MAY 1983

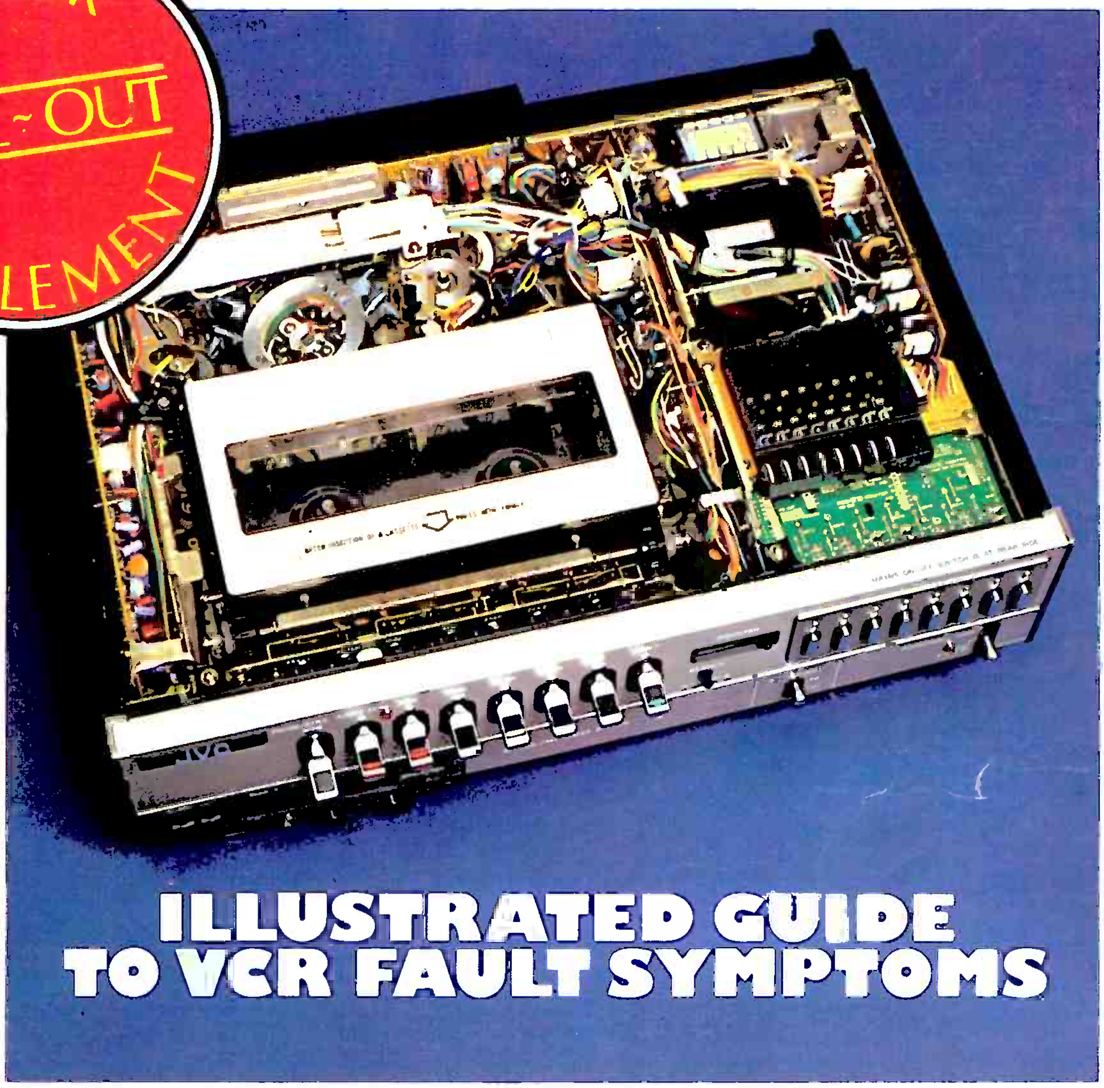
Australia $1.74: New Zealand $2.00: Malaysia $5.50: I.R. £1.33 (inc. VAT)

90p

TELEVISION

SERVICING·VIDEO·CONSTRUCTION·DEVELOPMENTS

COLOUR PULL-OUT SUPPLEMENT



ILLUSTRATED GUIDE TO VCR FAULT SYMPTOMS

EXPERIMENTAL 4GHz CONVERTER

ROUTINE TESTS: THORN 9000 CHASSIS

VCR CLINIC

NOVEL EHT SYSTEM

TEST REPORT

Interested in Television Servicing?

Try a ZED Pack. Effect Repairs at Minimum Cost.

Z1	300 mixed $\frac{1}{2}$ and $\frac{1}{4}$ watt and miniature resistors	£1.95
Z2	150 mixed 1 and 2 watt resistors	£1.95
Z3	300 mixed capacitors, most types amazing value	£3.95
Z4	100 mixed electrolytics	£2.20
Z5	100 mixed Polystyrene Capacitors	£2.20
Z6	300 mixed Printed Circuit Components	£1.95
Z7	300 mixed Printed Circuit resistors	£1.45
Z8	100 mixed High Wattage Resistors, wirewounds etc.	£2.95
Z9	100 mixed Miniature Ceramic and Plate caps	£1.50
Z10	25 Assorted Potentiometers	£1.50
Z11	25 Assorted Presets, Skeleton etc.	£1.00
Z12	20 Assorted VDR's and Thermistors	£1.20
Z13	1 lb Mixed Hardware, Nuts, Bolts, Selftappers, "P" clips etc.	£1.20
Z14	100 mixed New and marked transistors, all full spec. includes: PBC108, BC148, BF154, BF274, BC121L, BC238, BC184L and/or Lots of similar types	ONLY £4.95
(Z14A)	200 Transistors as above but including power types like BD131, 2N3055, AC128, BFY50 etc.	£9.95
Z15	100 Mixed Diodes including: Zener, Power, Bridge, Signal, Germanium, Silicon etc. All full spec.	£4.95
Z16	20 IN4148 Gen Purpose Diodes	£1.00
Z17	20 IN4003/10D2	£1.00
Z18	20 Assorted Zeners. 1 watt and 400 mw	£1.50
Z20	10 Assorted switches including: Pushbutton, Slide, Multipole, Miniature etc. Fantastic Value	£1.20
Z21	100 Assorted Silver Mica caps	£2.20
Z22	10 Mixed TV convergence Pots	£1.00
Z23	20 Assorted TV Knobs including: Push Button, Aluminium and Control types	£1.20
Z24	10 Assorted Valve bases B9A, EHT, etc.	£1.00
Z25	10 Spark Gaps	£1.00
Z26	20 Assorted Sync Diode Blocks	£1.00
Z27	12 Assorted IC Sockets	£1.00
Z28	20 General Purpose Germanium Diodes	£1.00
Z29	20 Assorted Miniature Tantalum Capacitors. Superb Buy at	£1.20
Z30	40 Miniature Terry clips, ideal for small Tools etc.	£1.00
Z31	5 CTV Tube Bases	£1.00
Z32	10 EY87/DY87 EHT bases	£1.00
Z33	20×PP3 Battery Connectors	£1.00
Z34	6×Miniature "Press to Make" Switches, Red Knob	£1.00
Z35	12 Sub Min S.P.C.O. Slide Switches	£1.00
Z36	12 Min D.P.C.O. Slide Switches	£1.00
Z37	8 Standard 2 Pole 3 Pos Switches	£1.00
Z38	4×HP11 Batt Holders (2×2 Flat type)	4 for £1.00
Z39	3.5mm Jack Sockets, switched, enclosed Type	8 for £1.00
Z40	100 Miniature Reed Switches	£2.30
Z41	100 Subminiature Reed Switches	£4.20
Z42	20 Miniature Reed Switches	£1.00
Z43	12 Subminiature Reed Switches	£1.00
Z44	TO3 Mounting kits (BU208)	8 for 60p
Z45	TO220 Mounting kits (TIP33)	10 for 60p
Z46	TO126 Mounting kits (BD131)	12 for 60p
Z47	Pack of each Mounting kit. All include insulators and washers	£1.50
Z48	3a 1000v Diodes (IN5408 type)	8 for £1.00
Z49	Brushed Aluminium Push Button Knobs, 15mm long × 11mm Diam. Fit standard $3\frac{1}{2}$mm square shafts	10 for £1.00
Z50	Chrome finish 10mm × 10mm Diam as above	10 for £1.00
Z51	Aluminium Finish. Standard Fitting Slider Knobs. (Decca)	10 for £1.00
Z52	Decca "Bradford" Control Knobs Black and Chrome. $\frac{1}{4}$" Shaft	8 for £1.00
Z53	Tuner P/B Knobs, Black and Chrome. Fit most small Diam Shafts, ITT, THORN, GEC etc.	8 for £1.00
Z54	Spun Aluminium Control Knobs (ITT) $\frac{1}{4}$" Shaft, suitable for most sets with recessed spindles	8 for £1.00
Z55	14 Pin DIL I.C. Sockets	12 for £1.00
Z56	16 Pin Quil I.C. Sockets	12 for £1.00
Z57	16 Pin DIL TO QUIL I.C. Sockets	10 for £1.00
Z58	22 Pin DIL I.C. Sockets	10 for £1.00
Z59	B9A Valve Bases P.C. Type	20 for £1.00
Z60	0.47Ω $\frac{1}{2}$ Watt Emitter Resistors	40 for £1.00

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
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

*Axial. All others are Radial.

CAN TYPES

22μf 375v (3 pin)	50p
50μf 250v (3 pin)	50p
100+200 350v	£1.00
2000μf 100v	£1.00
1000μf 100v	60p
2,200μf 40v	60p
2,200μf 63v	70p
3,500μf 35v	50p
4,500μf 35v	60p
220μf 400v ITT/RBM	£1.00

EHT DIODES

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

R.B.M. USERS LOOK!

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

SPECIAL OFFERS

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

12V BULBS on leads. Suitable for most **VIDEO RECORDERS.** **90p each 3 for £2.50**

BY127 Type diodes. Unmarked, untested, Approximately 90% o.k. **100 for £2.95**
AC128 untested **100 for £3.95**

ZENER DIODES

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

10 of one value	80p
10 of each	£6.60
1.3 watt, 12v, 13v, 18v	
10 of one value	£1.00
10 of each	£2.50

DIODES

25 × IN4002	£1.00
	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
25 × IN4002	£1.00
10 × SKE4F2/06 (600v 2a fast switching)	£1.00
12 × BY127	£1.00
8 × BY255 (3A 1000V)	£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

V.C.R. BATTERY PACKS.

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

THORN "VIDEOSTAR" 3V25/26 Nicad pack. Type VA214. Also suitable for J.V.C. etc. These are untested units which contain **10 × "C" size (HP11) Nicads,** which alone would cost in excess of **£20.** A Real Bargain at **£10 each 3 for £25**

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. $2\frac{3}{4}$"×2"×$\frac{3}{4}$" 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
Buch CTV 25 Quadrupler type Q25B equivalent to ITT TU25 3QK	£3.00 each, 2 for £5.00
Focus VDR Rods $2\frac{3}{4}$"×$\frac{1}{4}$". 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
Anti Corona Caps	3 for £1.00
4.433 Mhz CTV Crystals	£1.00 each, 3 for £2.50
Cassette Mains Leads. 7ft with fig 8 plug	60p each, 3 for £1.50
6 MHZ sound filters, ceramic 3 pin "TAIYO" type	50p each, 3 for £1.00
10.7 MHz Ceramic Filters "Vernitron" FM4	50p each, 3 for £1.00
PYE CT200 Control Knobs	8 for £1.00
Cassette/Calc Leads. 2m long, figure 8 skt. to flat pin. American plug	60p each, 3 for £1.50
3.5mm Jack Plug on 2m of screened lead	5 for £1.00
Degaus VDRs. $1\frac{1}{2}$" diam, for RBM etc.	5 for £1.00
Mains Neons	10 for £1.00
2k2 Screenfeed Resistors. White ceramic, 9 watt, with fusible link.	8 for £1.00
Philips G8 Transductor.	£1.20 each, 3 for £3.00
E.H.T. Discharge probe, with heavily insulated handle, with lead and chassis connector.	60p each, 3 for £1.50

THEY'RE BACK

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

5kg £9.95 **10kg £14.95**

THORN SPARES

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

"RIFA"

0·1μ 1000v Flameproof **5 for £1.00**

THYRISTOR

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

CONVERGENCE POTS

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

REGULATORS

7812 12v 1a	3 for £1.00
7805 5v 1a	3 for £1.00

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

May 1983

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All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.

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

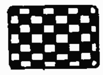
this month

OUR NEXT ISSUE DATED JUNE WILL BE PUBLISHED ON MAY 18

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**

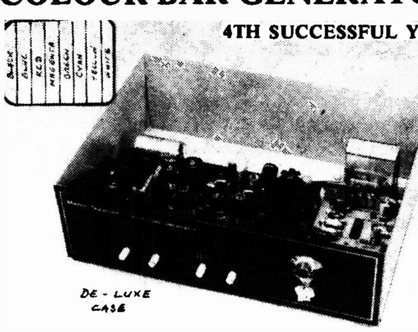
SPECIAL TEST REPORT 'TELEVISION' DEC. 1982

Post/Packing £2.50

All above prices include VAT 15%

PAL COLOUR BAR GENERATOR (Mk 4)

4TH SUCCESSFUL YEAR



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

PRICE OF 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 £80.50 + £1.80 P & P.
VHF MODULATOR (CHI to 4) FOR OVERSEAS £5.50.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

(ALL PRICES INCLUDE 15% VAT)

MANOR SUPPLIES TELETEXT ADAPTOR KITS

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

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

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BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

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

SAW FILTER IF AMPLIFIER PLUS TUNER COMPLETE AND tested for T.V. SOUND & VISION **£32.80** p.p. £1.20 (SUITABLE FOR USE WITH TELEVISION SIGNAL BOARDS).
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SPECIAL OFFER TEXAS XMII TELETEXT MODULE NEW & TESTED, AT REDUCED PRICE **£57.50** p.p. £1.60
PHILIPS-PYE G11 TYPE TELETEXT DECODERS **£34.50** 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 **£2.60** DE LUXE CASE **£5.50** p.p. £1.20.)
ADDITIONAL GREY SCALE KIT **£3.35** p.p. 45p.
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CRT TESTER & REACTIVATOR PROJECT KIT FOR COLOUR & MONO **£29.40** p.p. £2.00.
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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 T.B. salvaged **£11.50 each** p.p. £2.00.
GEC 2110 Decoder, RGB panels (ex rental) **£5.75 each** p.p. £1.00.
GEC 2040 DECODER PANEL **£2.88** 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 TX10 T.B. PANELS salvaged ex factory for spares **£17.25** p.p. £3.00.
THORN 3000 LINE T.B., POWER PCB **£5.75 each** p.p. £1.30.
THORN 8800 Varicap channel selector & front control unit **£4.37** p.p. £1.80.
THORN 8000/8500 IF/DECODER PANELS salvaged **£3.70** p.p. £1.80.
THORN 8000/8500 FRAME T.B. PANELS salvaged/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 210, 300 Series Frame T.B. Panels **£1.15** p.p. 80p.
PHILIPS G8/G9 IF/DECODER Panels for small spares **£1.75** p.p. £1.40.
G8 IF Panels for small spares **£1.15** p.p. 95p.
G8 Decoder panels salvaged **£4.25.** Decoder panels for spares **£2.00** p.p. £1.40.
G9 Scan Panel. Basic PCB in fibreglass **£16.68** p.p. £1.80.
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.
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.
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	**£5.60**
INDESIT 20/24EGB	**£8.80**	**GEC** 2040	**£6.70**
ITT/KB VC 200, 300	**£8.80**	**GEC** 2110 Series	**£12.20**
MURPHY 1910 to 2414 series	**£6.80**	**ITT** CVC 5 to 9	**£11.30**
PHILIPS 19TG 170, 210, 300	**£8.80**	**ITT** CVC 20	**£11.30**
PYE, INVICTA, EKCO, FERR. 368, 169, 569, 769 series	**£8.80**	**ITT** CVC25, CVC30 series	**£10.15**
SPECIAL OFFER		**PYE** 691-697	**£11.50**
DECCA 20/24, 1700, 2000, 2401	**£4.40**	**PYE** 713, 715, 731 to 741	**£7.85**
GEC 2114J/Junior Fineline	**£3.25**	**PYE** 725 (90°)	**£10.60**
PYE 40, 67	**£2.00**	**PHILIPS** G8, G9	**£10.15**
KB VC ELEVEN (003)	**£2.00**	**PHILIPS** 570	**£7.85**
KB VC1	**£3.25**	**THORN** 3000/3500 SCAN, EHT	**£7.85**
		THORN 8000/8500/8800	**£14.80**
		THORN 9000 to 9600	**£10.15**

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.
6·3V CRT Boost Transformers **£5.80,** Auto Type **£3.20,** p.p. £1.20.

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THOUSANDS OF ADDITIONAL ITEMS AVAILABLE, ENQUIRIES INVITED
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P. V. TUBES

REPLACEMENT ELECTROLYTICS

PYE 169 (200/200/100/32)	2.12
PHILIPS 320 (400/400/200V)	2.74
DECCA 30 (400/400/350V)	2.96
DECCA 80 (400/350V)	3.15
DECCA 100 (800/250V)	3.15
DECCA 1700 (200/200/400/350V)	4.83
PHILIPS G8 (600/300V)	2.21
PHILIPS G9 (600/300V)	2.21
PHILIPS G11 (470/250V)	2.90
PYE 691/7 (200/300/350V)	2.39
PYE 731 (600/300V)	2.31
RBM A823 (2500/2500/30V)	1.66
RBM A823 (600/300V)	1.26
RBM Z146 (300/300/350V)	3.15
RR1 T20A (220/400V)	2.00
ITT CVC5/9 (200/200/75/25)	2.47
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)	2.01
THORN 1500 (12/300V)	31
THORN 1500 (1591/1691 4700/25V)	1.20
THORN 3500 (175/100/100/400/350V)	2.46
THORN 3500 (1000/63V)	65
THORN 3500 (1000/70V)	84
THORN 8000/8500 (2500/2500/63V)	1.54
THORN 8000/8500 (4700 P/C 25V)	1.20
THORN 8000/8500 (700/250V)	2.31
THORN 8000/8500 (400/350V)	2.56
THORN 9000 (400/400V)	3.05
GEC (200/200/150/50)	2.64
PHILIPS 69 2200/63V	1.25

CAPACITORS AXIAL

Volts	Mfd	Price
6V3	33	9
10V	22	8
	47	8
	100	10
	220	12
	470	20
16V	33	11
	68	11
	220	14
	1000	20
	3300	53
25V	10	8
	22	8
	47	10
	100	12
	220	19
	470	24
	1000	38
	2200	48
	4700	80
40V	10	10
	22	10
	400	48
63V	1	12
	2.2	12
	4.7	11
	10	11
	15	12
	22	13
	33	12
	47	19
	100	23
	220	37
	470	49
	1000	58
	2200	94
100V	10	13
	22	15
	47	20
	100	29
	220	35
450	1	33
	2.2	30
	4.7	35
	10	30
	22	65
	33	75
500	1	32
	10	32
600	1	35

MIXED DIELECTRIC CAPS

Volts D.C.		
250V	0.91mF	84
400V	0.22mF	20
600V	0.1mF	41
1000V	0.01mF	24
	0.047mF	46
	0.033mF	33
	0.1mF	35
	0.22mF	68
	0.47mF	98
1250V	0.1mF	59
	0.91mF	85
1500V	0.0022mF	25
	0.0047mF	32
	0.022mF	30
	0.033mF	59
	0.005mF	60
2000V	0.0052mF	70

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	7.00
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
PYE 697 Repair Kits	6.97
ITT 6 way P/B with VCR	8.90
ITT/PYE/GEC 7 Button P/B	13.95
GEC 2110 6 way P/B	7.98
U321 UHF Tuner	7.50
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
KT3 PHILIPS	14.50
KT30 PHILIPS	10.30

SWITCHES

4A Double Pole On/Off Switch General Purpose Push/Push	66
Philips G8 Push On/Off Switch	1.38
4A Double Pole Rotary On/Off	66
A1 Beam Switch (THORN 3500)	70
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

CONVERGENCE PRE-SETS

3 Watt complete with knob
5R0-6R8-10R-15R-20R
50R-100R-200R-500R 60

METRIC CONVERGENCE POTS

PHILIPS G8
5R-10R-20R-50R 35

NEW PRODUCTS ASSTD.

Philips RGB 10G diodes	50
OR 39 3W resistors	60
Switch	2.60
Focus Unit	7.00
Focus Unit	2.70
Focus Unit	2.30
Philips Clock Radios (AS390)	21.39
Fluorescent Torch	6.50
5 pin-5 pin Audio Leads	95
Travel Plugs	3.50
Electrical Circuit Testers	1.50
Video Head Care Kit	3.50
L5 7" × 3½" Speaker 15R	4.25
Ayr Teletext Adaptor	127.00
Battery Chargers Universal	6.75
Gen. Purpose Thristors THY15/80	2.20
(many applications) THY15/85	
Diodes SKE 4/2/02	1.09
SKE 5F/3/10	1.19
SKE 4G/2/06	90
Video Heads VHS ("Universal")	38.00
Diodes Y723	1.30
Y827	1.42

BATTERIES

RX6 – HP7/NN1500	1.39
RX14 – SP11/HP11/NN1400	2.17
RX20 – SP2/HP2/NN1300	2.34
RX22 – PP3/NN1604	4.69

VIDEO/AUDIO

VHS E30	3.06
VHS E60	3.66
Scotch E120 Video Tape	5.00
Scotch E180 Video Tape	5.13
BETA L500	4.90
BETA L750	5.80
PHILIPS VCC 240	5.93
PHILIPS VCC 360	8.30
PHILIPS VCC 480	10.21
Video Cassette Cases (Red/Blue/Green/Brown)	80
Scotch Audio Tape C90 Ferric	65
C90 Super Ferric	96

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

SUNDRY TUNER ACCESS.

