, Decca etc.	75p each, 3 for £2.00
Grundig UHF/VHF Varicap Tuner for 1500GB, 3010GB.	£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
4.433 Mhz CTV Crystals	70p each, 3 for £2
75Ω 2¼ Loudspeaker	60p each, 4 for £2
6 MHz sound filters, ceramic 3 pin "TAIYO" type	50p each, 3 for £1.00
PYE CT200 Control Knobs	8 for £1.00
Degaus VDRs. 1¼" diam, for RBM etc.	5 for £1.00
Mains Neons	10 for £1.00
2k2 Screened Resistors. White ceramic, 9 watt, with fusible link.	8 for £1.00
E.H.T. Discharge probe, with heavily insulated handle, with lead and chassis connector.	60p each, 3 for £1.50

UNIVERSAL TEST LEAD KIT

Comprises: Red and black meter leads with 14 interchangeable probes, clips, points, plugs etc with screw threads.
ONLY £2.50

I.C. EXTRACTING TOOLS

Small **90p** Large **£1.20**

SMART ALUMINIUM FINISHED ¼" SHAFT KNOBS

¾" diam. Ideal for TV or Hi-Fi.
10 for £1 100 for £8

"MITSUMI" MINIATURE ROTARY UHF TUNERS

Single nut fixing as used in various JAP portables	£3.95
"Mitsumi" varicap tuner "AM-UF-125".	£4.95

SPECIAL OFFER

PHONO PLUGS, metal with plastic tops. Red, grey or black.

20 of ONE colour	£1
20 of EACH colour	£2.50
100 of ONE colour	£4
100 of EACH colour	£10

SPECIAL OFFER

LIGHTWEIGHT STEREO HEADPHONES. Good quality with 3.5mm stereo jack plug. **£2.95 each, £25 for 10.** Further discount available on large quantities.

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
"950" Can. 100 + 300 + 100 + 16μf	£1.00

THYRISTOR CONVERGENCE POTS

SS106 (BT106) 75p each 3 for £2.00, 10 for £5.50

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

November 1983

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Issue 397

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

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

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

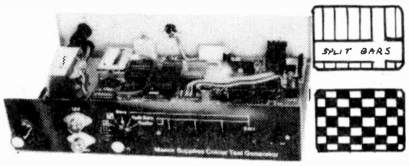
this month

OUR NEXT ISSUE DATED DECEMBER WILL BE PUBLISHED ON NOVEMBER 16

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″×2½″)	**£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	**£120.75**

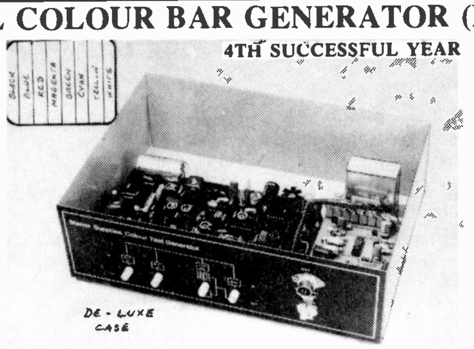
SPECIAL TEST REPORT 'TELEVISION' DEC. 1982

Post/Packing £2.50

All above prices include VAT 15%

PAL COLOUR BAR GENERATOR (Mk4)

4TH SUCCESSFUL YEAR



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

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £34.50. DELUXE CASE £8.50. BATT HOLDERS £3.20 OR MAINS SUPPLY KIT £4.80 (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 £78.20 + £1.80 P & P.
VHF MODULATOR (CHI to 4) FOR OVERSEAS £6.60.
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 **£158.70** p.p. £2.80.
MK 2 (Philips/Mullard) Infra-red remote control **£198.40** 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

TELEVISION MAGAZINE PROJECT PARTS
NEW COLOUR PORTABLE TV
MONO PORTABLE TV, SMALL SCREEN MONITOR
LISTS AVAILABLE, PANEL TEST SERVICE

MULLARD TELETEXT DECODER + INTERFACE suitable for TX9, TX10 **£69.00** p.p. £1.80. (Decoder only **£57.50** p.p. £1.80).
SAW FILTER IF AMPLIFIER PLUS TUNER COMPLETE AND tested for T.V. SOUND & VISION **£32.80** p.p. £1.20.
PAL DECODER KIT FOR RGB MONITORS £31.00 p.p. £1.00.
SPECIAL OFFER TEXAS XMII TELETEXT DECODER NEW & TESTED AT REDUCED PRICE **£46.00** p.p. £1.60.
PHILIPS-PYE G11 TYPE TELETEXT DECODERS **£28.75** p.p. £1.60.
TELETEXT 23 BUTTON DE-LUXE HANDSET WITH 5 YDS. CABLE **£7.80** p.p. £1.20. XMII STAB. POWER SUPPLY **£4.40** p.p. £1.20.
CROSS HATCH UNIT KIT, AERIAL INPUT TYPE, INCL. T.V. SYNC AND UHF MODULATOR. BATTERY OPERATED. ALSO GIVES PEAK WHITE & BLACK LEVELS. CAN BE USED FOR ANY SET **£12.65** p.p. 60p. (ALUM CASE **£2.90** 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 **£2.90** DE LUXE CASE **£8.50** p.p. £1.80.
CRT TESTER & REACTIVATOR PROJECT KIT FOR COLOUR & MONO **£29.40** p.p. £2.00.
BUSH A823 POWER BASIC PCB. IN FIBREGLASS **£6.40** p.p. £1.00.
BUSH Z718 BC6100 SERIES IF PANEL **£5.75** p.p. 90p.
BUSH A816 IF PANEL (SURPLUS) **£1.90** p.p. 90p.
DECCA "Bradford" T.B. POWER ex rental **£5.75 each** p.p. £1.40.
DECCA 80, SERIES, IF FRAME T.B. **£5.75 each** p.p. £1.40.
DECCA 80, 100 LINE SCAN UNIT salvaged **£11.50 each** p.p. £2.00.
GEC 2040 Convergence panels, Decoder panels **£2.88 each** p.p. £1.80.
GEC 2040 IF PANELS **£3.22** p.p. £1.60.
THORN TX9 PANELS ex factory for small spares. Includes I.C.s & Semiconductors etc. **£5.75** p.p. £2.00.
THORN TX9 PANELS salvaged ex factory for spares incl. LOPT & mains transformers **£11.50** p.p. £2.80.
THORN TX9 PANELS ex factory salvaged complete cond **£23.00** p.p. £2.80.
THORN TX10 T.B. PANELS salvaged ex factory **£17.25** p.p. £3.00.
THORN TX10 SIGNAL BOARDS salvaged ex factory **£17.25** p.p. £2.00.
TX10 type Remote & tuning control panel **£8.50** p.p. £1.50.
THORN 3000 LINE T.B., POWER PCB **£5.75 each** p.p. £1.30.
THORN 8000/8500 IF/DECODER PANELS salvaged **£3.70** p.p. £1.80.
THORN 8000/8500 FRAME T.B. PANELS salvaged/spares **£2.88** p.p. £1.40.
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 G8/G9 IF/DECODER Panels for small spares **£1.75** p.p. £1.40.
G8 Decoder panels salvaged £4.25. Panels for spares **£2.00** p.p. £1.40.
G9 Scan Panel. Basic PCB in fibreglass **£16.68** p.p. £1.80.
GRUNDIG 8630 Series Varicap Tuners **£7.82** p.p. £1.00.
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. MAKERS VARICAP CONTROLS Pye CT200 4PSN **£8.60,** A823 4PSN **£5.50,** Decca 6PSN **£6.70** p.p. 80p.
ITT CVC5 7 position **£7.82** p.p. £1.00.
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. **DECCA** Bradford 5 position **£2.88** p.p. £1.80 etc.
LOPT TESTER Serivice Dept approved **£17.82** p.p. £1.20.
LOPTS NEW & GUAR. P/P Mono **£1.35p,** Colour **£1.45p,** Bobbins **80p.**

BUSH 161 to 186 (twin panel)	**£6.80**	**R.B.M.** A823	**£5.60**
BUSH, MURPHY 774 series	**£9.80**	**R.B.M.** Z179	**£11.30**
BUSH, MURPHY A816 series	**£9.80**	**R.B.M.** T20, T22	**£11.30**
FERG., HMV, MARCONI, ULTRA 950, 1400, 1500, 1580,1590, 1591	**£6.80**	**R.B.M.** T20, T22 Bobbin	**£6.44**
THORN 1600, 1615, 1690, 1691	**£10.50**	**DECCA** Bradford (state Mod No)	**£10.15**
GEC 2000 to 2038 series	**£7.80**	**DECCA** 80, 100	**£10.15**
GEC series 1 & 2	**£9.20**	**GEC** 2028, 2040, 2100	**£6.70**
INDESIT 20/24EGB	**£8.80**	**GEC** 2110 Series	**£12.20**
ITT/KB VC 200, 300	**£8.80**	**ITT** CVC 5 to 9, CVC20	**£11.30**
MURPHY 1910 to 2414 series	**£6.80**	**ITT** CVC25, CVC30 series	**£10.15**
PHILIPS 170, 210, 300 SERIES	**£8.80**	**PYE** 691-697	**£11.50**
PYE, INVICTA, EKCO, FERR. 368, 169, 569, 769 series	**£8.80**	**PYE** 713, 715	**£7.85**
SPECIAL OFFER		**PYE** 725 (90°) 731 to 741	**£10.60**
DECCA 20/24, 1700, 2000, 2401	**£4.40**	**PHILIPS** G8	**£10.15**
GEC 2114J/Junior Fineline	**£3.25**	**PHILIPS** G9	**£11.30**
PYE 40, 67	**£2.00**	**PHILIPS** 570, 571	**£7.85**
KB VC ELEVEN (003)	**£2.00**	**THORN** 3000/3500 SCAN, EHT	**£7.85**
KB VC1	**£3.25**	**THORN** 8000/8500/8800	**£14.80**
		THORN 9000 to 9600	**£10.15**
		THORN 9800	**£21.90**

OTHERS AVAILABLE, PRICES ON REQUEST. ALSO F.OPTS.
TRIPLERS Full range available. Mono & Colour.
Special Offer: Thorn 1400 5 stick EHT Tray **£1.72** p.p. 65p.
TRANSDUCTORS suitable for G8, A823, Bradford etc. **£1.72** p.p. 60p.
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LARGE SELECTION TESTED COLOUR PANELS POPULAR MODELS

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DECCA 80 (400/350V)	3.00
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DECCA 1700 (200/200/400/350V)	4.83
PHILIPS G8 (600/300V)	2.30
PHILIPS G9 (600/300V)	2.21
PHILIPS G11 (470/250V)	2.90
PYE 691/7 (200/300/350V)	2.70
PYE 731 (600/300V)	2.31
RBM A823 (2500/2500/30V)	1.66
RBM A823 (600/300V)	2.83
RBM Z146 (300/300/350V)	3.55
RR1 T20A (220/400V)	2.00
ITT CVC5/9 (200/200/75/25)	2.98
ITT CVC 20 (220/400V)	2.00
GEC 2110 (600/250V)	1.94
GEC 2040 (1000/2000/35V)	1.19
GEC 2040 (300/300/150/100/50)	4.10
THORN 3500 (400/40V)	30
THORN 950 (100/300/100/16/275V)	1.83
THORN 1400 (150/100/100/100/150/320V)	2.79
THORN 1500 (150/150/100/300V)	2.20
THORN 1500 (12/300V)	31
THORN 3500 (175/100/100/400/350V)	2.78
THORN 3500 (1000/63V)	86
THORN 3500 (1000/70V)	86
THORN 8000/8500 (2500/2500/63V)	3.38
THORN 8000/8500 (700/250V)	2.31
THORN 8000/8500 (400/350V)	2.56
THORN 9000 (400/400V)	3.28
GEC (200/200/150/50)	2.64
PHILIPS 69 2200/63V	1.25
THORN 4700 P/C 25V	1.20
PHILIPS 320 400/400/200V	2.74
THORN 1591/1691 4700/25V	1.20

CAPACITORS AXIAL

Volts	Mfd	Price
6V3	33	9
10V	22	10
	47	10
	100	10
	220	15
	470	20
16V	33	11
	68	11
	220	16
	1000	27
	3300	53
25V	10	11
	22	13
	47	15
	100	15
	220	29
	470	30
	1000	55
	2200	51
	4700	98
40V	10	10
	22	10
	400	48
63V	1	12
	2.2	12
	4.7	12
	10	11
	15	12
	22	13
	47	19
	100	23
	220	37
	470	49
	1000	58
	2200	94
100V	10	13
	22	15
	47	20
	100	36
	220	70
450	1	33
	4.7	30
	10	30
	22	65
	33	75
500	1	32
	10	32
600	1	41

SPECIAL DIODES

SKE 49	£1.09
SKE 5F	£1.19
Y723	£1.30
Y927	£1.42

MIXED DIELECTRIC CAPS

Volts D.C.		
250V	0.91mF	84
400V	0.22mF	29
600V	0.1mF	38
1000V	0.01mF	24
	0.047mF	46
	0.033mF	33
	0.1mF	35
	0.22mF	66
	0.47mF	98
1250V	0.1mF	59
	0.91mF	1.15
1500V	0.0022mF	28
	0.0047mF	32
	0.022mF	30
	0.033mF	62
	0.005mF	65
2000V	0.0052mF	1.20

DISC CERAMIC CAPACITORS

8kV (12kV Wag)
39pF 200pF **each**
150pF 220pF **30p**
180pF 250pF

CERAMIC CAPACITORS

63V A range of pref. values **each**
22pF-4700pF **6p**

ELECTRONIC TUNERS AND ASSEMBLIES

Mullard ELC1043/05	8.40
Mullard ELC1043/06	8.40
4 P/B DECCA/GEC/ITT	6.88
6 P/B DECCA/GEC/ITT	7.50
4 P/B PYE	9.00
6 P/B PYE	16.00
PHILIPS G8 Tuner	10.50
PHILIPS G8 Ass. (Square/Early)	13.50
PHILIPS G8 Ass. (Sloping/Late)	13.90
PHILIPS G9 Tuner	10.50
PHILIPS G11 Tuner	9.00
ITT/PYE/GEC 7 Button P/B	13.95
GEC 2110 6 way P/B	7.98
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THORN 8800 SELECTOR (HMV Model 2725/6 way round button)	7.50
THORN 9000 SELECTOR	11.40
U322	7.20
HITACHI 4 way Chan. Selector (Also Rank A823)	10.75
RR1 T20A 6 way Chan. Selector	9.75
RR1 T20/22/26	11.00
PHILIPS 8 way TIP Switch Unit (suitable for all G11)	23.00
ITT CVC8 (5 wheel modified)	£12
ITT 6 way with VCR (Also Slim GEC)	8.90
PHILIPS KT3	14.50
PHILIPS KT30	10.30
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ELC 2003	£16.50

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A1 Controls 5m (THORN 3500)	89
GEC 2110 A1 Control IM5 (Red, Blue, Green)	58
GEC 2040 On/Off Switch	88
On/Off Switch G11/G12	1.58
On/Off Switch GEC/TCE TX9/10	1.06

SLIDER POTENT

Lin or Log
470R-1K-2K2-44-10K-47K-470K **65**

SKELETON PRE-SET POTS

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

PANELS + UNITS

AFC UNIT PHILIPS G8	8.82
IF GAIN MODULE (Pye/Philips)	9.00
CDA PANEL (Pye/Invicta/Ecko/Dynatron)	20.00
REAR CONVERGENCE PANEL (Philips G8)	23.00

MIDGET CONTROLS

Insulated Spindle Length 44mm

Log or Lin Without Switch 5K-10K-25K-50K-100K-250K-500K-1M	39p
With D.P.S.T. Switch Log: 5K-10K-25K-50K-100K 250K, 500K, 1M, 2M	81p
Dual gang Controls	1.25
16mm Rotary Controls 10K, 22K, 100K, 1M, 10K	39p

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THORN 3000 2A Metal	1.60
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MULTITURN POTS

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

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Please send **large** S.A.E. for full EAGLE Catalogue

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3 W/5R-6R8-10R-15R-20R 50R-100R-200R-500R **60**

METRIC CONVERGENCE POTS

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5R-10R-20R-50R **60**

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CHARGERS	
CH1/22 For PP3/NN1604	6.40
1 battery (RX22)	
CH4/50 For HP7/NN1500	5.55
1-4 batteries (RX6)	
CH3/RX6 For SP2/HP2/NN1300/SP11/HP11/NN1400/HP7/NN1500	14.00
2-4-6 batteries in pairs. (RX6-RX14-RX20)	
CH3/RX4 For SP2/HP2/NN1300/SP11/HP11/NN1400/HP7/NN1500	9.55
2-4 batteries in pairs. (RX6-RX14-RX20)	
BATTERIES	
RX6 – HP7/NN1500	1.39
RX14 – SP11/HP11/NN1400	2.17
RX20 – SP2/HP2/NN1300	2.34
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PHILIPS VCC 240	5.93
PHILIPS VCC 360	8.30
PHILIPS VCC 480	10.21

VIDEO CASSETTE CASES

Red/Blue/Green/Brown	80
Book Type – Any Format	
Scotch Audio Tape	
C90 Ferric	65
C90 Super Ferric	96
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	Per type	Pack of 10
1¼" QUICK BLOW		
100ma		73
250ma-500ma-750ma-1A		60
1.5A-2A-2.5A-3A-5A		60
1¼" ANTISURGE		
250ma, 500ma, 600ma, 630ma, 750ma, 850ma, 1A, 1.25A		
1.5A, 2A		1.70
2.5A, 3A, 5A		2.70
20mm ANTISURGE		
80ma		4.80
100ma		2.50
160ma, 200ma		2.20
315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A		1.30
2.5A, 3.15A		1.90
20mm QUICK BLOW		
100ma, 250ma, 500ma, 630ma, 800ma		90
1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A		60
1" MAINS		
2A, 3A, 5A, 10A, 13A		1.00

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Surface Mount Splitter	1.70
Surface Mount Outlets	80
Cable Clips per 100	1.18
Coax Plugs per 10	1.80
P.V.C. Tape	35
F.M. Plugs	25
PL259 Plugs	40
Line Connectors	35
Reducers for PL259	16
T.V. Filter 50db Rejection 27mhz	2.10
Attenuators 6db, 12db, 18db	1.80
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RANK Drive Cams	10
GEC 2110 Tuner Neons	14

SUNDRIES

Delay Lines DL60, DL700, DL50	2.20
CRT Tube Base	70
EHT Final Anode Cap	53
EHT Cable	25p mtr.
6.3V CRT Boost Trans.	4.35
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Quick Set Adhesive	78
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Double End 4mm/8mm Trim Tools	20
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Keynector Safe Block (mains)	7.00
Cassette Drive Belts price each	
35mm	35
46mm	37
57mm	37
66mm	39
71mm	41
76mm	43
90mm	43
110mm	59
Torch (handy for tool box)	42
I.C. Inserter	1.18
SM Neon Screwdriver	40
DIN Plugs 3 pin	22
4 pin	22
180° 5 pin	20
Stnd. 5 pin	20
Phono Plugs	12
Car Aerial Plug	18
2.5mm Jack Plug	14
3.5mm Jack Plug	14
Stnd. Jack Plug	20
Stereo Jack Plug	36
5A Connector Block (12)	40
Fuse Wire 5A-15A-30A	5
Battery Plug Thorn TV's	28
Gen. Purpose Power Supply 9V 200ma	3.25
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Portable Oscilloscope	150.00
Probes x10	10.90
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EHT	
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SERVISOL Aero Duster	94
SERVISOL Excel Polish	76
SERVISOL Video Head Cleaner	80
Super 40	1.50
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Solda Mop standard reel	72

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CM7061 Power Unit 12V	10.70
CM7062 Reg. Power Unit 12V	11.67
CM7060 MHA 10db 12V W/B	8.94
CM7065 VHF/UHF MHA W/B 12V	13.01
CM7067 UHF 12V MHA (Specify A-B or C/D)	9.72
CM7068 UHF 12V MHA High Gain (Specify A-B or C/D)	14.47
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CM7054 Behind Set UHF Amp. (Battery e.g. Caravans)	9.45
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CM7093 Behind Set UHF Amp. 3 Sets	13.85
CM7063 Dist. Amp. VHF/UHF 17db/output 12V	20.10
CM7018 VHF/UHF 8+1 Dist. Amp.	39.24
CM9700 27mhz CB Suppress.	3.68
CM6011 Outdoor Splitter (2 way) W/B	7.10
CM9003 Flush Single Outlet	1.33
CM9010 Flush Twin Outlet	1.69
CM9034 UHF Group Filters with DC Through Pass (state A/B/CD)	6.97
CM6006 6 Way Passive Splitter	10.97
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CM9009 Flush TV/FM Outlet	2.76
CM7069 Tri Star Amplified Set Top Aerial W/B	17.50
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CM6038 UHF/VHF 625 Pattern Gen.*	50.00
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* While stocks last

RECTIFIER TRAYS

THORN 950 Mk II	4.25
THORN 1400 3 Stick	4.25
THORN 1500 3 Stick	4.55
THORN 1500 5 Stick	5.29
THORN 1600	3.90
THORN 3000/3500	7.98
THORN 8000	5.28
THORN 8500/8800	6.15
THORN 9000	7.93
DECCA 1730/1830	4.48
DECCA 1910/2213 Bradford	5.92
DECCA 30	6.76
DECCA 80	6.60
DECCA 100	6.14
UNIVERSAL ITT or REMO	6.00
GEC 2100	7.40
GEC 2200 (20AX)	6.50
GEC 2040/2028	6.60
GEC 2110 Pre Jan '77	7.00
GEC 2110 Post Jan '77	7.00
PHILIPS G8 Short Focus Lead	6.75
PHILIPS G8 Long Focus 550	6.75
PHILIPS G9	6.37
Pye/Philips K3 Tripler	6.65
PYE 691/3	6.58
PYE 713/4 Lead	7.00
PYE 713 Doubler 5 Lead	7.50
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R.B.M. A823	7.60
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RRI T20	6.80

RECTIFIER STICKS

TV11	74	TV18	90
TV13	79	TV20	1.20

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

DIODES

AA119	9
BA102	17
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA317	26
BAX13	4
BAX16	8
BB105B	30
BB105G	30
BY126	12
BY127	11
BY133	15
BY164	45
BY176	85
BY179	63
BY182	87
BY184	55
BY199	28
BY206	14
BY210/600	28
BY210/800	33
BY223	90
BY227	28
BY298	22
BY299	22
BYX10	20
BYX36/10	30
BYX36/600	35
BYX55/600	30
BYX71/600	90
OA47	9
OA90	10
OA91	10
OA95	6
OA202	11
IN914	4
IN4001	4
IN4002	4
IN4003	4
IN4004	5
IN4005	5
IN4006	5
IN4007	6
IN4148	2
IN4448	10
IN5401	12
IN5402	14
IN5403	12
IN5404	12
IN5405	13
IN5406	16
IN5407	16
IN5408	16
ITT44	4
ITT2002	11
Y969 (30V Thorn 3500)	89
BZY15-24R	1.18
BZY15-12R	1.18

ZENER DIODES

BZX61/85 (1.3W)	20
6V2-7V5-8V2-9V1-10V-11V-12V-13V-15V etc up to 75V.	
BZY9390, 18V	1.18
BZY88 (400MW)	10
2V7-3V-3V3-3V6-3V9-4V3-4V7-5V etc. up to 24V.	