RANK Tuner P.B. 1½" × ½"	35
2" × ½" (yes we have some!)	35
2" × ¾"	35
RANK Drive Cams	10
GEC 2110 Tuner Neons	14

SUNDRIES

Delay Lines DL60	2.20
DL700	2.20
DL50	2.20
EHT Final Anode Cap	53
EHT Cable	25p mtr.
6.3V CRT Boost Trans.	4.35
13A Plug Top box 12	4.80
Quick Set Adhesive	78
Moulded Plastic Hex. 6mm Trim Tools	10
Double End 4mm/8mm Trim Tools	20
Focus Rod	1.25
Focus Holder	2.00
Keynector Safe Block (mains)	5.50
Cassette Drive Belts per pack of 5: 44.5mm	1.65
64mm	1.71
74mm	1.80
57mm	1.65
89mm	1.90
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, 12V 200ma	3.25
Mains Connector 4 way 13A	5.00

TEST EQUIPMENT

Portable Oscilloscope	150.00
Probes x10	10.90
CRT Tester/Rejuvenator	172.00
KHP30 Measuring Probe (3 okv) EHT	29.95
T120 RF Signal Injector	4.00
Avo 8 Test Lead Set	4.20
Degaussing Coil (stick type)	15.50
Degaussing Coil (disc type)	24.00
Universal Battery Charger	7.50

SERVICE AIDS

SERVISOL Freeze-It	96
SUPER SERVISOL	88
SERVISOL Foam Cleanser	84
SERVISOL Plastics Seal	88
SERVISOL Silicone Grease	1.00
SERVISOL Tubes Silicone Grease	1.60
SERVISOL Aero Klene	78
SERVISOL Aero Duster	94
SERVISOL Excel Polish	76
Penetrating Fluid	70
Fire Extinguisher 640G	2.80
Heat Sink Compound 25G	1.08
Silicone Rubber Tube 110G	2.98
Solda Mop standard reel	72
Super 40	1.50

FUSES

	Per type	Pack of 10
1¼" QUICK BLOW 100ma		70
250ma-500ma-750ma-1A		60
1.5A-2A-2.5A-3A-5A		60
1¼" ANTISURGE 250ma		1.60
500ma, 600ma, 630ma, 750ma, 850ma, 1A, 1.25A		
1.5A, 2A		1.70
2.5A, 3A, 5A		2.50
20mm × 5mm ANTISURGE 80ma		4.80
100ma		2.40
160ma, 200ma		2.20
315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A		1.30
2A		1.80
2.5A		1.90
3.15A		1.89
20mm × 5mm QUICK BLOW 100ma, 250ma, 500ma, 630ma, 800ma		60
1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A		60
1" MAINS 2A, 3A, 5A, 10A, 13A		1.00

AERIAL ACCESS.

Aerial Jump Lead 2m	
Triang Splitter	1.20
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	1.60
Olympic II Set Top Aerial	2.20
M.H.A.U.P. the pair	16.00
Aerial Isolator Kit	2.08
4m Fly Lead	1.20
2m Fly Lead	90

ANTIFERENCE

CS200/SP Comb/Splitter	2.96
SB11 Indoor Splitter	1.91
COB11 Single Outlet	78
TRR/VSP Transformer 75-300R	2.25
Super Set Top Aerial	6.80
Caratenna	7.80
XG8 High Gain Aerial A-B-CD or W/B	17.50

NB A full range of aerials and accessories available from trade counter.

MINIATURE SKELETON PRESET POTS

Horizontal or Vertical
100R-220R-470R-1K0-2K2-4K7-10K-22K-47K-100K-220K-470K-1M0 15p each

STANDARD SKELETON PRESET POTS

Horizontal or Vertical
100R-220R-470R-1K0-2K2-4K7-10K-22K-47K-100K-220K-470K-1M0-2M2-4M7 15p each

SLIDER POTENTIOMETERS

Lin or Log

470R	65p	2K2	65p
4K7	65p	47K	65p
1K	65p	100K	65p
10K	65p	470K	65p

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

THERMAL CUT OUT

THORN 3000 2A Metal	1.60
THORN 8500 2.5 Plastic	1.60
GEC 2040 Metal	2.50

MULTITURN POTS

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

THICK FILM RESISTOR NETWORK

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

EAGLE PRODUCTS

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

DF615 Full Range Speaker 6½"	8.95
Multimetres	
KEW 7N 2,000 opv	5.25
KEW 20	14.50
EM5 5,000 opv	9.95
EM10 10,000 opv	11.50
EM20 10,000 opv	13.95
EM50 50,000 opv	19.95
EMC321 Carrying Case for above	2.25
Digital Meter TS1000	44.50
MM20 20,000 O.P.V.	21.95
MM50 50,000 O.P.V.	25.95
MM100 100,000 O.P.V.	36.50
MM125 100,000 O.P.V.	45.00
MM150 100,000 O.P.V.	59.95
TL64 Test Leads	1.20
Case for MM100	15.95
T1206 2 Station Intercom	6.95

DATA BOOKS (No VAT)

Transistor Equivalent TVT 80 A-Z only	3.75
TVT 80 2N/2S series only	4.00
TVT 80/80 A-Z and 2N/2S together	7.50
LIN IC Books LIN 1	5.95
LIN 2	5.95

Please ensure that you order out of the latest magazine to avoid missing some inevitable price changes.

ELECTROLUBE PRODUCTS

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

DISC CERAMIC CAPACITORS

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

LABGEAR

CM7061 Power Unit 12V	10.70
CM7062 Reg. Power Unit 12V	11.67
CM7060 MHA 10db 12V W/B	8.94
CM7065 VHF/AHF MHA W/B 12V	13.01
CM7067 UHF 12V MHA (Specify A-B or C/D)	9.73
CM7068 UHF 12V MHA High Gain (Specify A-B or C/D)	14.47
CM7053 Behind Set UHF Amp. (Mains)	11.81
CM7054 Behind Set UHF Amp. (Battery e.g. Caravans)	9.45
CM7043 Second Set Amp. UHF	11.00
CM7093 Behind Set UHF Amp. 3 Sets	13.86
CM7068 Dist. Amp. VHF/UHF 17db/output 12V	20.10
CM7073 VHF/UHF 8z1 Dist. Amp.	39.24
CM9700 27mhz CB Suppress.	3.68
CM6011 Outdoor Splitter (2 way) W/B	7.10
CM9003 Flush Single Outlet	1.34
CM9010 Flush Twin Outlet	1.78
CM9034 UHF Group Filters with DC Through Pass (state A/B/CD/)	6.90
CM6006 6 Way Passive Splitter	11.52
CM7042 TV Games Combin.	2.56
CM9009 Flush TV/FM Outlet	2.77
CM7069 Tri Star Amplified Set Top Aerial W/B	17.59
CM7090 Amplified Caravan Aerial 12V DC W/B	15.52
CM6038 UHF/VHF 625 Pattern Gen.	96.05
CM6052 UHF/VHF PAL Colour Bar Gen.	235.06

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	7.39
THORN 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	6.70
PHILIPS G8 Long Focus 550	6.70
PHILIPS G9	6.37
PYE 691/3/7	6.58
PYE 713/4 Lead	7.00
PYE 731/725	7.60
R.B.M. A823 (plug in) AV	7.40
R.B.M. A823	7.40
R.B.M. T20	6.60
KORTING (similar to Siemens TVK1)	7.32
ITT KB CVC5/9	10.85
ITT KB CVC20/25/30 (Mullard)	8.60
RRI T20	6.80

MAINS DROPPERS

DECCA 20	2.48
DECCA 2R5	85
DECCA 27R/47R	1.40
DECCA 56R/6R8	1.40
R.B.M. A823	88
R.B.M. 161	82
GEC 2000/2018	70
GEC 27840	64
PYE 713/15 3R5/15/45R	1.80
PYE 731 3R/23W	1.98
PYE 725/31 3R0/56R/27R	1.84
PYE 725 56R/27R	1.84
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
RANK 56R-68R A823	94
THORN 1400	1.50
THORN 1500	1.38
THORN 1600	1.77
THORN 3000/3500	99
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.

HOW TO ORDER

ADD 65p per order for Post and Packing (UK). (Export orders will be charged at cost.)
THEN ADD 15% VAT TO TOTAL COST.
Orders which contain aerosols or degaussing coils are very heavy — please add extra 30p per can/coil.
First Class Mail is used whenever possible.
All enquiries S.A.E. please.
VAT invoice on request.
SEE SPECIAL NOTE RE MAIL ORDER TUBE COSTS.
Goods are despatched on the day we receive your order. If for any reason we are out of stock we will try to inform you as quickly as possible.
We try our best to give a speedy, fair and efficient service. As our regular customers know, orders telephoned in before 4 p.m. will be despatched the same day.
Give us a ring — we'll give you service.
Please ask if what you need is not listed — we will try to help.
For test equipment etc. Please allow an extra 50p per parcel.
Prices are subject to change without notice.

TOP WINTER VALUE FROM BTC–THE TV SPECIALISTS

You won't better these BTC bargains!

Top quality sets to set you up for the winter televiewing boom. Brighten your winter profits with better sets from BTÇ.

	Sets	Untested		Working	
COLOUR	**HYBRIDS**				
	DECCA BFD 30 TELPRO KORTING PYE 697, GEL 2040	SINGLES	£15.00	SINGLES	£25.00
		FIVES	£12.00	FIVES	£20.00
		TENS	£9.00	TENS	£18.00
COLOUR	**SOLID STATES**				
	PHILIPS G8's 2-CHIP BUSH/MURPHY GEC 2110, 8500 3500 VARICAPS P/BUTTON HITACHI's 18" PHILIPS	SINGLES	£25.00	SINGLES	£35.00
		FIVES	£20.00	FIVES	£30.00
		TENS	£18.00	TENS	£28.00
COLOUR	**1-CHIP BUSH/MURPHY** THORN 3000, THORN 8000 18" PYE's ROTARY JAPS	SINGLES	£20.00	SINGLES	£30.00
		FIVES	£18.00	FIVES	£28.00
		TENS	£15.00	TENS	£25.00
COLOUR	**LATERS SETS** i.e. THORN 9000 TOUCH TUNE SETS ETC.	SINGLES	£35.00	SINGLES	£45.00
		FIVES	£32.00	FIVES	£42.00
		TENS	£30.00	TENS	£40.00

MONO — **SINGLE STANDARD MONO TV's IN BATCHES OF 20 @ £4.00 EACH**

PLEASE NOTE 15% VAT ON ALL PRICES

0274~306018

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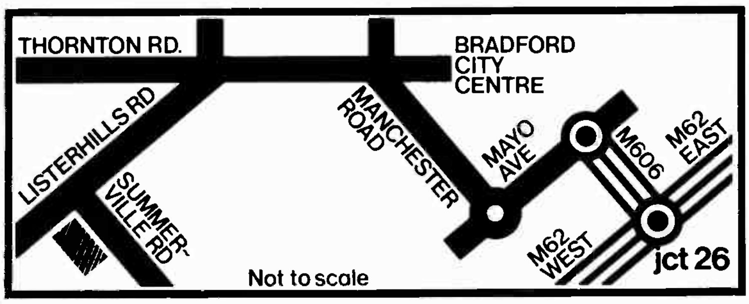

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Technical Prospects

One thing about television is that it never stands still for long. That prevents us getting either bored or complacent. Even in the days BC (before colour), there was a constant succession of developments – flywheel sync, vision a.g.c., new valve ranges, the use of higher and higher frequencies and so on. AC (after colour) brought solid-state circuitry in many forms, the intrusion of digital techniques for teletext and remote control purposes, and the whole gamut of video technology. What next?

It seems reasonably safe to suggest that digital techniques will play an increasingly large role in TV receivers. The use of digital techniques in the timebase generator stages will give rock-steady sync, while converting the video signal into digital form will enable almost anything to be done to it depending on the amount of digital memory available in the receiver. The BBC have promised us digital sound signals for their DBS services, and are investigating the use of digital sound for terrestrial two-channel transmissions.

A digital field oscillator is already in use, as mentioned in our report on the Thorn 1696/1697 chassis in the February 1983 issue – it's in the Monomax i.c. Some eighteen months ago, in November 1981, we reported on the set of LSI and VLSI chips being developed by ITT in W. Germany to provide digital TV receiver signal processing – the ITT Digivision system. The i.c.s were presented at the 1981 Berlin Radio Show and the 1982 Paris Components Show. Sets using the i.c.s are to be demonstrated at this year's Hanover Fair, Berlin Radio Show and the Great Home Entertainment Spectacular to be held in the UK later this year. Digivision ITT sets are expected to be on sale in the UK early next year. They are likely to be up-market models, though it may be only a matter of time before the technology appears in simple, no-frills receivers. It all depends on relative costs as the production of digital TV i.c.s increases.

ITT are not alone of course in developing chips of this sort. Others treading the same path include Philips, RCA, Sony and Hitachi. How long will it be before most TV chassis use digital signal processing? It's probably relevant to recall the long time it took for discrete component i.f. circuitry to become obsolete. I.F. i.c.s have been around for many years, but it took quite a time before performance and cost swung decisively in favour of the i.c. approach. The digitalisation of TV receiver signal processing is likely to follow a similar pattern.

The conventional analogue approach is perfectly satisfactory of course – so are thermionic valves for that matter! – but just think about what can be achieved once the video signal has been converted to digital form. First it can be regenerated – converted to nice square pulses to remove signal distortion effects. Then features such as picture-within-a-picture, picture zoom, still pictures and slow motion become possible. These are probably rather unnecessary – you don't want to spend your time playing with the set rather than viewing, while reports on VCR use suggest that such features are seldom in practice used. More interesting is the prospect of using digital technology to double the number of lines to give high-resolution pictures. One of the problems here is that a high-resolution tube would be required to display the picture, though computer requirements have already led to much work being done in this field.

In ten years then the average domestic telly could be a precision instrument compared to today's set. What else? Cable/DBS will extend the range of programmes available, though the extent of the likely increase is open to question. The present problems with TV-am underline the fact that merely filling an empty slot in broadcasting time is of questionable worth. You've got to substantially increase the number of programmes made for television if a real increase in choice is to be provided. Programme production is an expensive business however, and since viewing habits long since reached saturation point the more programmes transmitted the smaller the prospective audience for each. It remains to be seen how the economics will turn out, though the difficulties experienced by US cable operators suggest that cable is not going to be the bonanza it's been made out to be in some quarters.

It's also interesting to note that delays in the establishment of cable networks – the necessary legislation will take time, and an election will probably intervene, while the services have yet to be sold to the public – mean that few people will have the cable at their doorsteps before DBS starts. The cable enthusiasts had hoped to get going before the advent of DBS, and to offer the DBS services via cable. As it is, it's more likely that the public will be installing DBS dishes and then finding they've enough choice without cable's offerings – especially with the amount of material available on tape and disc. Much was made of the prospects of selling cable technology abroad during the great cable debate – but we might do just as well by selling dishes and microwave electronics.

This leaves the display device. We've not heard so much about flat-screen displays recently. They seem to be as far off as ever. If high-resolution tubes come into wide use the day of the flat-screen display will recede even further. The c.r.t. may be bulky, but there's no more efficient picture source than a phosphor screen activated by an electron beam.

PCB SERVICE

The Readers' PCB Service continues in operation – details as given on page 265 of the February issue. Boards for the Frequency Counter-Timer project will be available, also for the In-Circuit Transistor Tester (see next month).

Long-distance Television

Roger Bunney

FEBRUARY 1983 was a relatively quiet month, the only events of note being a tropospheric lift over the 13-19th (peaking on the 18-19th) and enhanced auroral activity on the 4-5th. A very slow moving high pressure system gave almost two weeks of freezing temperatures during the month, with clear skies – the classic condition leading to tropospheric propagation. As the pressure started to fall, so the signals rose. The midlands/north of the UK seem to have faired better than the south for European TV reception. Indeed Ryn Muntjewerff (Holland) reported "a little tropo" on the 16-17th which would normally have meant reception of a considerable number of stations. In his case Band III and the u.h.f. bands were open, producing CST (Czechoslovakia) chs. R10/R38, while here at Romsey (Hants) there was improved reception from the east (i.e. France and the Low Countries, and just W. Germany), but nothing on the scale of the tropospheric opening in January.

Reports from Cyril Willis (Cambridge), Garry Smith (Derby) and Iain Menzies (Aberdeen) indicate that things were better in the north. Garry Smith for example received several W. German stations and DFF (E. Germany) at good strength from around 2100 onwards on the 15th. Following this peak (15th) things died down until the 18th, when Band III and the u.h.f. bands opened up, giving W. and E. German signals and, at Cambridge, two European ATV stations (DC40N and ON6LM, W. Germany/Belgium). At Derby reception was mainly from Belgium, France, W. Germany and (just) E. Germany (at u.h.f.). The peak occurred on the night of the 18th/early 19th – when Cyril Willis rose at 0500 he was rewarded with TVP (Poland) on ch. R30. Conditions fizzled out during the morning, and by 1200 things were dead. It's interesting to note that several enthusiasts received forces TV stations – AFN ch. E34 (Shape) and various BFBS outlets – during the period, the main ones being on chs. E28/48. Another small lift occurred on the 23/24th, experienced mainly in the north – Iain Menzies reported reception of a large number of NRK (Norwegian) Band III transmitters at good strengths.

Intense auroral activity was logged throughout the UK on the 4/5th, mainly in northern parts, though there was some evidence along the south coast. All the Band I channels were affected and Cyril Willis noted suspected System M signals on chs. A2, 3, 4. Both early and late phases were observed on the 4th, but the 5th was less intense and only the early phase seems to have been seen.

There was the usual meteor scatter reception – short signal bursts of anything from one to ten seconds. The signals generally logged here are from SR (Sweden), CST and TVP (Poland) on chs. E2/R1. For those with no experience of this mode of propagation, the procedure is to leave the set tuned to one of these channels, with the correct line and field settings, and eventually short bursts of picture information will be seen – the best time is early morning, though MS occurs throughout the twenty four hour period.

There were SpE signals on the 7th, during the evening (2100-2300), on chs. E2/E2a/IA/E3. The only identified programmes were from RAI (Italy) on ch. IA, the others showing mainly skiing.

My thanks to Cyril Willis, Iain Menzies, Garry Smith, Arthur Milliken and Ryn Muntjewerff for sending in reports of their reception.

News Items

Eire: A new list of RTE TV transmitters has been issued by RTE (available from Reception Investigation Dept., RTE, Dublin 4). The main transmitters and the relays with over 1kW e.r.p. are as follows.

Main transmitters	*RTE-1 channel*	*RTE-2 channel*	*Vision e.r.p.*
Three Rock (Dublin)	29	33	25
Cairn Hill (Longford)	40	43	800
Kippure	H	—	100
Maghera	B	H (V)	100
Mt. Leinster	F (V)	I (V)	100
Mullaghanish	D (V)	G (V)	100
Truskmore	I	G	100
Clermont Carn (Co. Louth)	52 (V)	56 (V)	250
Holywell Hill (N.E. Donegal)	23	26	20
Relays			
Achill	E	H	1
Cahirciveen	F	I	1
Castlebar	D (V)	F (V)	1
Clifden	D	F	1
Fanad	F	D	2
Monaghan	D	—	1

Polarisation is horizontal unless otherwise indicated (V = vertical).

Spain: The "Euskal TeleBista-TV" Basque service is now in operation with studios at Durango (Vizcaya). The Philips PM5544 test pattern with ETB identification in the upper black rectangle is used. Transmitters are: Durangesado ch. E33; Bilbao ch. E35; Vitoria ch. E42; Jaizkibel ch. E51.

E. Germany: The Helpterberg ch. E3 DFF-1 transmitter (an old friend of DXers!) has now closed, the service being transferred to ch. E37.

SEBC: As mentioned last month, this stands for Southern European Broadcasting Corporation. The mystery of the ch. A2 TV transmissions from the same direction now seems to have been solved. Duncan Fraser reports that there's an AFRTS transmitter at the base in Vicenza, Italy. Readers will recall that ch. A2 transmissions have been received via SpE from this direction for several years, though the AFRTS deny operation in Band I in Europe or the Middle East.

New EBU listings: Spain Villadiego RTVE-1 ch. E47, 200kW. The Finish Taivalkoski ch. E2 YLE-1 transmitter has now closed down – yet another old friend of DXers.

Publications

Newsletters have arrived from Cyril Willis and Dave Launder during the month. The former is called "DXTV News" and is issue number one. It's hoped to publish this monthly at £4·50 for six issues. The publication, on photocopied A4 paper, includes photographs, news items, details of DX equipment, reception logs and profiles of DXers and their equipment – Iain Menzies and Arthur Milliken are featured in this issue. For further details send s.a.e. to Cyril at 17 Main Street, Little Downham, Ely, Cambs CB6 2ST.

Dave Lauder's "DX-TV Group Newsletter" is published every two-three months on photocopied folded A4 and has a much more technical bias. Items include information on auroral E layer propagation and likely dates, methods of monitoring the TV bands with audio warning of signal onset (a circuit using the MC1310 stereo decoder i.c. tuned to the 15·625kHz line fequency is shown), a test report on a Hugh Cocks' MOSFET preamplifier, satellite information and a brief rundown of reception loggings. A sample can be obtained by sending a SAE to Dave at 18 Burnside Close, Barnet, Herts EN5 5LN.

I feel it's an encouraging sign of the increasing interest in TV-DXing that such newsletters are becoming available. One favourable aspect nowadays is the comparative ease with which equipment for DX use can be obtained – no need to modify old 405-line receivers!

Robert Copeman has sent an Australian list of radio/TV stations entitled "Sound and Television Broadcasting Stations", dated June 30th 1982, edition three, published by the Australian government's Department of Communications. The book costs $4 from the Australian Government Publishing Service, Canberra. Include sufficient postage – the weight is 175g.

"Build a Personal Earth Station for Worldwide Satellite TV Reception", a Tab book by Robert J. Traister, has been sent by Maplin Electronics. This provides a mainly US approach to the subject and doesn't contain circuitry. It's really a practical guide to the installation and operation of the types of commercial terminal kits available in the USA, at prices now of under $2,000 for a complete system. As a general guide to 4GHz satellite reception I found it interesting and informative. The book has 296 pages and costs £8·25 in the UK. It concentrates on how the equipment works rather than how to construct boards, feedhorns, etc.

A list of CB filters is available from AKD, 10 Willow Green, Grahame Park Estate, Hendon, London NW9 5GP on receipt of a SAE. The filters are all in-line types for 75Ω coaxial cable use. There are various types with mainly braid/inner break functions – the BB1 for example has a 1:1 transformer braid break only.

Simple IF Preamplifier

A simple BF254 (or equivalent) transistor wideband i.f. preamplifier circuit has been sent to us by the French TV-DX club AFATELD, see Fig. 1. It's for fitting at the output of a standard u.h.f./v.h.f. tuner. An i.f. transformer could be added at the input to increase the selectivity, but

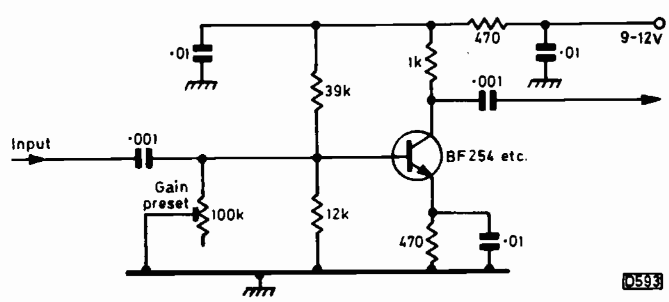

Fig. 1: Simple i.f. preamplifier circuit. A BF254, BF314 or equivalent transistor can be used.

I feel that its merit lies in simplicity and that sufficient selectivity should be available in the later i.f. stages to give adequate DXing performance.

From our Correspondents . . .

Ian Moody (Sutton) has been TV DXing for three years and is now using a Ferguson 3840 (Thorn 1690 chassis) with good results. He's sent details (see Fig. 2) of modifications to the receiver to cater for French u.h.f. vision signals. Switched, parallel detector diodes are used, the subminiature SPDT toggle switch S1 selecting the video sense. R1 is introduced on system L to reduce the bias applied to the base of the video driver transistor to avoid picture flaring. A 10kΩ preset could be used in this position, set for optimum results, but the value of 6·8kΩ works well enough. Ian mentions reception of aircraft scattered French u.h.f. signals due to his proximity to flight paths!

Ian Johnson (Bromsgrove) reports that the Bush Ranger Model BM6714A Mk. III, with its discrete component i.f. stages, is good for DXing – he's got two of them in use and judging by his reception during January they're working very well. MS signals synchronise easily and over the period January 10-26th there was only one day when he failed to log anything.

Since the Thorn 1690/1 series chassis is no longer in production, I would appreciate comments from readers on alternative current models suitable for DX use. The aim is to compile a list of suitable models for future publication.

Mike Ockenden (Pevensey, Sussex) reports that the French version of Nationwide goes out at 1920-1940 local time and includes regional identifications (Nord, Picardie, etc.) which appear behind the newsreader.

John Tellick (Surrey) reports that the Gorizont downlink channel 3 carried Top of the Pops on January 27th just three hours after the UK transmission but with the links (i.e. announcements between numbers) badly edited out! This was followed by the recent King Kong feature film. On subsequent nights various W. European offerings that were flying around the Eurovision links were to be seen.

Chandra de Silva (Colombo, Sri Lanka) is using a standard domestic Tatung monochrome receiver which, with an eight turn indoor helix aerial and no aerial amplifier, is able to resolve the sound and vision signals from the Ekran satellite (714MHz downlink).

Miniature Active Aerials

For some years I've been interested in compact active aerials, and have experimentally made a ch. E4 (62MHz) system using helically wound "rubber ducks". This, with an amplifier, provides better results than a standard dipole whilst being only 18in. long. The opportunity arose recently to test a commercial active aerial produced in the Far East – one with a combined v.h.f./u.h.f. array and integrated amplifier. The system is so integrated that the riveted PVC container can't be opened – it's not even translucent! The length is some 680mm., the width 470mm. and the thickness 50mm. An optional add-on element extends the coverage via internal filtering to the "hi" band (i.e. Band III), or a larger folded dipole can be added for v.h.f. reception down to 40MHz. The one I've tested has this folded dipole.

The results at u.h.f. have been surprising. I'd expected poor results considering the size of the aerial, which appears to be some form of log-periodic array at u.h.f. The unit was mounted at 41ft above ground level and powered. Comparison tests were then made with an Antiference XG21W and Labgear CM7066 amplifier mounted at 63ft. The measured output from the active aerial system on Crystal Palace ch. E23 was found to be only 5dB down on the XG21W combination. Obviously if the active aerial was lifted to 63ft there would be a corresponding increase in its output. There are possibilities for improvement. For example there's no efficient reflector system (I suspect that the rear mounting clamp is all that gives rear protection): a suitably mounted reflector would increase the forward gain and improve the front-back ratio from the present 6-16dB to a constant 25dB. The beamwidth at the −3dB points resembles that of the Colour King type aerial – around 55-65°.

The Band III performance seemed to be good, at least when compared with an Antiference HC2011R with 12dB gain amplifier. Again improvement could be obtained by adding a reflector – the Band III element is the sole v.h.f. pickup, the front-back ratio being 0dB.

The performance on Band I is poor when compared with a two-element wideband aerial of the WB2 type.

It would appear to be best to exploit the active system for its Band III/u.h.f. coverage. I would expect two units correctly stacked for u.h.f. operation to have a 30° beamwidth at the −3dB points, with a 40-45° beamwidth in Band III when used with a suitable double reflector system.

The amplifier is again a mystery, being hidden away inside, but is obviously mounted directly on to the u.h.f. array, thus obtaining an optimum noise match. The amplifier operates at 12V, 120mA and has a noise figure of 1·7-3·5dB.

Further tests will be carried out to establish the aerial's potential for DX use. It certainly resolves the stronger Band I MS and weakish u.h.f. tropospheric scatter signals, and the results on London u.h.f. (a steady, over the horizon signal here) seem convincing.

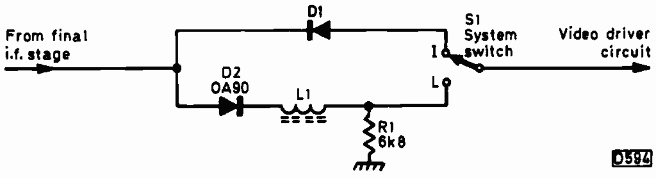

Fig. 2: Switched video detector circuit for the Thorn 1690 chassis.

Small-screen Dual-standard Portables

Some time back I reviewed three small-screen (approximately 5in.) monochrome portables featuring v.h.f. and u.h.f. tuners and sound i.f. switching between system B/G (5·5MHz) and system I (6MHz). The one best suited for DX use was the Plustron Model TVR5D, which also has f.m./l.w./m.w. radio coverage. The importers have now discontinued this model unfortunately, so I'm at present investigating possible alternatives. I expect to be able to report back shortly on this subject.

System L-I Converter

I've received several requests for details from those wishing to wind the coil in the system L-I converter featured in the February issue (see Fig. 2, page 195). The details for L1 are as follows: 7 turns of 22 g. wire wound on a ⅜in. coil former, spaced over 1in. and tapped at two turns.

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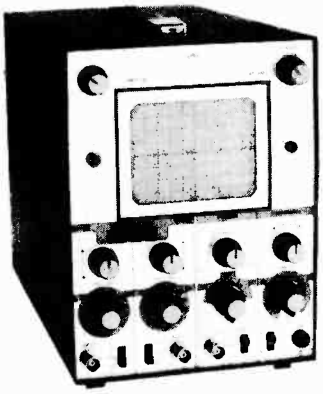

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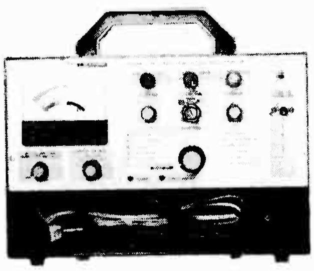

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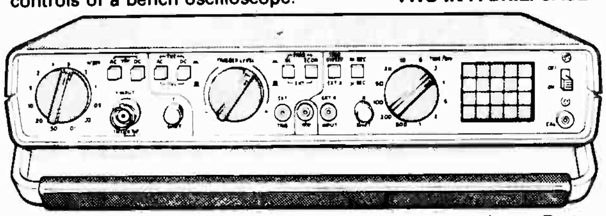

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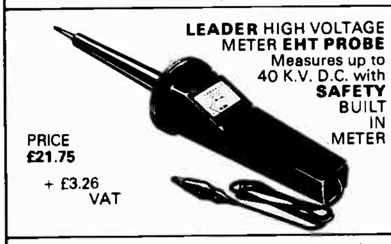

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The Further Adventures of Tiny Tim

Les Lawry-Johns

Tiny Tim woke up early in the morning and started to think his usual gloomy thoughts. What was wrong with the world was that there were too many people in it, most of them wanting him to do things that he didn't want to do for them. He killed off a million people mentally. Still too many. So he killed off another million and too many remained. Wouldn't it be nice if there were no people at all?

The animals would be able to go about doing whatever it is that animals do, and the forests would grow nice and big. There would be great big forest fires with no one to put them out. All the animals would be burnt. Oh dear, that wouldn't do. His cat Spock would catch cat flue and die because she wouldn't have had her jab from the vet. Oh dear. Perhaps firemen and vets could live then? Except the vet who was going to bring in his car radio-cassette. This frightened Tim because it was a Philips machine and he had a job to get the cassette drive belt back on when it bounced off as it had a habit of doing. So one vet would have to go and another would have to be found to give Spock her jab to ward off cat flue.

Pinnacle of Despair

As he lay there he thought of the nasty letter he'd had from one of the wholesalers. If he didn't pay their account they would do nasty things to him. He always paid his accounts on time, but he wasn't going to pay this one because it was daft. He'd ordered six video cassettes for his wife to play with and they'd sent sixty one. As eight were loose he'd decided to keep these and send the rest (53) back. He'd phoned the firm and the girls who'd answered the phone had laughed and said the rep who'd taken the order must have had a shaky hand. So they'd laughed some more. He'd put the phone down but nothing was done about it. The cassettes were collected by a well known firm of carriers who signed the collection note.

Tiny Tim had again phoned the wholsesalers to let them know that the cassettes were on their way back to them, but the man at the other end said he didn't know what it was all about. Tim was eventually promised a credit note, but it never came despite several more phone calls. One person had said that they hadn't got back the number specified. This had made Tim angry, and he'd said nasty things that his wife had said he should have been ashamed of saying. So the statement had come in, along with a nasty letter which Tim had returned with a comment to the effect that the liaison between their departments was deplorable. This was much nicer than what he'd said on the phone. So he dug in his tiny heels and waited for the nasty things to happen.

Daylight

As it was beginning to get light, Tim decided it was time that someone should get up and make the breakfast. So he stirred around enough to wake up his wife and then snored to pretend he was asleep. His wife looked at the clock and heaved a sigh.

"He lays awake all night thinking stupid things and when it's time to get up he goes to sleep. God how I suffer."

Tim snored loudly to ensure that his wife wouldn't go back to sleep, and eventually she got up. Tim smiled at the picture of the tiger on the wall. "We each of us have our own ways of getting our food" he told the tiger.

His wife brought up his breakfast, and Tim noticed that she couldn't burn the scrambled eggs like he did to give them a nutty flavour, but he thought it best not to complain. Something about not tampering with your luck.

He ate his breakfast and drank his tea, then laid back and sort of slipped off to sleep. He was rudely awakened by his wife talking to customers in the shop.

"I'm sorry but he's out with the dog at the moment."

Which was a bit shaky since Ben had been standing with the lead in his mouth for the last half hour or so.

Tim waited for the customers to leave, then crept down the stairs.

"Mr. Crankcase wants a new colour set delivered by ten o'clock. He wants a 22in. without remote control or any trimmings. No later because he's off to America and wants to see it and settle before he goes. So you'd better put your skates on."

"I'll just take the dog for his walk, then I'll get cracking" said Tim.

"Oh excellent" said his wife. "Mr. Crankcase lives at Birling, which is a long way away. You haven't unpacked the set yet and it's now nine fifteen."

"Oh dear" said Tim. "Why didn't I get up earlier? Why did you let me nod off again? I must fly." So he flew, but went in the wrong direction because he'd fogotten where Birling was. He ended up feeling very confused, driving along the M20 towards Maidstone. It all ended happily however, because Mr. Crankcase had delayed his departure.

But Ben was rather peeved. He stopped at a post but missed it, contriving to hit Tim's leg instead. This reminded Tim of the time he'd been standing at the top of Windmill Hill looking out over the river and a big black dog had come and stood beside him. Tim had patted the dog's head, thinking how good he was with dogs, but had suddenly become asware that his leg was soaking wet. It was a very large dog.

Tiny Tim made his way back to the shop, talking to Ben and telling him that in addition to getting rid of all the people in the world the dogs would have to go as well, leaving just a few bitches – they don't cock their legs at every tree, post and leg that happens to be near.

Trying TVs

When they got back, quite a few jobs were waiting to be done. The first was a GEC set fitted with the 20AX tube (Model C2233H). A note on it said "no results". The right side fuse (on the switch-mode power supply panel) had blown, so Tim looked askance at the BU126 chopper transistor. It was short-circuit. As he fitted a new one Tim was thinking. He'd had this trouble a year or so ago and the new one had died very quickly indeed. Then there was a note on the same subject in a recent Fault Report item in *Television*. The driver transistor is biased by a nasty 150kΩ resistor. Now where was it? Ah, just there, R515. Take it out and measure it. Reading about 4MΩ.

Tim didn't have a 1W, 150kΩ resistor, so he was a devil and used a 220kΩ one instead. It worked well enough, so he logged this information in that magnificent computer he has atop his shoulders – another one not to be forgotten.

The next set was an ITT CVC9 that belonged to one of Tim's old school chums (which makes him very old). It had been in several times of late, suffering from loss of colour which seemed to be restored permanently each time Tim did almost anything around the decoder, only to fail again several days later.

Tim had first found that when the base of the 4·43MHz reference oscillator transistor T38 was touched with the test prod the colour returned and couldn't be made to go off again. So he'd changed T38. On the next occasion it had seemed that the crystal was faulty, so Tim had fitted a new one. He'd thought that this was unusual in an ITT set, but concluded that as he was very rarely right about anything it must be the case since the colour stayed and stayed. Here it was again however.

He put the probe on the base of T38 and the colour appeared. He looked at the board and the blue 470pF capacitor (C228) in the oscillator circuit (base-emitter feedback) caught his colour prejudiced eye. He doesn't like blue things. So he changed it and the set has been all right ever since.

The Music Centre

A Fidelity 440 music centre sat there waiting its turn. Its owner, a nice man by the name of Les Woolends, came in just as Tim was about to perform.

"Thought I'd pop in to tell you what's wrong with it. It won't record on one channel."

Tiny Tim scowled at him. "It's a pity you didn't take it back where you bought it."

"I bought it here."

"Just testing, just testing." Tiny Tim was aware of his wife's eyes boring into his back.

Without further ado Tim removed the bottom of the music centre and squirted a jet of Servisol into the record/playback switchbank. Much to his surprise, it now worked on both channels.

Putting on his 'leave it to the master' air, Tim replaced the bottom cover and chatted away to Mr. Woolends about cats and things.

Night-time

That night Tiny Tim had a nasty dream about being eaten by a great big cat. He awoke bathed in perspiration and decided to have a nice wash to freshen himself up a bit. So down to the bathroom he went, and gave himself a good wash down. He dried off and looked for his talcum powder. It was some distance away, at the far end of the bath, so he decided to use some of his wife's instead. But no matter how hard he shook the pink tube nothing would come out. So he tried the green one which had two nice big holes at the top. He shook the powder all over his private places and rubbed it in, noting that it seemed rather coarse for his little body. He tumbled back into bed, thereby waking up his wife.

"Now what are you up to?"

"Just been to the bathroom for a wash. What's the talc in the green tub?"

"That's not talc, you fool. It's shake 'n vac carpet cleaner."

"Oh dear" said Tiny Tim.

VCR Clinic

Mike Phelan, Richard Roscoe and Michael J. Cousins, T.Eng. (C.E.I.)

Ferguson 3V23

The fault with a Ferguson 3V23 was noticeable only on a stationary picture. It looked as though there was a slight ripple on the verticals – but only on about the centre third of the picture, the top and bottom being o.k. As the fault was also present on still frame we had a look around the drum motor drive circuit. This is a brushless, direct drive motor, so the pole switching is done by Hall sensors and a magnetic ring (instead of a commutator and brushes).

The sensors drive many transistors, culminating in two power stages which supply current to the two sets of poles. When the head is running we should have an equal sinewave on each pole, but in this case one was missing. As a result, the drive was varying. One very discoloured power transistor gave itself away, but while we were measuring voltages we noticed that the supply to the motor was about 22V instead of 12V – the regulator transistor in the power supply had gone short-circuit. It's surprising that anything worked at all! **M.P.**

Ferguson 3V00

"We've fitted a new head, but can't get the tape guide rollers adjusted" they said. We connected the scope to TP7 to monitor the video f.m. envelope, and found that while we could get rid of the dip at either end of one channel it was then transferred to the other channel. Now in theory each head follows the same path, so the condition we had shouldn't be – unless the heads were not following the same path, due possibly to the spindle being bent. We removed the head and there is was – a piece of something indescribable, compressed to a few thou and stuck to the mounting flange with the result that the drum tilted fractionally. **M.P.**

Ferguson 3V00

The fault with a Ferguson 3V00 was severe herringbone patterning on the chroma on its own recordings only – prerecorded tapes played back o.k. The chroma record current control R2 on the pre-rec board was set too high. **M.P.**

Ferguson 3V29

There was no capstan servo action with this Ferguson 3V29, and a check showed that there were no off-tape control pulses at TP2 (adjacent to IC2) even with a prerecorded tape. IC2's supply pin had a 50Hz waveform on it, and this varied if the head was slowed down! The fault was due to the HA13008 head motor drive i.c. drawing excessive current from the supply, though it was otherwise functioning correctly. **M.P.**

Ferguson 3V29

The problem we had with a Ferguson 3V29 was gradually increasing noise on playback while the playback f.m. signal, monitored at the test point, decayed to zero. The same thing happened when a prerecorded tape was tried, so we changed the head amplifier etc. i.c. (IC202, HA11724). Unfortunately the fault symptoms remained exactly the same.

The HA11724 also contains the record current amplifier. On record the playback paths from the heads are earthed by applying the E-E 9V supply to the switching transistors Q216/7. These transistors should thus be off on playback, but we found that the E-E 9V line, which should then be at 0V, had risen to 1.5V. The E-E 9V line is switched between 0V and 9V by transistor Q102, which turned out to be leaky. **M.P.**

Toshiba V8600

A Toshiba V8600 would not accept a tape — it ejected the tape instead of threading it up, though very occasionally it would work. Now pin 5 of the microcomputer control i.c. is fed with inputs from the dew detector and the slack sensor and is normally high. The slack sensor reed switch is normally disengaged until play is selected. As pin 5 of the i.c. was low, we checked this switch and found that it was sticking (permanently magnetised?) until disturbed. **M.P.**

Ferguson 3V22

The problem with a Ferguson 3V22 was intermittent loss of servo action on record. Checks revealed that in the fault condition no control pulses were being recorded. These are derived from the video signal via a sync separator on the servo panel. The video input to this panel seemed to be o.k., so we changed the AN301 amplifier/sync separator i.c. No change. On examining the video input to the panel more closely however we noticed that there was slight distortion in the region of the field sync waveform — like poor l.f. response.

The machine worked all right with a video input signal, so we turned attention to the i.f. panel. The video is fed out at pin 36 of this panel via an emitter-follower buffer stage (X201). The signal coupling to and from this transistor is via 47μF electrolytics, and the one on the input side (C207) turned out to be partially open-circuit. **M.P.**

JVC HR7200

Failure to record was the fault on a JVC HR7200 (Ferguson 3V29), and a check at the heads confirmed the absence of an f.m. record signal. Tracing farther back, we discovered that the signal disappeared at the point (pin 1) where it enters the HA11724 i.c. There's a switching transistor (Q209) here — the relevant bit of circuitry is shown in Fig. 1. When record is selected, diode D204 conducts. The voltage at its anode is then just under a volt, and as a result the 4.3V zener diode D208 and transistor Q209 are non-conductive, allowing the record signal to pass through to the heads. The problem was that D208

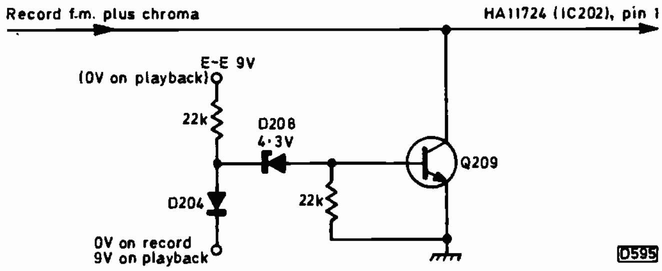


Fig. 1: Record signal muting circuit used in the Ferguson Model 3V29. The circuit is inoperative on playback.

was short-circuit, as a result of which Q209 was conductive. A replacement zener diode restored normal operation. **M.J.C.**

Grundig 2 × 4 Super

The trouble with a Grundig 2 × 4 Super looked like a servo fault — the picture disappeared into noise every few seconds — and we found that the ramp waveform at the drum servo test point disappeared when the fault occurred. This waveform comes from a PLL which is supplied with a reference frequency from the DTF module. It was quickly proved, by substituting known good panels, that the fault wasn't in either the servo or the DTF sections of the machine.

Our next step was to look at the supply lines with a scope. This revealed that the 20V supply to the servo board had about 0.5V of very high-frequency ripple (at some 20kHz) on it. A 15V supply is derived from the 20V rail via a UA723C/chopper transistor arrangement, and it looked as if some of the switching signal was getting out. The 20V line smoothing was checked to no avail, and we next found that the ripple was of higher amplitude on the output side of the 15V regulator. Whilst making checks in this area we noticed that C455 (100pF), between pins 4 and 13 of the UA723C i.c., had never been fitted. **M.P.**

Ferguson 3V30

The fault with a Ferguson 3V30 was erratic lines of interference on playback. Now if a normal picture (with tracking lines) was present with pause selected (not freeze frame) then the fault would be in the capstan servo circuit. A check at TP5 on the servo panel showed that the capstan servo trapezoid waveform was present, but there was no sample pulse on the ramp. The off-tape sample/control pulses pass through IC2 and then inverter transistor Q1 before being applied to the HA11711 servo i.c. They were present at the control head but vanished at the base of Q1. Cold checks revealed that C55 (0.01μF), which is connected between Q1's base and chassis, was leaky, measuring some 120kΩ. Replacing C55 restored the sample pulses and a stable picture. **M.J.C.**

Ferguson 3V16

A customer brought his Ferguson 3V16 along for repair one wet and windy day — it was encased in a duffle bag. His complaint was that the machine was "completely dead — probably only the fuse". Well this was the longest fuse change I've ever come across. It was indeed a fuse — the thermal fuse buried deep inside that most inaccessible component the mains transformer. A new transformer was ordered and fitted, restoring normal operation, but can anyone say why JVC in their wisdom bother to have a thermal fuse that can't be reset? M.J.C.

Mitsubishi HS303B

Last month I mentioned the trouble we'd had with a brand new Mitsubishi HS303B whilst it was still in the showroom. Then we sold it. Last week it came back again. This time when we switched it on the pause and stop lights both came on and eject wouldn't work — we couldn't even load a tape.

We started with the errant pause light. All the function indicators are driven by the MC14174BCP i.c. IC500 under the control of one of the microcomputer i.c.s, IC5A0 (TMS1400/MP7309). The pause light was on because pin 20 of IC5A0, which drives pin 14 of IC500, was high instead of low. Further laborious checking through the rest of the control circuitry (how a good circuit description in the manual would have helped!) revealed that the other symptom, no eject, was due to the same thing. So we unsoldered pin 20 of IC5A0 to check whether it was the source of the high signal. It wasn't. An internal fault in IC500 was the cause of the trouble. R.R

Ferguson 3V23

VCRs don't seem to be prone to stock faults, apart from various mechanical weaknesses (i.e. take-up idlers, motors, etc.). We've recently had three cases of Ferguson 3V23/JVC HR7700 machines with unstable pictures however, and in each case the cause was the 4.433MHz crystal on the servo-2 panel. The output from the crystal oscillator is counted down by IC1 (AN6342) and used to produce the 50Hz reference squarewave for the drum servo circuit. M.J.C.