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THEN ADD 15% VAT TO TOTAL COST.
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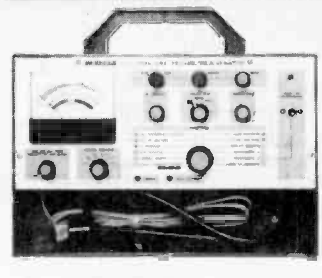
Size: H 230mm W 330mm D 120mm.



PRICE £151 + £22.65 VAT

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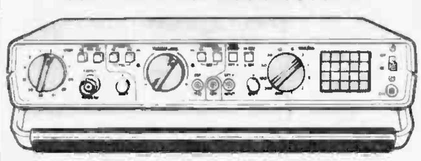

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x 1/x 10 Switched Probe £9.50 + £1.42 V.A.T.
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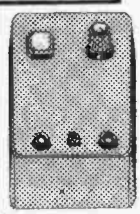

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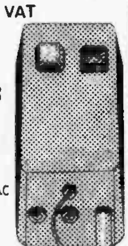

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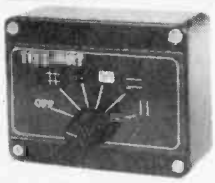

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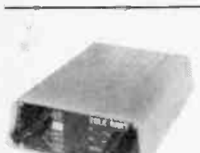

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Broadcasting Non-policy

Traditionally, governments are supposed to have policies. Our present one is radical in considering this to be unnecessary in some fields. The attitude seems to be that best results are likely to be produced when people are left alone to get on with things rather than being subjected to overall control from above. That may well be so in many cases, and don't most of us prefer to do our own thing? There are times however when one feels that this studied non-policy stance amounts to something that comes close to gross irresponsibility. In the economics field for example the government's lack of an exchange rate policy has done great damage to industry over the last four years.

Another field in which the government seems to feel it best to stand aside and see what happens is broadcasting. My comment last month about the IBA sitting back and looking on whilst the BBC faces up to the problems presented by starting a satellite service on two channels was very soon up-staged by the Home Secretary Leon Brittan's announcement at the Cambridge Royal Television Society convention that the IBA is to be authorised to start satellite broadcasting on another two channels. So in addition to the existing four channels we are to have four satellite ones plus all those extra cable ones – as well as what we choose to see on discs and tapes. A plethora of goodies? Maybe.

The problem is that all this has to be paid for in one way or another, and that providing worthwhile programme material to fill all these channels will be no small matter. Has it all been thought out? The answer seems to be no – there's to be a sort of non-policy, letting developments take place whilst we see how it all turns out.

To suggest the need for a considered policy is not to advocate strict control over broadcasting. That would be a disaster. Countries that control broadcasting rigidly tend to have the worst broadcasting. This doesn't however mean that the opposite approach, a sort of broadcasting anarchy, does very much better. Countries where conditions of this sort apply don't provide a particularly good viewer service either. There has to be some sort of balance in the provision of broadcasting services for overall worthwhile results to be achieved. Good old British compromise you may say, but compromise of some sort, i.e. a policy, is necessary.

There is already much doubt and confusion over the future of broadcasting services in the UK, whether off-air or via cable. No one seems very sure how things will turn out. Some cable enthusiasts remain certain that cable services can be profitable and worthwhile. Those who are expected to put up the money seem to be less sure. To get satellite services going means putting enough money in to get a decent supply of extra programmes – always assuming that the ideas and creative talent are also available. Otherwise people won't bother to buy the necessary receiving equipment or pay the cable fees. It seems clear enough that providing worthwhile viewing material on the existing four channels is a problem. What will we get from a choice of ten or twenty?

These are serious problems that require serious thought leading to a definite policy. The present broadcasting arrangements in the UK may not be perfect. They nevertheless appear to be, on international comparison, the least bad. The developments already approved by the government are unlikely to do other than make a marginal improvement and could actually lead to a worse service. If the broadcasters' budgets are grossly over stretched all round the result could be a greater choice between a worse selection of programme material.

One overriding need is to maintain a good public service network. In the BBC we have an organisation that's admired world wide. It may appear to be so firmly established as to be in no conceivable danger. It probably isn't. But if the demands upon it become excessive, and the funds inadequate due to the need to spread them too widely, it could become something far less worthwhile and less able to maintain its independence. Public service broadcasting will always remain a tender plant.

These may seem to be alarmist thoughts. But the fact is that ill thought out (or not thought out at all) changes are being enacted. The need is for balance between financial possibilities and what sort of service can be provided, something any company director would appreciate. The commercial services are as much affected since there's a limit to the amount of advertising revenue available. Too little supporting too many channels would mean that we end up with endless video pap. A carefully considered policy is essential if these dangers are to be avoided.

One factor that's cause for concern is that much of the pressure for change is coming as a result of new technical possibilities. Yes, it would be nice to have a satellite and cable TV industry in the UK exporting to the rest of the world and creating wealth and jobs. Other countries are not without the same idea however, and the overriding question is what will the technology be used for? To end up with a lot of brand new technology and a worse service would not be particularly clever. The time to be thinking this through is now. The chance seems to be going by default.

FRONT COVER

Our thanks to Philips Video for the loan of the KT3 chassis shown in this month's cover photograph.

Long-distance Television

Roger Bunney

Sporadic E signal propagation during August was more active than expected or usual at this time of the year, with sustained signals on many days during the first three weeks of the month. Tropospheric propagation was also very active as a result of the long period of stable high pressure over W. Europe. Overall therefore the month was most rewarding.

The following SpE log is based on my own reception and reports received from other enthusiasts in various parts of the country.

5/8/83	TSS (USSR) chs. R1-3; MTV (Hungary) R1, 2; TVP (Poland) R1; CST (Czechoslovakia) R2; JRT (Yugoslavia) E3, 4; ORF (Austria) E2a; RAI (Italy) IA, IB; NRK (Norway) E2. An unidentified Arab with fez was noted during the late afternoon on ch. E2 (Dubai, Lebanon?).
7/8/83	RTVE (Spain) E2-4; RTP (Portugal) E3; RAI IA.
8/8/83	RTVE E2, 3.
9/8/83	RTVE E2-4; RTP E2, 3; RAI IA, IB; MTV R1, 2; TSS R1.
10/8/83	RTVE E2-4; RAI IA; JRT E3; MTV R1, 2; ARD (W. Germany) E2; ORF E2a.
11/8/83	TSS, MTV R1, 2; TVP R1; RAI IA; RTP E3; ORF E2a; RTVE E2-4.
12/8/83	RTVE E2-4; RAI IA; Canary Islands E3.
13/8/83	RTVE E2-4; RAI IA; JRT E3; CST R1, 2; ORF E2a; DR (Denmark) E3; TSS, TVP R1.
14/8/83	RTVE E2-4; RTP E2, 3; RAI IA, IB; SR (Sweden) E2; NRK E2, 3.
15/8/83	TSS, CST R1, 2; TVP R1; RTVE E2-4.
16/8/83	RTVE E2-4; RTP E2, 3; RAI IA, IB; ORF E2a; MTV, TSS, TVP, CST R1, 2; +PTT/SRG (Switzerland) E2.
17/8/83	TSS, MTV, TVP, CST R1, 2; JRT E3; RAI IA, IB; RTP E3; ORF E2a; RTP E2, 3; +PTT/SRG E2.
18/8/83	RTVE E2-4; RTP E2, 3; ARD E2; JRT E3, 4; RAI IA, IB; ORF E2a, 4; TSS, MTV, CST R1, 2; NRK E2, 3; SR E2, 3.
19/8/83	TSS, MTV, CST R1, 2; TVP R1; JRT E3, 4; ARD E2; +PTT/SRG E2, 3; RAI, IA, IB; RTVE E2-4; RTP E3; NRK E2.
20/8/83	TVP R1.
21/8/83	RTVE E2-4; RAI IA; ORF E2a; TSS R1.
22/8/83	RTVE E2, 3; RAI IA.
27/8/83	RTVE E2, 3; RAI IB. Gwelo (ZTV) was noted during the evening at 1800 BST on ch. E2; there was also an African type programme, announcer with fez, on ch. E3 at 2000 (TE).
29-30/8/83	RTVE E2, 3.
2/9/83	RAI IA, IB; JRT E3, 4.
3/9/83	JRT E3; TSS R1.

Meteor scatter reception was fruitful during the time of the Perseids shower. Paul Barton noted YLE (Finland) and NRK ch. E6 on test pattern (August 11th at 1315 BST). A further peak of activity was logged on August 27th.

Tropospheric lifts occurred over the 8th-11th, with mainly W./E. Germany and Denmark in Band III and at u.h.f., and the 19th-31st, again with several days of considerably improved though not exceptional reception in Band III and at u.h.f. On the 24th and the 25th NRK ch. E2 was received in Ely and Harrogate (most unusual). On the 30th I received (at Romsey) Naessjoe SR-1 on ch. E10 via tropospheric ducting, a distance of some 820 miles. This was remarkable considering the low site here and the range of hills towards the N.E., rising some 600ft above my location about four miles away. Be encouraged, valley dwellers! Swedish u.h.f. signals were well received along the east coast.

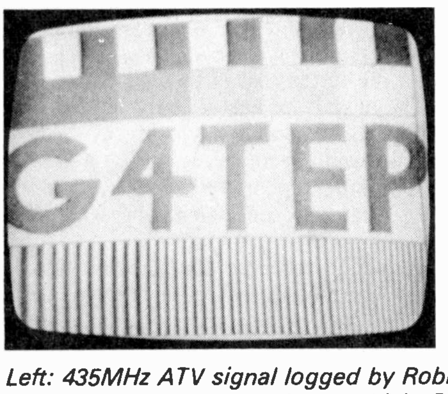
My thanks to Paul Barton (Harrogate), Simon Hamer (Powys), Cyril Willis (Ely), Hugh Cocks (E. Sussex), Iain Menzies (Aberdeen), Robin Crossley (St. Albans), Arthur Milliken (Wigan) and Kevin Jackson (Leeds) for sending in extensive logs of their reception.

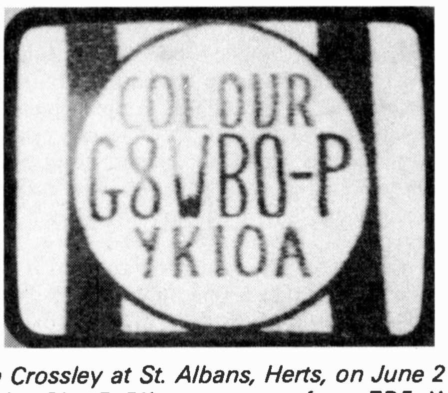
Last month I mentioned the TSS diamond shaped caption seen at close down, with three words, the centre one flashing. We now have a translation – the Russian viewer is being advised "not to forget to switch off the set"!

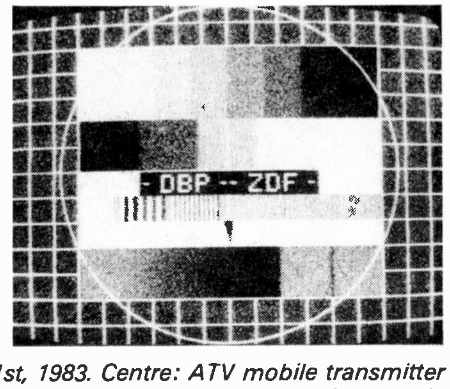
Gosta van der Linden reports that Lebanon TV was still operational up to August 22nd on ch. E2 with French language programmes between 1900-2300 local time and on ch. E4 with the Arabic service between 1700-2300.

ATV Reception

Amateur TV activity continues to increase in the Southampton area. A mobile station was operational recently at Shaftesbury (Winn Green, August 28th) and gave high quality, noise free colour at a distance of some 45 miles. The video sources consisted of a Sony HVC3000 camera (views of the local countryside and the operators) and a Sony SLF1 VCR (test pattern), feeding a Microwave Modules 20W transmitter with Jaybeam MBM28







Left: 435MHz ATV signal logged by Robin Crossley at St. Albans, Herts, on June 21st, 1983. Centre: ATV mobile transmitter received at Romsey on August 28th. Right: The FuBK test pattern from ZDF, W. Berlin, received by Seppo Pirhonen in Helsinki on August 10th (ch. E33).

435MHz Yagi aerial mounted atop a 12ft mast. Site height 950ft a.s.l.

Various Dutch and German ATV stations were received along the E. coast during the recent tropospheric lift. Robin Crossley (St. Albans) received a test pattern from G4TEP (location unknown).

News Items

Bands I/III: It seems that UK radio amateurs will be given the 50-52MHz slot, probably for class A operators. The remainder of the band will be largely used for land mobile purposes. The Home Office/Department of Trade and Industry has written to say that in making future Band I allocations due consideration will be given to TV reception in other European countries. The DTI feels that a 50-52MHz slot should be allocated to amateurs to match the US allocation even though this is within the European TV broadcasting spectrum (the US TV spectrum starts at 55MHz). We shall have to see what degree of interference to DX-TV reception this produces and what can be achieved by means of appropriate filtering measures.

The Department has also suggested that from January 1st, 1985 Band III will be divided into three sub-bands for PMR use. These will be as follows: sub-band 1 base transmit 176·5-183·5MHz, mobile transmit 184·5-191·5MHz; sub-band 2 base 200·5-207·5MHz, mobile 192·5-199·5MHz; sub-band 3 base 208·5-215·5MHz, mobile 215·5-223·5MHz.

India: The TV network is to be expanded with the installation of thirteen high-power and 112 low-power transmitters by the end of 1984.

Tunisia: The new second network went on air this June, with mainly French language programmes.

USA: The FCC has authorised a medium-power broadcast service in the 11·7-12·2GHz band to be operated by United Satellite Communications Inc. (NY). There will be five channels initially, via the Canadian Anik C2 craft, with transfer to a US satellite late next year.

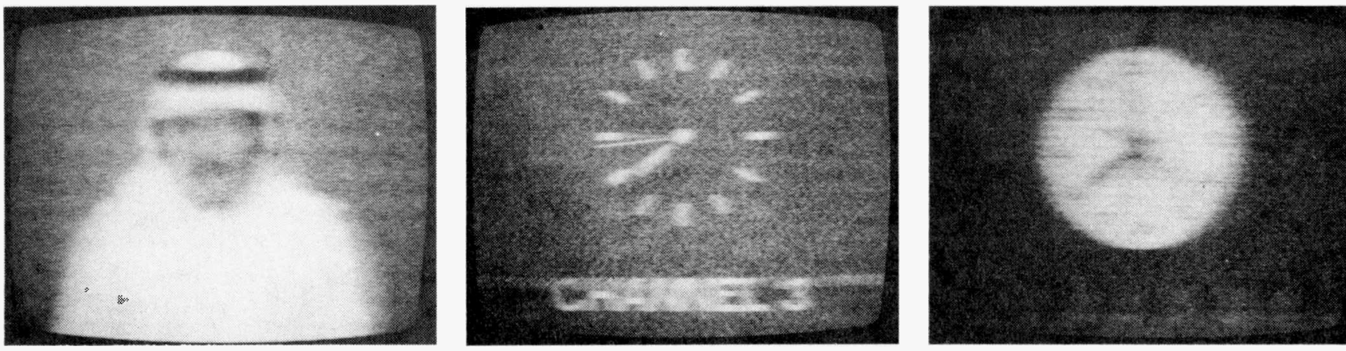
Satellite spacing at only 2° is being proposed by the FCC. This could result in problems with dishes of under 10ft diameter due to co-channel interference. This spacing is for 12GHz use – at 4GHz the minimum 2·5° spacing is to be maintained. Due to higher powered transmissions at 4GHz the dishes can be smaller – with a resulting wider beamwidth and more interference... With four time zones and thus more satellites the air is going to be mighty cluttered!

UK: The Goldcrest Corporation is to set up a rival operation to STL, with 4GHz signals coming down via an Intelsat craft some time next year for cable distribution.

In brief: The Swedish government has approved expenditure on their Tele-X satellite broadcasting project. The aim is to start operating in 1986 with two channels... Irish Aerial Manufacturers Ltd. of Lisdoonvarna, Co. Clare, have introduced a range of seven v.h.f. and two u.h.f. aerials.

Fibreglass Masts/Booms

The subject of log-periodic aerials came up during a recent discussion with a well known supplier of telecommunications aerials. Apparently problems have been experienced when some of the larger v.h.f. log-periodic aerials are mounted on a mast shared with other aerials. If the metal mast passes through a supported log-periodic array (assuming that this is lowest on the mast), the performance falls off appreciably – it's the performance at the rear end that deteriorates, from the mast to the back.



Double-hop SpE reception from the Gulf by Petri Pöppönen in Lahti, Finland on June 19th, 1983. Left: Dubai ch. E2, received at 1710 GMT. Centre: Aramco TV (Riyadh, Saudi Arabia) ch. E3, received at 1639 GMT. Right: Bahrain ch. E4, received at 1700 GMT.

The log-periodic is a balanced system, the presence of the mast introducing an electrical unbalance at the support point despite there being no electrical connection. The result is that only the front half of the aerial works at full efficiency. Use of a fibreglass mast overcomes the problem.

In the latest issue of the BATC magazine *CQ-TV* (no. 123) a member reports on his experiences with high-gain v.h.f. and u.h.f. systems. A large MBM88 u.h.f. aerial and an 8 over 8 were remounted on the mast side-by-side, supported by a fibreglass cross boom. The improved performance is described as "incredible"!

The whole matter of metal or fibreglass booms/masts is clearly worth further investigation and any comments from readers would be welcome.

From our Correspondents . . .

Paul Barton (Harrogate) has sent in a simple circuit for scale expansion with a typical DX-TV varicap tuner system. Without expansion the lower channels are crowded together at the low reading end of the scale: the modification (see Fig. 1) spreads them out to make calibration and channel location easier. With an ET021 tuner, the 88-98MHz band scaled 15-25 without expansion and 28-40 with expansion (see Fig. 2). Paul comments that the circuit uses the property of a forward biased silicon diode to "tie down" the meter's output as the input voltage increases – its resistance falls as the voltage rises. The 47kΩ preset is used to set the meter's f.s.d. The 4·7kΩ preset adjusts the linearity – set so that ch. B5 is about a third of the way up the scale (with the ET021 tuner). Reset f.s.d. on the meter whenever this is done as it's quite critical. The component values may need to be changed as the diode characteristics are critical,

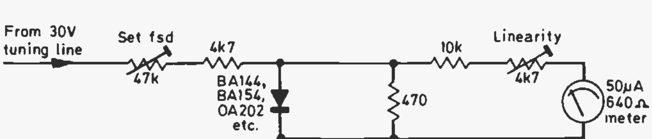


Fig. 1: Paul Barton's scale expansion circuit.

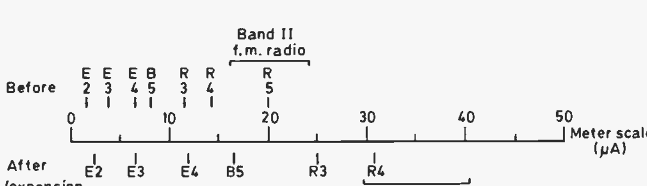


Fig. 2: Expansion achieved with the circuit shown above.

though the circuit as shown could be adjusted for all the diodes tried. Use of a 100µA meter may require experimentation – halving the values of the 10kΩ and 470Ω resistors might be a good start but this has not been tried. Diode characteristic drift with temperature doesn't seem to be much of a problem.

Bud Lloyd Bennett is now operational in Jordan, using a Yugoslavian made Boch aerial for Bands I/III. He receives Amman (JTV) chs. E3 (Arabic) and E6 (English), ch. E7 Syria, ch. E8 Israel and the Middle East Television service from Lebanon on ch. E12 daily. He's also seen MTV-1 via SpE. Further information is promised!

Carlos Serodid from Mozambique, at present resident in Reading, corrects an error in the August 1983 issue. There's apparently no such town as Malherbes in Mozambique. The situation is that an experimental station has been constructed at Maputo, operating on ch. E33, system B. It's on air each Sunday at 1800-2300 local time with occasional weekday transmissions, and carries the name "TVE" (Televisao Experimental). The plan is to introduce a commercial service.

Seppo Pirhonen (Helsinki) now concentrates on u.h.f. DX only, using two stacked Hirschmann Yagi arrays with Labgear CM7066 head and CM7080 cascade amplifiers, a simple pin diode attenuator being used prior to the latter to reduce the input level when the local ch. E49 transmitter ten miles away is on air. Many u.h.f. TSS stations can be received at his location. The best "catch" to date has been a W. German Band IV station close to the Dutch border. His next season's quest is to receive the UK at u.h.f.! A selective tropospheric duct recently gave him reception from W. Berlin (August 8-11th).

Petri Pöppönen (Lahti) received Dubai ch. E2, Aramco TV ch. E3 (Riyadh, Saudi Arabia), and a clock on ch. E4 suspected as being from Bahrain on June 19th. These signals were present from 1630-1715 GMT, all via double-hop SpE.

Holiday Reception

I spent a week at Ventnor, Isle of Wight, during August. With a sea path from N.E. to S.W., this is a truly ideal TV-DXing site. With just a wideband Band I dipole (WB1), Belgium and Holland were received daily via tropospheric lifts and the Paris ch. 6 system L transmissions were present all the time. At u.h.f. the bands were jammed with French stations – French Band II f.m. was also of fantastic quality continuously. The hills behind the town (some 750ft high) ensured that "interference" from the UK was at minimum, and the open aspect to the south makes for an ideal satellite monitoring area.

Selecting a Second-hand VCR

Derek Snelling

Now that VCRs have been with us for a few years, more and more are beginning to appear on the second-hand market. Some are good bargains, but the occasional one will prove to be a problem. The purpose of this article is to give guidance on what to look for; also on what to do to ensure reasonably trouble-free operation, for a while at any rate.

When you go to see the machine, take with you a new three-hour tape with a colour recording on it, made using a known good VCR – preferably one less than six months old. The recording should contain at least one piece of music, one section with a stationary picture, one section with a moving picture, also preferably someone, e.g. a newsreader, talking. The recording need be only a few minutes long, but the tape must be a three-hour one.

First what to look for when contemplating the purchase of a second-hand VCR. Check the outside appearance – it's a fair bet that one knocked about on its outside has had a fair bit of wear inside. Look for any outward signs that something has been spilt on the machine: it may be working all right at the moment but corrosion often sets in, the effects showing up weeks or months later. Check the aerial and TV connecting sockets: they are prone to breakage in some models, for example the Ferguson 3V29 and 3V30. Check the lead connecting the machine to the TV set. It's usually a black lead with moulded on plugs at both ends. In some VCRs, e.g. early Hitachi and Ferguson models, an isolator was built into the lead: hence leads made up from standard coaxial plugs and cable should be replaced.

One final point before moving on to testing: check for a serial number. All the machines I've dealt with have a serial number either with the model number on the back or occasionally on a sticker on the bottom of the machine. Absence of a serial number, or obvious attempts at defacing labels, could mean that the machine has been stolen. One exception to this is the Sanyo VTC9300P (black), where the serial number is located in the bottom right corner of the front and has a habit of dropping off.

Testing the Machine

Now to checking the operation of the machine. Insert your cassette and put the machine into fast forward till the end of the tape is reached. Then rewind back to the beginning. Difficulty near the ends of the tape, or failure to reach the end, could mean worn clutches and/or belts.

Playback should now be checked. Using your cassette, switch the machine to playback and adjust the tracking for the best picture. If you cannot get the tape to track, i.e. there's a noise bar on the screen wherever the control is set, the machine's alignment may be off. This assumes of course that the machine on which the recording was made is correctly aligned.

Having set the tracking, look at the stationary picture. Is the picture still, or does it shake from side to side? Does the colour pulse from side to side? Either of these symptoms indicates trouble in the drum or capstan servo circuit, usually a need for setting up but occasionally something more awkward. The problem is very common with Ferguson 3V22s.

Stand back six or so feet from the TV set displaying the picture. At this distance the picture should be of similar quality to an off-air one. Lines on the picture probably indicate the presence of dirt on the head drum or elsewhere in the tape path. A fuzzy picture could indicate a worn head.

Listen to the music. If it wavers, this may indicate worn belts, clutches, or even a faulty capstan motor.

Look at the section with someone talking. Is the sound in sync with the picture? If not, there are bad mechanical alignment problems.

Now try making a recording and playing it back. If the quality is noticeably worse than your original recording, the heads could well be worn. If the quality is noticeably better, the mechanical alignment could be off. Check that the best picture is obtained with the tracking control in its preset position. If not, adjustment will be required.

If the machine has any of the "trick" modes, e.g. freeze frame, visual search, etc., check that they work. Remember that apart from V2000 system machines you'll always get noise bars in visual search.

Select fast forward until near the end of the tape, then change to play. It's not necessary to have a recording on the tape at this point. Watch the take-up spool: if it doesn't turn, or turns jerkily, the take-up clutch probably needs replacing.

This completes the main checks. It just remains to test the counter, memory, clock, timer and remote control (if fitted). Check that the counter counts up or down as the tape moves. Check the counter memory by zeroing the counter, winding forward for a few seconds, switching in the memory and rewinding. The machine should stop with the counter at zero (a couple of digits either way is acceptable). See that the clock will set to the right time and keep it. If possible set the timer to come on two minutes ahead and see that it does. Make sure that all remote control functions work.

Finally insert the cassette and lower the housing several times. Any difficulty here indicates a worn cassette flap spring or bent lever.

Assessment

If the machine has passed all these tests it can be bought with confidence. If it has failed any of them this does not mean that anything serious is wrong. It may simply be that adjustment is required. Belts and clutches are fairly easy to replace. At least you will have been given warning of any problem(s), and can perhaps get the price adjusted accordingly. The only machines I'd definitely advise against purchasing are those that appear to have mechanical alignment problems.

Overhaul

Having bought your machine, what should you do to it by way of an overhaul? The first thing is to tackle any defects you found before buying the machine. Most problems have been covered in various past articles in this magazine. If any mechanical or electrical alignment is required, refer to the relevant service manual.

If the machine appears to work correctly, give it a thorough clean inside. Use a paintbrush and vacuum cleaner to remove any fluff or dust. Clean all pulleys and belts with methylated spirit and cotton buds, not forgetting those under the cassette housing – it's usually best to remove the housing to get at them. Clean the heads and tape path with a proper cleaning stick and isopropyl alcohol, taking care not to rub the video heads vertically. One of the kits sold for this purpose can be used.

If the machine is more than a couple of years old, or has had a fair bit of use, it may be advisable to change the belts and clutches even though it appears to work all right. Certainly changing the take-up clutch, fast forward/rewind belts and capstan belt is a good idea.

Look around carefully for any loose screws. Check the service manual for details of any lubrication or greasing recommended. If the machine has record/playback switches, clean them thoroughly with Servisol.

On Betamax machines check the setting of the end sensor circuits. On the Ferguson 3V00 and similar models, if possible carry out the following adjustments as described in the manual: capstan sample position adjustment; drum discriminator gain adjustment; drum free-running adjustment.

Quick Checks Q and A

Part 2

S. Simon

The Pye Hybrids

Which parts are live when the set's switched off?

The mains input goes to the fuse first before being routed to the on/off switch. On the earlier 691 chassis the right side edge connectors on top of the line output stage housing are live whenever the mains plug is connected: on the later 697 chassis the mains input is taken to the top centre fuse on the right side power panel – there should be a plastic cover over the fuse, but the print below it is live.

What was the expensive weak link in the design of the 691 chassis, and how was it overcome in later chassis?

There was just one fuse in the 691 chassis. The transformer-fed BY164 l.t. bridge rectifier has a habit of shorting internally, putting a severe overload on the mains transformer. This does not blow the mains fuse immediately, as a result of which the transformer is damaged. So it's quite common to locate and replace a faulty bridge rectifier, only to find that the fuse blows immediately after application of the mains. The only answer is replacement of the transformer. Later chassis have a thermal fuse in the transformer: it responds to the heat produced by a shorted bridge, thus saving the transformer's life. The manufacturers recommend replacement of the fuse complete in the event of failure, but it can be withdrawn fairly easily and repaired with a dab of solder.

What are the initial quick checks to make when the mains fuse is found to have blown?

Make a resistance check from the top cap of the PY500 boost diode to chassis. If the reading is very low, suspect that the 0·47μF 1kV boost reservoir capacitor is short-circuit. It's mounted on the line output transformer. If a smell of burning has been mentioned however, check the condition of the 100kΩ boost supply filter resistor (R227). If it's in poor shape, replace the associated 0·1μF 1kV smoothing capacitor C224. When the capacitor goes short-circuit the resistor burns up, losing value rapidly till the two become a virtual short across the boost line. Alternatively the boost diode may be defective: remove the top cap and check the valve itself – it could have a heater-cathode short.

If the resistance reading is high the cause of the blown fuse is likely to lie somewhere other than in the line output stage. Check the BY127 h.t. rectifier which could be short-circuit. It's located on the top left of the power panel in the 697 chassis. The BY164 l.t. bridge rectifier is at the bottom right of this panel. While it's fairly easy to remove a faulty bridge, it's difficult to fit a new one. Careful fitting on the print side is permissible.

How do you check a bridge rectifier?

The bridge has four legs, with the a.c. input taken to the centre two, the positive output being obtained at one end and the negative at the other. A reading of about 20-30Ω should be obtained with the meter's red (negative on resistance ranges) prod applied to the positive output side of the bridge and the black prod applied to either of the centre contacts. A similar reading should be obtained with the black prod applied to the negative output side and the red prod applied to one or other of the a.c. legs. Higher readings should be obtained when the prods are reversed. Check with a known good bridge to confirm.

Which items should be checked as a matter of routine?

From the physical location point of view, we'll assume that the set is fitted with the later 697 chassis. First shine a torch on the previously mentioned 100kΩ resistor (R227). It's about a third of the way down in the centre of the power panel, above the line output transformer. The colours should be easily identifiable. Farther down on the left there's a larger 47kΩ resistor (R203) which is part of the flyback pulse integrating network in the feed to the flywheel line sync discriminator circuit. It tends to fall in value, upsetting the line hold and becoming discoloured in the process. If it's allowed to fall too far in value, it will destroy the discriminator diodes. A check on the condition of this resistor is essential.

What is the routine to be followed when the complaint is sound but no raster?

This could mean absence of the h.t. supply. First allow the valves time to warm up, then bring the neon screwdriver close to the PY500 and PL509. If it shows no sign of glowing, note whether there are signs of overheating. If the valves are cool, suspect lack of h.t. – check the VA1104 thermistor (R305) and the surge-limiting resistor (R306) in the feed to the h.t. rectifier and the condition of the h.t. reservoir/smoothing electrolytics C306/C315.

If the neon glows, check the tube base voltages. There should be something under 200V at the cathodes, some 100V at the grids and over 400V at the first anodes. If *there's a negative voltage at the grids, suspect C315 (front right).*

If the tube grid voltages are correct but the cathodes are at well over 200V, check the left side PL802 luminance output valve and its circuitry – the condition of the panel, soldering etc. Check the beam limiter and brightness circuit and the voltages at the PL802's base.

If the neon fails to glow and the line output stage valves overheat, check for lack of line drive.

If the colours are wrong and the raster is shaded blue on one side and green on the other, which item(s) are most likely to be at fault?

Note the three PCL84 colour-difference output/clamp valves. Behind them are three wirewound resistors with three test points nearby. If the h.t. is absent at any of the three test points, the relevant 12kΩ resistor is open-circuit. This supposes that h.t. is present at the other end of the resistor – if not, the print is likely to be cracked under the board. If the three primary colours are all present but the raster is still shaded, check the goodness of the earthing at the clips that secure the rear of the panel – scrape and clean the clips.

The raster is narrow and the PL509 is overheating. There have previously been line hold troubles. Which item is most likely to be faulty?

The 100kΩ resistor R210, which is connected from a point at h.t. to one end of the line hold control. It changes value (decreasing) and therefore passes excessive current. The reason why the PL509 overheats and the raster is narrow is that the excessive current drawn by the resistor lowers the h.t. available to the line oscillator stage. As a result, the amplitude of the line drive is reduced. Similar symptoms occur — but without the previous line hold trouble — when the 16μF h.t. supply decoupling electrolytic C215 becomes leaky, also lowering the h.t. available for the line oscillator stage.

Pye 725/731/735/737/741 Series

The 3·15A mains fuse has shattered. Where's the most likely culprit?

Just above the fuse – the 0·22μF mains filter capacitor C915. Replace it with one specifically designed for 250V a.c. working or 1kV d.c. The BT116 h.t. rectifier thyristor is also suspect but is much less likely to be the cause.

The set appears to be dead but there's a.c. at both ends of the fuse. What's the next step and why is care required in taking it?

Although the centre 56Ω section of the power resistor assembly ("dropper") is likely to be open-circuit, testing it can be dangerous. This is because if the initial 3·3Ω surge limiting section is intact the h.t. reservoir capacitor C880 will be fully charged – and may remain charged for a considerable time. Thus the first tag of the 56Ω section will carry this charge if this section is open-circuit. Check the power resistor assembly with a voltmeter, with the set switched off, before taking any other action. If full voltage is found on the 3·3Ω section, bridge the 56Ω section with a resistor (any value below 100Ω) to discharge C880. Normal procedures can then be followed.

There's h.t. at the tags of the power resistor assembly but the h.t. fuse has blown. What action is required and why?

If the tripler is disconnected and a new fuse is fitted, it will probably fail at switch on. In this event one might be inclined to replace the tripler. This could be the action required, but probably not. The item to check first is C563, 0·1μF 1·25kV. It's housed under the top of the line output stage screening – its white outline can just be seen. Trace its contacts on the print side and connect a meter across them. A short-circuit will probably be found. The fact that it's short-circuit could well have damaged the tripler, and if a new tripler is fitted without replacing the capacitor it could suffer the same fate – perhaps also the line output transformer and the BU108/BU208 line output transistor to complete the chaos. Be very careful with this one.

If this capacitor is not short-circuit, what's the next most likely cause of h.t. fuse failure?

The BU108 line output transistor on the front end of the left centre panel. This and the tripler are suspect after the capacitor.

In the event of one primary colour being absent, what procedure should be adopted?

Check the tube base voltages. Most often the first anode voltages will be correct but one of the cathode voltages will be high to denote that the relevant RGB output transistor is not passing current. A check on its base voltage will probably show that there is no forward bias. This usually indicates that the relevant 39kΩ preamplifier load resistor has gone high in value. The exact value of 39kΩ is not too important – up to 47kΩ can be used for replacement purposes without ill effect. Use a 2W type. Another suspect is the thick-film resistor unit which is prone to deterioration and can produce several fault symptoms, some of which can be of an intermittent nature. These thick-film units are generally available and should be kept in stock so that a replacement can be fitted if there is any doubt.

The weak links as far as colour faults are concerned are the thick film unit, the 39kΩ resistors and the BF336/BF337 RGB output transistors.

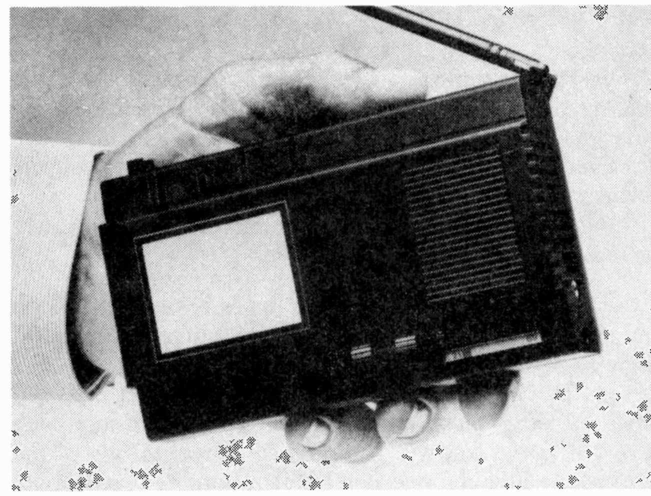
The tube appears to have lost emission suddenly, but the heaters are glowing normally. What's the first check?

The first anode voltages on the tube base. It's a fact that reduced first anode voltages in these receivers give the impression that the tube has lost emission. The two parallel resistors that supply the first anode presets, R642 and R643, tend to go open-circuit – they are just above the line output stage screened section. R642 may in fact not be in circuit at all, as the associated link may be open. Closing this link may be the only action required. The value of R642 is 270kΩ, the value of R643 390kΩ. Closing the link may result in faint flyback lines on the screen – resetting the first anode presets should clear this. The presets may have been readjusted previously to take into account an increased resistor value: restoring the normal supply could well result in excessive first anode voltages with flyback lines apparent.

The picture became grainy suddenly, giving the impression that the aerial or the tuner unit is faulty. What's the first move?

In these and other sets of the same vintage from the same stable (those fitted with the Pye 713 series and Philips 570 chassis) the i.f. gain/filter unit develops dry-joints on the rivets of the coils or on the legs of the coupling capacitors. Remove the unit and carefully resolder all suspect connections on the input side of the panel, not at the end where the i.f. transistors live. There's no short cut – the unit must be removed. It follows and is at an angle to the tuner unit, i.e. it's horizontal, along the lower part of the left side signals panel. Use a small iron to resolder the suspect connections, so as not to risk shorting out the printed coil turns.

Teletopics



The new Sinclair 2in., flat-screen mini TV set.

SINCLAIR LAUNCHES MINI TV

The long-awaited flat-screen Sinclair pocket TV set was officially launched on September 16th, though you can't for the present go out and buy one. To start with the set will be available by mail order only — and you can't send in your money for that either. You send in an order, on a special application form which will be dealt with in order of receipt. The reason given for this rather unusual arrangement is that production is at present limited — the aim is to increase this to 10,000 a month by the end of the year. There's been some criticism of these arrangements, especially from the trade, but it's obviously difficult to get new technology to the mass production stage and it's as well that this much talked about product should be brought out into the open. Application forms are available from Sinclair Research Ltd., Stanhope Road, Camberley, Surrey GU15 3PS.

The set has a 2in. screen, measures $5\frac{1}{2} \times 3\frac{1}{2} \times 1\frac{1}{4}$in. and weighs $9\frac{1}{2}$oz. A special Polaroid flat battery that provides 15 hours' operation has been produced to power it — there's also a mains adaptor. The set itself goes on sale at £79·95, with the 6V Polaroid lithium batteries in packs of three at £9·95 per pack and the adaptor at £7·95, all prices inclusive of VAT, postage and packing. Normal retail and export sales are expected to start during the first half of 1984. Sir Clive Sinclair predicts sales rising to a million or more a year worldwide, and speaks of the set "achieving for television what the transistor radio did for wireless, creating a new one-per-person product".

The set has some interesting technical features. It is for example a multi-standard receiver with automatic switching between most u.h.f. standards worldwide except for France. Most of the circuitry is contained within a single i.c. that uses innovative digital techniques to monitor the vision and sound signals and adjust the circuitry automatically to suit the transmission standard. The i.c. was jointly developed by Ferranti and Sinclair Research and is being produced by Ferranti. Manufacture of the flat-screen tube (the gun is mounted to one side and the phosphor is deposited on the rear section of the viewing part) has been subcontracted to Timex in Dundee, using Sinclair designed and owned automatic plant. Assembly of the sets has been subcontracted to Thorn.

Apart from the tube and the i.c., the main electronic items consist of the video output transistor, line and field output stages, the tube power supply generator and the tuner. The latter measures just 31 × 23 × 11mm and uses hybrid microminiature components with advanced surface mounting. It's output is at 230MHz, which has been chosen to avoid image frequency problems in the u.h.f. band.

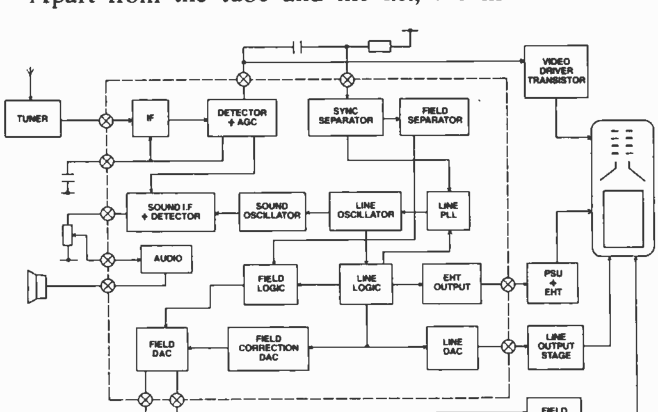


Fig. 1: Block diagram of the Sinclair pocket TV receiver.

The special i.c. uses a combination of linear and digital techniques. The majority of the logic in the i.c. is used to synthesize the field and line scan waveforms digitally, an arrangmenet that allows for multi-standard operation. Fig. 1 shows a block diagram of the chip. A digital countdown circuit is used, with a high-frequency voltage-controlled oscillator that's locked to a multiple of the received line sync pulses. In addition to driving the line logic, the voltage-controlled line oscillator synchronises an identical oscillator in the sound detector circuit. There's also count down from line to field rate, with on-chip logic giving a 525 or 625 line display by adjusting the count and VCO centre frequency. Additional logic improves the line and field lock noise immunity.

For correct display on the flat screen the field scan waveform must be modulated by a line frequency correction waveform. The field sweep and correction waveform are both generated digitally, followed by digital-to-analogue conversion. No set-up components or adjustments are required. A further DAC working at line rate produces the signal to drive the line output stage.

After amplification the vision signal is applied to a novel low-level envelope detector and then d.c. restored. The intercarrier sound signal is converted to a 250kHz second i.f. The sound channel local oscillator operates at 5·75MHz on 625 lines and 4·75MHz on 525 lines, enabling 4·5MHz, 5·5MHz and 6MHz intercarrier sound signals to be demodulated without external switching.

The tube's folded electron optics would produce a raster with curved vertical edges and horizontal edges in the form of the sides of a trapezium without correction. The previously mentioned field correction waveform eliminates the trapezium distortion. Optical techniques are used to overcome the other distortion. First, the height is reduced by two thirds with the width held constant. This narrows the angle at which the beam strikes the screen, reducing both the distortion and the deflection power required. A Fresnel lens which is part of the faceplate restores the height optically.

The connections to the electron gun and the electrostatic deflection assembly are screen printed on to the baseplate.

There are three sets of deflection plates — for line and field deflection and to bend the electron beam so that it strikes the rear phosphor screen. The focusing electrode consists of a transparent tin oxide coating on the tube's front face. Sinclair say that the brightness is up to three times that achieved with a conventional c.r.t. using the same beam energy. A major technical breakthrough is claimed for the perfection of a new method of vacuum forming the glassware.

The main competition is Sony's Watchman, which is at present being produced at a rate of 200,000 a year. It sells in the UK at £249. A mark II version is at present being developed and is expected to sell at around £135. It will be smaller and lighter than the present version and will incorporate a redesigned tube.

CED LAUNCHED

The RCA CED video disc system was shown to the public at the Great Home Entertainment Spectacular exhibition in mid-September and has now gone on sale nationwide. Hitachi who produce the players and RCA who produce the discs and developed the system hope to sell 100,000 players and a million discs during the first fifteen months on the UK market. In the USA, half a million players and ten million discs were sold during the first 30 months. It's hoped to have a thousand outlets selling the system in the UK to start with, with dealers expected to stock both the players and the discs.

Model details and prices were given last month. The launch catalogue lists 100 titles and a further dozen or so titles are to be released each month, starting in December. The playing times vary from an hour to 140 minutes and about half the discs have stereo sound. The information is stored on the disc in the form of capacitance variations, the output from the tracking stylus being connected to a resonant circuit. A servo-controlled turntable rotates at a constant speed of 375 r.p.m., with the stylus tracking pressure at 0·065 grams— less than a fifteenth of that of a conventional audio stylus. There's an automatic stylus cleaner and the styli are expected to last for about five years. Replacement is simple and inexpensive.

The basic player, Model VIP101, provides mono sound only. In addition to play there's forward search at 120 times normal speed, pause without picture, a reset control to return to standby and a play time indicator. The two stereo sound models differ in their remote control arrangements. They provide scan in either forward or reverse, high-speed forward search, fast playback at four or sixteen times normal speed, and four-field picture repeat playback. A switch enables either sound track to be selected with a bilingual disc.