Fault Report

Richard Roscoe, Mick Dutton and George R. Wilding

Dead Deccas

Our winters here in Cornwall always take their toll of triplers and line output transformers — especially in the Decca 80 and 100 series chassis. These sets have a couple of evil and potentially expensive tricks it's worth knowing about. For instance, it's quite common for the tripler to fail and the mains fuse to blow. If you replace the fuse for test purposes it can last just long enough for the faulty tripler to kill the output transformer and often the TBA920 sync/oscillator chip and output transistor as well. So we follow a very strict procedure when we get a call to one of these sets with no sound or raster and the 3.15A mains fuse (on the tuner panel) blown.

First we check the bridge rectifiers D600-3 on the power supply board. One or more of these often goes short-circuit. If they haven't we swing up the main chassis, remove the screen from around the line output transformer (one screw) and disconnect the tripler from the transformer before fitting a new fuse.

We then switch on — keeping our hand on the switch. If the sound comes up and the line output transformer produces a spark, the damage is confined to the tripler alone. Again we breathe a small sigh. If nothing at all happens we fit a new TBA920 sync/oscillator chip and try again. If we hear a hum from the input choke we switch off fast and don't breathe any sighs. The line output transformer will certainly have failed. When replacing the transformer we check the line output transistor and the diodes on the panel, but provided the precautions outlined above have been observed these usually survive — especially the more rugged BU208A transistor used in the 100 chassis.

If the transformer has failed we always change the tripler as well. Even if it seems to be o.k. it won't last long and it will probably kill the new transformer when it does fail. We also carefully check the soldering of all the plug pins on the line output panel, since dry-joints here are often the cause of line output transformer failure in the first place.

This simple procedure takes care of 95 per cent of the cases of blown mains fuses we've had to deal with on these chassis — and does so at minimum expense in terms of replacement parts. R.R.

Intermittent Hitachis

We've had trouble with several fairly new Hitachi sets recently — ones fitted with the NP81CQ Mk. II chassis. In each case the symptom has been a tendency to fail to start, though once the set gets going it will run quite happily and can't be induced to stop. John Coombes (Fault Report, December 1982) mentioned dry-joint trouble on the earlier NP81C chassis, which is very similar. We've also had that (dry-joints around the line output transformer), but the situation was slightly different in that the set could be made to start and stop.

The cause of the problem with the more recent sets has been traced to the soldering of the chopper transformer's pins (T901), especially pin 4. It seems that the soldering here must be perfect — any small resistance at this point causes heating as a result of which the joint deteriorates further. Eventually the point is reached where the ability of the power supply to start up is affected, though once it does start the connections are good enough to keep it going.

We've found that the best cure is to remove T901 completely and scrape all the pins clean before carefully resoldering them. R.R.

Grundig Gremlins

Here are a couple of faults that crop up time after time with Grundig colour sets. If you get these symptoms it's odds on that the culprit will be the same.

Sound o.k., blank screen: This applies to sets fitted with the 29301-046.02 RGB module (Models 8632GB and 8232GB for example). The fault is usually intermittent: the picture will dramatically disappear and reappear at random, and it can be infuriatingly elusive, showing up perhaps only once in a while. The cure is simple however. At the top of the RGB module, above the three output stages, there's a zener diode (Di1948). It's anode is rather poorly connected to earth via the lead of an adjacent

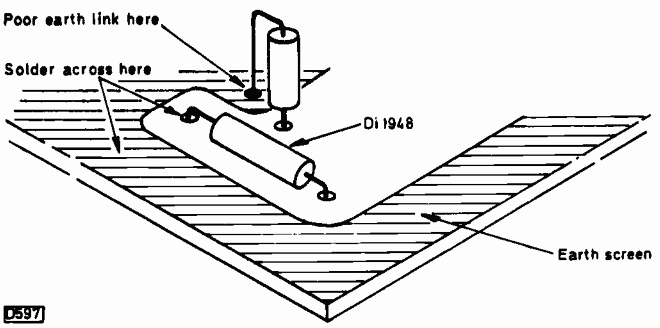


Fig. 1: Location of a very common source of trouble on later Grundig colour-difference output modules.

resistor through the board — this link gets lost. Solder the diode to the top earth screen (see Fig. 1) without removing it from its existing position and you'll experience no further trouble.

No colour or intermittent colour: This fault occurs on a large number of models (e.g. 6210GB, 6610GB, 8632GB, 8232GB and 1510B) fitted with colour decoder module type 29301-024.01. The cure is to change both the 0.1μF decoupling capacitors C861 and C863. They cause the fault by going slightly leaky — in fact we've had so much trouble with them that we fit replacements whenever one of these sets comes into the workshop for whatever reason.

We had a 1510B portable however where replacing these capacitors failed to restore the colour — in fact a whole new decoder module failed to do so. The fault turned out to be on the colour-difference output panel. Unlike most modern chassis, this Grundig chassis employs colour-difference drive to the tube's grids/cathodes. The cause of the fault was that the three colour-difference output transistors were cut off due to a break in the track of the preset R587 (200Ω) via which their emitter circuits are returned to chassis. The colour-difference drive coupling capacitors C574/584/594 prevented the altered d.c. conditions affecting the tube's biasing, with the result that it displayed the luminance signal normally. **R.R.**

Decca 30 Series Chassis

A Decca hybrid set (30 series chassis) would work perfectly for about half an hour after which faces in particular and the picture in general would suddenly turn a ghastly green. The ident amplifier was obviously working, otherwise there would have been no turn-on bias for the chroma channel via the colour-killer transistor TR208. Drift of the ident coil L205 can cause incorrect operation of the PAL switch, which is inside the MC1327P i.c. The coil turned out to be o.k, the fault being cured by changing the chip. **G.R.W.**

Ekco T554 Portable

An Ekco T554 14in. monochrome portable came in with field troubles – unsteady lock, random jitter and bottom cramping. The voltages in the field timebase seemed to be about right, so we put a scope on the output. Riding on top of the field sawtooth was a lot of random, low-frequency noise – it looked suspiciously like transistor noise.

The field generator circuit is a bit unusual. There are two transistors, TR501 and TR502. TR501 is labelled "vertical oscillator" and provides the discharge action. TR502 acts as a Miller integrator so that the field charging capacitor C506 produces a linear ramp. Anyway we found that TR502 was faulty, but we didn't have a 2SA609E in stock (who has?). A BC212, carefully fitted the right way round, proved to be a suitable substitute. It cured all the field troubles, but the steadier display revealed that all was not well with the line sync – the verticals were decidedly wavy, though the line lock itself was good.

It's said that lightening never strikes twice, but in this case it did. The sync separator transistor TR209 is another 2SA609E and was also noisy – the noise was passing through the flywheel sync circuit. Another BC212 put an end to that. Incidentally if, like us, you don't have a manual for the T554, you'll find that the circuit for the Teleton TW12BS applies. **R.R.**

Thorn 1500 Chassis

A Thorn monochrome set fitted with the 1500 chassis produced ample sound, which was undistorted, but the picture — which could barely be locked in either direction for more than a minute — was weak with little definition or tonal graduation. The sound signal is tapped off at the collector of the video emitter-follower transistor VT8, so the obvious conclusion was that the fault was in the following video output stage or the coupling networks between VT8 and the tube's cathode. As a start we checked the voltages in the emitter-follower and output stages. These were correct, so the operating conditions in these stages were normal.

There are two video coupling capacitors, C37 (64μF) between the video emitter-follower and output stage and C40 (0.47μF) between the video output transistor and the tube's cathode. The latter was ruled out since if open-circuit it would not affect the sync. If C37 had partially dried up on the other hand the h.f. response would still have been acceptable.

Attention was directed to the i.f. strip therefore, and it was discovered that the final i.f. transistor VT7 was open-circuit between its collector and base. This transistor is located just under a small clip-on screening can near the bottom of the chassis — if care isn't taken, the securing clip breaks off. Replacing it restored normal results, with first class timebase locking. The sound signal had obviously managed to get through via the shunt capacitance present, though the video signal had been distorted and attenuated. **G.R.W.**

Bush BC6338

The problem with a Bush Model BC6338 (Z718 chassis with touch tuning) was that the channel selector was stuck on channel one, with no tuning ability. The touch sensor contacts looked clean, so we decided to change the ETT6016 selector i.c. This enabled us to change channels, with the appropriate neons lighting up, but there was still no tuning ability. The 33V tuning supply was correct, but the voltage on the tuning line was also 33V. A check at the slider of the selected tuning potentiometer showed that it did what it was supposed to do, i.e. vary from zero to approximately 30V, but this voltage was not being applied to the tuning line via the blocking diodes 9D1-11. The voltage at pin 8 of the i.c. was next found to be low, and on checking back we found that the 180V supply at pin 4 of 9Z1 was also low, at approximately 30V. This voltage comes via 1R116 (7·5kΩ) on the Varicap tuner panel, and a check here revealed that 1R116 was virtually open-circuit. **M.D.**

Teletopics

EUROPEAN MERGERS

The proposed link up between Grundig and Thomson-Brandt – as reported in our February issue, the French state-owned electronics giant Thomson-Brandt had signed an agreement of intent to purchase the 75·5 per cent of Grundig not owned by Philips – is now off, having been vetoed by the W. German Federal Cartel Office on the grounds that a Thomson-Brandt/Grundig merger would have 40 per cent of the W. German CTV market and 25 per cent of the W. German VCR market. Instead, Thomson-Brandt now propose to take a 75 per cent controlling interest in Telefunken, whose ailing parent firm AEG-Telefunken has been in a form of receivership. It's not expected that the Thomson-Brandt/Telefunken link up will be vetoed by the Federal Cartel Office, even though it will have some 30 per cent of the W. German CTV market. Thomson-Brandt already own Saba and NordMende, each of which have ten per cent of the W. German CTV market, while Telefunken's share of the W. German CTV market increased from six to ten per cent over the past year.

This leaves Grundig, which has been making substantial losses during the past two years (DM 187m in 1980-81 and DM 35m in 1981-82, though a profit for the year 1982-83 is expected to be announced), in a difficult position. The speculation is that Philips might wish to increase its stake in Grundig, to which it is an important components supplier as well as the two firms being joint developers of the V2000 VCR system, though this might raise fresh problems with the Cartel Office (stringent conditions were imposed when Philips originally acquired 24·5 per cent of Grundig).

The Thomson-Brandt/Telefunken link up has interesting implications in the VCR field. A merger with Grundig would have given Thomson-Brandt an interest in the V2000 system. Telefunken however are part of the J2T joint venture partnership (with Thorn and JVC) manufacturing VHS machines in Europe (in W. Berlin and Newhaven), while Thomson-Brandt have been importing JVC machines for sale in France and had been planning to start assembling VHS machines in about a year's time. The position of the VHS system in the European market has thus been given a considerable and unexpected boost.

In a recent move Thomson-Brandt established the European Electronics Corporation as an umbrella organisation for the activities of Saba and NordMende.

JAPANESE-EEC VCR AGREEMENT

The agreement between the Japanese Ministry of International Trade and Industry and the EEC Commission to limit the export of VCRs (for one year initially) to Europe and to set "floor" prices for Japanese VCRs has now come into effect. As far as the floor price system goes, three classes of machines (basic, mid-range and top-range) have been established, with floor prices of £195, £240 and £280 respectively f.o.b., i.e. delivered to the docks. Decisions about how the market is to be shared out amongst the various Japanese VCR manufacturers and how the machines will be allocated between countries have not been annouced. To meet the requirements of the General Agreement on Tariffs and Trade, all these matters have to be decided by the Japanese unilaterally.

The net result in the UK, taken in conjunction with the recent fall in the value of the pound, is expected to be a rise of £100 or more in VCR prices with corresponding increases in rental charges. Rental at present accounts for 60 per cent of VCR deliveries to consumers, and it has been suggested that the price increases could boost this percentage. Stocks of machines are low at present, and with distributors anxious to increase profit margins price rises in the short term could be quite sharp. The long term prospects will depend on market conditions, the present excess Japanese VCR manufacturing capacity, whether the V2000 system manages to establish a firm position in the market, and what happens to the agreement under its proposed second and third years of operation.

THE COMPACT DISC

Not a TV subject perhaps, but one nevertheless very much of interest to dealers and technicians: the compact (4¾ in.), laser scanned, digitally recorded audio disc which has now been launched in the UK and three other European markets. The system was developed jointly by Philips and Sony – one could say that it's on offspring of LaserVision. The sound is two-channel of course and the discs have a playing time of an hour per side. The players provide an ouput of some 1·5V at 500Ω. The great advantages are the elimination of mechanical problems on the signal pick-up side and the clean digital signal. A frequency response of 20Hz-20kHz and a dynamic range of greater than 90dB give a rough guide to the excellent quality of which the system is capable.

Players from Philips, Sony, Fisher (Sanyo), Hitachi and Marantz (a Philips subsidiary) have so far been announced in the UK, with prices in the range of roughly £500-£550. Over thirty eight manufacturers worldwide have taken out licences to produce players. The discs cost around £10 each, and an expanding catalogue of titles from several record companies is already available. Sony expect the UK market for players to be around 40,000 during 1983.

Philips are pressing for a special 19 per cent EEC tariff on the players (the tariff on conventional audio equipment is half that), claiming that Far Eastern manufacturers are planning to flood the European market.

TAPE STORAGE

BASF have issued some simple guidance on video tape storage. The temperature should be 20-22°C and the relative humidity 50-60 per cent. Major temperature fluctuations should be avoided, as of course should be exposure to magnetic fields. Upright storage is best, to prevent slippage, and an extra plastic bag is recommended when tapes are going to be stored for any length of time.

TSR VACUONICS

The Scottish c.r.t. rebuilding firm TSR Vacuonics Ltd. is particularly interesting in being able to process a very wide range of tubes including Trinitrons, the latest Hitachi tubes, and those used in monitors and games machines. The company assemble their own guns and offer a 7-10 day turn round on an exchange basis, though an off-the-shelf service is envisaged when sufficient glass is available. OTV of OTV House, 144 Lea Bridge Road, London E5 9RB have been appointed distributors in the London area.

TSR are now investigating the possibility of rebuilding VCR heads, and have had talks with a number of large national rental and sales companies who have expressed interest in the idea. The process involves laser cleaning of the gap and rebonding new ferrite pole pieces. It's hoped to be able to provide such a service by the end of the year, initially offering VHS and Betamax heads at £10-£12 each. If there's sufficient interest, TSR would hope to extend the service to cover V2000 heads.

BBC-UNISAT DBS AGREEMENT

The BBC's satellite TV service, which is due to start in 1986, came a step closer with the signing of an agreement on the provision of the satellites by Bryce McCrirrick, BBC Director of Engineering, and Alan Jeffries, Managing Director of United Satellites Ltd. (Unisat). Unisat is jointly owned by British Telecom, British Aerospace and GEC and will be responsible for building and launching two satellites, the first to be operational and the second an in orbit spare. As an additional safeguard, a third satellite will be made available ready for launch. The service's footprint will cover the UK and parts of W. Europe, and the power output will be suitable for high-quality reception by individual households via suitable receivers and dish aerials of less than one metre diameter. The agreement covers a period of operation lasting at least seven years.

The satellites will carry transmitters for the two BBC DBS services. DBS-1 will be a subscription channel carrying feature films and other attractions. DBS-2 will have an international flavour. There will also be a number of digital sound channels, providing stereo TV sound and some high-quality radio channels.

British Telecom will be using the satellite to provide various facilities, including the distribution of TV programmes and feature films to local cable TV networks. This will be entirely separate from the two high-power channels used by the BBC.

The IBA developed C-MAC colour signal encoding system will be used for the two BBC channels. C-MAC was recently demonstrated by the IBA in W. Germany, at the invitation of the German Post Office. About one hundred senior broadcast and telecommunications engineers saw signals sent from Crawley Court to Darmstadt via the European Test Satellite (OTS). A presentation was also made to representatives of German industry, the Post Office and the broadcasting research institute (IRT).

THE BATC

The British Amateur Television Club will be holding an exhibition of amateur television at the Post House, Leicester, on May 22nd. The doors will be open at 10 a.m., admission is free and all will be welcome. Attractions will include the BATC outside broadcast unit and demonstrations of both fast- and slow-scan television. There will be the usual trade stands plus a comprehensive supply of the Club's books and PCBs. The Post House Hotel provides a reasonably priced Sunday lunch and special half-priced rooms are available for people attending the exhibition.

The latest BATC publication, "TV for Amateurs" by John L. Wood, G3YQC, is available from BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN, at £1·50 plus 25p post and packing. It's main aim is to serve as an introduction to the world of Amateur TV, but in doing so it provides much useful reference material and a lot of practical information (circuits etc.). Excellent value and highly recommended.

ELECTRACK

A new mains plug-socket system that should prove useful where large numbers of mains connections are required, in workshops and retail showrooms for example, has been announced. Called Electrack, it consists of a slim aluminium track carrying three copper conductors along which plugs can be inserted at intervals of either 100 or 200mm. It's totally enclosed, and the safety aspect is enhanced by the fact that contact with the mains supply is completed only when an Electrack key plug is inserted and rotated through 90°.

The track will be available in various standard lengths from 600 to 3600mm, and can easily be cut to any required length. By adding a clip-on housing it becomes a skirting system. It can also be used as a flush floor distribution system. Apart from the improved safety aspect, the advantages of Electrack include much increased flexibility plus a reduction in installation time and costs.

Electrack will be made available through wholesalers later this year. Details can be obtained from Electrack International Ltd., 45 High Street, Kingston-upon-Thames, Surrey KT1 1LQ (01-546 7799).

NEWARK VIDEO CENTRE

Steve Beeching's eagerly awaited book "Domestic Videocassette Recorders" can be obtained from Steve's Newark Video Centre, 108 London Road, Balderton, Newark, Notts (0636 71475) at £14·50 plus post and packing. You might even be able to get an autographed copy! We hope to review the book shortly.

Steve's two-day weekend VCR servicing courses are still being held from time to time as circumstances permit. The next one is on May 14-15th.

TV R & D

Much work is being done in research departments on methods of processing video signals in digital form for TV receiver applications. Some details of one approach were given in our November 1981 issue. What are the advantages? For one thing the signals can be cleaned up, improving a receiver's performance, the disadvantage (at present) being the added complexity of converting the transmitted signal into a digital one and then converting it back to analogue form to drive the c.r.t. This disadvantage could be eliminated with a fall in the cost of the digital circuitry required. An interesting prospect is the use of digital techniques to increase the number of lines. Converting from 625 to 1,250 lines in the receiver would greatly improve the resolution and could be done using the techniques employed in 525-625 line standards conversion. The idea is to create the extra lines by averaging the information carried by successive pairs of transmitted lines. Eliminating interlace would improve matters further.

Amongst the firms understood to be working on this are ITT, Philips, RCA, Hitachi and Sony. In a recent issue of *Radio-Electronics,* an RCA spokesman was quoted as saying that a compatible high-resolution system would come "in this decade".

The aim of the 5-D Corporation is just that – a 3-D display plus surround sound. The breakthrough claimed is plans for a camera that provides compatible 3-D pictures, i.e. those viewing without special blue/red spectacles see the picture without the usual double image effect. Another step contemplated is receivers that don't require special glasses to be worn by the viewer.

US set maker Zenith has developed a self-converging colour projection TV system. The three (red/green/blue) projection tubes are mounted in line, the outer tubes having angled screens that distort the images to compensate for the distortion introduced by off-centre mounting.

GLARE

Last month we mentioned a filter to reduce VDU operator eye strain. An alternative approach is to use a spray on treatment. An anti-glare treatment kit called Glarego has been introduced by Vision Products, Unit 10, Wessex Road, Bourne End, Bucks SL8 5DW, and is said to provide a lasting non-reflective surface on TV screens, computer terminals, video games and glass-fronted pictures. It doesn't damage the screen and is easy to remove. The screen is first prepared with Cleanscreen spray, the Glarego spray (which contains anti-static dust repellent) then being applied. The suggested price of the kit, which includes a mask and lint-free cloth and enough spray to treat three screens, is £7·95 plus postage.

SATELLITE TV LTD

Satellite TV Ltd., which was originally established to provide a European TV service via a spare transmitter aboard the OTS satellite, has been allocated one of the UK transmitters on board the European Communications Satellite ECS-1 which is due to come into operation by the end of 1983. Satellite TV Ltd. is at present in the process of raising funds from institutional investors for the further developemnt of its service.

IN BRIEF

Under a deal with J.J. Silber, the company that acquired the Murphy brand name from Rank, the Rediffusion subsidiary Doric Radio will in future be marketing Murphy TV sets . . . ITT Consumer Products is to be taken over by STC, which became independent of its former US parent company ITT last October . . . Sony is due to release its 2in. Watchman flat-screen TV set in the UK shortly. The set measures $7\frac{3}{4} \times 3\frac{3}{8} \times 1\frac{1}{2}$in. and is expected to sell at around £200. According to a survey carried out by Oracle, the number of UK homes equipped with teletext sets grew from 300,000 to 800,000 last year, a household penetration of 3·9 per cent. About 16 per cent of sets now being sold/rented are teletext models, the percentage rising with screen size . . . A further round of talks on establishing a new world standard for 8mm video, i.e. for the coming generation of portable "camcorders", took place in Tokyo this March . . . The recently introduced Mitsubishi portable VCR, Model HS700, is unusual in incorporating a tuner/timer. The suggested price is around £500, the weight 16·3 lb and the dimensions 16·7 × 9·1 × 6in.

Test Report

Eugene Trundle

A PERENNIAL problem for those involved in television servicing is the difficulty in deciding whether a line output transformer is faulty, especially when short-circuit turns or internal leakage is suspected. The diagnosis can often be proved conclusively only by fitting a known good transformer, so the traditional drill is to eliminate all other suspects (such as the e.h.t. rectifier/tripler, the scan coils and the secondary supply rectifiers) first. This is time consuming, and the heavy loading introduced by a defective transformer can take its toll of line output transistors and the like whilst the necessarily repetitive tests are being made. All this assumes that no cut-out or trip is banging away to confuse the situation further!

Many testers have been devised over the years to overcome this problem. The idea is that they test the line output transformer (or the power supply transformer in switch-mode circuits) independently, usually in situ. They work with varying degrees of success, but none has been infallible. Most of them work by acting as a threshold oscillator, with the suspect line output transformer incorporated in the feedback path: if short-circuit turns are present, the damping this introduces prevents oscillation and the transformer is thus condemned. Because there are so many different types of line output transformer in use however, while the effective load on them in situ varies from model to model, a degree of doubt is inevitable and diagnosis cannot be certain in every case.

Dynamic Testing

The Bi-Pak line output transformer tester works on a quite different principle. The idea in this case is to energise the transformer in much the same way as when it's working under normal conditions and see how it performs. Two or three turns of wire are wound around a winding or limb of the suspect transformer to form a primary which is energised from the mains-powered tester. The transformer's windings now all act as secondaries, and the voltages induced in them are proportional to the drive level. A damped transformer will not respond, and will show no signs of life.