SPACE INVADERS OVER THE CABLE

W.H. Smith plans to offer cable TV system operators a video games service. Subscribers would pay extra for a games console which can play games either from its own memory or via a central computer. Such services are already available in some areas in the USA. Since the console has a full keyboard, the system is capable of providing other services.

NEW TV TEST GENERATOR

Video Techniques (101 Derby Street, Bolton, Lancashire BL3 6HH) have introduced a portable, battery operated TV test generator, Model TG3, at £46 inclusive of VAT and postage (UK only). It's British designed and built and uses CMOS circuitry with crystal control. Four test patterns are provided — 2MHz lines for checking focus, plus grating and dot patterns and a blank white raster. The unit uses a 9V PP3 battery and provides an output on ch. 36 (nominal).

BBC's TELESOFTWARE SERVICE LAUNCHED

The BBC telesoftware service, which enables microcomputer users to take computer programmes via Ceefax, is now in operation. It's initially restricted to those who own Acorn BBC computers, for which an adaptor costing £196 plus VAT has been designed. The adaptor consists of a tuner plus decoder whose output is plugged into the microcomputer's 1MHz bus line for feeding into the memory.

LUXOR'S NEW SX9 CHASSIS

The new SX9 range of Luxor colour receivers incorporates provision for adding a plug-in satellite receiver module when transmissions become available. Luxor claim to be one of the world's leaders in satellite TV technology, with over 25 per cent of the market for decoders in the USA. An article on the SX9 chassis will appear in a later issue.

SONY EXPAND UK PRODUCTION

Sony are to double the tube production capacity at their Bridgend, S. Wales plant to an annual rate of 240,000. Production of colour TV receivers at the plant is at present running at some 180,000 a year. The tubes will also be supplied to a Sony factory in W. Germany.

VIDEO ROUND-UP

V2000 system developments: Both Grundig and Philips showed two-speed V2000 system VCRs at the recent Berlin Radio Show. They use a new formulation tape to give up to sixteen hours' playing time in the slow speed mode. In addition, Philips demonstrated an intriguing remote VCR programming system. The idea is to have programme details (programme time and channel) bar coded in lists published by the broadcasting authorities etc. The remote control unit incorporates a bar-code reader so that all you have to do is to apply the reader to the printed bar codes to obtain automatic VCR programming.

New VCRs: Ferguson's mid-range 3V30 has now been superseded by the 3V36. The new model features front loading, stereo sound capability and Dolby noise reduction. An instant record button simplifies record selection, allowing consecutive totals of thirty minutes' recording time. There's electronic sweep tuning and full infra-red remote control.

Sony's latest VCRs, Models C30 and C40, feature peep search — brief glimpses of the picture in the fast forward and reverse modes. Both models have full infra-red remote control. The C30 is expected to sell at around £500 and the C40, which has stereo sound, at about £550. Sony's latest VCR for the Japanese market, Model SLF5, is a talking machine — a voice synthesizer confirms the mode selected and warns of possible incorrect operation.

Betamovie launch: Sony's Betamovie cam-corder has now been released in the UK, at a price of around £1,200. Basic details were given in the last two Teletopics columns. The UK model weighs just 6.3lb with battery and measures approximately 14 × 8½ × 5in. The tube is a ½in. Trinicon.

Tape: Matsushita have granted BASF a licence to use

Matsushita patents and technology for a new generation of thin-film, high-density video tapes. The new technology uses a metal evaporation process to produce video tape that is only half as thick as conventional tape, enabling several times more information to be stored per square centimetre. A licence was given to 3M earlier this year. In the manufacturing process, magnetic materials (cobalt and nickel) are evaporated in a vacuum and crystallized on to a plastic film, eliminating the need for binder resins and yielding a surface whose magnetic content is almost one hundred per cent compared to thirty per cent with conventional resin bonding. The tape is ten microns thick instead of the conventional 21 microns.

Sony have added VHS and V2000 blank cassettes to their Dynamicron and High Grade ranges.

VCR production: Mitsubishi HS304 budget machines are now being assembled at the Livingstone plant in Scotland. Two other Japanese VCR manufacturers, Sanyo and Hitachi, have also got their European operations going, Sanyo at Lowestoft and Hitachi at Landsberg, W. Germany. Sony and Toshiba are both to set up VCR manufacturing capacity in Taiwan. Toshiba's plant will be jointly operated with Tatung.

LaserVision pickups: Hitachi have introduced two laser disc players for the industrial market in Japan using solid-state lasers. Advantages include the elimination of the elaborate power supply required by a helium-neon laser, quicker response time and longer life.

Letters

TELEVISION COLOUR RECEIVER

My *Television* colour receiver (1978 project) has just failed for the first time after four years of faultless operation. The initial fault was that the line scan coils went open-circuit due to connector B6 on the timebase board running hot. This carries quite a high peak current and as the adjacent pin B7 is unused and is also connected to chassis is would seem sensible to connect them in parallel – or even to solder a cable to the print near the line output transformer. Unfortunately loss of the line scan load in my set resulted in failure of the TDA1270, R70, the field flyback 22V zener diode used with the TDA1270 and a burnt spot in the centre of the tube.

After carrying out the necessary replacements I examined a test card critically and noticed that the right-hand verticals were distorted. The transductor's line ballast resistor R53 was found to be open-circuit – the effect had not really been noticeable on picture. Readjusting the quadrature coil L1 greatly increased the volume, also much improving the sound to caption buzz ratio, while retuning the tuner's aerial trimmer restored the fringe performance. Surprisingly, even a critical look at the grey scale failed to show any room for improvement.

Two lessons then: watch connector B on the timebase board and, applicable to any receiver, take a critical look at a test card from time to time. Finally, my belated congratulations to the designer of this set. Mine really was a screwdriver assembly job, giving an entirely acceptable picture within two hours of first switching on. The hybrid *Television* colour set I built in 1973 took five months to achieve that, and certainly never provided the same standard of picture or reliability.

Ian C. Donaldson,
Sale, Cheshire.

Editorial comment: A number of constructors have reported the overheating connector problem, so readers are advised to check on this even if they've not experienced any problems to date. What seems to happen is that the connector pins heat up (though not appreciably), producing corrosion that gets worse. The contact resistance increases, complete failure eventually occurring. The best solution is to hard wire, i.e. do without the connector altogether.

Some of the copper tracks on the timebase board also suffer as a result of the heavy peak currents circulating around the circuit. The relevant tracks will be seen to be discoloured on close inspection of the copper side of the board if a set has been in operation for some time. The cure is to solder a length of 18 s.w.g. tinned copper wire along each track. This will ensure a much lower resistance and avoid catastrophic failure at a future date.

SONY FIELD ENGINEER?

I'm a self-employed video/TV engineer who looks after a couple of shops in addition to my own clients. A customer who bought a Sony C7 from one of the shops brought it back some eighteen months later with the complaint that "the picture wobbled from side to side". I removed the top and checked the tape path, and after finding nothing suspicious decided to take a look at the servo board. I've previously found a few faults here with Sony C7s, but you can imagine the shock I had when I was carrying the scope probe towards IC1 – see the accompanying photograph. This poor mouse must have starved to death, as there isn't much voltage in this area. And what a journey it must have had.

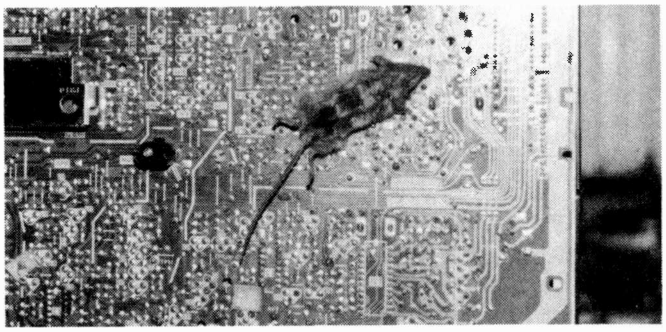
I figure it could have got in only through the loader. Incidentally, removing the mouse provided a permanent cure!

S. Sheldon,
Liverpool.

CARRY ON LES!

An ancient Waltham 24in. monochrome set with open-circuit heater resistor led me to check back through past issues. I discovered the circuit (August 1977) and an article on it by Les Lawry-Johns. This set me thinking about the number of years Les has contributed to our reading – he must qualify for a gold watch by now.

Though his subject is mainly the natural animosity of the inanimate objects we endeavour to repair, it has always been leavened with some levity, the more so as he's



Cause of picture wobble in a Sony C7.

mellowed. Regarding his recent efforts, I didn't know about the AF117 transistor trick, but the BCY70-2 series make super replacements.

As to cinema organs, while he was serving in the Fleet Air Arm I was an assembly chargehand where their aircraft were made! A sparks in the gang had been an operator in a midlands cinema where, in addition to the usual attractions, the usherettes provided horizontal entertainment in the staff rest room. There were also organ interludes, the first organ lift being driven by a cycle chain. When that broke the organist had to be rescued by ladder.

Now to that canine conundrum (September). A midget was summonsed to show cause etc. and the magistrate decided "someone must have put him up to it" – or has he heard the saying "they're all the same height laying down"? Finally, Ben must be ginger.

Carry on Les.

William Harrison,
Windsor.

VINTAGE TV

Chas E. Miller's vintage TV article on the Pilot VS9 started me daydreaming about my early days as an apprentice in the Yorkshire dales town of Ilkley, which was then primarily a residential area for wool barons and those from associated businesses able to afford the luxury of TV in the early post-war period. My induction started in 1965 when the TV sets of the fifties were starting to give expensive trouble and were generally scrapped in favour of the new dual-standard models. The sets I remember best were those in the Ultra, Murphy, Ekco, Pam, Bush, KB, Ferranti, GEC, Dynatron and English Electric ranges.

One of the most idiosyncratic sets we dealt with was the Ultra V718. It had a narrow-angle, circular tube, permanent magnet focusing, an ion trap and a 6K25 thyratron gas discharge valve in the line timebase working along the lines of today's thyristor. The tuner was enormous, with just three positions and a plug-in coil assembly which was shifted either side of the contact on the tuner chassis.

The main points I remember about the early Bush sets were the brown Bakelite cabinet and the double-decker chassis, with the video output and i.f. stages tucked under the power supply and timebase chassis. Being single channel sets, the tuning at home was done on the i.f. panel. If you owned a 9in. model you would quite likely have had a large floor-standing lens, filled with liquid paraffin, to provide some magnification. Unless you viewed it dead square however there was severe distortion.

Murphy produced at least one chassis of note. It looked like a radial aircraft engine and was often called the Aero Murphy. The tube was again a circular, narrow-angle one, the circuitry being wrapped around it on several sub-chassis that were not easy to work on. The line output transformer and EY51 rectifier were together in an oil-filled aluminium can. When the rectifier lost emission it was a messy job replacing it and resealing the can properly. The later V470 used the same transformer but changed to a rectangular, 90° tube: it had a novel flip top lid to give access to the controls.

The Ekco sets of the time had a line output transformer made of a plastic material similar to Perspex, with the rectifier (EY51 to start with, U26 later) laid horizontally. If the set was allowed to stand for any length of time damp collected in the dust and the resultant e.h.t. discharge would crystallize the plastic and eventually disintegrate or fire the transformer. The large-screen version (21in.) used spot wobble to minimise the effect of the dark gap between the scan lines – an oscillator on a small sub-chassis was mounted on the tube, with its coils around the tube neck at 90° to the line scan coils. A switch was provided to remove the wobble which had the effect of defocusing the picture. Some customers preferred the gaps to the defocusing.

Pye, Pam, Ekco and Philips eventually merged, but for a time Pam (a Pye subsidiary) manufactured some of the easier sets to repair and maintain, with their printed panels. The 600 series was the true start to slim-line TV, using a short-neck, 110° aluminised tube. Earlier Pam models used the good old Fireball tuner which, though it was a dust collector, was a pleasure to clean and reassemble.

The most memorable feature of the early English Electric sets was the large round tube with its metal cone covered by a thin plastic sheet. It certainly held its charge – sometimes wickedly charged by an unscrupulous senior engineer for an unsuspecting apprentice to find.

The Ferranti sets we handled were projection models. In about 1969 the senior engineer and I were called to a wool baron's house to pass judgement on one of these by then ancient sets. The e.h.t. transformer was unpotted from its oil-filled can and the EY51s were replaced, giving another few months of bright – well dim – viewing. It was given the last rites a few months later and was not preserved for posterity.

KB used standard circuitry but some odd hardware in the early sixties – 6·3V valves, mains isolation transformers for the heaters and items such as the EL84 sound output and 6CD6 line output valve by Brimar. Later models had series heaters and a 50CD6 line output valve with an autotransformer. They got round to a dropper resistor eventually!

The Dynatron with its Ekco chassis was the rich man's set. The cabinets were made by craftsmen, using highly polished veneered wood. The sound output stage was upgraded and better loudspeakers were fitted. Up-grading was not necessary in the video circuits – they were as good technically as they could be.

I hope this has nudged a few memories for engineers past and present. Maybe at some time in the future we shall have articles from today's youthful engineers recalling the PIL tube, convergence yokes, thyristor line output stages, Syclops and so on!

Denis G. Mott
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THYRISTOR LINE TIMEBASE

The problem I had with a Grundig Model 6010 – one of those with a thyristor line output stage – was no e.h.t., due to the BT119 scan thyristor being short-circuit. Before replacing it I checked the associated components in circuit but couldn't find anything wrong. Unfortunately the new BT119 went short-circuit at switch on. After this I removed the associated components for a more thorough check and discovered that R515 (270Ω) in the thyristor's gate drive circuit had an internal break that hadn't showed up during the initial tests. Replacing this and the thyristor restored normal operation. Something that may be worth looking out for on these sets!

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Servicing Notes on the Philips KT3 and K30 Chassis

John Bourne

The Philips KT3 and K30 chassis have been used in Pye and Philips colour sets from 1979 to the present. They are of modular construction, consisting of seven plug-in daughter boards mounted on a main mother panel. The KT3 is designed to drive Mullard 90° in-line gun tubes with screen sizes up to 20in. Its big screen sister, the K30, drives 110° 30AX tubes in 22 and 26in. screen sizes. Apart from this the two chassis are electrically very similar, the main differences being associated with the line output stage: the KT3 uses a line output transformer plus tripler powered from a 129V h.t. rail, whilst the K30 has a diode-split line output transformer and 140V h.t. rail. The modules are for the most part directly interchangeable, the exceptions being the chopper control and sound panels.

There have been two versions of each chassis. The more recent versions are known as "edition II". They incorporate slight changes in the mother panel and a completely redesigned decoder panel which is not interchangeable with the earlier panel. The new decoder panel has a single TDA3560 chip whilst the earlier panel uses a TDA2560Q and a TDA2523Q.

In addition an improved power supply (chopper control) panel, type BY02, has been introduced. It's a direct replacement for the previous panels.

To service a panel "in situ", a module extension board is required (part number 39537085). The KT3 and K30 chassis have proved to be extremely reliable, so there's only a limited fault history. Our experiences to date are summarised below.

Random Tripping

Because of the high sensitivity of the power supply, look for dry-joints etc. rather than a faulty component. Usual causes are as follows. Incorrect h.t. setting – the h.t. can be conveniently measured at pins 2 or 4 of the line scan coils connector M5. The e.h.t. lead not being pushed home fully into the line output transformer (K30 chassis only). Dirt or grease (e.g. cigarette tarnish) around the e.h.t. cap, focus unit or the printed c.r.t. spark gaps – clean with a suitable solvent, e.g. Thorn Genklene. If necessary, carry out the following modifications: change R7354 from 270Ω to 560Ω (at the same time, if there's a resistor in parallel with R1461, remove it); fit (if not there already) an 0·1μF capacitor (C7337) between pin 12 of IC7322 (TDA2581Q) and the base of T7336 (BC558).

Tripping

If the set trips three minutes after switching on, check the efficiency diode (D1464) in the chopper circuit. It should be type BY208 in the KT3 chassis and type BYX55-600 in the K30. If it's running warm or of incorrect type, replace it.

If there's permanent tripping (ticking), disconnect the line scan connector M5 to isolate the line output stage. If the tripping stops and the h.t. is correct, check the tripler (KT3), the line output transistor T1562 (BU205 KT3, BU208A K30), and the EW modulator diodes D1562 and D1567. D1567 is type BY228 in both chassis; D1562 is type BY208 in the KT3, type BYX55-600 in the K30. If necessary check the line output transformer.

If the tripping persists with M5 disconnected, i.e. the h.t. voltage is varying, the fault is in the power supply. Check the chopper transistor T1463 (BUW84 KT3, BU426V K30), the efficiency diode D1464 (see above) and the chopper control panel by substitution.

Dead Set

If the fuses have blown, replace the BY227 bridge rectifier diodes D6292/4/5/6 and of course the fuses – 2A delay types.

If some 300V is present across the bridge rectifier's reservoir capacitor C1460a (part of the electrolytic can C1460a/b/c), check the h.t. at C1460c. If the reading is 300V, the chopper transistor T1463 is short-circuit. If the reading is zero, either the chopper transistor is duff or it's not being switched on. In the latter event, check first whether the 12V output from the rectifier panel is present at point 10 on this panel – or is less than 9V. If this supply is correct and is reaching point 12 on the chopper control panel, the latter is faulty.

The usual offenders on the chopper control panel are the 6·8V zener diode D7343 (type BZX79-B6V8 – check for 6·8V at pin 10 of the i.c.) and the TDA2581Q chip itself (IC7322). If necessary carry out cold resistance component checks.

The TDA2581Q chip provides protection under the following conditions: voltage at pin 7 higher than 6·8V (over-voltage protection); the pulse amplitude at pin 6 exceeds $-0{\cdot}6$V (excess-current protection); voltage at pin 9 less than 9V (low i.c. supply); voltage at pin 10 exceeds 8·2V (excessive reference voltage, i.e. the zener diode D7343 is open-circuit); the voltage at pin 5 is 5V (this is the stand-by facility).

No Raster

Check whether the orange plug has dropped off the focus unit (K30 only). In both the KT3 and the K30 chassis, the c.r.t.'s first anode supply/supplies are derived from the earthy side of the 24MΩ focus potentiometer.

Check whether the surge limiter R1590 in the 30/32V supply is open-circuit. This line output transformer derived supply is used by the field driver and output stages. It also biases off the field flyback blanking transistor T1535 (BC558) during the field scan, so its absence leaves this transistor hard on and no raster.

Field Collapse

If the 30/32V supply is missing (30V in the KT3 chassis, 32V in the K30), it's usually necessary to replace the surge limiter resistor R1590 (3·3Ω KT3, 1·2Ω K30), the two transistors in the field output stage, and their emitter resistors R1531/2. The resistors are 0·5W safety types, value 1·5Ω. The transistors are BD223/BD234 (T1530/

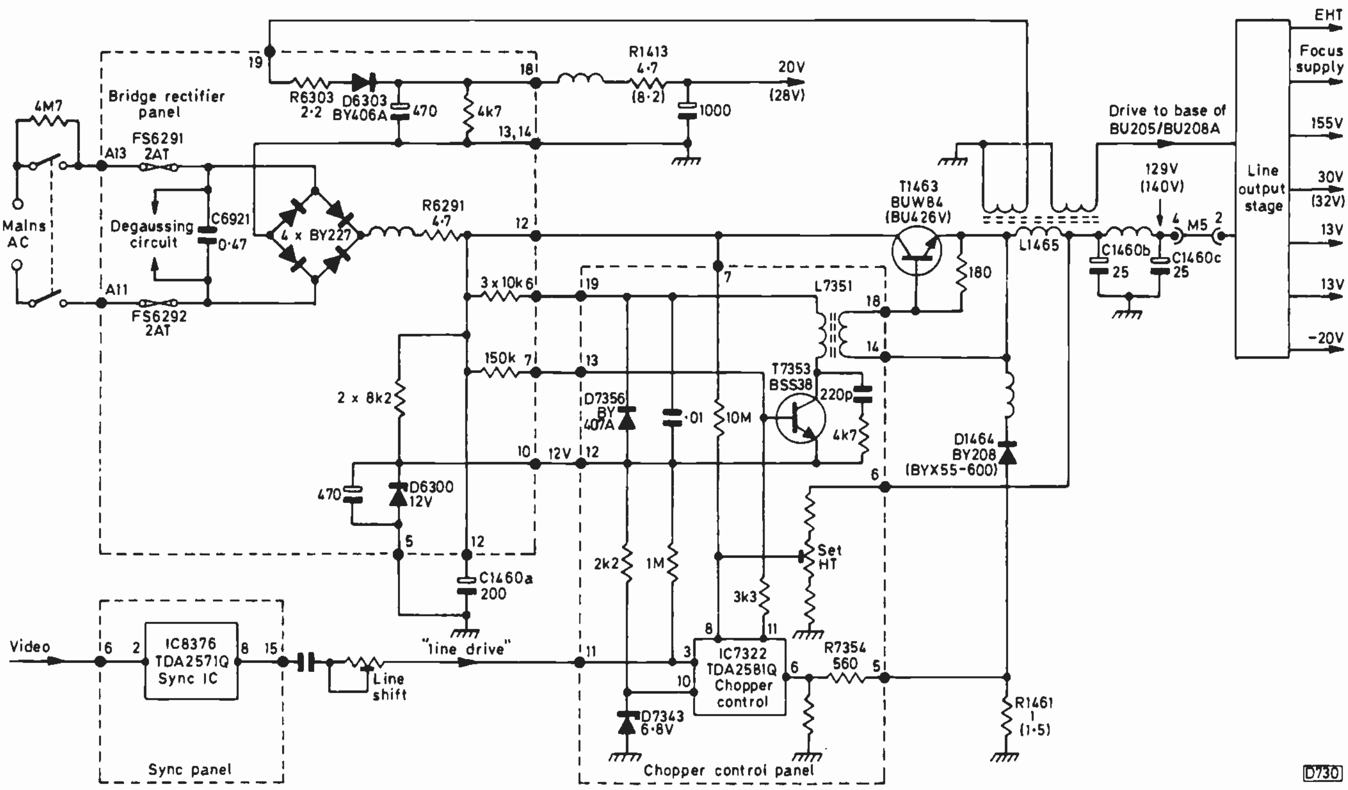


Fig. 1: Simplified circuit showing the power supply arrangements used in the Philips KT3 and K30 chassis. Component values/types and voltage readings shown in brackets apply to the K30 chassis.

T1532) in the KT3, BD437/BD438 (T1530/T1532) in the K30. Also check the field scan coupling capacitor C1521 (470μF KT3, 1500μF K30). Other causes of field collapse (30/32V supply o.k.) are cracks in the print around the edge of the mother board near the field driver and output stages or a faulty field oscillator (this is on the sync panel).