Construction

The Bi-Pak tester is fitted in a small plastic box measuring 10 × 7·5 × 4cm. It has a spring-loaded "on" button, a rotary "drive" knob and a pilot lamp, along with two sockets. The lead which forms the "primary" of the transformer being tested is plugged into these two sockets – the lead comes with the tester. There's just over one metre of mains cable.

The tester's precise mode of operation is not immediately obvious for the very good reason that the internal components are partially potted in epoxy resin! Oscilloscope tests suggest that the incoming mains waveform is chopped by some thyristor like device to produce short-duration output current pulse spikes with very fast rise times indeed – I measured 15V peak-to-peak across the ends of the test lead. During the test each spike rings the transformer to produce a series of decaying bursts of oscillation at about 25kHz. This is below the resonant frequency of the transformer itself, and means that there's probably a tuning capacitor inside the mystery box!

Operation and Tests

Operation is very simple. The lead supplied is looped a couple of times around the windings – or a yoke limb – of the suspect transformer, be it in or out of the set. The go button is next pressed, then the drive control is slowly wound clockwise. A good transformer will respond with signs of life such as whining or buzzing. There will be a healthy corona discharge from the overwinding, and often sparking around the primary winding. A neon held several millimetres away from the transformer will light up. A dud transformer on the other hand will show no signs of life.

I started off with a good selection of new stock transformers, ranging from types used in small monochrome portables to large multi-winding types used in colour sets. The first thing I discovered was that the tester needs a "stiff" mains supply – it didn't work at all when fed from the bench isolating transformer (a 500W type). On raw mains however the results were satisfactory – the response from most of the new line output transformers was good. I was a little alarmed however to find that even at the minimum drive setting many transformers produced internal and external sparking between points up to 8mm. apart! This happened on pressing and releasing the go button, and I made a mental note to be wary of this when making in situ tests on transistor receivers.

Amongst the stock were jellypot transformers of the type used in many Thorn chassis. These couldn't be tested because of the impossibility of setting up an effective primary winding. The same thing applied to many types of switch-mode power supply output transformers. Most diode-split line output transformers have an exposed ferrite limb, and I had specimens of Mullard, Hitachi and National Panasonic manufacture. Unfortunately on all these the plugs at the end of the lead supplied were too large to go through the gap between this limb and the heavily-sheathed winding block. By improvisation however I was able to set up a test and was rewarded with a beautifully buzzing transformer, with little "snicks" from the e.h.t. and focus connector wells to indicate a good transformer. This required three primary turns and a fairly high drive level, probably due to the foil-type windings used in the particular specimen I chose for the test.

I found that small conventional transformers were very lively, and in the case of a transformer for the ITT VC300 chassis (with e.h.t. rectifier and reservoir capacitor attached) I had no difficulty in raising an e.h.t. output of 15kV (way above normal) with the tester's drive setting at one third – this was with just two turns of the test lead wound on! An ITT FT110 line output transformer produced 10kV pulses (normal operation produces 8·5kV pulses) with modest drive, and 15kV was registered at a high drive level, all with a two-turn primary winding. The transformer used in the Thorn 8500 chassis has a full-voltage overwinding, and with the tester's drive control advanced a little the transformer was lively: at about half drive 4cm. sparks were leaping from inside the e.h.t. connector sleeve to the transformer's metal frame . . . So it's important to heed the warning in Bi-Pak's instructions to avoid excessive drive levels.

Having exhausted the possibilities of testing good transformers out of circuit, I tried introducing short-circuit turns on various types of transformers by winding a loop of wire around the ferrite core and shorting together the free ends. A single short-circuit turn merely called for a higher drive level than before to get the same results. Two short-circuit turns were (in many transformers) betrayed by the need for an abnormally high drive setting before the sparks began to fly. In most cases three short-circuit turns gave an unambiguous dud indication. Strangely enough however an ITT CVC20 transformer could be made very lively at low drive settings with its five-turn c.r.t. heater winding dead short!

The dustbin was next turned out and a rich harvest of dead line output transformers was found. The first, from an ITT CVC32 set, tested dud, but as the drive was wound up the tester's 2A mains plug fuse blew. A 3A replacement fuse was fitted and held out for the remainder of the tests, which confirmed faulty line output transformers from the Decca 100 chassis, the Philips G8 and the Pye 725. The second transformer from a G8 let us down however: it was known to have short-circuit turns in the overwinding, but on test a lively response was seen at the main winding, with sparks in all directions – the overwinding was quite dormant of course.

In-circuit Testing

We always have plenty of working TV sets on test, and several were tried with the Bi-Pak tester. The short mains lead proved to be very inconvenient – the instrument has to be very close to the transformer under test, and it was not always easy to get the transformer within a metre of the mains socket.

In-circuit testing was possible and fruitful with many sets, and good results were obtained provided normal checks around the line output stage had previously eliminated obvious faults. For example, a leaky BU208 line output transistor (500Ω collector-to-emitter both ways) prevented an o.k. indication with a good transformer, as might be expected. The tester was found to be reasonably tolerant of normal loads such as the scan coils and the tube heaters.

I was unlucky with the majority of Japanese colour sets in at the time, either because the transformer was physically incompatible with this sort of testing, for the reasons described above, or because it was buried inside a substantial and well battened down screening can. A known working Pye CT200 didn't give a good indication for reasons that I don't know, and the neighbouring Thorn 9800 was likewise disinclined to co-operate, maybe due to the foil/diode-split type of transformer used. In both these cases removal of the c.r.t. base (to disconnect the heater load) didn't help matters. I must confess that I shied away from in situ testing on certain sets for fear of component damage, though this is not to say that such damage would have actually happened.

Conclusion

As mentioned above, there's no such thing as an infallible line output transformer tester. The Bi-Pak tester is no exception to this rule. It's a lively device, perhaps a little too lively, but if used with care it's unlikely that anything untoward will happen. The sorts of transformers it won't test are the ones that generally don't fail anyway. Use of the tester will provide experience of what it can and cannot do, which counts for a lot in interpreting results. One thing is for sure – if it fails for any reason it's irrepairable due to the encapsulated circuit.

It's a useful diagnostic tool and is worth having, but if it was mine I'd replace the mains lead with a three metre one before putting it in the toolbox. I can't honestly say that it's more effective then the i.c. oscillator type, and where the transformer under test is not physically suited to this particular mode of testing, or where it's buried in heavy screening, the alternative type of tester has the advantage. It seems rather over priced at £41.40 (including VAT), though there's no doubt that its cost will be saved (in terms of labour time and materials) once a few tests have avoided the need for line output transformer replacement.

The tester is available from Bi-Pak, PO Box 6, Ware, Herts (telephone 0920 3182).

Vintage Video: Baird's Discs

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

"PICTURES from a silver disc" – so runs the Philips advertisement for the LaserVision disc system. The concept of LaserVision involves the use of advanced technology, which Philips and now Pioneer are doing their utmost to exploit. The idea of recording pictures on disc is far from new however. Indeed the history of video discs goes back to the early pioneering days of television. John Logie Baird conceived the idea of storing TV pictures on disc for two reasons. First to have a means of demonstrating television without too much trouble, and secondly to enable viewers to use their televisors – the mechanical TV receivers used in the early thirties – when programmes were not being transmitted.

Baird's original TV system was a mechanical one, using a Nipkow disc at the studio and at the receiver to produce a scanned picture. There were thirty vertical lines and 12½ pictures per second, with no interlacing. A photocell was used to sense the light at the studio end, a neon in the televisor being modulated at the receiving end.

Because of the small bandwidth of the signal – the maximum frequency was about 13kHz, while for broadcast transmission it was around 9kHz – it could be recorded on a conventional 78 r.p.m. gramophone record. Baird's patent number 289,104, filed on October 15th, 1926, describes a disc cutter and reproducer (see Fig. 1) for use with his proposed TV system. The patent includes details of the disc's groove structure, which was envisaged as consisting of two parallel sections, one carrying the sound and the other the vision signal. A double-headed pickup for reproduction was also described, and Baird coined the name Phonovision for the system. In practice Baird never seems to have developed the double-groove system, the few surviving examples of Baird discs all being single grooved with no sound track.

Problems seemed to have arisen with the disc cutting process when trying to record a signal with a lot of high-frequency content. Other experimenters continued to work on the idea however, and by the mid-thirties it seemed clear that there were two alternatives: using a conventional type of record and player you could have either imperfect reproduction of pictures with a fair amount of detail, or reasonable accuracy if the subject was a simple one. The Major Radiovision Company of London, run by R.O. Hughs, adopted the latter option, and in June 1935 were selling their 30-line TV discs by mail order (at 7/- plus 6d post and packing) and in Selfridge's London store. The subject matter was not particularly inspiring, consisting as it did of ten still cartoons: the "artistes" apparently included Marconi, Harry Lauder, Charlie Chaplin and Stanley Baldwin. The discs were double sided, ran for just six minutes per side, and used different modulation depths on each side to allow the user to experiment with different types of pickup. Major Radiovision also suggested that by reversing the pickup leads you could obtain negative pictures.

Quite a few televisors were around in the mid-thirties. Plessey had produced about 1,000 for the Baird Company, and kits were available from firms such as Peto Scott. There are no sales records for the discs, so we shall never know how popular they were. They were certainly not a financial success, and Major Radiovision went out of business shortly afterwards.

One of the main problems with Baird's mechanical TV system was poor sync. No sync pulses were transmitted, reliance being placed on the fact that the signal fell to black level at the end of each line and on motor speed controls. Needless to say the discs suffered from similar

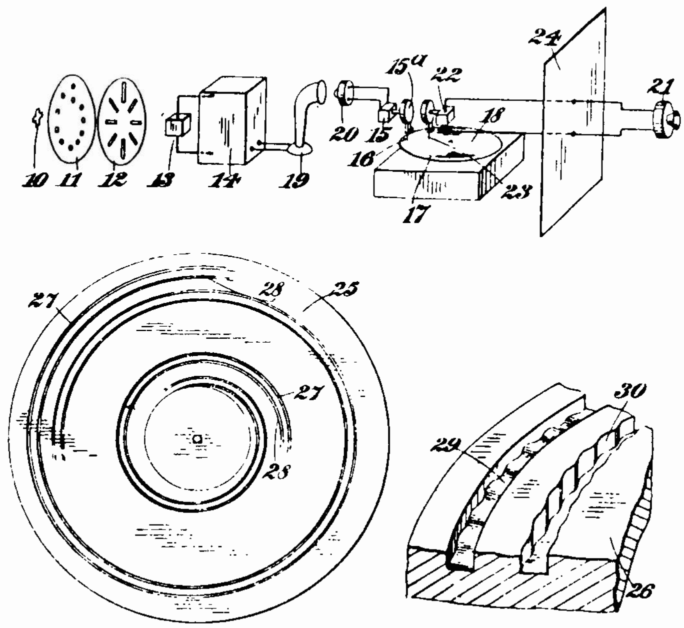


Fig. 1: Baird's 1926 ideas for a video disc recorder and player – Phonovision. The lower part of the diagram shows details of the proposed twin-groove arrangement. (10) Subject matter. (11) Nipkow disc. (12) Light-interrupting device. (13) Photocell. (14) Amplifier. (19) Microphone. (20) Pick-up transducer. (15a/16) Vision signal groove cutter. (21) Sound pick-up microphone. (22/23) Sound signal groove cutter. (18/25/26) Disc. (29) Hill-and-dale modulation for the vision signal. (30) Side modulation for the sound signal.

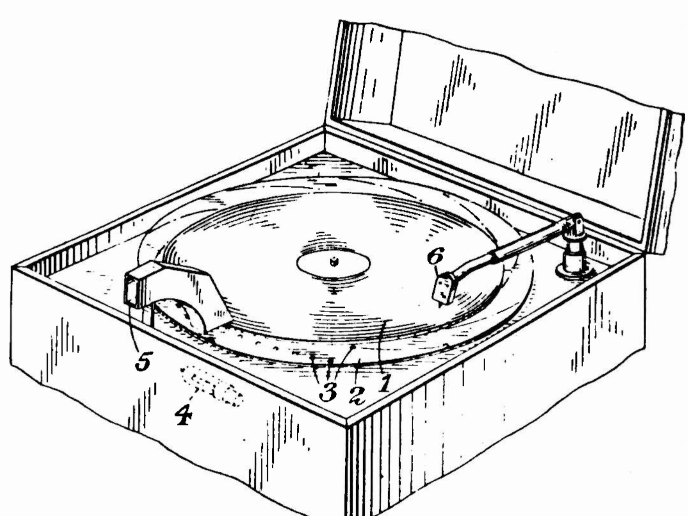


Fig. 2: Baird's 1928 idea for a combined disc player and televisor. (1) Disc. (2) Combined turntable/Nipkow disc. (3) Scanning holes. (4) Modulated neon light source. (5) Viewing lens. (6) Pick-up.

problems. The televisor's scanning speed was 750 r.p.m., the disc's 78 r.p.m., and it was necessary to keep the two in step. As with an off-air transmission, this was a tricky and time consuming task.

In April 1928 Baird registered a patent for a complex system in which a disc player and televisor were linked via a mechanical gear train. It's not known whether he ever built the device, and in October of that year another Baird patent proposed a more elegant solution. This consisted of a combined disc reproducer and viewer, with the record player turntable also acting as the televisor scanning disc (see Fig. 2). As the turntable/disc were combined, sync could not be lost once it had been set up by carefully aligning the record with marks on the turntable. The viewer was to watch the pictures, produced by a neon, through a series of lenses. Unfortunately it seems that Baird never built this system either.

In 1966 the BBC "decoded" a Major Radiovision disc, displaying the signal on an adapted oscilloscope. In 1971 the IBA did something similar, this time displaying the output on a renovated televisor. The 30-line system was finally abandoned for broadcast purposes in September 1935. By August 1936 high-definition television had arrived. The author would like to hear from any readers who may have any further information on Baird type video discs – or even examples!

A New EHT Circuit

George R. Wilding

THE current Telefunken 415/615 CTV chassis is conventional in most respects, with its self-oscillating chopper power supply which also provides mains isolation, TDA 3560 single-chip decoder, class AB RGB output stages, TDA1670 field timebase i.c. and BU208 line output transistor. The line output transformer is something quite new however.

Line output transformers are nowadays reliable components though a percentage of failures do occur. Tripler breakdown after some years' service is far more common, except in Japanese sets. The transformer is certainly one of the most expensive items in a TV receiver: the pulse windings and secondaries used to provide various supply lines add greatly to the manufacturing cost and increase the insulation problems.

Telefunken decided to do something about this in designing the 415/615 chassis. The aims were to reduce the cost of the transformer, make it as small as possible, mountable without securing screws, and producible by automatic production methods whilst having a power handling capability, reliability and internal resistance equal to or better than conventional designs.

To achieve these aims it was decided to use a half-wave e.h.t. rectifier arrangement. This in itself is not unique of course, but for CTV use the problem of a half-wave rectifier circuit is the high leakage inductance and internal capacitance in the transformer. The result is an e.h.t. system with a high internal resistance.

It was decided therefore to use a transformer with just two windings, the primary and e.h.t. overwinding. The l.t. supplies are derived from the chopper transformer, while a transistor to which the line flyback pulses are fed produces the feedback pulse for the flywheel sync system. The latter is in the TDA1950 sync/line oscillator chip, which also produces the sandcastle pulse used by the TDA3560 decoder i.c. for gating, blanking and clamping.

This decision greatly simplifies the transformer of course, while collaboration with a specialist manufacturer or ferrite cores enabled the cross-sectional area of the core to be reduced by some 25 per cent. The result is a transformer which is extremely compact and light.

The main design advance however is the use of what Telefunken call the "push-pull high-voltage concept". This uses two rectifier diodes, one at each end of the winding as shown in Fig. 1. The action of the circuit is shown in Fig. 2. D1 acts as a conventional peak rectifier when the positive-going flyback pulse arrives at its anode, charging the e.h.t. reservoir capacitor C2 (tube capacitance). During this time D2 conducts, clamping the bottom end of the e.h.t. overwiding to chassis. At the end of the flyback pulse half cycle the bottom end of the winding swings positively and D2 cuts off. It conducts again when the voltage at its cathode (circuit oscillatory action) tries to swing negatively, thus charging the interwinding capacitance C1. The next time the flyback pulse occurs, D1 sees an enhanced voltage at its anode, i.e. the sum of the flyback pulse and the charge on C1. The circuit thus acts as a voltage multiplier, and the number of overwinding turns can be substantially reduced in comparison with a simple half-wave rectifier circuit.

Even though it's on such a small former the primary winding has only two layers. These terminate in connection pins which together with two snap-on springs hold the transformer securely to the board for soldering. The diodes and the e.h.t. connection are secured to the body of the overwinding and encapsulated in heat hardened epoxy resin.

The focus supply is obtained via a bleed resistor in the tube's anode cap connector. Fig. 3 shows the feedback pulse generator stage.

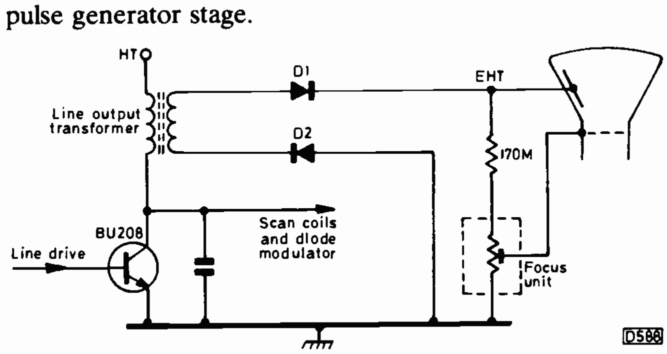
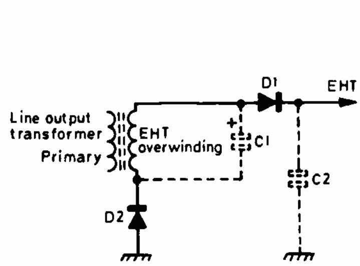


Fig. 1: "Push-pull" e.h.t. rectifier circuit.



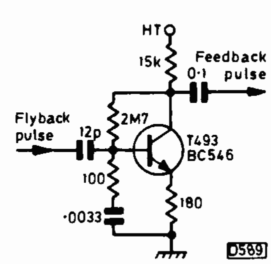


Fig. 2 (left): Operation of the rectifier circuit.
Fig. 3 (right): Feedback pulse generator stage.

socket, check back to the line linearity coil L705 and the diode modulator transformer T705. If there's continuity through these points, check the 2·2μF scan correction capacitor C724 which could be open-circuit.

Field Timebase

The field timebase lives on the right side panel above the Syclops driver etc. A field hold control may or may not be fitted. In the event of field roll, check C406 (47μF) which smooths the supply to the field oscillator.

The field timebase is basically reliable but is inclined to suffer from dry-joints, normally at the transistor connections, i.e. the base, emitter or collector. These poor connections can't always be seen, even under a strong light, so a few moments with the soldering iron may be called for.

The field oscillator consists of a pnp-npn pair (VT401/2) which periodically discharges C405 (0·68μF). The following stage employs a field effect transistor, VT403 (BF256L), the height control being in series with its source connection. The output from this transistor is capacitively coupled to the driver transistor VT404, which has the linearity feedback applied to its base. This is followed by a class AB output circuit which consists of a Darlington pair (VT405/6), a second driver (VT408), the second output transistor (VT407), and the bias diodes W406-8. VT405 is a BC337, VT406 a 16802, VT407 a 16801 and VT408 a BC327. In the event of incorrect or complete loss of height, check these various items.

Signals Panel

The signals panel closely follows that used in the 8800 chassis, as does the tuner. See the comments made last month. The tuner panel carries the 33V stabiliser (TAA550) and its 10kΩ feed resistor R15, which takes its supply from the 90V rail. There's no other supply resistor as there is in other models where the source voltage is some 200V.

Grey-scale problems can be caused by the RGB output stage decoupling/compensating capacitors C174/5/7 (560pF later 330pF).

Beam Limiting

Another similarity with the 8000 series is the beam limiter arrangement. The tube's grids should be at about 23V. If not, check R725 (180kΩ) and diode W722 (1N4005). These items can be damaged by a faulty tripler.

Puzzling Symptoms

Returning to the power supply arrangements, various puzzling symptoms can be produced when the 90V supply smoothing capacitor C715 is defective. If you find that there's marked line pairing ("horizontal lines"), possibly centre foldover and whistling, with intermittent tripping or tripping on channel change, check this item.

Audio ICs

Finally note that where an i.c. audio output stage is used the i.c. is type SN76033N. These have been in short supply for some time. Any that are available should be snapped up, together with any SN76003s, which are commonly used in various popular stereo units.

VCR Fault Guide

Photos and text by Mike Phelan

Supplement to 'Television', May 1983

The purpose of this supplement is to illustrate common VCR fault symptoms to assist newcomers with fault diagnosis.

Photo (1) shows the typical effect produced on a VHS or Betamax machine when one of the video heads is not working or there's a fault in the head circuitry. The fault may be on either record or playback: to prove which, check with a prerecorded tape. The cause could be a defective or dirty head or a fault in one of the preamplifiers. If on record only, check the record/playback switch (Beta) or the switching transistors (VHS) – the result is the same, i.e. alternate fields of noise only.

On V2000 machines, also certain early Philips and Grundig VCRs, the drop-out compensator continually reinserts the last line of "good" video, so one head not working gives an overlay of vertical bars as shown in photo (2), due to the last line of video from the good head being repeated throughout the following field.

Similarly, lesser drop-outs due to tape creases, a worn head etc. produce a series of bands of like appearance on these machines, as shown in photo (3).

If the whole picture on a V2000 machine goes into drop-out stripes every few seconds, check on fast search if available – see photo (4). Regularly spaced drop-out or noise bars prove that the dynamic track following is not working – fast search should be noise free, unlike VHS or Beta machines.

Incorrect Head Switching

If the head switching point (controlled by pulses from the head drum or flywheel) is in the wrong place, this will show on the picture as a band of disturbance or, if the switching is too late, the field sync pulses will be mutilated, causing jitter or roll. Photo (5) shows a case where the switching point was way out – it was discovered that the flywheel had been put on in the wrong position.

Noise Bars

Noise bars on a prerecorded tape only – see photos (6) and (7) – point to a fault in the tape path, affecting either the writing angle or the wrap of the tape around the head. Early VHS machines were prone to problems with the mechanical tape loading arm system, as a result of which the tape is not fully wrapped. Troubles on the supply (left-hand) side give a noise bar at the top of the picture and vice versa.

Spaghetti

The fault shown in photo (8), called "spaghetti", can be caused by quite a lot of things, but the basic reason is that the playback f.m. limiter is not coping – due to the f.m. being too low, excessive, noisy or the limiter being misadjusted. Worn heads can give this system, especially with V2000 machines.

Worn/dirty Heads

Worn or dirty heads with VHS and Betamax machines usually produce this symptom – see photo (9). Definition is lost; also the l.f. and h.f. ends of the f.m. spectrum, corresponding to the sync level and peak white respectively, are lost, so we get clogging and "dirty" highlights lacking in detail. With the cost of replacement heads in mind, a clean is worth a try.