Field Linearity

If poor, check by replacement the following feedback capacitors: C1522 (220μF) and C1541 (0·056μF). Check whether the feedback resistor R1502 is open-circuit (15Ω, 0·25W safety type).

Sync Faults

In the event of a rolling picture, replace all four transistors on the sync panel – T8386 (BC548), T8392 (BC548B), T8397 (BC558) and T8396 (BC548C). Only when the line sync is also poor is the TDA2571AQ sync i.c. suspect.

Teletext Sets

On teletext (Mk. II) KT3 and K30 sets the teletext power panel at the base of the cabinet seems to be vulnerable to transit damage – you can get badly cracked panels.

Failure of the 5V regulator IC1007 (MC7805CT) that supplies the teletext decoder panel results in complete loss of sync.

No Sound

Make sure the customer hasn't switched off the loudspeaker – a muting switch is fitted on the front in most sets. Next check whether the supply is present at point 12 on the sound module. This is 20V in the KT3, 28V in the K30, and comes from a chopper transformer fed rectifier on the bridge rectifier panel. If the supply is absent, check R1413 (4·7Ω KT3, 8·2Ω K30) and if necessary R6303 (2·2Ω) on the bridge rectifier panel. Failure of these resistors is almost always due to a duff TDA2611AQ audio output i.c. (IC5181). If the supply is present, apply a signal (your finger on a screwdriver blade will do) at pin 7 of IC5181. If a hum is heard, the audio i.c. is o.k. and the most likely culprit is the TBA120AS intercarrier sound i.c. (IC5164).

Sibilance

Some customers complain that their sets suffer from excessive treble/sibilance, particularly those fitted with the KT3 chassis. This is not a fault in itself, but an improvement can be obtained by increasing the value of the de-emphasis capacitor C5177 to 0·039μF as in current production.

The Cabinet

Philips/Pye do not supply cabinets with the plastic front moulding attached. We've always found it best and safest to glue the front surround to the cabinet and use a sufficient quantity of self-tapping or wood screws of suitable length.

White Raster

If there's a flooded white raster with the brightness and contrast controls having no effect, you will probably find that the 155V line filter resistor R1456 (100Ω safety) is open-circuit due to a short-circuit transistor in one of the RGB output stages. Use cold resistance checks on the RGB panel as the voltage readings obtained are often confusing, then replace as necessary. In the edition II version of the KT3 R1456 becomes R1587.

Poor HF Resolution

If the picture is not as sharp as it could be, a fractional adjustment of the tuner's i.f. output coil is required – never more than a quarter of a turn. No problems have been experienced with the i.f. module to date.

Tuner

The U321 tuner unit should be replaced if the fault is low gain, cross modulation, etc.

365 Days Shalt Thou Labour

Les Lawry-Johns

That's not quite true of course. We don't exactly labour, because things have been quiet for some considerable time. During the working week that is. Today's sets are far more reliable than those of yore, so there are fewer repairs. Sales are at such a low ebb that when they do occur the wisdom (and ability) of buying replacement stock comes into question, the current account being constantly eroded by rates, taxes, water charges and all the other overheads.

So when a relative of a friend phoned on a Saturday to ask if he could bring his Philips colour set over on Sunday morning, since he lived some twenty miles away and this was the only chance he's get, I agreed. "After ten and collect it well before twelve" I told him. Thinking it would be a G8 or a G11, I didn't see any problems.

A Fiendish Philips

I had a distinct shock when he arrived at ten fifteen with a large set in the back of his car. It was a 26in. set of Swedish manufacture. Fitted with the K80 chassis.

My peace of mind was shattered when he said there were quite a few things wrong. Lack of width (no trouble I thought), no control over the brightness (oh dear), contrast control not working and colour funny (bloody 'ell). "I'll be back at eleven fifteen, Les." Gulp.

I started at the wrong end of course. Let's get the width right first I thought. The circuit of this beast is fearsome – no kidding, it's horrific if you're not familiar with it, and who is? At least I had the manual, but shock followed upon shock as I perused it, which is difficult if your eyes are trembling. I started by changing the two parallel connected PL509 line output valves and the PY500 boost diode. No change. The line drive was, er, odd. So I decided to have a go at the uncontrollable brightness and contrast – in fact there was no contrast, the modulation consisting of chroma only, so that when the colour was turned down all we had was a bright, blank raster. "Fancy that" I thought.

When time is pressing it's not easy to examine the circuit carefully and make the proper checks. But I tried and found the voltages in the video circuit haywire. "Ah ha" thought I. "Why are they haywire? Something's obviously wrong somewhere." With that profound thought I stopped thinking and merely checked voltages. My fruitful search was diverted by seeing that a PCF80 was used in the brightness control circuit. So I fitted another, which made absolutely no difference. I resumed the voltage checks in this area and found that there was no negative supply at R934. This is the −1 (−8·8V) line from the power supply panel, which is bolted on the lower front of the main frame. It's a bit awkward to get at, but checks suggested that there was no positive supply coming from the relevant l.t. bridge rectifier. Removing the panel confirmed this – the BY164 was open-circuit at the positive end.

A new one was quickly fitted and order was restored – full width, control of brightness, full contrast, the lot. Only minor adjustment of the grey scale was required. The trembling subsided and my eyes could focus if I took off my specs. I was free. At only eleven o'clock. But what was this?

Another Mindbender

A car had drawn up outside and a chap was lifting out a G11. No problem thought I. "It's had a new line output transformer, output transistor and several capacitors, but it's still blowing the h.t. fuse and we can't find out why." So off we started again.

A cold check at the h.t. fuse produced a reading of over 5kΩ, so there were no direct shorts. A meter switched to the 500mA range was clipped across the fuse and the set was switched on. Clonk. The line output transistor was unplugged. Try again. Clonk. The edge contacts to the line timebase were removed. Another try and another clonk.

So the trouble must be on the power supply panel. But the only thing after the fuse is C4040, the 47μF h.t. decoupler. The 5kΩ reading was still there, so we removed C4040. I was surprised to find that it appeared to be reversed, i.e. positive to chassis. Surely I must be wrong? On test it read perfectly the right way round, 5kΩ when the leads were reversed. It was put back in correctly. Correct meter reading. Refit the line output panel plugs, plus the output transistor plug. The set now performed perfectly. Fit 1A fuse and everything O.K.

The gentleman left with my curses ringing is his ears. I think the culprit is a reader. Are you listening out there? Only I'm allowed to do things like that, you're not supposed to . . .

Christmas Day in the Workshop

You may say that working on a Sunday morning is no great sweat, and if it doesn't last too long it isn't. But it would be nice to have one day off a year. Not entitled? O.K. What about Christmas Day though, surely . . .

No. At 7 p.m. Fred phoned. "Les. I've got company and the set's gone on the blink. Be a pal and do it for me." Well, we'd sold him the set years earlier, so we told him to bring it along. At 7.30 p.m. he arrived. We whipped the back off, snipped out the mains filter capacitor, fitted another and a new fuse. "O.K. Fred, now off you go."

"Well done Les. Take a pound for your trouble. It's worth it to me."

"Merry Christmas Fred. Mind how you go. There aren't many left like you."

Come Easter

He phoned again on Easter Sunday. This time his radiogram had gone on the blink and once again he'd got company. "We'd rather listen to records than watch television when we've got company."

He brought it along, upside down, in the back of his estate car. We did the job noting that the spindle was missing, assuming that he'd removed it for the journey. The next day (Easter Monday) we heard from him again. "Les. I didn't phone you yesterday because I didn't think it fair to disturb your holiday, but you've got my record spindle."

"I haven't got your spindle Fred. The set was brought in upside down, so the spindle is probably under the record deck. Lift it up and get it out."

"I don't like to do that. I'd rather you ran over with one and fitted it. After all you're the one who lost it."

"I didn't loose it Fred. You've still got it and as it's an old Philips one I haven't got a replacement."

"What can I do then?"

"Lift up the deck and get the spindle out. If you can't do that, stick a pencil in the hole for now. A short, round one. You can play the records one at a time. I'll nip in and fix it when I'm passing. Cheers Fred."

As it happened I found an old Philips spindle and gave it to Fred when I saw him some time later. Fred phoned: "it won't go in the hole."

I had to make a call in his locality some time later so I popped in. His wife was there. "It's been heaven without those old records of his."

I lifted up the deck and found the spindle. It wouldn't fit in the hole. Fred had rammed a piece of wood down inside and bits of it were still clogging up the bottom. After a struggle I got the pieces out and fitted the spindle. It worked O.K. and his wife wasn't pleased at all.

"I knew you had it" Fred said when I saw him. It's August Bank Holiday this weekend. I wonder . . .

Old Records

A couple of chaps came in and were talking about their very old 45s dating from the fifties. My goodness, they should see some people's collections of 78s. Norman Stevens had such a collection. Remember Norman? The present editor is also reputed to believe that the only proper recording medium is shellac.

My first clear recollection of a record was of the Bing Boys singing "We didn't want to fight but by jingo now we do." This referred to the Crimean War I believe. What do I remember of it?

"The dogs of war have looked for the eagle of the south.
About to throw defiance in the British Lion's mouth.
They're asking for a thrashing, and a thrashing they will get.
Britannia's not prepared to take an insult yet.
We didn't want to fight, but by jingo now we do.
We've got the ships, we've got the men, and we've got the money too."

Well, you asked for it. You can have "The Charge of the Light Brigade" if you want it . . .

VCR Servicing

Part 23 **Mike Phelan**

Now to some guidance on servicing the 3V23. We'll start with the mechacon board — not because it's the least reliable but because this is the part of the machine that tends to baffle people most. Two points to make before going further. First, a scope is essential for fault-finding. In fact if it's left switched to 2 V/cm d.c. there's no need to use a meter. Secondly, carry your diagnosis down to individual component level if possible — the double-sided print on the mechacon, tuner/timer and display control boards will not stand much handling. Remove all components using solder wick, even diodes: the pop-gun type of desoldering device can damage the fine print by mechanical shock. When changing an i.c., first cut all the pins from the body with fine cutters, then pull them out one at a time with pliers, desoldering as necessary. An aluminium or stainless steel prod is useful for clearing the holes.

Mechacon Faults

For some reason, the first temptation when it comes to a mechacon fault is to change the microcomputer IC1. Of the hundreds of 3V23s we've had through our hands however it's only been necessary to change this i.c. on about three occasions. This is as well since it has 42 pins!

The symptoms caused by faults in this area are usually that the machine will not switch on, that it will switch on but no other functions will work, or that it packs up after so many seconds. With any fault that causes one or more functions to be inoperative it's useful to have a remote control handset to try as well - if this produces the required results, the fault must be before the point where both control paths join, i.e. pin 4 of IC5.

If the machine will not enter the power-on mode, first check that all the rails from the power supply are present — except the ones that are switched of course. Assuming that the power supply is o.k., the next thing to do is to check that pin 17 of IC38 (series to parallel conversion) is going high. If not, the "low" at pin 6 of IC20 as a result of pressing the switch is not operating the gates between here and IC38. The low at pin 4 of IC20 must also be converted to a 250msec pulse by C14: this eventually reaches the keyboard via connection 194, the information going back via connection 192. This latter point will have a serial code during key press only, except in the case of the power-on-mode when the code is present for approximately 250msec. This is a test point to remember.

We sometimes get a machine in which power on works but nothing else will and it's found that connection 194 is permanently high instead of having a pulse on it. This means that the keyboard is transmitting the power-on code all the time. The i.c. on the keyboard can carry out only one function at a time, so the rest of the machine is inoperative. The cause is often that C14 (22μF) has its leads shorted.

Apart from this fault, any malfunction in the circuitry around IC1 on the mechacon panel will affect all operations other than switch on. For IC1 to work, its clock must be operating — check for oscillation at pins 1 and 42. Absence of this means that the 400kHz ceramic resonator is suspect. In addition, pin 7 must be reset at switch on. It remains low thereafter. Pin 6 must be high — if stuck low, suspect IC30/17/21 in the tape guard system — but check the cassette bulb first! Pins 30 and 31 of IC1 should both have serial code on them: these pins provide the outputs that address the data selector i.c.s. If one of these pins is stuck high or low, unsolder pins 2 and 14 of IC23 to IC26: one of these data selector i.c.s will most likely be the culprit, as it will if there's no information reaching IC1's A or B ports.

When the machine returns to stop several seconds after going into the play mode, see if it has threaded up. If not, check the loading motor drive circuit. Faults are common here and in the cassette and reel motor drive circuits — sometimes dry-joints, but if one transistor has failed check all the transistors in the relevant circuit to avoid further failure. Do not replace the large 2SA1020 and 2SC2655 transistors with anything else.

If the machine has threaded up, check that the pinch wheel engages and that the capstan, head drum and take-up reel are all rotating. If there's no drum flip-flop pulse, possibly due to an open-circuit pickup head, the drum motor is switched off but the machine doesn't go into stop.

Failure of one command only should lead to a check on outputs D0-D7 (pins 4-10) of the serial-to-parallel converter IC38 — the truth table in the manual is useful here. Note that the outputs are present only when a key is being pressed.

Tuner/timer Panel

Some of these outputs go to the tuner/timer board to provide remote tuner/timer commands. A fault on this board (usually one of the TA57 transistor arrays) can remove one or more outputs. The effect varies, depending on which outputs are stuck. Things like only eight out of sixteen channels being selectable by remote operation, the tape remaining indicator going berserk, or fast forward and rewind not working can occur. Unplugging the link to the tuner/timer board will prove the point.

Display Faults

Other faults on the tuner/timer board can cause problems. Either the display digits or the legends missing should lead to suspicion of the clocks at IC1 or IC2 — check at pins 1 and 42 with a scope.

This type of fault could conceivably be caused by IC1 or IC2 on the display control board, but rarely is.

If there's no display illumination at all, check whether the display device has lost its vacuum. Has the getter turned white? If not, run a wet finger along the display connections — segments should glow at random, indicating that the filament supply is present. If it isn't, the d.c.-d.c. converter has probably packed up. Earlier ones with a screw head on top can be opened up: the fuse inside will probably be found open-circuit.

Fault Round-up

The rest of the machine is not too bad — the signal sections are very straightforward compared with the 3V00. Early versions had a 2·2Ω safety resistor in the capstan motor supply, situated in the centre of the power supply. This went open-circuit with monotonous regularity. Beware also of unplugging any connections with the mains supply on — this will result in destruction of IC1 and IC2 (type 4066) on the junction board.

The earlier machines had an optical record safety switch that tended to fall to bits. It was replaced by a more reliable mechanical switch. In very late machines the mechacon panel was redesigned, mainly to replace IC23-IC26 with one TMS1024 i.c.

The cassette carriage has given us one or two mechanical problems. If the two "ears" at the top bind against the front chassis rail the motor will not switch off and the tape won't eject. Failure to load a cassette correctly can be caused by dodgy rubber rollers or a loose screw in the pivot of one of the nylon gears at the side of the assembly. Lock the threads with paint. If the cassette switch (below deck) doesn't close, or light falls on both sensors, the machine will eject — remember this when operating the machine with the cabinet removed.

One or two 3V23s suffer from the symptom that they do things by themselves! It's rather like having someone with a hidden remote control handset. This is caused by transistor X1 in the remote control receiver being noisy — the noise is interpreted as a valid command. Either select a quieter f.e.t. or remove the source decoupling capacitor.

Complete failure to tune in is usually due to the MN1204A digital-to-analogue converter i.c. (IC9) on the tuner/timer panel. If manual tuning works, suspect that the gain of X15 in the coincidence detector circuit is low.

Erratic clock timekeeping, or only *one* flash of 8s at switch on, means that the real-time clock is not working. The culprit will be IC3 (SM5502A) or the crystal.

Negative pictures on playback and E-E occur when the u.h.f. modulator has developed a fault — usually a noisy preset, but check the input level before adjusting anything.

Next month we'll take a look at the 3V24 portable machine.

The Schottky Barrier Diode

Phosphor

Ever since Edison discovered the thermionic diode, whose use for signal rectification was later patented by Fleming, there's been a search for a more nearly ideal diode. That is, one with zero voltage drop across it when conductive, infinite resistance when non-conductive (up to an infinite applied voltage), and zero capacitance with any applied reverse voltage. Needless to say, this ideal diode should not generate excess noise. Judged by these standards the thermionic diode doesn't come off too badly, but the forward voltage drop is large in comparison with a silicon diode, and a small reverse voltage has to be applied to stop conduction. It's also rather noisy, and can't be cooled to reduce this noise.

The silicon pn junction diode's characteristics approach the ideal in a somewhat different way. The maximum reverse voltage is around 1kV per unit; the forward voltage drop is current dependent, being between 0·6V and 1·4V; and with a signal type the junction capacitance is about 2pF. There's a defect which is serious when fast switching is required however – the stored charge due to the presence of minority carriers. This charge has to be removed before conduction comes to an end after the diode has been reverse biased. The charge current is over and above any capacitive current flowing via a reverse biased diode.

If the p-type silicon is replaced by a metal such as aluminium the junction still rectifies, in much the same way as a point-contact diode. The resulting device is known as a Schottky barrier diode. It's been around for a good few years as a small-signal device, but is now becoming available for high-current applications. What's so good about it? It differs from the more familiar pn junction in not being a minority carrier device, so the stored charge problem doesn't exist. This provides fast switching times, comparable with those achieved with point-contact germanium diodes but with the advantage of good reverse resistance. Schottky diode ring modulators have been used as wideband mixers (zero to more than 2GHz) in professional and military equipment for a decade. The conversion loss is high, the intermodulation performance very good, but considerable local oscillator power is required. The cost is not acceptable for TV tuner use, though Schottky diode mixers are suitable for use in converters for satellite TV reception.

The forward voltage drop with a Schottky junction is about half that of a pn junction. This, coupled with the absence of stored charge, makes the Schottky junction useful for preventing saturation in switching transistors – saturation implies that the collector-base junction also becomes forward biased, with the associated stored charge. When a conventional bipolar transistor is switched off, there's a delay whilst the stored charge is removed. This sets a limit to the switching speed, with TTL in particular. If a Schottky diode is connected in parallel with the transistor's collector-base junction however this diode will conduct before the collector-base junction, since it has only half the forward voltage drop. With this arrangement the transistor can never saturate, and when switched off there's a much reduced capacitance to discharge. Thus the appearance of S (Schottky), LS (low-power Schottky) and advanced LS TTL in the digital i.c. market.

The high-current Schottky diodes that have become available more recently are still not ideal. The reverse voltage is low, about 45V seems to be the maximum at the time of writing, and the reverse current at the maximum voltage is on the high side – 100mA at 45V for a particular 30A diode at 125°C. This same diode drops only 0·47V at 10A and 0·6V at 20A. Its reverse capacitance is high – 2,000pF at −0·5V. A smaller diode, rated at 1A 40V, has a surge rating of 40A, a reverse current of 2mA at 70°C and a capacitance of 200pF at zero voltage.

Whilst these characteristics don't make Schottky diodes suitable for use in line output stages, they are suitable for use in low-voltage, high-current switch-mode power supplies, where the low forward voltage drop and rapid switch-off improves the circuit efficiency. The cost at present is between two and three times the equivalent pn junction device, but should come down as their use increases. Pairs of diodes in one encapsulation are available, so far only with common cathodes – the manufacturing process is unable to produce common-anode diode pairs.

To sum up then the Schottky diode has about half the forward voltage drop of a pn diode, switches quickly, but has a low reverse voltage capability. It also costs too much for such a desirable device!

Satellite TVRO System

Part 2

Nick Harrold

Last month we described modifications to a u.h.f. tuner for wideband operation, a wideband 35MHz i.f. amplifier circuit and an f.m. discriminator. This type of demodulator is capable of giving excellent results when the signals are strong. This month we shall look at the rest of the video circuitry, an a.f.c. system and an alternative type of demodulator capable of resolving weaker signals. The latter uses a phase-locked loop. It has no advantage over a discriminator with strong signals, but by reducing the drive level and narrowing the tracking range to effectively reduce the bandwidth gives a significant improvement with weaker signals. The result is a watchable picture on weak signals though with some loss of definition.

Energy Dispersal

Before going further however let's consider the subject of energy dispersal. In the early days of satellite transmission the Intelsat engineers were concerned about the possible interference their signals might cause to terrestrial microwave links operating in the same frequency band. To overcome the problems, a dispersal signal is added to the video signal.

When a TV picture changes from one full of detail to say one of just black level plus syncs, the majority of the energy will be concentrated at just two frequencies corresponding to the black level and the sync tips. Adding a permanent energy dispersal waveform ensures that the signal energy is dispersed over a wide band even under no picture conditions, thus reducing the possibility of high-power radiation at one or more spot frequencies.

The dispersal waveform is usually at quarter or half field rate, and will result in a flicker on the received picture. The problem is overcome in the present design by including a simple 40dB clamp in the video circuit. Gorizont ch. 1 employs a different energy dispersal waveform however — a 2Hz triangular wave which produces a large 6-8MHz deviation. The video clamp cannot eliminate this. To overcome the problem, an a.f.c. loop with a controlled response is used. The components on the a.f.c. board to be described can be optimised to provide a completely stable picture.

Video Section

The circuit of the video section is shown in Fig. 5. This includes the narrow-band demodulator consisting of IC1 and the associated components. We'll look at this first. The 35MHz input from the i.f. section is fed to the NE564 PPL via the drive level control RV1. The frequency of operation is set by C4. The demodulated video appears at pin 14 and is transformed to 150Ω impedance by the emitter-follower Tr3 to match the C.C.I.R. de-emphasis network L4/C12.

S1 switches between the outputs from the wideband or narrow-band demodulators. To remove any unwanted effects that could be caused by the presence of the sound subcarrier, the signal is next passed through a 5·5MHz low-pass filter consisting of L5, L6, C13 and C14. The video signal is then amplified by the NE592 i.c. (IC2). RV2 sets the final video output level to 1V peak-to-peak. S2 allows video signal inversion. Tr4 then provides a low-impedance output to drive the clamp circuit C19/D1. Finally, the output is converted to 75Ω by Tr5 to feed a video monitor.