Misadjustments

When a new head has been fitted it's necessary to go through any preamplifier frequency response adjustments – there are usually four with VHS machines, four or six with Betamax machines. If not, the picture may contain excessive f.m. noise as shown in photo (10). It looks like grains of rice on mid-grey areas (spaghetti, rice, what next? – that's nothing to the edible matter with which some customers fill their machines!).

There are also normally adjustments for the f.m. (luminance) and chroma record levels. Excessive f.m. gives a noisy playback picture, possibly with some spaghetti. If greatly excessive the chroma will be affected, as it rides on the edge of the f.m. waveform. See photo (11). Excessive chroma record level will *not alter the saturation,* as the burst and chroma are altered in proportion and the a.c.c. in the TV set compensates. You will however get a diamond pattern effect – see photo (12) – on saturated colours due to cross-modulation between the l.f. chroma and the f.m. If the playback chroma level is too high the effect is different – see photo (13). This time there's a fringe of patterning following all vertical edges – the effect is produced in the r.f. modulator.

Unlocked Colour

When the carrier used for chroma conversion is off frequency, the result is similar to the reference oscillator in a TV receiver's colour decoder being off frequency – see photo (14). A scope is essential for tackling this type of fault.

Displaced Colour

If the chroma is displaced with respect to the luminance, see photo (15), the machine is replaying the wrong number of lines per field. The TV set's flywheel line sync system compensates but the PAL delay line has a fixed period. The cause of the condition can be incorrect tape speed, excessive back tension, a tight head bearing or anything else that loads the head. If the displacement is not steady, suspect the pinch wheel or problems in the tape path. If the head speed is too far out for the TV set to be able to compensate the result is line slip as shown in photo (16). In this case the head servo circuit will have to be checked.

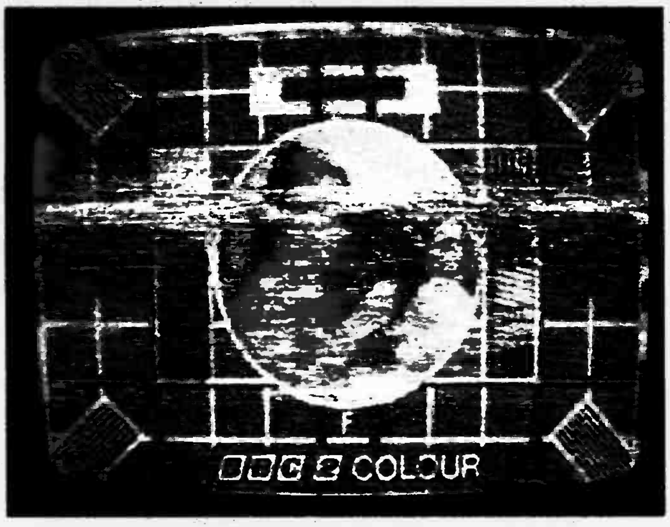
FM Modulator Faults

When confronted with a display such as that shown in photo (17), there are problems in the f.m. sections. In this example the carrier and deviation adjustments in the f.m. modulator had been twiddled. A scope, frequency counter and calibrated power supply are necessary to put things right again.

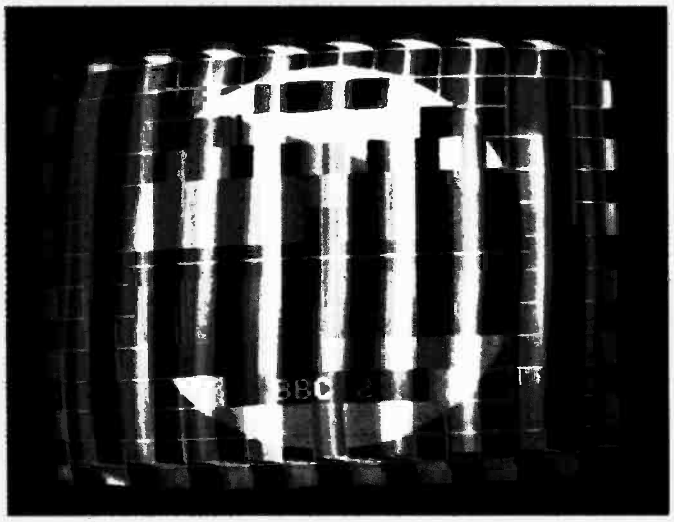
Drum Earthing Problems

As the head drum rotates in contact with the tape, it becomes charged electrostatically. Random white lines on the picture – see photo (18) – mean that the earthing brush for the drum spindle needs cleaning.

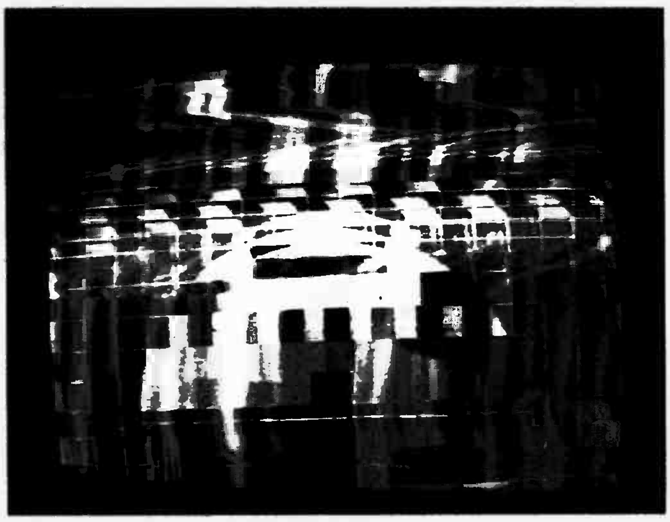
VCR Fault Guide



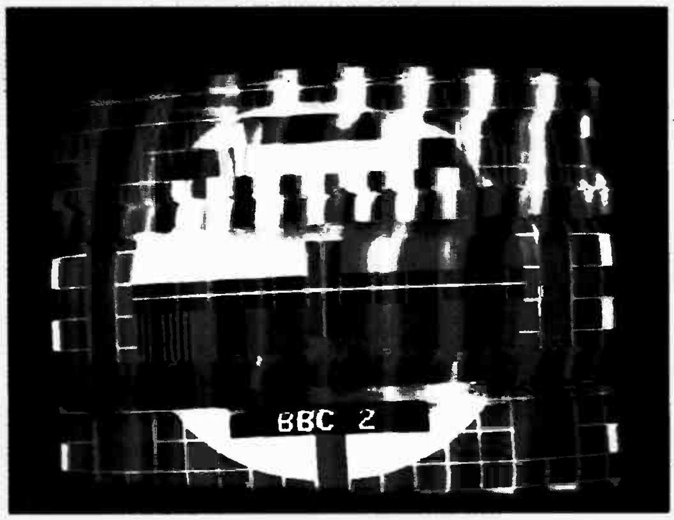
(1) Typical symptom on a VHS or Betamax machine when one head is not working.



(2) The effect when one head is not working on a V2000 system machine.



(3) The effect produced by minor drop-outs on a V2000 system machine.



(4) Effect when the dynamic track following system is not working on fast search with a V2000 machine.

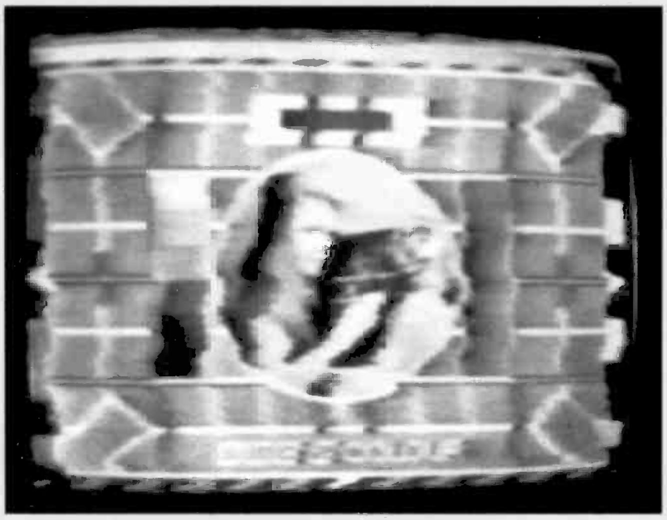
(5) Effect produced when the head switching point is far out – due here to incorrect flywheel position.

(6) Noise bars at the top and bottom of the picture due to a tape path fault.

VCR Fault Guide

(7) Noise bar at the bottom of the picture due to a tape path fault on the take-up side.

(8) If the limiting is inadequate or the f.m. noisy the result is "spaghetti" as shown here.



(9) Badly worn heads in VHS and Betamax machines produce this type of display.

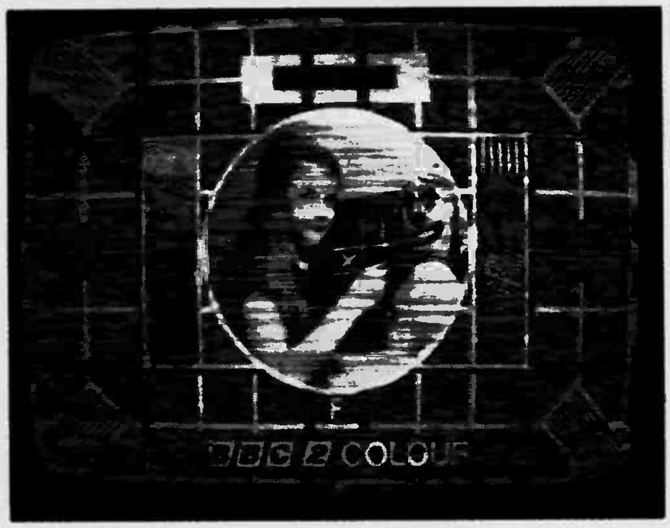
(10) Effect produced when the head preamplifier *Q* and resonance adjustments are incorrect.

(11) Effect produced when the f.m. record current is excessive – noisy playback, possibly with spaghetti.

(12) Effect produced when the chroma record current is excessive – patterning, not excessive saturation.

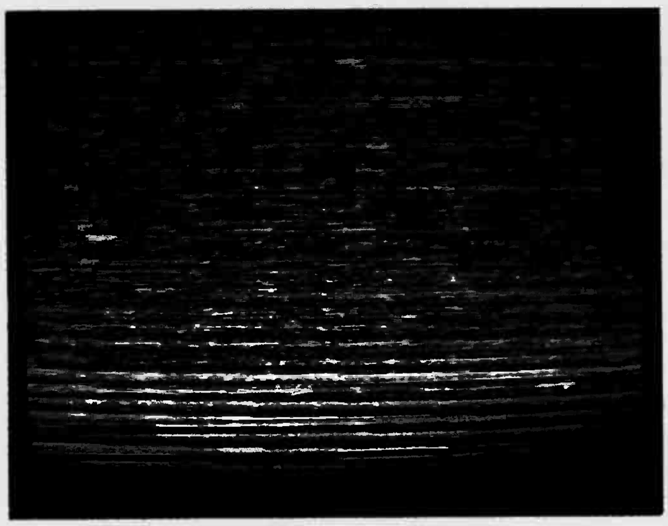
VCR Fault Guide

(13) Fringe patterning on vertical edges due to excessive playback chroma signal.



(14) An off-lock chroma conversion carrier produces unlocked colour.

(15) Chroma displaced with respect to the luminance, due in this case to incorrect head phase control.



(16) When the drum speed is too far out the result is line slip as shown here.

(17) Type of display produced when the f.m. modulator adjustments are mis-set.

(18) Random white lines will be present when the drum's static discharge system is not working.

Digital Counter-Timer

Part 2

Tony Jenkins, G8TBF (WKF Electronics)

WE'LL assume that those contemplating the construction of the frequency counter-timer are proficient at wiring and assembly. The aim of the following notes therefore is to ensure that the unit goes together with the minimum of problems, thus saving both time and frayed nerves.

Construction

Start with the main board. Fig. 7 shows the component layout. First of all fit the two through-board links under IC1 – it's impossible to do so after fitting the i.c. socket. Now install the i.c. sockets, which must be spaced sufficiently away from the board to allow access to the pins requiring top soldering. We suggest that the four corner pins on each socket are soldered first, with only about 1mm. showing on the underside of the board. Next fit the resistors, capacitors, diodes, crystal, etc., making sure that all top-soldered connections are made. Fit the SIL resistor networks with the dot on the body matched to the "1" shown on the PCB. Then fit the transistor and preset, followed by the regulator i.c. which also needs to be secured to the board by its tab with a short 3mm. screw

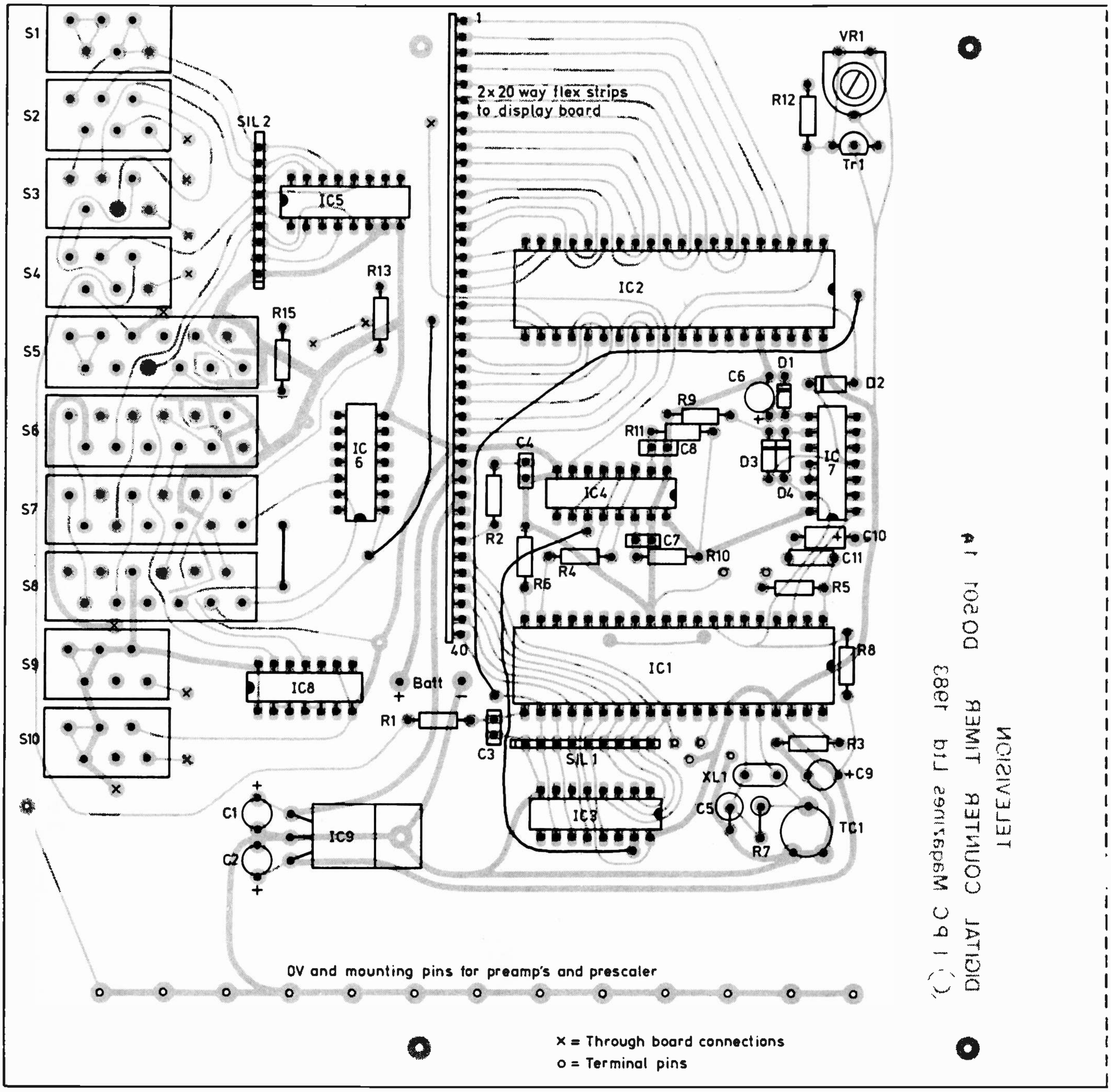


Fig. 7: Main panel component layout.

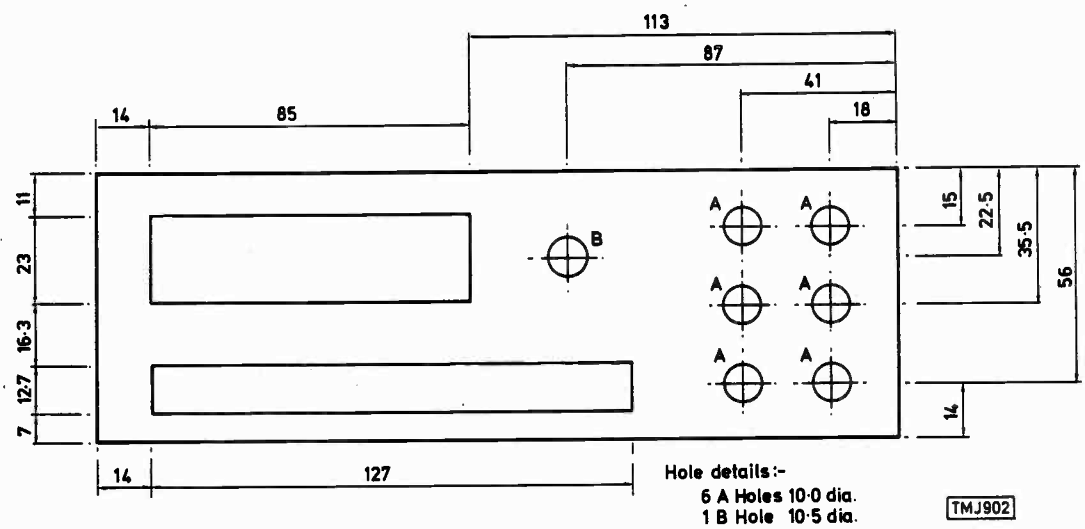


Fig. 8: Front panel cut-outs – dimensions in mm.

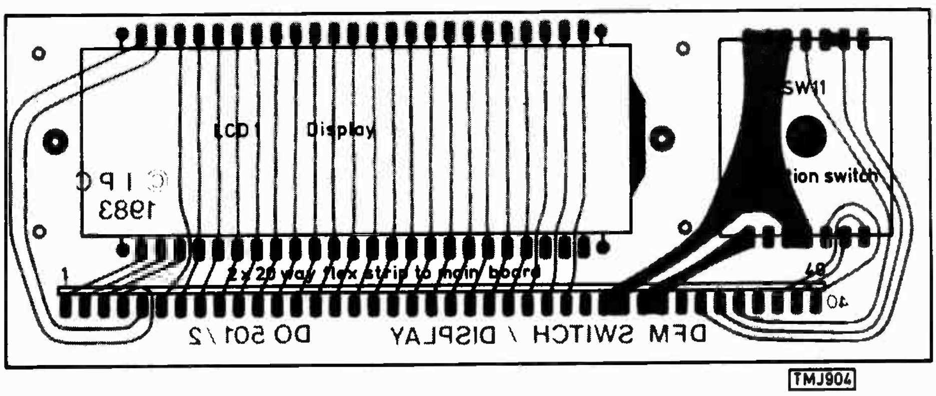


Fig. 9: Display panel layout.

COMPONENT LIST – 2

Prescaler One

Resistors: all 0.25W carbon film, ±5%, except where stated

R1	47R	R5	330R
R2	1k	VR1	10k
R3	10R	miniature horizontal-mounting	
R4	4k7	skeleton preset	

Capacitors:

C1	10n		ceramic plate
C2	22p		ceramic plate
C3-6	10n		ceramic plate
C7-9	$1\mu F$	35V	tantalum bead
C10	10n		ceramic plate

Semiconductors:

Tr1	BC183L	IC2	LM2931-Z5·0
IC1	8629		

Miscellaneous Items Required:

Set of p.c.b.s	Printed labels for front panel
I.c. sockets:	4 BNC sockets, single-hole mount, 50Ω
2 40-pin	2 20-way, 85mm Flexstrip jumpers
4 16-pin	Knob for function switch
2 14-pin	Display bezel
1 8-pin	4 3mm screws and washers
Case	PP7 battery

Preamplifiers (each of two units)

Resistors: 0.25W carbon film, ±5% except where stated

R1	1M	R10	220R
R2	100k	R11	220R
R3	10k	R12	47R
R4	22k	R13	470R
R5	150R	VR1	1k
R6	470R	subminiature cermet preset	
R7	47R	VR2	1k
R8	2k2	carbon track preset with knob	
R9	10k		

Capacitors:

C1	100n		polyester
C2	15p		ceramic plate
C3	$1\mu F$	35V	tantalum bead
C4	10n		ceramic plate
C5	10n		ceramic plate
C6	10n		ceramic plate
C7	$100\mu F$	6V	tantalum bead
C8	10n		ceramic plate
C9	10n		ceramic plate
C10	1n		ceramic plate
C11	$1\mu F$	35V	tantalum bead

Semiconductors:

Tr1	3N201
Tr2	BC183L
Tr3	BC183L
Tr4	BC212L

Miscellaneous:

L1 One turn e.c.w. on ferrite bead

and nut. Next fit the terminal pins followed by the remaining through-board links (note that there are two between sections of the switch bank). Finally fit the switch bank.

The next stage is to drill and prepare the front panel. Fig. 8 shows the cut-out details which must be adhered to. Readers purchasing PCBs from Readers' PCB Service will receive a paper template which should ease the task. The March cover showed the suggested lettering, which can be done using a suitable style and size of dry transfer lettering. Protect the finished panel with at least two coats of a suitable spray-on laquer. When the front panel is completed, letter the display bezel in the same way, then fit the bezel on to the front panel.

It's necessary to prepare the front panel prior to the display board since the function switch SW11 is not soldered flat to the board but has to be spaced away from it to provide the correct mounting distance from the front panel. More on that later. Fig. 9 shows the display board component layout. The LCD display has 24 connections on each side. The manufacturers supply it with connector strips which have 26 pins, one spare being located at each end. The socket strips to be soldered into the PCB have 25 pins. So the spare pin at one end of the display connector will go into the socket but the spare pin at the other end will be left floating. As the socket strip pins are offset, ensure that they are mounted the same way round and that the display is offset towards SW11. Then insert the display into the socket strips, making sure that it is correctly orientated and fully seated.

Insert SW11 *but do not solder.* Put the shakeproof washer on the spindle and strip off the antirotation pin (otherwise the switch will not mount flush to the front panel). Locate the whole assembly on the bezel studs, using a nut at each side for positioning. Align the board so that the display is parallel to the bezel, leaving a gap of about 1mm. Fit and tighten the securing nut on SW11, then solder the switch to the board.