AFC Circuit

The a.f.c. circuit is shown in Fig. 6. Detection is performed by the NE564 PPL detector, a d.c. signal

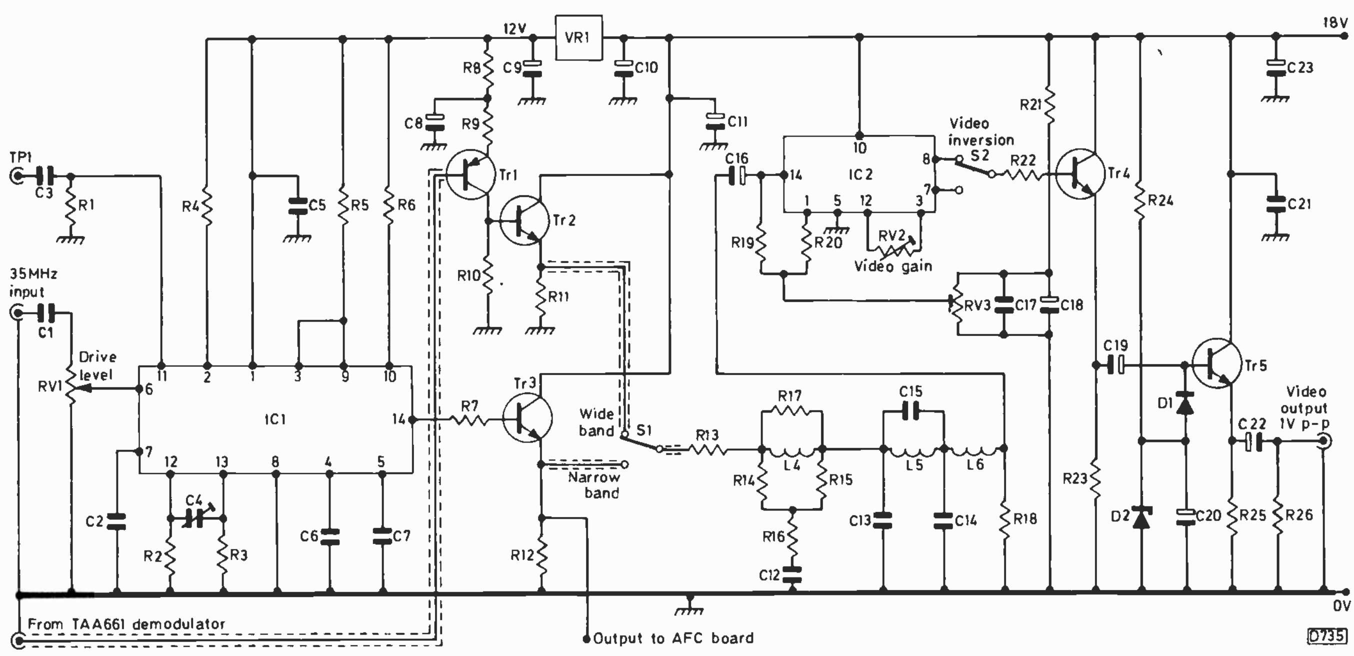


Fig. 5: Video and narrow-band demodulator circuitry.

proportional to any change of input frequency appearing across R12 (Fig. 5). This is filtered by R27 and C24 to remove unwanted video information and is then applied to Tr6 and Tr7. A long time-constant is included to remove the Gorizont satellite's 2Hz energy dispersal waveform. Tr8 converts the a.f.c. output to a low impedance to prevent possible hum pick up before being fed via a short length of coaxial cable to the a.f.c. transistor Tr1 in the i.f. section. The a.f.c. switch S3 should be a front panel control.

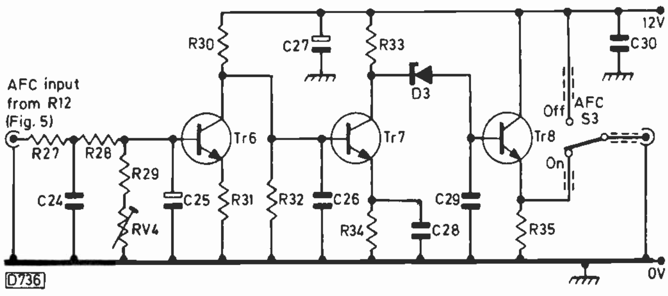


Fig. 6: A.F.C. circuit.

Construction

The layout of the PLL and to a certain extent the video amplifier is fairly critical. I built the section shown in Fig. 5 on a piece of double-sided copper-clad board measuring 5 × 2½in. The tracks are on one side, the other being completely covered in copper, all components being mounted on the copper-clad side. Since the PLL operates at 35MHz, the connections around this stage should be kept as short as possible. All supply rails should be adequately decoupled.

Wire S1 using screened cable. RV1, which is a front panel mounted control, and RV2 should have short connections. Tr2 and Tr3 should be fitted with small heatsinks.

The clamp diode D1 is a high-speed Schottky device. A 1N916 switching diode can be used in this position but there will be a slight loss of clamping efficiency.

The a.f.c. board is less critical – a piece of Veroboard could be used. The prototype uses a single-sided PCB.

Use screened cable for the connections to the a.f.c. switch S3.

Setting up

Set the drive control RV1 to maximum and RV2/3/4 to mid-position. Check that the 12V and 18V rails are correct. Monitor the d.c. voltage at pin 1 of IC2 and set RV3 for 8V. Connect a frequency counter to TP1, then set the frequency of the voltage-controlled oscillator in IC1 to 35MHz using C4.

The discriminator board can now be set up. Set the a.f.c. switch S3 to off and S1 to wideband. If suitable test equipment is available, set L1 to 35MHz, then align L2 and L3 for best linearity consistent with maximum bandwidth. If a signal generator is not available but an f.m. TV signal can be received, set up the discriminator board as follows.

Set L2 and L3 to maximum and minimum inductance respectively. Use a wire loop to couple a small quantity of the 35MHz output from TP1 to L1, using the smallest possible coupling. Use a monitor to observe the video output, tuning L1 for maximum output. Remove the test signal coupling and adjust L2/3 with an off-air signal. As L2 is adjusted, the video output at the emitter of Tr5 will increase (monitor with an oscilloscope). When the colour information on the video signal starts to crush, back off one turn and leave. Next adjust L3. Again the video output level will start to increase. When the bottom of the sync pulse starts to crush, back off one turn and leave. This completes the alignment of the discriminator board.

Switch S1 to narrow-band and adjust RV1 for best picture. It will be found that the setting of RV1 can be

Components List — Figs. 5 and 6

Resistors:				C5	0·001	C29	0·5 Mylar
R1	2k2	R24	3k9	C6	3pF*	C30	0·01
R2	10k	R25	560	C7	3pF*	* Silver mica	
R3	10k	R26	10k	C8	100μF, 16V		
R4	27k	R27	15k	C9	1μF, 16V	**Coils:**	
R5	1k	R28	15k	C10	1μF, 25V	L4	62μH
R6	220	R29	4k7	C11	100μF, 25V	L5	2·2μH
R7	1k	R30	120k	C12	2,700pF	L6	3·3μH
R8	470	R31	1k	C13	68pF		
R9	220	R32	22k	C14	220pF	**Semiconductor devices:**	
R10	470	R33	18k	C15	240pF	TR1	BCY71
R11	560	R34	18k	C16	100μF, 25V	TR2	2N2219A
R12	560	R35	15k	C17	0·001	TR3	2N2219A
R13	150	RV1	1k (RS 173-603)	C18	100μF, 25V	TR4	2N2369A
R14	150	RV2	10k	C19	1μF, 25V	TR5	2N2219A
R15	150	RV3	10k	C20	22μF, 15V	TR6	2N2369A
R16	39	RV4	10k	C21	0·001	TR7	2N2369A
R17	560			C22	4,700μF, 25V	TR8	2N2219A
R18	150			C23	100μF, 25V	D1	HP5082/2800
R19	4k7	**Capacitors:**		C24	0·001	D2	12V
R20	4k7	C1	0·001	C25	10μF, 12V	D3	6·8V
R21	10k	C2	0·01	C26	0·01	IC1	NE564
R22	470	C3	0·001	C27	100μF, 15V	IC2	NE592
R23	560	C4	2-18pF	C28	0·01	VR1	7812

Components List – Fig. 1

Resistors:		R19	100Ω	C8	0·01	**Coils:**	
R1	12k	R20	1k	C9	0·01	L1	8 turns
R2	10Ω	R21	1k	C10	0·01	L2	14 turns
R3	220k	R25	180k	C11	0·01	L3	9 turns
R4	2k7	RV1	4k7	C12	0·001	All 20 s.w.g. on 5 mm formers with cores	
R5	5k6	RV2	5k, multiturn	C13	5p		
R6	560Ω	RV3	2·2M, preset	C14	12p		
R7	390Ω			C15	0·01	**Semiconductor devices:**	
R8	10k			C16	0·01	Tr1	BC108
R9	270Ω			C17	0·001	Tr2	BF180
R10	5k6			C18	0·01	Tr3	BC109
R11	2k7	**Capacitors:**		C19	18p	Tr4	BC109
R12	560Ω	C1	0·1	C20	27p	IC1	RS560C
R13	390Ω	C2	0·01	C21	12p	IC2	TAA661B
R14	1k	C3	1μ	C22	1p		
R15	47Ω	C4	0·001	C23	0·01	**Miscellaneous:**	
R16	470Ω	C5	36p, 1%	C24	330p	M1	50μA meter
R17	1k	C6	0·001	C25	10μ, 15V	Mullard ELC1043/05 u.h.f. tuner	
R18	330Ω	C7	130p, 1%				

optimised for the best picture quality on weak signals.

Finally, adjust RV2 for a video output of 1V amplitude.

To set up the a.f.c. board, switch S3 to on. The a.f.c. should now lock. Slight adjustment of RV4 may be needed to centralise the signal in the i.f. passband. The values of C29 and R32 may need slight adjustment to eliminate completely any disturbance on the picture when viewing Gorizont ch. 1.

The final part next month describes the tunable sound i.f. board. This uses a PPL detector and a pilot-tone controlled expander circuit for correct reproduction of the Gorizont ch. 1 audio signal.

Video Head Checker Review

Mike Phelan

Assessing video head wear is rather like c.r.t. testing – at what stage of wear do you replace the item? As with c.r.t.s, video heads can suffer sudden catastrophic failure, e.g. open-circuit windings or physical damage. Apart from this their life is limited by wear of the ferrite part that contacts the tape. Manufacturers estimates of head life vary: a figure of 2,000 hours seems to be typical. There are so many variables however that this is only a very rough guide – actual wear depends on the condition of the tapes, atmospheric dust and a few other things.

It would be useful, especially for rental companies, to establish a definite borderline for head wear, beyond which the head is automatically renewed. To this end Thandar have introduced the LHC909B head checker, which is available in Betamax and VHS versions. The one we received for testing was the VHS one, type LHC 909B/V.

Methods of checking head wear vary from empirical ones like feeling the amount of head penetration into the tape to measuring the f.m. output – this latter method fails if someone has turned up the f.m. level control. The LHC909B appears to be an inductance bridge that measures the inductance change as the ferrite wears away. It comes in a pocket-sized carrying case and derives its power from a PP3 battery. The instrument has a meter with green, white and red segments, a battery check segment, and numbers from six to zero, the latter being approximately 50 per cent f.s.d. There's also a calibration mark.

The only controls consist of an on-off switch, a range switch (A, B and C), a battery/calibrate/measure switch and a rotary control for calibration — this is fairly critical and must be carried out on each range before use. The eleven page instructon book gives the ranges as 0·2-3·5μH (A), 0·8-3μH (B) and 0·5-1·5μH (C). A table in the book has to be consulted to find the appropriate range for particular machines. Unfortunately this covers only National Panasonic and Hitachi VHS machines. For other makes you have to check a new head on each range to obtain a value indicated in another table, then disconnect the leads on the suspect head and measure. One cannot help thinking that if a new head was available it would be just as quick to try it in the machine. This is not true of course in those Betamax machines in which the head requires precise mechanical alignment.

The test clips are a bit fiddly, especially with newer JVC heads that use "relay pins" instead of leads. We found that all the worn heads we had were "in the red" on all ranges, but the middle range gave the lowest reading. Obviously if the device is in use regularly the ranges for all makes handled can be ascertained.

The handbook is a little difficult to follow in places, e.g. the table that shows "deflection when heads need replacing" less than "deflection when heads are worn", and gives two or three readings on each range for these. Despite this the device proved an excellent yardstick for deciding when a head should be replaced. It should be helpful to anyone who sells or rents VCRs in any quantity.

Available from Thandar Electronics, London Road, St. Ives, Cambs. PE17 4HJ at £50·89 including VAT.

Service Briefs

The following notes are based on information given in recent issues of *Philips Service Link* and *Ferguson Feedback.*

Philips KT3/K30 chassis: A new tuner unit, type U341, is used in the latest versions of these chassis coded BA02 (KT3) and BA01 (K30). Since the tuner's a.g.c. system works in the reverse manner a new i.f. module, coded BA11, is used. The U341 tuner has a beige coloured label and the i.f. module carries an extra label printed with the words "to be used with U341".

To avoid random horizontal bars near black level when playing back tapes on a VHS machine via sets fitted with a single-chip decoder, C3043 as well as C3044/5/6 should be changed to 10μF – the positive lead goes to pin 10 of the i.c.

Some sync panels coded BY03 or BY04, fitted with a TDA3571BQ i.c., give poor sync performance on VCR playback. The solution is to fit the latest type of panel, coded BY05, or change the i.c. to the later version of the TDA3571BQ which is identifiable by the letter S behind the date code (the letter S is not part of the type number) and ensure that the value of R8366 is 5·6kΩ.

Where poor sync with a VCR is experienced, an improvement can be obtained by changing the values of R7322 and R7323 on the chopper control module to 3·9kΩ and 18kΩ respectively. This change is incorporated on later panels coded BY03.

Philips TC2 chassis: C620, which decouples the slider of the line hold control, has been changed in value from 560pF to 0·0015μF to avoid intermittent line collapse: sets bearing factory codes TY, TN or TU should be checked when serviced to ensure that the new value is fitted.

Philips TX2 chassis: An 0·1μF decoupling capacitor has been added between pin 13 of the tuner and chassis to avoid line jitter and critical tuning.

Philips V2000 VCRs: There have been some cases of Models VR2022 and VR2023 failing to operate when unboxed. This is usually due to condensation as a result of storage in a cold place. The machines may need up to two hours to reach normal room temperature.

The head drums of V2000 models are being modified with the addition of an earthing arrangement to eliminate electrostatic interference (white flashes on the picture). The modification involves a change in the shape of the top of the drum and the addition of a brass earthing leaf spring mounted on a new type of light sensor. A new type drum can be used without the earthing spring on the light sensor, though a new type sensor and drum should be used where interference has been experienced. New type light sensors must not be fitted to older type drums without first removing the earthing spring – ensure that the plastic spacer supporting the printed panel is fitted. Machines fitted with the new type drum must not be fitted with the older type.

In some early versions of the portable Model VR2220, high actuator sensitivity can give rise to a double half picture display with the second half picture displaced about 4mm vertically. The solution is to change the values of R3138 and R3139 on panel A620 to 270kΩ. Another problem that's been reported on these machines is no audio erasure when making a new recording. This can be the result of a broken lead or connection at pin 8 of plug A3 on panel A520. If this occurs the lead can be connected direct to pin 2 of coil L5004 with the screening to the negative end of C2040.

Thorn TX9 chassis: It's unwise to operate the switch-mode power supply (PC1044 board) off load. If the receiver is switched on with the 18V supply rectifier D70 or the 115V supply rectifier disconnected the chopper transistor TR62 is likely to be damaged. If an overload condition is suspected, check by removing the r.f. choke L65 in the 115V line and connecting a 4·7kΩ, 3W resistor across the reservoir capacitor C152. The 18V rail can be isolated by removing D70 – but only after adding a 4·7kΩ resistor across C152 as before since no current is drawn from the 115V rail when there's no 18V supply.

R942 has been changed from 18kΩ to 27kΩ and R970 from 120kΩ to 82kΩ in the infra-red remote control receiver (preamplifier panel PC1527) to reduce the gain slightly in order to prevent interference operating the remote control system.

Low voltage at pin 9 of the TDA9503 line processor i.c. can cause loss of line lock under certain conditions, e.g. when changing to an unused channel and then tuning a station in. The usual causes are leakage in D916 in sets fitted with the U725 remote control system or D117 in teletext sets.

Thorn TX10 chassis: A resistor (R706) has been added across the secondary winding of the chopper driver transformer T803 to decrease the current trip sensitivity. The value has been reduced from the initial 100kΩ to 22kΩ to avoid random tripping under extreme peak white picture conditions.

Thorn TX90 chassis: Two modifications have been introduced. First, to increase the a.f.c. range at the top of the u.h.f. band a VDR is fitted in parallel with R102.

Secondly, due to component tolerances a field hold control (RV174, 68kΩ) is now fitted. It's connected in series with R116, at the 12V end. R116 is reduced in value to 560kΩ. Previously, some chassis were modified individually for correct field lock. Where the field oscillator was running slow, i.e. picture rolling downwards, an 18MΩ resistor was added in parallel with R116 beneath the board. Where the oscillator was fast, i.e. upwards picture roll, an 0·01μF capacitor was added in parallel with C112 beneath the board.

Thorn 1696/1697 chassis: Three different deflection yokes have been used in these monochrome portables. The earlier ones have a field scan coil impedance of 3Ω (in parallel) and are interchangeable. The current yoke has a field scan coil impedance of 8Ω and was introduced to lower the dissipation in the TDA1044 field timebase i.c. Associated component changes are: R60 1kΩ, mounted on main board; R58 150kΩ; R 59 68kΩ; R68 replaced with a wire link. To eliminate bottom cramping, R67 was changed to 27kΩ.

Thorn 1790 chassis: This monochrome chassis uses a 625-line count-down field oscillator with no hold control. Since the Acorn Atom provides an output with 60Hz field sync pulses, this cannot be displayed with a locked field.

The Betamax Video System

Part 4

Eugene Trundle

Apart from amplification, the colour-under signal from the video heads on playback must be processed in three ways before it can be fed to a monitor. These processes are up-conversion to the standard chroma subcarrier frequency of 4·433619MHz, de-jittering, and colour crosstalk cancellation. The de-jittering process removes timing errors introduced by the mechanics, while crosstalk cancellation eliminates noise and patterning due to signal pick up from adjacent tracks. These three processes are somewhat intermingled in the playback electronics: Fig. 20 shows the basic arrangement in block diagram form when Sony purpose-designed chips are used.

First Control Loop

Much of the playback electronics is common to the record circuitry, and the switched phase-locked loop (block Y) should by now be familiar – see Fig. 17 last month. It works in the same way as before, but this time locks to alternately 351 and 353 times the off-tape line sync pulses – as a result, any jitter in the off-tape line sync pulses will be present at its output. Once again the counter is switched by the head drum flip-flop signal, so that the PPL's output is at 5·484375MHz for head A and 5·515625MHz for head B.

The output from the divide-by-eight counter is alternately 685·546kHz and 689·453kHz. This output is presented to the sub-mixer, which also receives a stable 4·43MHz reference signal from crystal oscillator 1. The additive sub-mixer's output will thus consist of 5·119165MHz and 5·123072MHz alternately, synchronised to the head sweeps. When mixed with the off-tape, colour-under chroma signals in the subtractive main mixer we get 5·119165 – 0·685546 = 4·433619MHz for head A and 5·123072 – 0·689453 = 4·433619MHz for head B. Up-conversion has thus been achieved, and at the same time the "twisted" vectors shown in Fig. 18, rows W and X, have been restored to normal (row V). The up-converted chroma from the main mixer is now as shown in rows Y and Z, and we next need to eliminate the crosstalk (i.e. the small arrows in rows Y and Z). This is done by the following two-line delay line and adder matrix. The output from this is finally added to the luminance signal.

The fact that the switched PPL loop Y is locked to the off-tape line sync pulses goes some way towards de-jittering the chroma signal. Since the sync and colour-under signals are recorded and played back simultaneously, they will have the same jitter characteristics and the timing errors present at the output of PPL Y (known as the "jittering reference") will also be present at the input to the additive sub-mixer. Thus the two inputs to the main mixer move in the same direction (in terms of frequency or phase) when timing errors occur, and the difference between them, i.e. the 4·43MHz mixer output, does not change.

Phase Control Loop

The de-jittering process just described is quite effective, and in early machines of other formats (e.g. the Philips N1500) was all that was necessary. The slower tape speed and higher information packing density of more modern formats means that closer control over chroma jitter is required however. This is the purpose of the second control loop shown in Fig. 20: it makes use of the pilot burst signal added during record.

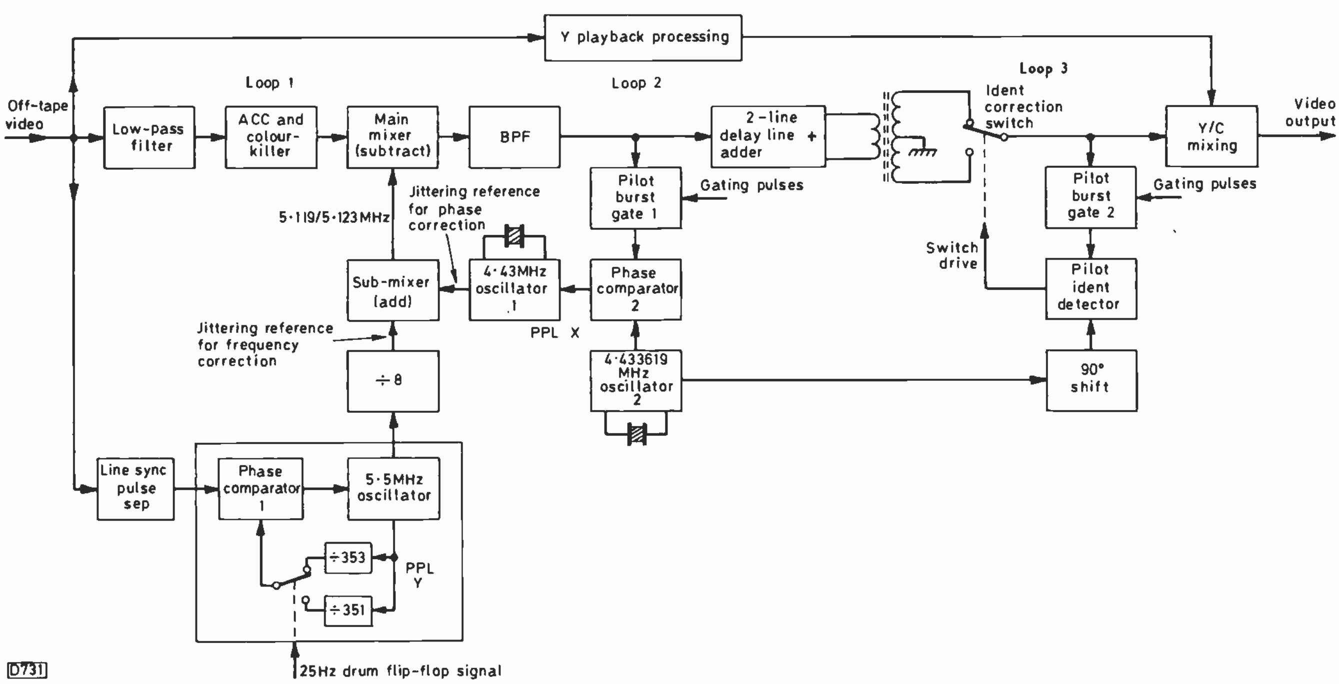


Fig. 20: Block diagram of the basic Betamax colour playback system. Note that in some machines the pilot ident detector inverts the output from the sub-mixer rather than the chroma signal itself – the effect is the same of course.

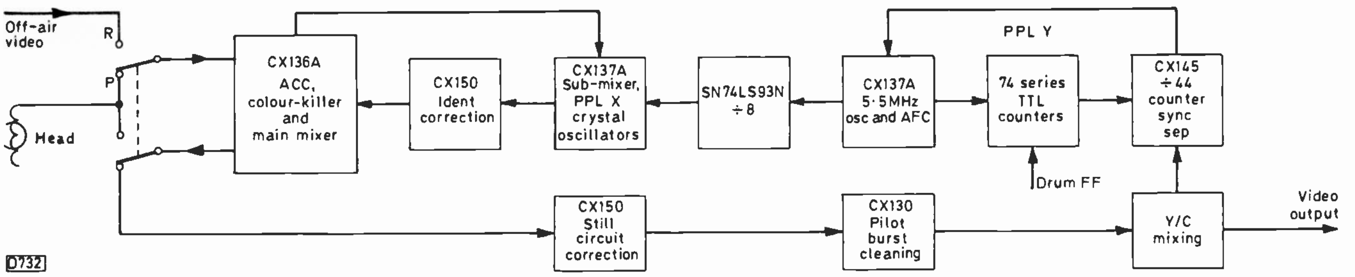


Fig. 21: Block diagram showing a typical i.c. configuration for a Betamax colour system. Ident correction is in this case applied to the output from the sub-mixer. This diagram, with minor variations, is common to many Betamax machines.

The up-converted pilot burst, at 4·43MHz, is gated out and fed to a phase comparator whose other input consists of a rock-steady 4·433619MHz reference signal generated by crystal oscillator 2. Any discrepancy between the two inputs appears at the output as an error signal representing the jitter. This is used to phase modulate the output from crystal oscillator 1, which thus provides a second "jittering reference". Since this is one of the inputs to the additive sub-mixer, the second de-jittering loop is completed. Its effect is to lock the VCR's chroma output to the reference provided by crystal oscillator 2.

Chroma phase errors are taken care of by the second, pilot-burst loop, while frequency errors are taken care of by the first, off-tape line sync pulse loop. It can happen however that a timing error too large for the phase-correction loop occurs. To prevent this, a third loop is incorporated.

Ident Loop

You will recall that the pilot burst is laid on the tape during the recording process as a subcarrier with a 90° phase angle. We've seen that the replayed chroma reference is locked to crystal oscillator 2. So if a 90° phase shift is included in the output from this oscillator, it should coincide with the pilot burst. This is monitored by the pilot ident detector. If the inputs to this suddenly go "antiphase", it means that phase detector 2 has so to speak run out of road and commenced operation in the opposite quadrant of the "phase clock". This will result in a 180° phase change in the chroma signal emerging from the main mixer, so corrective action is required. The ident detector sends a pulse to the inverting switch shown, cancelling the error in the signal fed to the luminance/chrominance mixer.

Standard Chip Sets

Several special chips have been developed for use in Betamax chroma circuits: the CX136 colour processing chip, along with several others, has been used in VCRs produced by all three major Betamax manufacturers. A fairly typical block diagram is shown in Fig. 21. Current machines use second-generation chips designed with the requirements of still-frame and trick-motion playback in mind. These are quite different.

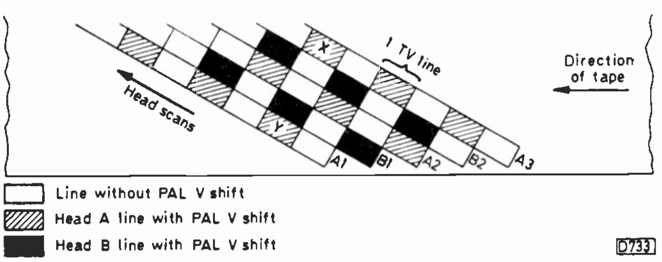


Fig. 22: Betamax tape format for PAL colour signals.

During record the colour-killer function is carried out in the CX136 chip. The operating level of the a.c.c. stage is monitored and the main mixer switched off during a monochrome recording. A killer output is available from the chip to perform luminance filter switching (greater Y bandwidth is permitted during monochrome operation) and, in some models, disablement of the chroma section of the record amplifier.

The same killer stage is used during playback. A further process, pilot burst cleaning, is required during playback. The CX130 chip (Fig. 21) does this job by blanking out the pilot burst along with any chroma noise during the line blanking period. This ensures clean line sync pulses and porches in the video output signal.

Colour in the Track-hopping Modes

We have seen that the TV lines of successive fields are adjacent to one another on the tape. Because of the 180° V signal phase shift on alternate lines in the PAL system, the successive sweeps *of any one head* record normal and phase-shifted lines adjacent to one another – see tracks A1 and A2 in Fig. 22. This means that PAL signal concurrence occurs at four-track intervals across the tape – see the lines marked X and Y.

This is important where colour is required in the still-frame or trick-speed modes. Track jumping during a single head sweep occurs in these modes, and unless precautions are taken colour ident can be lost. The effect of this depends on the TV receiver in use. Where the a.p.c. loop in the set's decoder has a short time-constant, recovery will be quick and normal ident will be restored after a few lines. In many sets however the response time is relatively slow, in order to overcome the effect of the swinging PAL burst. In some sets this could result in large areas of complementary colours being displayed between noise bars. To prevent this, some inexpensive Betamax machines settle for monochrome pictures in the still-frame and visual search modes. In machines where colour is allowed through in these modes, the chroma phase must be corrected to compensate for the error introduced by track jumping.

The action centres on the CX150 chip shown along the bottom in Fig. 21. A block diagram for this chip is shown in Fig. 23: it contains a phase detector, a flip-flop and a switch to select either the direct or one-line delayed 4·43MHz chroma signals that enter at pins 8 and 9 respectively. A reference signal from crystal oscillator 2 (Fig. 20) is fed in at pin 11 for comparison with the chroma input at pin 2. The comparison is done on an alternating line basis due to the half-line frequency gating

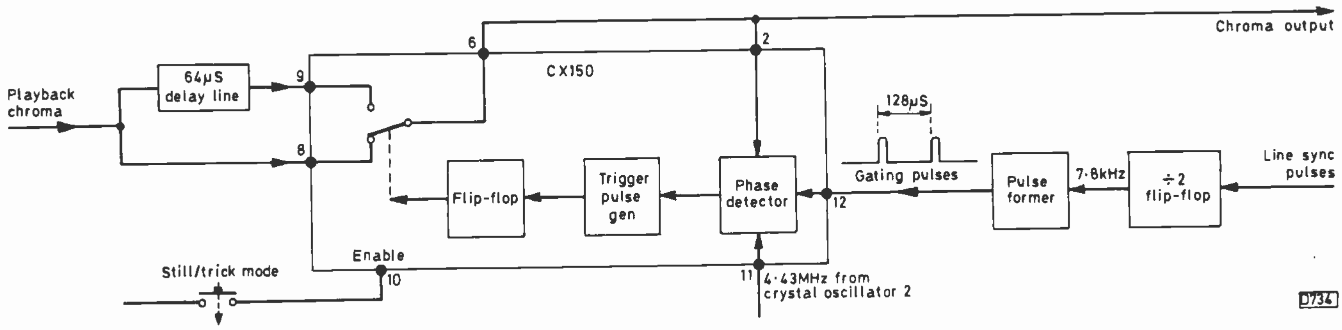


Fig. 23: Arrangement used to prevent PAL ident changes in the track-hopping modes, e.g. still frame. The main items are an CX150 i.c. and a standard PAL delay line.

pulses applied to pin 12.

The PAL signal should generally show no marked phase change on a two-line basis, and all is quiet within the i.c. when this is so. When the PAL signal becomes disordered due to track jumping however the phase detector within the chip produces rapid changes at its output. These are fed to a trigger pulse generator which drives the flip-flop, as a result of which the switch comes into operation, selecting the direct or delayed chroma signal as required to achieve PAL chroma signal continuity.

The action is similar to that of the pilot ident detector in Fig. 20, the same type of chip (CX150) being used for both purposes. The difference in operation is that the still chroma checker works only in the still and trick-frame modes, selecting either a direct or a delayed chroma signal, whereas the pilot ident checker is operative at all times, inverting the chroma signal as necessary.

The level of activity in the still chroma checker i.c. provides an indication of the degree of tracking error present. In later machines such as the Sony C7 an output from the still chroma checker chip is fed to the capstan servo circuit so that the latter inches the tape to the point of minimum mistracking during the active field period. Mistracking bars and noise are thus reduced to a minimum and shunted out of the picture into the field blanking period. The resulting obliteration of the field sync pulse is overcome by inserting an artificial vertical pulse which is generated and timed within the VCR.

Corrections

A couple of corrections are required to the treatment of rotating vectors in Part 3 last month. Line 10 from the top of column 2, page 651, should have read ". . . for each four cycles of the sample . . .", not five cycles. The caption to Fig. 16 should have made it clear that the reference (upper waveform) vector is shown rotating clockwise with respect to the sample (lower waveform).

TV Fault Finding

Reports from Mick Dutton, Richard Roscoe, M. Brett T.Eng. (C.E.I.) and George R. Wilding

Fidelity CTV14

We've had several faults recently on 14in. Fidelity colour sets. The first had a very dark picture due to C412 (100pF) going leaky. This capacitor forms the reservoir at the input to the focus unit, and since the first anode network is in series with the focus unit there was lack of focus and first anode voltage. The second set was dead with the power supply tripping. We disconnected R828 to isolate the power supply from its load but the supply still tripped. Replacing the TDA2581 chopper control i.c. cured the trouble.

Other faults have included a short-circuit BUX84 chopper transistor – the 2A mains fuse blew at switch on – and an effect that looked similar to a.g.c. hunting but was due to the h.t. rail being set low. Inability to change channels is usually due to IC3 – it's worthwhile checking that the control panel is screwed up tight otherwise the switch will not make contact when the channel change button is pressed (the board will bend instead).

Sets fitted with a Mullard tube should have the two metal shields on the deflection coils earthed to the same point as the c.r.t. Aquadag on the tube base to cure intermittent tripping. Also check that C807 (100μF) and C813 (0·0015μF) are mounted on the print side of the panel as close as possible to IC10 (TDA2581). If not they can also be responsible for intermittent tripping. **M.D.**

Thorn TX9 Chassis

A set fitted with the Thorn TX9 chassis (PC1040 main panel) came in with the complaint that it was completely dead. The mains fuse had blown, and a few checks revealed that the line output transistor TR68 was short-circuit. After fitting a replacement we powered the set via a variac. At 140V mains input the h.t. rail was at the correct 115V but there was no picture or sound and the line output stage sounded as if it was loaded down – this was due to the 24V supply rectifier D94 being short-circuit. After replacing this item a picture was obtained, but as soon as the mains input was increased above 140V the h.t. rose above 115V and the overvoltage trip blew the fuse.

A check through the power supply revealed that D75 in the slow-start circuit was leaky. The h.t. would still not regulate after replacing this. We eventually replaced the triggering SCR CSR3 twice. The first replacement produced the correct h.t. voltage, but it was hunting up and down at about 10V. The second replacement put this right and we concluded that the first one must have been out of tolerance. **M.D.**

Decca 130 Chassis

The complaint with one of these sets was no results. We found that there was voltage at the collector of the chopper transistor Q801 and that the power supply was making a ticking noise. A check on the voltages around the TDA4600 chopper control i.c. proved to be inconclusive as they were all slightly different from those specified. We changed the chip, which made no difference, then checked all the semiconductor devices in the power supply in circuit. Eventually we found that R816 (100Ω) was open-circuit. It's in series with the feedback winding on the chopper transformer and is rated at 1W: when removed it looked as though it had been under considerable stress. **M.D.**

G11 Teletext Receiver

The problem with a Pye teletext set (G11 chassis) was that the raster would go blank after the set had been on for a while, the sound remaining normal. It was not possible to display teletext with the fault present. The cause was the SAA5050 character generator i.c. on the teletext panel. **M.D.**

Thorn TX10 Chassis

It's becoming common to find these sets changing channels intermittently due to faulty insulation within the focus unit. We had one recently that would change channels and display random teletext information due to the lead from the focus unit not being pushed fully home into the top of the line output transformer. **M.D.**

Thorn 1500 Chassis

Low gain is quite a common fault with the Thorn 1500 chassis – low gain with the picture drowned in snow should direct attention to the tuner, where the earthing springs on the tuner bar are notorious, whereas low gain with a noise-free raster means trouble in the i.f. strip. Well, not necessarily. We often find that the contrast control R37 has developed a poor contact on its wiper – jiggling it will prove the point. It's also a good idea to check the setting of the preset contrast control at this stage.

If these points are o.k., it's worth checking R79 (317Ω) before diving into the signal stages. It's the end section of the mains dropper and often goes open-circuit, depriving the video driver transistor VT8 of its base bias. There should be 43V at one end and 7V at the other.

In two recent cases we reached this point without finding anything amiss and so started to make voltage checks around the i.f. transistors. In the first set we found that the third i.f. amplifier transistor VT6 was biased off because its base bias resistor R18 (390kΩ) had risen in value. In the second set we were forced to check right through the i.f. strip till we reached the video driver transistor VT8. Here we found that the base and emitter voltages were much lower than they should be. Since we'd already checked R79 (see above) we had to look for some other cause. This turned out to be C30 (0·01μF) which had developed a largish leak – it decouples VT8's base bias. **R.R.**

RBM Tube Bases

Most engineers will be aware of the unreliability of the tube bases used in many of the later RBM chassis (Z718, T20, T22 etc.). The focus pin spark gap is integral with the base, and it's this area that causes the trouble. The base material starts to break down and conduct around the spark gap cavity, causing a variety of symptoms depending on individual circumstances. The focus pin can eventually tarnish, corrode and snap off when the base is removed.

In one recent ten-day period we fitted four new bases. The first set had poor focus at switch on, clearing after a few minutes and remaining all right for the rest of the evening. The second set had flashing streaks on the picture and a pronounced "ticking" noise on the sound. The third set would be fine for long periods: the picture would then suddenly blur and right itself.

The fourth set caught us out. It too displayed flashing streaks, which tapping the tube base seemed to aggravate. So we decided to fit a new base. A few minutes afterwards the fault returned however. The problem was eventually traced to dirty pins on 3Z6, one of the plugs on the signals panel.

Plugs and sockets are another common source of trouble on these sets, especially the power carrying sockets 5Z1 and 4Z2 on the timebase panels. The state of the soldering around the pins of these plugs should be checked whenever one of these sets is repaired – if in any doubt, redo them all. **R.R.**

Israeli Report

I've been in Haifa, Israel for two years now and have found that certain "seasonal faults" are starting to show up on various TV chassis. The following fault reports may be of interest.

Grundig 1510B: Like Richard Roscoe, I too have been plagued with dry-joints. Another favourite to add to the list is poor joints on the speaker wires – in particular the wires from the cone to the tags. The result is intermittent sound. A good hot soldering iron is the cure here.

Grundig 1215a: This monochrome portable is similar to many others produced by Grundig. On replacing a blown rectifier diode in one of them I found that the picture was very overloaded while strange noises came from the sound. About five minutes later the raster disappeared. A check on the l.t. rail revealed that it was badly loaded, and disconnecting various items from the line output transformer brought us to rectifier Di554 (90V supply) which was short-circuit. The overloaded video was eventually traced to an excessive amplitude pulse at tag C on the line output transformer – it goes to pin 7 of the TDA1440 i.c. Rewinding the line output transformer cleared that one.

ITT 2705 (5861.63.01 chassis): The customer told me that the set sounded like his Atari space invaders game – it was making bonking sounds, i.e. the power supply was tripping. Changing the BU208 line output transistor stopped that.

In general at this time of year (summer) the normal faults are line output transformers and transistors and various troubles with power supplies. **M.B.**

Faulty Connections

The owner of a set fitted with the ITT CVC9 hybrid colour chassis phoned to say that although the set worked perfectly there were generally one or two pronounced cracking noises from the chassis when he switched on, and sometimes when he switched off. The fact that this occurred immediately following switch on naturally ruled out the possibility of e.h.t. sparkovers from the anode cap, something that quite often happens with these sets. On removing the back and switching on however the cause was immediately evident – the large solder blob on the negative tag of one of the multiple electrolytics had cracked, as a result of which the initial charging current sparked across, healing the break during the set's operating time. Resoldering with a really hot iron cured the trouble. Incidentally on more than one occasion we've known the resistance of a dry-joint at this precise point to be enough to register a reading of a few volts positive to chassis, causing a hum bar.

We've also had two identical, complete disconnections on sets fitted with the CVC30 solid-state chassis. These were at one of the thin leadout pins from the push on/off switch, where it's mounted on a small PCB. In both cases the original mounting hole in the panel had become blackened and somewhat enlarged, probably due to sparking prior to the complete disconnection. There are two contributing factors. First the leadout pins are a little on the short side, barely protruding through the surface of the panel, while secondly operation of the switch puts some strain on the panel. For a sound repair it's usually necessary to enlarge the hole further and get a looped jump lead on the switch pin. **G.R.W.**

Thorn 1500 Chassis

There was no sound and only very faint, undecipherable modulation on the screen, suggesting loss of l.t. or a fault in the i.f. strip or the tuner. There was ample l.t. however, so a check was made on the voltages around the a.g.c. amplifier transistor VT3 – on several past occasions we've known this transistor to go open-circuit, as a result of which its normal collector voltage reading of 0·4V rises to the l.t. rail potential. This time the a.g.c. transistor was o.k., while the voltages around all the i.f. transistors were about normal. The voltages at pins 3 and 4 of the four-pin plug that supplies the tuner were missing however. The feed comes via R67 from the 26V rail, but this resistor was in order. There was clearly a short in the vicinity of the tuner, and on removing it from the cabinet mounting we found that the lead from pin 3, which carries the 12V supply, was shorting against an earthed tag on the tuner's case. Pushing it clear restored normal results. **G.R.W.**

Encounter with a Skantic

Andy Denham

I was chatting to this chap I know who is a TV engineer and still does the odd private job. Told him I'd always been sold on the Philips K70 range, with their hi-fi-ish sound and good video rendering, but that one had never presented itself when I'd enough of the folding stuff. It turned out that he didn't have a K70 but he did have this Swedish thing. So up I go to have a look and guess what, it's a Skantic. A good solid-state set with a 110° delta gun tube but very dead with a duff power supply. It appeared that the owner had given up trying to get it repaired and that it was going cheap to anyone who'd take it. That's how I acquired a Skantic (and a headache).

Tackling the Power Supply

As a first step I made cold checks on the power supply – it's one of those Siemens self-oscillating chopper jobs. This revealed a short-circuit diode (D608), and after replacing this I fired the set up. All I got was the characteristic 1kHz whistle to indicate that the power supply was overloaded. A resistance check on the 185V h.t. rail revealed about 500Ω to chassis both ways, so the scan coil plug was removed (to disconnect the line output stage). This removed the overload, and a check on the BU208 line output transistor showed that it had a base-collector leak. I left the plug off and fired up again hopefully. Result, nothing! Back to the power supply. I couldn't find any obvious fault, so I decided to replace the thyristor – the one that switches the chopper transistor off. When I switched on again I'd some 200V on the h.t. line, and adjusting P601 got this down to the correct figure of 185V.

Lack of Width

Fitting a new BU208 restored the raster, but there was lack of width. "Flyback tuning capacitor" I thought, but a check with the scope revealed that the flyback was right at about 12μsec. So I scratched my head and next found that the front came off to reveal a convergence panel. This had a control marked "bredd", which along with the E-W amplitude and trapezoid controls did nothing. So apparently the EW modulator wasn't working. Cold checks in the relevant circuits (spread over three boards) failed to reveal anything and I then found that there's a fuse (S702, 315mA) in the drive to the EW modulator circuit on the line output stage panel. This was open-circuit, a replacement restoring full width with raster correction.

Miscellaneous Faults

At this point I found that most of the small presets in the set had fallen apart, due perhaps to the fact that it had spent the last two years in my friend's shed. To get stable results, I had to replace the line shift (P701), red first anode (P702), green drive (P705), height (P852), line hold (P803), and preset brightness (P402) controls, also three presets on the decoder panel and a mysterious one in the "vitpunktsomk" circuit (white point switch). The set uses colour-difference drive incidentally, with the "white point" changed on monochrome/colour.

Feeling pretty chuffed by now, I presented the family with their "new" TV set. To celebrate, the luminance went off. This turned out to be due to a short-circuit in the luminance delay line, and was cured by fitting a suitable replacement. Good, except that over the next few hours the focus deteriorated until, with the control at one end of its track, the picture was still blurred. There was also this smell, which I tried to ignore, assuming that the corona would go once the set had dried out. It seems that this was in fact the cause of the trouble, since now that I have a new tripler to hand the focus has settled down with the control about half way (the tripler was supplied in the space of eighteen hours by Telepart from a phoned Access order – top marks to them).

The wife kept mentioning "funny greens", and I must admit that the reds were more of an orange colour. So further investigation was called for. There was no flaring on high brightness monochrome scenes, which cleared the tube of suspicion. On reds and yellows there was noticeable overshoot however, the blue being o.k. in this respect. A check on the colour-difference output stages revealed plenty of voltage at the collectors of the R – Y and B – Y output transistors, but very little at the collector of the G – Y output transistor, due to its load resistor R4117 (10kΩ) being open-circuit.

Now that I've done the convergence and purity, I must say I'm very pleased with the results.