The whole assembly can now be removed and the two 20-way flex strips soldered to the copper track side of the display board and then through the main board, remembering to solder the top and bottom. The flex strips are supplied cut to size, so don't insert farther than necessary through either PCB or the display may not reach the front panel. After fitting the i.c.s and the battery lead (we suggest using a PP7 battery) the assembly can be tested.

On initially switching on the display should show 00000000 with the "measurement in progress" (MIP) flag flashing. The annunciator flags should change according to the range selected. If all is in order the assembly can be put into the case – after the input sockets and offset controls have been mounted on the front panel.

The earth tags on the input sockets should be linked together, with a short lead attached for connecting to the main board. Likewise the pins at the anticlockwise end of the offset controls.

Corrections

Finally this month some corrections to Part 1. An i.c. pin number was omitted from Fig. 6: pin 5 of IC4b is connected to pin 10 (the missing number) of IC4a. Incorrect type numbers were given for the two 5V regulator i.c.s: IC9 (incorrectly shown as IC8 in Fig. 6) is type LM2931-T5·0 and IC2 (prescaler 1) type LM2931-Z5·0.

TO BE CONTINUED

Letters

SONY MODEL KV1810UB

David Botto's article on the Sony Model KV1810UB in the March issue was excellent. The suggested replacement component count for a dead set was very high however, and many service engineers will undoubtedly be reluctant to allocate the time and expense necessary to follow all the recommendations. Few engineers seem to realise that this model can be powered up without using the regulator circuit. The procedure I adopt when the chopper and line output devices (Q603 and Q510) fail is as follows:

(1) Remove but don't replace the chopper GCS Q603. (2) Link across its anode and cathode on the panel. (3) Replace the line output GCS Q510. (4) Connect an 18V supply to pin 17 on the regulator panel. (5) Supply the set from a variac, adjusting this for 125V at pin 22.

The set can now be tested (or soak tested) without fear of Q603 locking on and destroying both GCSs. This test does not give sensible results in terms of visible picture content, but for the majority of faults on these sets this is irrelevant.

The diagnostic procedure to follow on the regulator panel itself is adequately covered in the article, but I think it's important to point out that IC501 rarely (if ever) goes wrong. Also the value of C624 is not critical for test purposes. Higher values (say 100μF) can be used but will cause a line down the centre of the picture: you can fit values as low as 32μF, but this should be done only if the engineer is prepared to monitor the waveform at pin 16 of IC501.

Finally, the protection transistor Q610 is a complete disaster in these sets. If it conducts, the trigger input to the monostable is clamped to chassis. When this happens the chopper Q603 is left without drive and usually remains on. The result is that two more GCSs are destroyed. I remove Q610 and associated components, cut the track, and fit a crowbar circuit – exactly as in the Thorn 3500 chassis but with two zener diodes that come into operation when the 130V line rises to 140V.

Grahame Danbury,
Berkhampstead, Herts.

FERGUSON 3292 DRUM ASSEMBLIES

In the December 1982 VCR Clinic Derek Snelling raised the point about the interchangeability of replacement head drums, and the need to replace the lower drum assembly, in early versions of the Ferguson 3292. I've found that it's not necessary to replace the lower drum assembly. The replacement head drums are fitted with plastic relay pins which protrude and foul the mounting. They can be removed and carefully exchanged for the PCB and wires from the old head drum – but do take care to maintain the colour identification of heads 1 and 2. This simple modification can save £50 in parts alone.

Brian Watkins,
Arun Video, Bognor Regis.

THORN TX10 CHASSIS

The problem of the Thorn TX10 chassis blowing its chopper transistor was mentioned in the March Service Bureau. The fault described has a very strong resemblance to a great number that have passed through our workshop. The trouble is that the focus unit arcs internally. Replace this and fit a new BU208 and no more trouble will be experienced.

B. Francis, Tech. (C.E.I.), A.M.I.E.E.I.E.,
Plympton, Plymouth.

Failure of the chopper transistor in the Thorn TX10 chassis was mentioned in Service Bureau, March. I've found that the usual cause, whether a BU208A or BU208B is fitted, is the focus unit, which tends to arc over to chassis – this sometimes can't be seen or heard, and causes much head scratching.

David N. Burns,
Penicuik, Midlothian.

WORKSHOPS

Last December Chas Miller commented on the subject of workshops. It's a problem that occurs beyond the UK shores, believe me. My first five years in the trade were spent in Hamilton, Victoria in a workshop that was structurally sound but had a severe lack of test gear, particularly for two-way radio servicing (TV equipment o.k., just). May 1981 saw me up in Cohuna, Victoria. This time the workshop was an old house that was falling down. The floor was uneven, so that CTVs on trolleys ran away to the back wall. There were only four (two double) general purpose 240V outlets plus a million dual adaptors. The roof leaked – into a VCR one evening, but still nothing was done about it! The service vehicle (1968 Holden) had next to no brakes and big, gaping holes in the back. When delivering a new CTV the set got in one hell of a mess if the client lived on a gravel road! Stocks consisted of two triplers, a couple of BU326s, 2SD380s etc. In the summer the workshop temperature went over 40°C whilst in winter it fell to 0°C. In all, it was a dump. I could go on about it, but won't.

That's why I'm now at Tennant Creek, Northern Territory. The workshop here is an ex-cool room, thermally insulated and air conditioned with a constant temperature of 72°F, also with controlled humidity. The inner and outer skin is colourbond steel, providing r.f. shielding, an important aspect according to our Department of Communications requirement for transceiver servicing. Test gear is being purchased as we can afford it – we need about $10,000 to set up properly – but it's paradise compared to my previous experiences. Les's rusty motor car? – it sounds like a roller to me compared with the heap of rubbish we had to attempt to drive! The moral of all this is to be wary of working for a retailer (we don't retail up here). Retail margins are so narrow that the workshop inevitably suffers.

To close with, here are some fault experiences I've had with the Sony Model KV1800A.

(1) The 2·2μF RGB output stage h.t. smoothing capacitor C168 goes open-circuit, causing modulation of the raster at line rate – white-going modulation.
(2) No results – press cutout!
(3) The line driver transistor shorts, taking out the line driver transformer in a cloud of smoke.
(4) The line output transistors Q801A and B go short-circuit, taking with them the pincushion output transistor Q604.
(5) Horizontal tearing/ragged verticals. The line oscillator transistors Q509/Q510 have noisy junctions.
(6) Varying grey scale. The RGB output transistors or more often the 330Ω trim pots in the relevant output stage.

(7) No chroma. The 4·43MHz driver transistor Q306 open-circuit or the ident coil L308 lossy (not open-circuit – possibly shorted turns). The bistable switch transistors Q314 or Q315 open-circuit.
(8) Varying vertical static convergence – replace the HV block (tripler and thick film potentiometer assembly).
(9) The tube occasionally gives trouble – usually the blue or green gun goes down. Take care when removing the e.h.t. cap – the lead is coaxial, with 25kV on the braid and the vertical static convergence voltage on the inner conductor. If the spring on the centre contact of the connector is broken off the c.r.t. will be useless.

Finally, regards to Les, Chas and all.
Andy Sutherland, VK8KAS,
Tennant Creek, Northwest Territory, Australia.

Editorial comment: A check with our KV1800UB (UK version) manual suggests that most of the servicing notes above apply to this as well, but the capacitor in item (1) is C161 while a different decoder is used – see item (7).

PLUG PROBLEM

A further point about the failure of the line ouput transistor etc. in the Philips G11 chassis due to arcing in the mains plug. I've also experienced this and on occasions have found that it was caused by loose screws in the mains plug. This was in turn due to the tinned ends of the mains lead not being cut off prior to fitting the plug. The solder on the stranded wires "cold flows", and after a few months the screws become loose and the connector arcs.
Michael Bennett,
Romford.

FERGUSON FEEDBACK

The letter from D. Hazell in your March issue calls for a reply. *Ferguson Feedback* is issued free of charge to all Ferguson dealers: it's also available, on application, to all *full-time,* bona fide retail or repair operators on the basis of one per retail or repair organisation.

Due to an administrative error, your correspondent was charged for issue 1 and the binder on a retail basis. As a matter of policy we don't supply this particular publication to members of the public, but our internal procedures require that all the items we stock carry a notional retail price tag. Our apologies to Mr. Hazell for having charged him for something he should have received free of charge, and for adding insult to injury by levying the notional retail price. We shall be sending a refund.
Frank Pack,
Editor, Ferguson Feedback.

VIDEO/AUDIO CONNECTOR

I was interested to read the system L-I converter article in the February issue. Because most UK receivers have only a u.h.f. input, the converter incorporates a u.h.f. modulator. The cost of this and the alignment problems would be avoided if a direct video input could be used. All TV sets now sold in France are equipped with an industry standard "peritelevision" connector, and there are moves to get this adopted throughout W. Europe. This makes interfacing with other video equipment much easier, with better quality than is possible using a u.h.f. modulator. The standard pin connections are as follows:

(1) Audio output B. (2) Audio input B. (3) Audio output A. (4) Audio common earth return. (5) Video B return. (6) Audio input A. (7) Video B. (8) Function switching. (9) Video G return. (10) Intercom data. (11) Video G. (12) Intercom data. (13) Video R return. (14) Intercom data return. (15) Video R. (16) Blanking. (17) Video return (composite). (18) Blanking return. (19) Video output (composite). (20) Video input (composite). (21) Chassis.

All connectors mounted on equipment are female and various types of cords fitted with male connectors are available. Only sets with mains isolated chassis can be fitted with such connectors of course. It seems to me that you would be doing a service by drawing attention to this new standard.
(Name and address supplied, omitted for professional reasons.)

BACK COPIES WANTED

I've purchased *Television, Practical Electronics* and *Practical Wireless* for over eight years, keeping all issues in bound volumes. Unfortunately my house and all that was in it was destroyed during the recent fire storms here in Australia. I'm now seeking any back issues – subjects of particular interest to me are vision mixing and special effects, TV test pattern generators, teletext, audio mixers, and microprocessors (especially the 6800 family). Perhaps other readers could help?
W. Steinke, c/o 9 Holehouse Street,
North Sunshine, Victoria 3020, Australia.

PLAYING NTSC TAPES

When a member of my family emigrated to Canada and started to send me NTSC VHS video tapes I naturally turned my thoughts to seeing whether a UK VHS machine could be adapted to play them back. Obviously my first concern was with the servo system, so I started with the simplest type of machine, in fact a mechanically controlled Ferguson 3292.

During playback the capstan in this machine is locked to a 475·2Hz reference oscillator whose output is divided down to 3·71Hz, while the drum is locked by the off-tape control pulses. I decided to unlock the capstan and speed it up until I had 30Hz control pulses coming off the tape for drum control. This was done by earthing the gate of the field effect transistor X14, connecting a 1kΩ resistor between its source and drain (the usual method of opening the loop when fault finding), and adjusting the capstan sample position potentiometer to get 30Hz control pulses. Adjustment of the drum sample position potentiometer then gave me locked monochrome pictures. These remain stable due to the drum servo compensating for slight variations in capstan speed as a result of the unlocked capstan servo.

My second effort was with a Ferguson 3V23. During playback the capstan in this machine is controlled by off-tape pulses while a 4·43MHz crystal oscillator provides a common reference for both servos, counted down to 50Hz by IC1 on the servo-2 board and then divided by two to 25Hz in IC3. If pin 6 of IC1 is disconnected the reference output is increased to 70Hz: changing the crystal to a US chroma type (3·579MHz) gives an output at 60Hz, as required. Adjusting the drum and capstan sample position potentiometers then produced perfect monochrome pictures with all the facilities this machine provides.

Getting chroma as well is a different matter of course. Has anyone tried this?
D. Plummer, 26 Vicarage Road,
Hastings, E. Sussex.

Experimental 4GHz Converter

Hugh Cocks

WHILST most US 4GHz receiver designs use dual conversion down to an i.f. of about 70MHz, single conversion is more convenient and also far less expensive. The problem with single conversion is the image frequency. To put the problem simply, if we mix a 4·07GHz local oscillator signal and an incoming 4GHz signal and select the difference we get an output at 70MHz (4·07GHz − 4GHz = 70MHz). If there's an incoming signal at 4·14GHz (the image frequency) this will also produce an output at 70MHz when mixed with the local oscillator signal (4·14GHz − 4·07GHz = 70MHz). Unfortunately 140MHz is a very small step away from the wanted signal at 4GHz, and if this image frequency is not sufficiently attenuated the result will be a reduction in the carrier-to-noise ratio of 3dB. That's like throwing away 1·5ft diameter on a 6ft dish! Another possibility is that the two signals could interfere with each other, which is highly undesirable. Hence the need for image frequency rejection with a single conversion receiver, as in the present design. With double conversion to a first i.f. of say 800MHz the image frequency is 1·6GHz away at 5·6GHz.

To keep the cost down, a current-controlled multivibrator is used as the local oscillator in the unit to be described instead of a packaged microwave integrated circuit (MIC) – the latter are expensive for use at these frequencies at one-off prices, especially as they all come from the land of the dollar! The current-controlled multivibrator is a very effective substitute.

Due to the conversion loss, a low-noise amplifier (LNA) is essential. A simple one can be made for under £50 however now that the price of gallium arsenide field effect transistors is falling. The combination of an LNA and the present design provides a very effective down-conversion system. It should be emphasized however that the project is not one for the inexperienced constructor.

Circuit Operation

The circuit is shown in Fig. 1. The amplified signal from the LNA enters the first hybrid which splits and phase shifts it. The input impedance, as with most microwave gear, is 50Ω. The two outputs from the hybrid are taken to two further hybrids where the input from the local oscillator, at 70MHz away, is introduced. The outputs are applied to the balanced Schottky diode mixers D1/2 and D3/4, which are forward biased via R8/L6 and R9/L7 respectively for optimum performance. A 4GHz stub at each output removes any trace of microwave signal, the outputs being passed via the high-pass filters L1/C1 and L3/C8 to the two identical common-emitter amplifiers Tr1 and Tr2.

From here the signals are resistively combined via C2 (d.c. block), L2 and R3 on one side and VC1 with R4 on the other side. VC1 is adjusted so that the wanted signals are combined in phase, the 140MHz image signal being out of phase and thus removed. The goodness of the cancelling action depends on the stripline hybrids: cancellation between 18 and 28dB can be obtained across the band. As the circuit will be preceded by a high-gain LNA, strong image signals will be present at the input but will be of no great consequence.

The signal finally goes to transistors Tr3 and Tr4, which provide amplification and some bandpass filtering, and then leaves the head unit for its trip via coaxial cable to the indoor receiver. Simple, isn't it!

The PCB is the most critical item in the system, being etched from Teflon with a critical dielectric constant of 2·5 (0·8mm. thick). This can be obtained from several sources in the UK but isn't cheap – a piece of the size required will cost several pounds. The 70MHz section of the circuit could be made up on cheaper PCB to reduce the cost, but I've not tried it and can't guarantee it.

Microwave Oscillators

The current-controlled multivibrator consists of transistors Tr5 and Tr6. They are fed from the 12V line, the two bases being soldered directly to the board. The emitters are fed with a variable tuning voltage, between about −1V and −15V, via R13 and R14 respectively. The higher this voltage the higher the frequency – the opposite to a varicap system. This is a low-impedance tuning supply (see Fig. 2), which is a help with long cable runs from the indoor unit. (Microwave varicap tuned oscillators run at about ten times higher frequency than TV tuner varicap tuned oscillators and give about ten times the trouble with hum pickup, due to the oscillator's voltage/frequency response.) Frequency drift is of little consequence, but a.f.c. derived from the demodulated video can be applied. Diodes D5 and D6 help by giving some thermal tracking in addition to providing reverse voltage protection.

The loop of wire that joins the collectors of the two transistors can be made of coaxial cable inner conductor. Keep about three quarters of the original collector lead lengths on both transistors (they are mounted with the cases almost touching), with the loop having just a slight curve to join the two. With BFR34A transistors the band is tuned across by varying the voltage from −6V to −10·5V, though this may differ with other transistors. The oscillator is built off the board, secured to the board by the transistor connections. Mount the loop about a quarter of an inch off the board: fine adjustment of the tuning range is done by bending the loop back and forth.

The oscillator's output is picked up by a piece of wire which goes right over the loop and is soldered through to the microstrip on the other side of the board. When finished, this is positioned to give a level response over the band. It helps to solder a small value capacitor from the "dead" end of the wire, about a quarter of an inch beyond Tr6, to the board. Another capacitor can be soldered from one side of the loop to the pickup wire.

If a MIC oscillator is used instead, it can easily be mounted in the space the multivibrator would occupy. Direct connection from the output pin should be taken through to the stripline. Most of these oscillators present a d.c. short-circuit which our forward-biased Schottky diodes won't like, so a small chip capacitor should be inserted in the feed just before the wire joins the microstrip. Remember to change the polarity of C16 and the tuning voltage supply diode D6, as a positive 0-15V

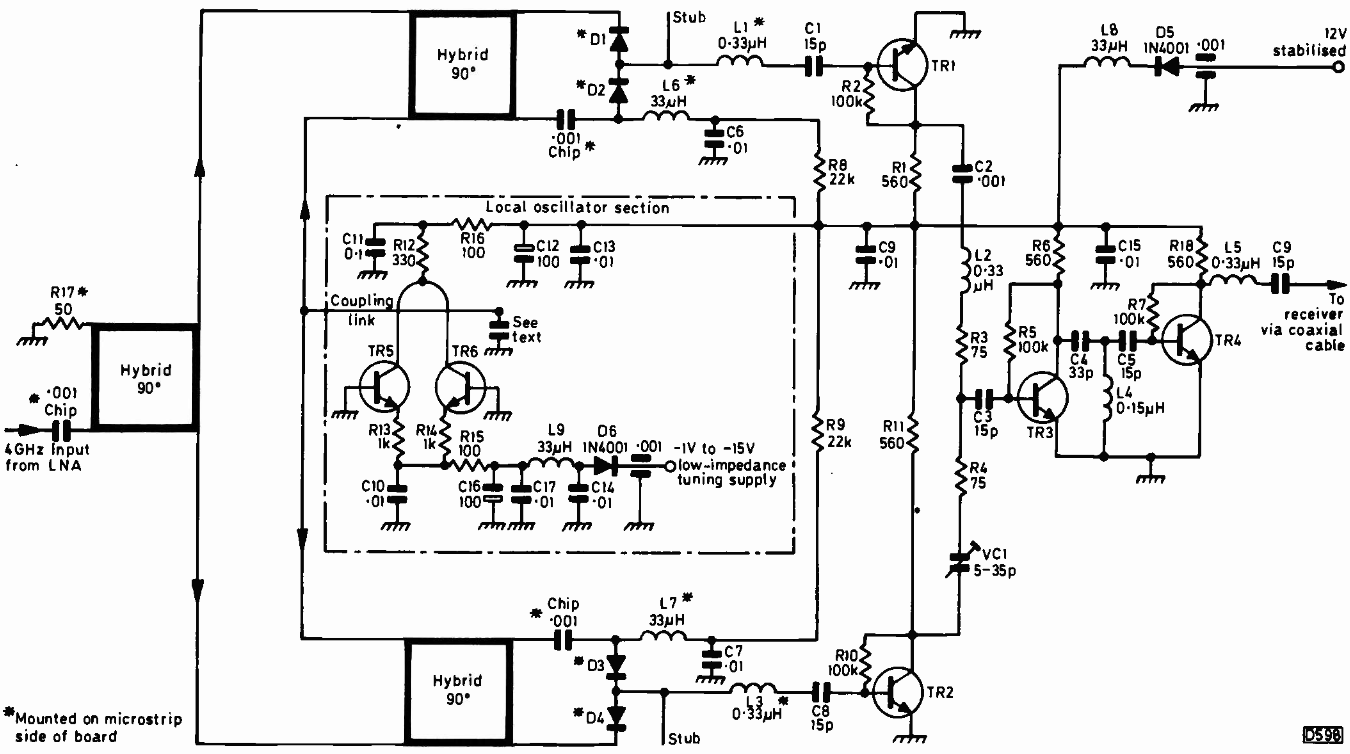


Fig. 1: Complete circuit of the converter.

(sometimes 22V) supply is required – the value of C16 should be reduced to say 2.2μF.

Construction

The PCB should have a tinplate surround with two feedthrough capacitors in the wall for the supply voltage inputs – the thing looks like a u.h.f. tuner when completed. The LNA may be built directly on to the input in order to do away with the need for expensive microwave connectors. If a US type with a gain of 50dB is used (some reach 57dB, which is not far off a million!) you will find type N output connectors fitted as standard (with waveguide input via a ferrite isolator), so either a chassis mounting plug or socket with back-to-back plug must be used.

Make sure that there's no danger of the coils touching the PCB. The various supply chokes are not critical in value and can be wound over resistors (high value ones!). I used BC109s in positions Tr1-4 – any npn transistor with a cut-off frequency of around 300MHz will do. It may be more convenient to have the trimmer on the same side as the oscillator: this is permissible though it will be a squeeze – check for obvious touching components. Finally put a lid on the top and bottom, with a hole for adjusting VC1.

Testing

We'll assume that you've some basic DX-TV equipment but no exotic test gear. Tune a TV receiver's tuner to around 70MHz and switch on (leave the oscillator switched off for the moment). There should be a vast increase in the noise seen on the screen. If not, check Tr3 and Tr4. If you can't tune to 70MHz, tune an f.m. radio to 88MHz. Next touch a screwdriver blade on the input ends of L1 and L3. This should produce a further vast increase in noise. If this happens on only one side, check the appropriate signal path.

When the oscillator is powered a "squegging" may be seen for an instant. This is normal. Check the voltages around the oscillator transistors. The collector voltages will vary as the emitter currents vary, down to about 8V at maximum current. It will certainly be oscillating now.

Those with microwave signal generators will have no problem. A lot of u.h.f. signal generators produce harmonics extending into the GHz range however, so you can at least prove that signals are being mixed. The humble u.h.f. tuner radiates microwave harmonics at its aerial input – the fourth or fifth harmonic can be used.

An LNA is essential. Even the Gorizont spot beam signals will be very low without one. No need to go into the design of one here. Castle Microwave (address later), who are NEC microwave component agents in the UK, have a very good application note for an LNA plus power unit. Alternatively an American LNA can be obtained.

In Use

With the LNA connected and the converter powered a lot more noise will be seen on the screen, probably varying as the unit is tuned across the band. The feedhorn used could be the same as that described by Roger Bunney in the November 1982 issue of the magazine. If an American LNA is used with waveguide input a matching horn such as the "Chapparal Superfeed" should be bolted on – it costs about $30.

Turn the receiving dish aerial to the Gorizont co-

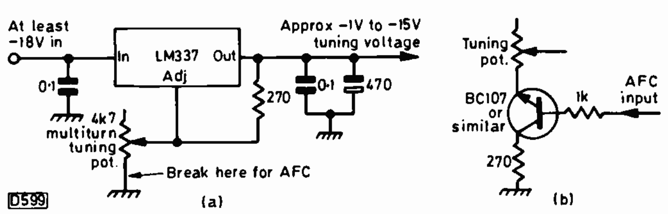


Fig. 2: (a) Method of obtaining a stable negative bias supply for tuning the microwave oscillator. (b) Method of applying a.f.c. to the bias supply.