VCR Clinic

Reports from Mick Dutton, Steve Beeching T.Eng. (C.E.I.), Les Harris, Michael J. Cousins T.Eng. (C.E.I.), Bob McClenning and John Coombes

Ferguson 3V16

This machine would play back a prerecorded tape quite satisfactorily, but its own recordings were spoilt by white smearing and thin black lines across the picture. Playing back a tape from the faulty machine on a good one presented us with the same symptoms, proving that the trouble lay in the faulty machine's record path. Waveform checks showed that the video from the white clip circuit was normal, but that the f.m. waveform at TP9 was slightly low with a distinct "bright up" in the top half of the waveform. This distortion was also present at the f.m. modulator's output, so we decided to fit a replacement. When this was obtained and fitted the problem was cured, the machine working perfectly after a general set up. **M.D.**

Sanyo VTC9300

I had a real problem with a Sanyo VTC9300 during the summer. The basic fault was simple enough: after a period of time, which could range from a few seconds to an hour, the servo lost lock on playback. It made no difference whether the tape was one recorded on the machine or a test tape.

The servo monitoring points are TP102 and TP104 – there's only one servo on this machine, as there's only one motor. The waveforms at TP102 differ depending on whether the machine is in record or playback – on record there's a squarewave with a slightly sloping positive edge which is sampled by the pulse at TP104, while on playback there's a sawtooth waveform (with curved rather than straight edges) whose positive, rising edge is sampled by the pulse at TP104. The two waveforms at TP102 are both derived from the rotating head drum. The pulses at TP104 are derived from the incoming sync pulses on record and the off-tape control pulses on playback.

When there's a servo fault you can compare the signals at TP102 and TP104 with a double-beam scope, triggering the scope from the pulses at TP104. With the machine in playback it could be seen that the drum waveform at TP102 was straining to the left: when lock was lost it moved from right to left. This meant that either the head drum was running fast or the tape was running slow. Playback of a test tape revealed that the chroma was displaced to the left of the luminance, confirming that the head-to-tape speed was incorrect. Further investigation revealed that the current running through the eddy current brake coil was very high at some 80–90mA.

Unfortunately the servo locked perfectly in record, with a brake current of 45–55mA, which is normal, and never wavered. By very accurate measurement the pulses at TP104 were found to be at 40msec intervals on record and at 41–42msec intervals on playback. How can we have a machine whose playback is slower than its record operation?

The motor was changed in case it was running a bit slow, even though it's an a.c. synchronous motor. This had no effect. The playback tape speed can be checked by measuring the frequency of the 3kHz audio signal on the manufacturer's test tape. It was found to be 2·942kHz, slow and too far out of specification. I then took a break while Sanyo supplied me with an assortment of different sized motor and tape pulleys (see parts section of manual), surveying the video scene in Corfu (business trip y'see).... Feeling fit and happy a few weeks later, I tried various pulleys in the Sanyo. The tape speed was still slow. As the motor drives the capstan via one belt, which had been changed, there couldn't be any reason why the tape was still running slow, even with a new motor. The take-up torque and back tension were not ridiculously out, the pinch roller was free and clean, and the capstan turned all right. Up the creek without a paddle as the saying goes.

I could be my usual rotten self and not tell you what it was, leaving you to waste as much time as I had. Before you do, slip the capstan out and lubricate the shaft. **S.B.**

Ferguson 3V30

A fellow dealer came round with a Ferguson 3V30 which was reputed to be losing time. In his hand was a replacement timer microcomputer i.c. "Can you just fit this for me mate? The customer's playing hell and wants her money back.".

"Yes Stu" says I. It wasn't till the timer chip was out that I discovered he had one for a 3V29. Same type number but different suffix. It makes a difference!

"Perhaps the real time clock crystal frequency is wrong?" I suggested. "No" he replied. "I rang Ferguson and the man said it was counting the mains frequency wrongly." "Oh did he indeed" says I, smug as a newt in a brewery.

So we checked the crystal frequency, which was 4·194307MHz, i.e. within the 4·194304 ±3Hz specification. The SM5502A clock/counter i.c. was producing a 1Hz output pulse with a period which varied between one second and 1·212sec however – no wonder the clock lost time! Nice kind Steve stripped a stock JVC HR7350 to borrow a chip and keep Stu out of trouble while Ferguson replaced the faulty one. **S.B.**

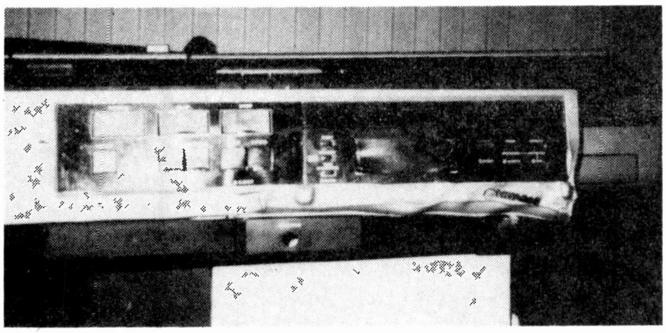
Sharp VC8300H

Milk had been spilt into a Sharp VC8300H, around the mechacon i.c. The board was cleaned and the machine was then tested. In fast forward or rewind the indicator LEDs lit, the motors ran but the tape didn't. On pressing the play button the loading ran in reverse. Panic!

When I calmed down I decided to find out why there was no fast forward. On checking, the main solenoid didn't move though its drive i.c. was being driven. The 20V supply to the solenoid was present, but there was no voltage on the start and hold leads. The deck has to be removed to get at the solenoid: on removing the tape covering the solenoid a thermal fuse was found to be open-circuit. Replacing this produced rewind and fast forward, also play – but don't ask me why the loading motor runs in reverse with the main solenoid open-circuit! **L.H.**

Hitachi VT9300

The accompanying photo shows the front panel of an



This Hitachi VT9300 survived a gas gun attack by a customer's son – a new front panel put things right!

Hitachi VT9300 – the customer's son had had a go at it with a gas gun! The machine worked all right however after removing the front panel – Hitachi tough as an old boot? **L.H.**

Hitachi VT9300

We've had trouble with the capstan motor in the Hitachi VT9300/GEC V4001 going stiff – the symptom is no play or intermittent stopping. The condition can be checked by removing the cassette lid and turning the motor by means of the pulley at the bottom of the capstan spindle – if it doesn't turn freely, remove the motor and spray with WD40 between the pulley and the top bearing, then spin the motor a few times. This should get it running freely. The problem seems to be due to hardened grease on the top bearing. We've had no bounces after treating six machines in this way. **L.H.**

JVC HR7700

The fault on one of these machines was a negative picture and buzzing in the E-to-E mode. Surprisingly, a replacement u.h.f. modulator failed to provide a cure. I felt sure that the fault lay in this area however. Voltage checks at the modulator's edge connector revealed that the supply pin 5 was at only 6V instead of 9V. The supply is obtained from the emitter-follower X12 (2SD638R) on the junction board (07) and it turned out that this transistor had a base-emitter short. A replacement restored normal operation. **M.J.C.**

Ferguson 3V31

The fault on a Ferguson 3V31 (now superseded by the dual-speed 3V32) was no record video signal. Scope checks revealed that there were no signals at TP223 and TP222 in the record amplifier section, though the record f.m. signal was present farther back at pin one of IC205 (HA11724), i.e. at the input to the record preamplifier in this i.c. The record amplifier consists of a complementary-symmetry push-pull circuit to match to the low impedance of the rotary transformers and video heads. Checks here revealed that the npn transistor Q235 (2SC1652Q) was short-circuit collector to emitter, thus shorting the record signal to chassis. Replacing Q235 restored the normal excellent quality of this machine. **M.J.C.**

Ferguson 3V23

In order to simplify the servicing of rented machines and limit stocks of costly spares, our company's policy is to exchange faulty machines for overhauled, tested ones. In this way an electronic machine came into the workshop with a label attached saying "eats tape". Following normal practice, we removed the cover and front to enable the cassette housing to be extracted. Inspection of the tape deck then revealed no tape oxide dust but an amount of rubber from the reel motor idler. Whilst we had the machine stripped down, all drive surfaces were cleaned. The housing was then reassembled and a tape inserted. Loading showed that the back tension arm was not going over fully, while fast forward search was extremely slow and painful. The culprit turned out to be a missing riveted boss on the supply brake assembly: in normal operation this would release the brake pad from the supply reel disc, allowing free transport of the tape. **M.J.C.**

JVC HR7350

We've had three cases to date of extreme wow and flutter, even seizure of the capstan motor, on this stereo version of the HR7300. The trouble seems to be due to a flat spot on the capstan motor bearings. Replacement cures the fault, but it seems a great pity that redesigning the positions of the capstan motor's fixing holes means an HR7300 capstan motor is not suitable as a replacement. **M.J.C.**

Ferguson 3V23

One of these machines would work perfectly in all modes except when still or slow was selected. It would then go into stop and unthread. We soon found that pin 6 of the microcomputer IC1 on the mechacon panel was receiving an interrupt signal. This signal is usually due to lamp failure, a stopped motor or the still/pause mode having gone into overtime. If still is selected, there's an approximately seven minute timer to provide head/tape protection. We eventually found that C42 (330μF) in the timer protection circuit was open-circuit, as a result of which the microcomputer chip was given an instant time-up signal and went into the stop mode. **M.J.C.**

Ferguson 3V32

The problem with one of these machines was sound distortion, coupled with a rise and fall in volume, varying between channels. Most odd! The output from the tuner/i.f. board was coming and going and it appeared that some form of muting was taking place. As with similar machines, there's a sound mute circuit which comes into operation when there's no signal. It operates rather like an ident stage, the sync pulses being used to drive a tuned circuit (T5). The output from this is coupled to the base of the muting transistor Q6 – high collector voltage here mutes the sound. We found that this voltage was wandering about. A tweak of T5 and this fault bit the dust. **B.McC.**

Hitachi VT8000

We've had no loading/unloading problems with these machines. The first thing to check is R081 (2·2Ω) on the system control panel for open-circuit. If faulty, replace it with a posistor kit (PTMAR2R2M). If still in trouble, check the loading and reel motors. Other items that might need to be checked are the HD44801A-05 microcomputer IC901 by replacement and the loading/unloading switches. **J.C.**

Service Bureau

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MITSUBISHI CT200B

There are faint green bands across the screen, about 5/8in. apart, when the colour control is correctly set. These bands are more noticeable with flesh and red/orange colours. For some reason they are not noticeable on a test card.

These striations are sometimes due to stray pick up of radiation from the line timebase. Make sure that the wiring harness has not been disturbed, and that the colour-difference drive leads to the c.r.t. base are as far as possible from the line output stage. If these measures fail to cure the fault, check the 22V supply reservoir capacitor C625 (100μF) and the following items in the blanker circuit: D620, D621 and C6D3 (10μF).

DECCA 100 CHASSIS

The picture is good except for curved verticals, noticeable particularly in the background — door frames for example. I've checked for dry-joints and tried all relevant adjustments but had no luck. A new line output transformer was fitted recently.

This sounds like an EW raster correction fault — you can confirm this by checking the raster sides on the test card. If so, check the EW driver transistor Tr312 (type 17351), the modulator diodes D401 and D402, and particularly the print connections to T402, L401 and plug PLB on the line output panel.

BERRYVISION 510

The trouble on this set is defective channel selection — it's fitted with touch tuning. I've changed the two i.c.s involved, the SAS560A and SAS570, but the problem persists. The next step would seem to be to change the six neons, but no one seems to list type TIL209.

LD701-6 are standard LEDs — suitable types are marketed by RS Components. It would be as well to fit a 4,700pF capacitor (with short leads) between pins 1 and 16 of each of the two i.c.s. Check the 10MΩ resistors in series with the touch contacts, also if necessary the touch panel chassis link resistor R707 (1·5MΩ), and thoroughly clean the touch panel and contacts with methylated or surgical spirit.

ROTATING PICTURE

The scanning lines on this monochrome portable (GEC 2114) slip, with the result that the picture moves round in circles. The fault is affected by the brightness and contrast controls — turning up either enables the picture to be locked for a short while. I've checked the video and a.g.c. circuits but cannot find anything amiss. We've a similar problem, this time unaffected by the setting of the brightness control, on a Bush TV350.

The cause of the fault is likely to be in the flywheel line sync circuit. In the GEC set, check the sync pulse phase splitter transistor TR209 and the discriminator diodes D206/7 (BA145, replace with type BY206). If necessary check the flyback pulse integrating resistor R234 (1·5kΩ), the reactance transistor TR210, and the two electrolytics in this stage — C224 (1μF) and C226 (10μF). In the Bush TV350 the items to check are D501/2, R513 (integrator) and C503 (filter, 10μF).

JVC 7445GB

After about an hour the channels start to change and then signals are lost altogether. This occurs with all the touch pads except number three, which remains stable. I suspect the channel selector i.c.s but these are difficult to reach.

The first thing to do is to clean the touch contacts thoroughly, preferably by dismantling them – grease and dirt deposits play havoc. If the fault persists, fit a small ceramic capacitor (0·001μF) between pins 1 and 12 of the two HD2909 channel selector i.c.s (IC01 and IC02). If this produces no improvement, replace IC01 then if necessary IC02.

THORN 9800 CHASSIS

The set will automatically switch off for a few seconds at intervals during an evening. To start with this would happen perhaps once a night, but the incidents are now becoming more frequent.

The recycling over-voltage trip seems to be operating intermittently. First make sure that the set h.t./e.h.t. control R725 is correctly adjusted – for 172V at connection 10-7. Then suspect the two zener diodes W712/3 and the thyristor W710 in the trip circuit. If the latter is type MCR106-5, fit a 100kΩ, ½W resistor across its anode-cathode leadouts.

HITACHI CNP190

There's no raster and the sound takes a long time to come up in volume. I suspect the e.h.t. doubler as the e.h.t. is only 6kV and the container has a hole burnt into it with a long crack. Unfortunately the lead between the line output transformer and the doubler is sealed in. Would anything else be a possible cause of the fault?

There seems little doubt that the doubler is defective. As you say, it's an integral assembly with the line output transformer T704, which means that both have to be replaced together. You will probably be able to prove that the doubler is faulty by disconnecting the e.h.t. leadout and dressing it well clear, when the sound and the auxiliary supplies from the transformer should come up to normal.

TELEFUNKEN 709 CHASSIS

The problem is line lock but very poor field hold. The voltages and waveforms around the sync and field timebase circuits all tie up with those shown on the circuit, with the exception of the sync separator transistor's collector voltage, which is slightly low. All bias/coupling components, also the sync and field driver transistors, have been checked/replaced – including those in the regulated l.t. supply. We've heard that the field output transformer is a weak point: could this be responsible in some way?

The usual cause of this symptom is a fault in the a.g.c.

circuit as a result of which there is excessive i.f. gain with sync pulse crushing. Check transistors T171 and T172 and the threshold diode Gr172. There's feedback from the field output transformer for linearity purposes but we doubt whether this would affect the hold: in our experience the transformer has proved to be reliable.

THORN 9800 CHASSIS

The set is stuck on channel 2 – any attempt to select another channel simply results in motor-boating noises. I assume this is an i.c. fault but am not sure which one to change.

The problem could be due to faulty neons – we generally replace all six at once. The first step however should be to dismantle and thoroughly clean the touch-tune contacts. If these measures fail to clear the fault, replace IC501 (type ML237).

TEST CASE

251

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.

Modern TV sets contain many wound components that operate at line frequency, and now that virtually all power supplies are of the switch-mode type, many of them working at line frequency, there are quite a few possible culprits when the complaint is whistling. This problem is becoming endemic of late, as relatively small ferrite-cored components are being called upon to handle large amounts of energy in the scanning, power supply and associated drive circuits. Due to physical effects and magnetostriction, it often happens that a resonance effect at a line-related frequency occurs, the afflicted component singing at 7·8 or 15·6kHz at a level that varies from slight to excruciating!

A recent encounter with this phenomenon occurred during the summer spell of very hot weather. The set concerned was a brand new Hitachi one, Model CPT2028 (NP82CQ chassis), which would produce a piercing whistle at random intervals – but only in high temperatures and after running for a while. This sort of intermittency is typical of a "nervous" ferrite core, and it's been our experience that the line linearity coil is the favourite in cases of this kind. In we dived, but couldn't find it. The manual confirmed that this set hasn't got one! By this time the singing had stopped, so we ran the set while pursuing other avenues of diagnostic frustration.

Eventually the whistle came back. We crept up and put gentle pressure on the chopper transformer T901. This immediately stopped the singing, and the suspect transformer was interchanged with another from an identical stock set. Both sets were switched on to run. It was some time before the whistle reappeared, and when it did it came from the first set, so plainly the chopper transformer was not responsible after all.

Each time the singing effect returned, another wound component was interchanged between the sets – and because of the spasmodic nature and "touchiness" of the fault, it took us several days to work through the line output transformer (T702) and the line driver transformer (T701). Each time the whistle returned it came from the original set, and we were beginning to have suspicions about the scan coils when we realised that a touch on any chassis-mounted component would stop the whistle whenever it appeared.

When we found the culprit, it seemed with hindsight obvious that little else could have been responsible for the symptom. The trouble was eventually cured without replacing any major component, and with no need for any further soak testing. So where was the whistle coming from? The only bird in our workshop is Wendy, the receptionist, and she has arms, not wings! See next month.

ANSWER TO TEST CASE 250
– page 658 last month –

The problem described last month concerned a Pye colour set fitted with the 731 chassis. The fault was no blue, because the c.r.t.'s blue gun was cut off. This was due to the blue output transistor VT463 providing no drive, for the very good reason that there was no voltage at its base. We'd discovered that the d.c. feedback voltage at pin 15 of the matrixing/preamplifier IC425 was low at around 4·5V. This voltage was coming from the 12V line, via R464, because there was in fact no feedback. What had happened was that R428E (27kΩ) in the video output stage thick-film resistor assembly had gone open-circuit. This suggested to the chip that VT463 was hard on, and as a result it reduced the d.c. drive level to compensate. A new thick-film unit restored normal operation.

The first voltage reading we took – 180V at the collector of VT463 – should have told us this. If the potential divider chain R428F/R428E/R468 had been intact, the voltage at the collector of VT463 would have been about 160V even with the transistor cut off. It's easy to be wise after the event!

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TELEVISION NOVEMBER 1983

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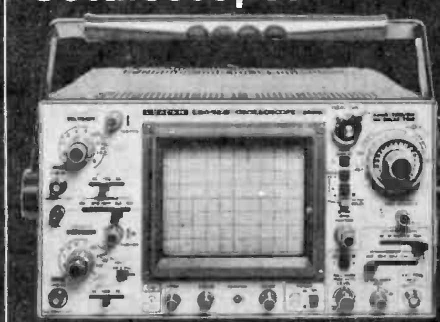

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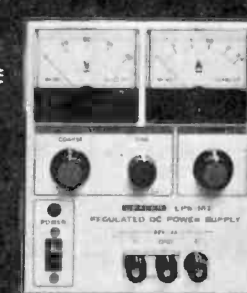

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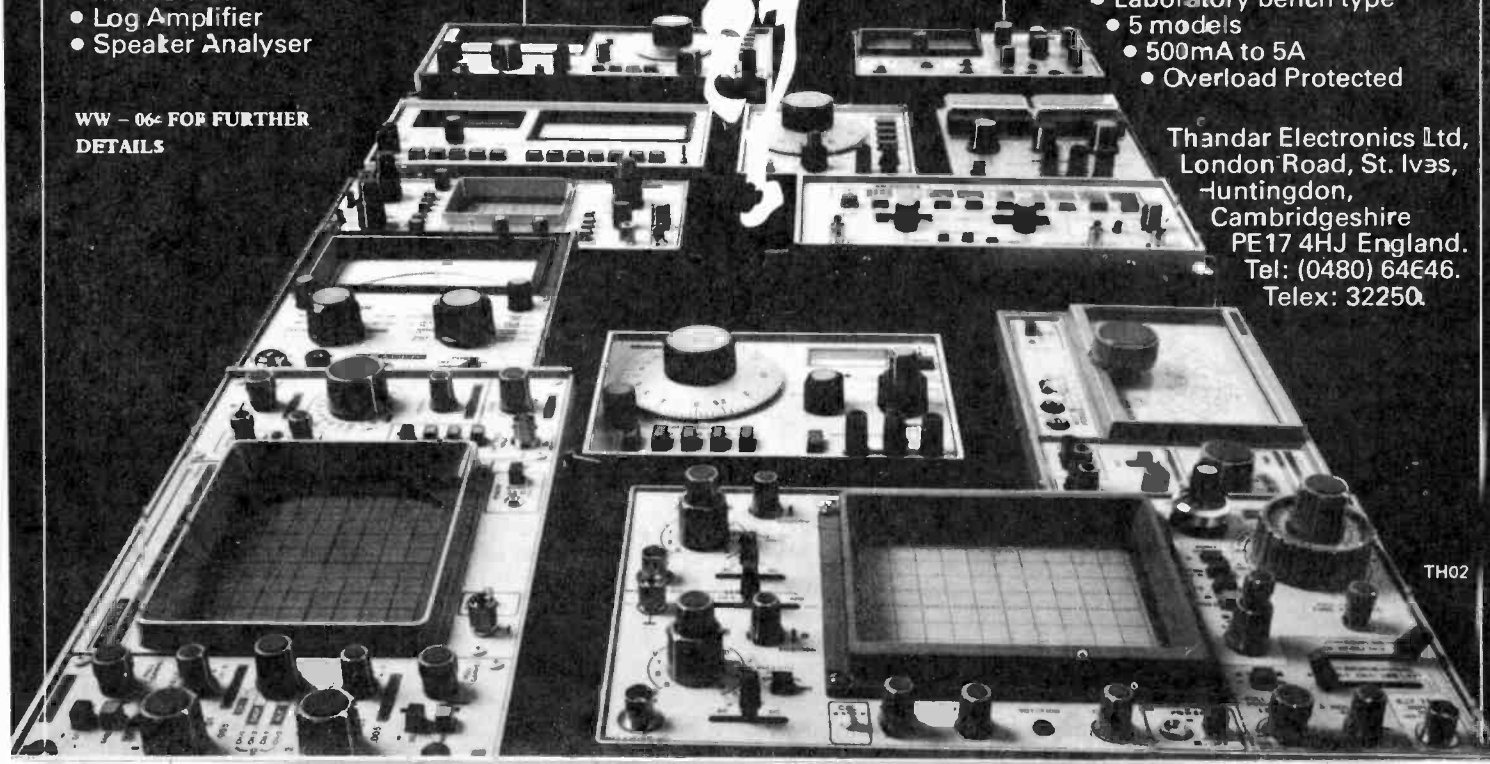

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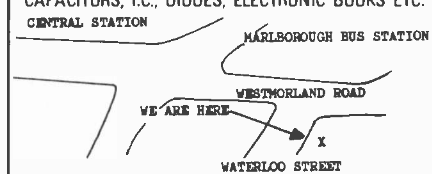

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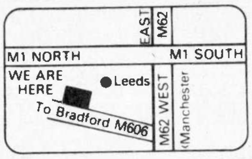

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