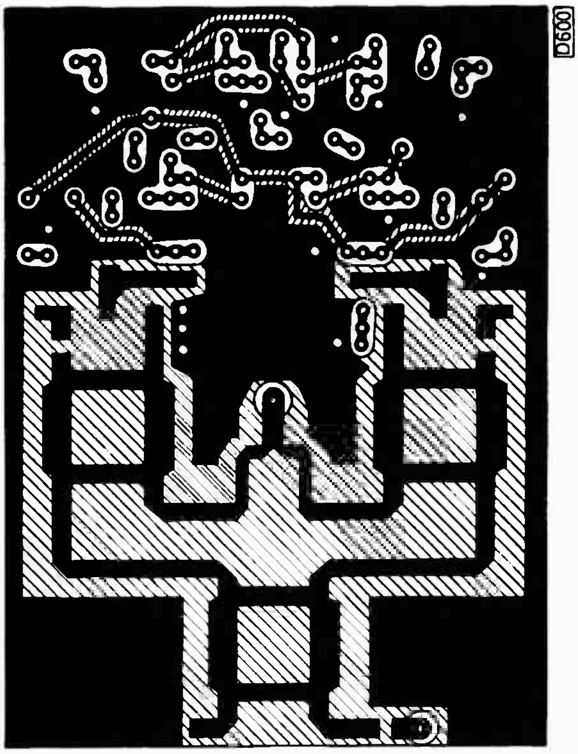


Fig. 3: Print pattern, microstrip side.

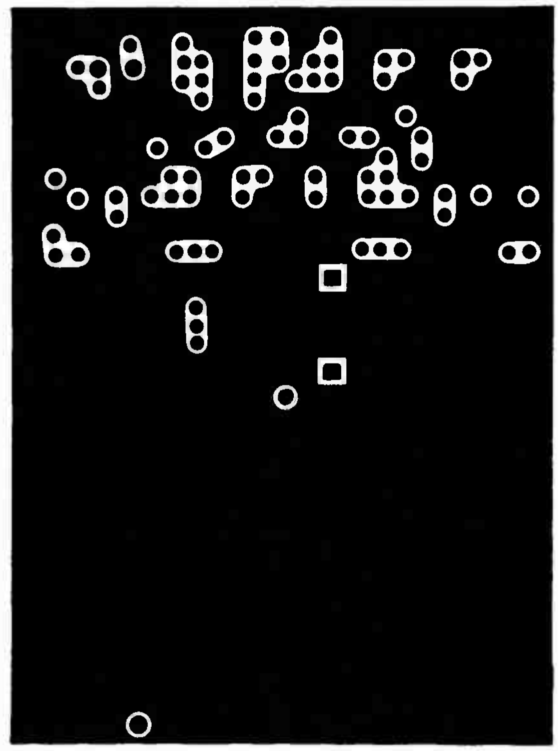


Fig. 4: Print pattern, component side.

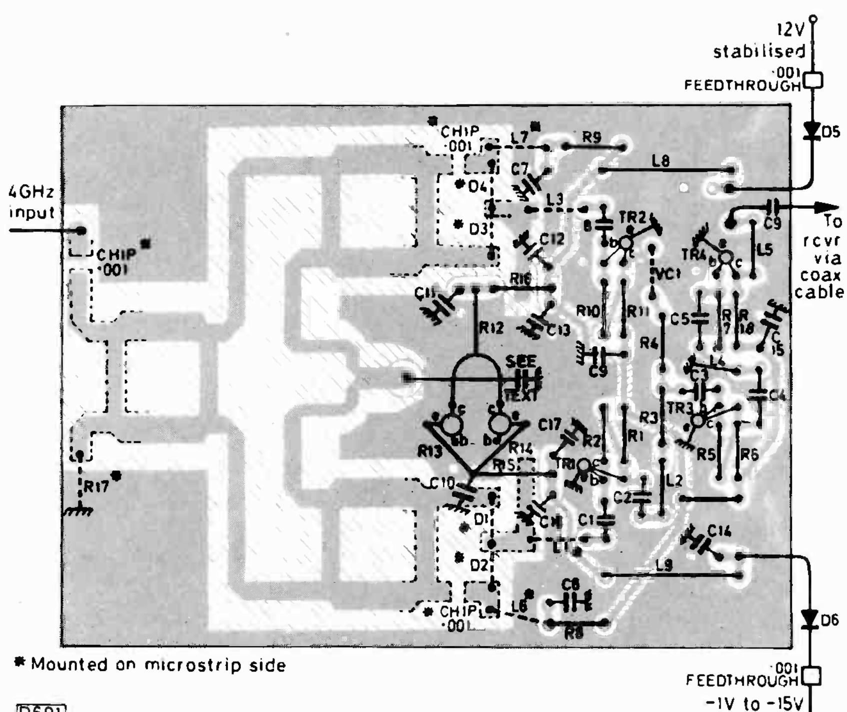


Fig. 5: Component layout. VC1 can be mounted on either side of the board.

ordinates of 198° from north and 30° elevation (reference London – the equatorial position is 14°W). The strong 3·675GHz spot beam should be quickly located, with its characteristic 2·5Hz flicker due to the energy dispersal waveform which is superimposed on the signal. It's preferable to set the oscillator on the high side of the signal to prevent weak image signals fouling the 3·825/3·875GHz transponder signals. Tune VC1 on the "lower" tuning position for least signal – you won't lose the image signal completely but it should have a lot less "spread". Confirm that the two weaker transponder signals are present (3·825GHz is at present the weakest of the three Gorizont signals and is often off air).

There have been several mentions of f.m. video demodulators in previous issues of the magazine. Phase locked loop i.c.s such as the NE564 (not the NE561) will work at 70MHz but are happier at 35MHz. A simple divide by two circuit can be used to convert the signal to 35MHz (see Long-distance Television, January 1982). An alternative is the quadrature detector type of i.c. such as the MC1357, TAA661 or CA3089 – even the ubiquitous TBA120 can be used at 70MHz – with the appropriate choice of gain, quadrature coil and damping resistor (quite a low value for f.m. video – a 470Ω preset is best).

To remove the unwanted energy dispersal, apply a.f.c. to the local oscillator by taking the d.c. component from the video demodulator plus up to 5Hz or so via an active filter, amplifying this with an operational amplifier or discrete component circuit, and feeding the output into the oscillator's tuning voltage supply. A good d.c. clamp in the video circuit will remove the "turning point" of the waveform so that the flicker is entirely removed.

The converter presented here is very much an experimental design, gleaned from an American source. If anyone builds or improves upon it I'd be interested to hear of their experiences. It certainly represents the lowest cost way of effectively receiving signals at 4GHz. My thanks to Dave Lewis for sorting out the PCB design.

Sources of Supply

Tr5 and Tr6 can be types BFR90, BFR91, MRF901, BFR34A or anything similar with a 4-5GHz cut off point. Such transistors are available from Ambit, Electrovalue, Maplin, etc.

Teflon PCB (often referred to as PTFE/woven glass laminate) 0·8mm. thick with a dielectric constant of around 2·5 can be ordered from Walmore Electronics, 11-15 Betterton Street, Drury Lane, London WC2 (telephone 01-836 1228). Ready etched boards (and chip capacitors) will be available from Hugh Cocks TV Services, Cripps Corner, Robertsbridge, Sussex (telephone 058-083 317).

The Schottky diodes D1-4 are NEC type ND4981-7E, Ambit part no. 12-49817, or can be obtained as a batch matched set for about £4 from Castle Microwave, 2 Clarence Road, Windsor, Berks. Some experimentation with diode types may prove beneficial.

American LNAs are available on a mail order basis from American Microwave Technology, PO Box 824, Fairfield, Iowa, 52556, USA. A 1·5dB maximum noise type costs about $360, a 1·3dB maximum noise type about $400 (120°K and 100°K respectively). The feedhorn required costs $30.

VCR Servicing

Part 17

Mike Phelan

TIME to take a further look at the 3V23's mechacon board. In Part 16 (March) we described how the basic command encoding system works, but there are some loose ends still to tie up – refer back to the block diagram shown in Fig. 68.

The function keys for the clock, tuning etc. are entirely separate from the mechanical function keys that feed ten-bit serial coded command signals to the serial-to-parallel converter IC38 on the mechacon panel – the tuner/timer board has its own key scan system. On remote control however both types of command are initiated by the hand unit, so it's necessary to feed five bits of the eight-bit parallel coded output from IC38 back to the tuner/timer board.

Some of the commands are not processed by the microcomputer IC1 but go from IC38 as four parallel lines to IC12 (a 4028 four to ten lines decoder) and then to the servo and display control panels. These commands are counter reset, frame advance and slow motion forward/reverse, see Fig. 73.

Although IC12 has ten outputs, only four are used here (the reason for this is that the other six output states have already been used in addressing the data selectors IC23/4/5/6). Starting with the Q0 output, this is inverted to give a low for counter reset. This also occurs at switch on. The Q1 (frame advance) output passes through an AND gate whose other input goes high for still/pause. The Q2 and Q3 outputs (slow forward/reverse) operate in conjunction with the voltage-follower IC36 (part) and C19. These latter items form a storage circuit whose output voltage goes to the servo board. When the Q2 output goes high, this appears as a low (after inversion) at C19 which will discharge via R104. When the Q3 output goes high C19 charges. As there's no load at the input to IC36, C19 retains its charge and the output from IC36 follows the input, varying the slow motion rate via the servo circuit. The "three-in-one" diode D27 acts as a zener diode to set the minimum speed – IC36's output cannot fall to zero.

Another four to ten line decoder (IC11) is used to drive the function LEDs on the front panel (see Fig. 74). This receives its inputs from the microcomputer's C port, while its outputs are passed through inverters. The operational amplifier (part of IC36) shown at the bottom in Fig. 74 is connected as an oscillator whose frequency is about 1Hz.

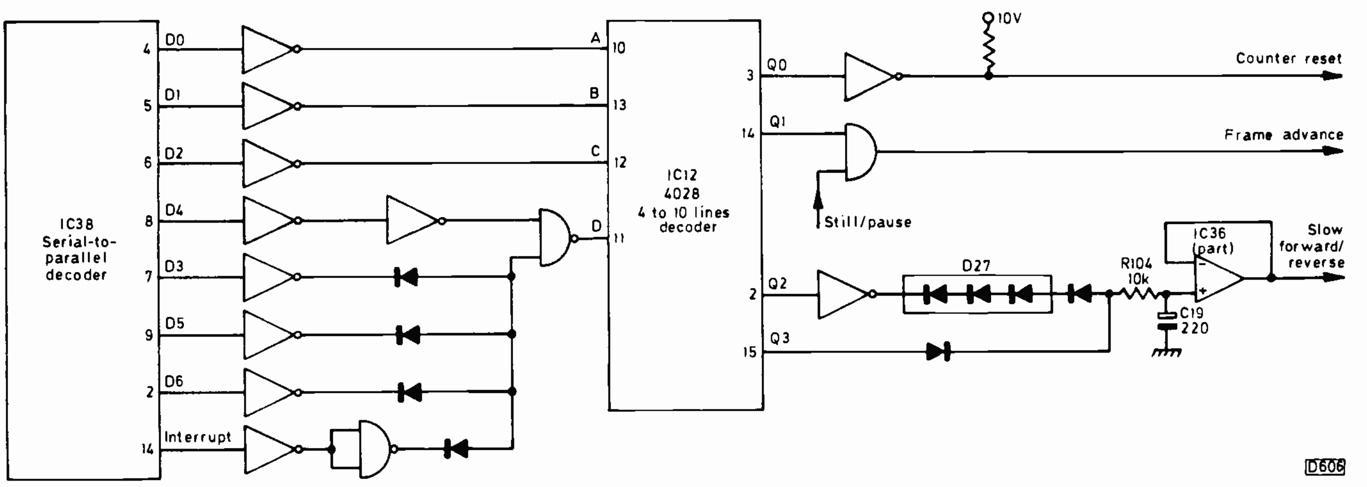


Fig. 73: Counter reset, frame advance and slow forward/reverse control.

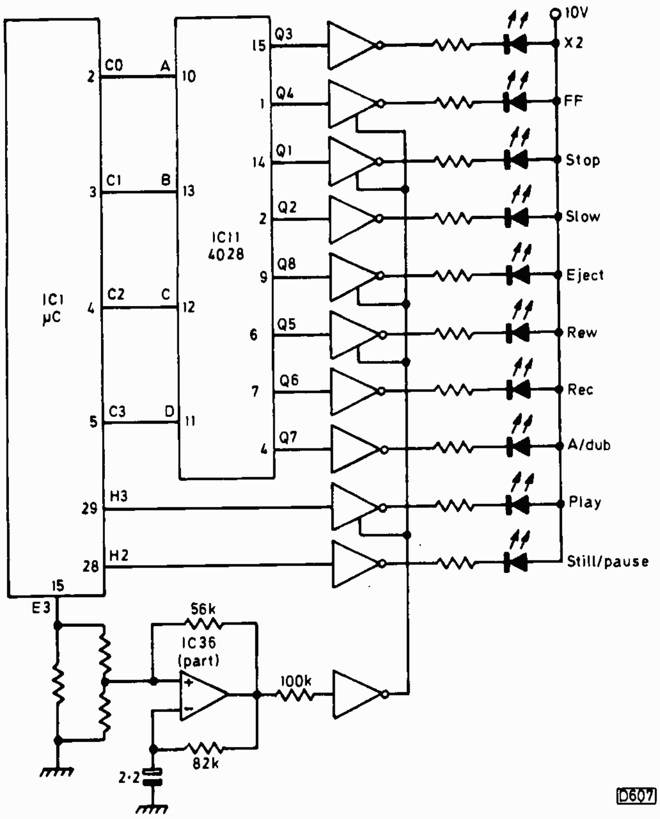


Fig. 74: Function LED drive circuit.

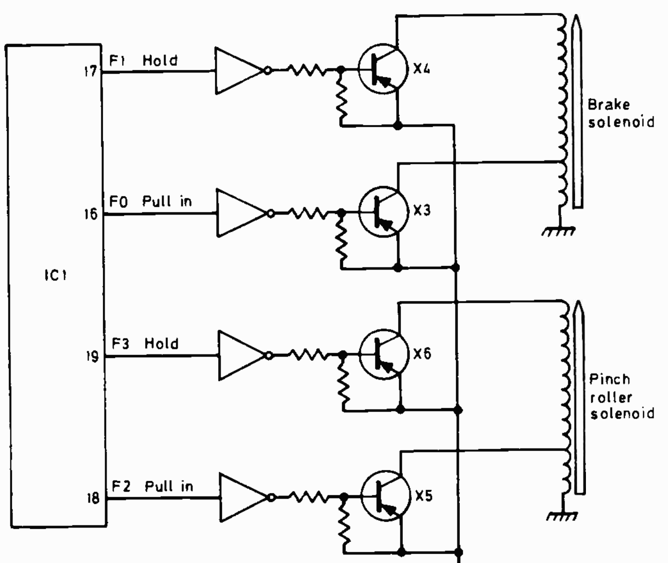


Fig. 75: Brake and pinch roller solenoid control.

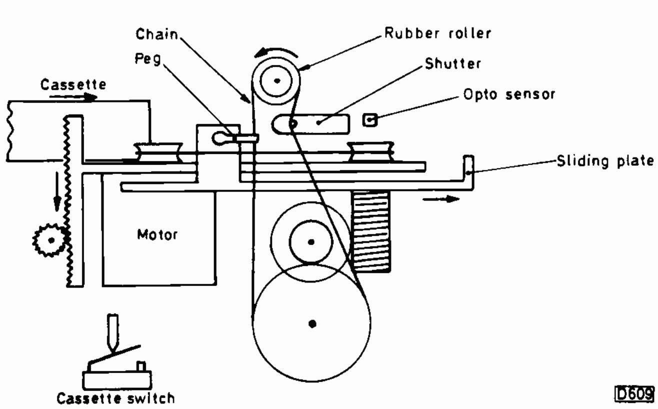


Fig. 76: Cassette housing, shown in the up position.

This is started when the microcomputer's E3 output goes high. Five of the inverters have a third connection. When this goes low, the inverter's output is open-circuit. Thus when the oscillator is running and one of the LEDs is powered it will flash, indicating that the machine is waiting for a previous function to finish or that a fault has developed.

The microcomputer's H1, H2, H3 and E1 outputs control power rail switching transistors via various gates to produce various switched supplies – things like "play 12V", "E-E 12V", "Rec 12V" to name but a few. There are 16 of these rails, which go from the mechacon board to various other boards in the machine.

We'll leave the D port (reel motor drive) until we've covered the servo boards. The remaining microcomputer output ports are F and G.

The F port drives the two solenoids (see Fig. 75), one for the pinch roller and one for the reel brakes. Each solenoid has two inputs: one is fed with a pulse to draw the solenoid in while the other is fed with a hold supply.

Cassette and Tape Loading Motors

The G2, G3 and H0 outputs control the cassette motor (the one that loads the cassette or ejects it). The loading process is initiated by pushing the cassette into the slot in the front of the machine (refer to Fig. 76). This lifts the rubber roller, tightening the chain and moving the shutter with the result that the opto sensor operates. This, via the data selector and microcomputer i.c., turns the cassette motor on for five seconds. The rollers rotate, drawing the cassette in and pushing the sliding plate to the right so that the peg enters a link on the downwards moving chain, drawing the complete carriage down until the cassette switch closes. The motor runs for a further 300msec, then turns off. If the cassette switch doesn't close within five seconds, eject occurs.

The drive electronics are shown in Fig. 77. It can be seen that the circuit is basically a bridge configuration – this arrangement is often used in VCRs to drive motors that need to be reversed, as in this case. IC1 output H0 goes high to unload the cassette while G2 and G3 go high for loading. If the cassette is pushed back in whilst the machine is trying to eject it, the load mode could be entered while the motor's inertia is still turning it in the eject direction. To overcome this problem G3 goes low to initiate reload: X12 turns off, and the motor drive current flows via X11 whose collector resistor provides current limiting.

The tape loading motor circuit (see Fig. 78) is driven by the G0 and G1 outputs and is very similar. In this case however the supply is switched off by transistor X7 to stop the motor. The motor drives toothed rings which move the tape guide rollers along tracks to pull the tape from the cassette and wrap it round the head drum.

Tape Guard Circuit

Fig. 79 shows the tape guard circuit, which provides protection in the event of the drum FF pulses being absent (no drum rotation), reel rotation stopping, lamp failure, and still/pause overtime (to prevent tape wear in one place). R154 and C42 form a timer circuit for the latter purpose.

The reel discs are slotted, the peripheries passing through optical sensors which produce signals to indicate that the reels are rotating. Both these signals and the drum

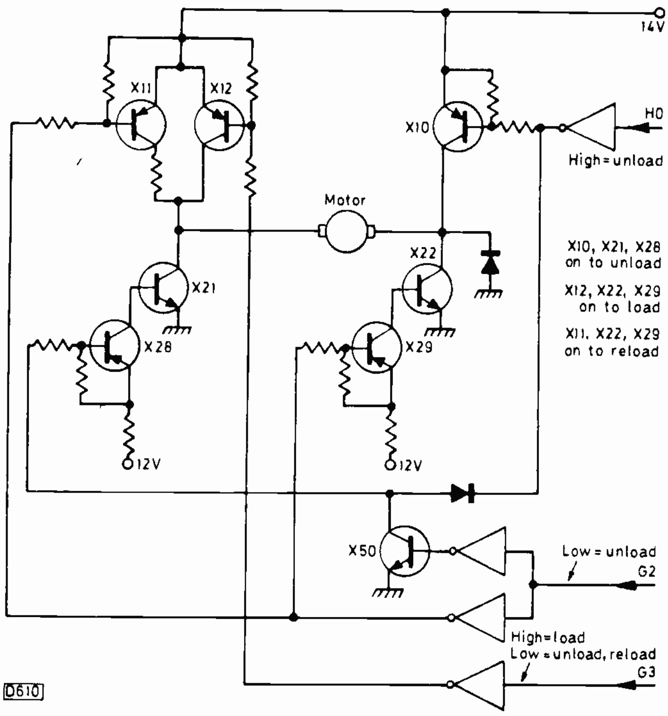


Fig. 77: Cassette loading motor drive circuit.

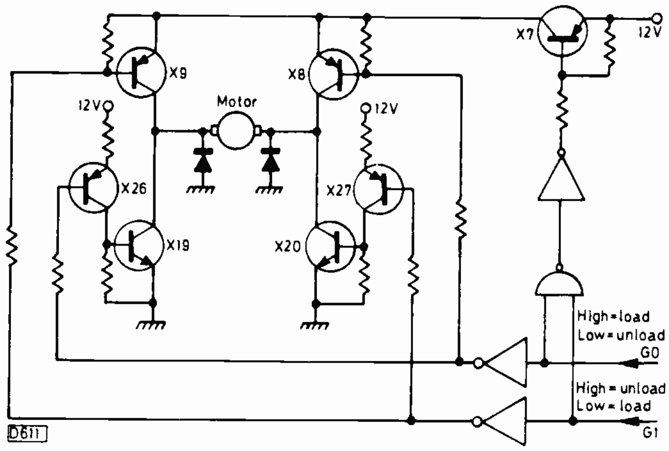


Fig. 78: Tape loading motor drive circuit.

FF signal go to a three-input gate which is followed by an inverter. The output from this normally keeps C43 discharged. In the event of any of the three inputs not being present however C43 charges via R158 to start the interrupt routine.

If the machine is in the still/pause or slow modes there will be no or interrupted reel rotation. The tape guard signal input to pin 13 of IC24 is therefore blocked via the NAND gate. After five minutes or so in pause C42 charges, the gate opens and the lack of reel rotation is detected with the result that the machine stops.

Failure of the cassette lamp produces the same effect.

The interrupt routine starts when pin 6 of the microcomputer IC1 goes low, even momentarily and irrespective of mode. The following sequence then occurs. The microcomputer checks its A2 input – this is the input from the data selector (IC24) that checks the unload switch, record safety switch, counter zero and command bit D2. A2 is high for stop and eject, low in all other modes. If the microcomputer finds that A2 is high, the tape guard input (IC24, pin 13) is checked. If this is high, the eject light flashes and the tape guard is rechecked. If A2 is low the machine is in a mode other than stop or eject, the outputs from the microcomputer are all cleared, then checked. This is repeated until A2 goes high, i.e. the machine is in the stop or eject mode. That's just a general idea – to go into the complete routine would require a detailed flowchart.

The Other Microcomputer

Before leaving the mechacon board, a brief mention of the other microcomputer here, IC2. This receives signals from both reel rotation sensors and from these calculates the relative reel speeds and thus the amount of tape remaining. The output goes to the tuner/timer board in the form of a five-bit code, to be translated into dots on the display. It also drives an up/down counter which operates the digital tape counter via the display control board.

Next time we'll look at the 3V23's servo circuits.

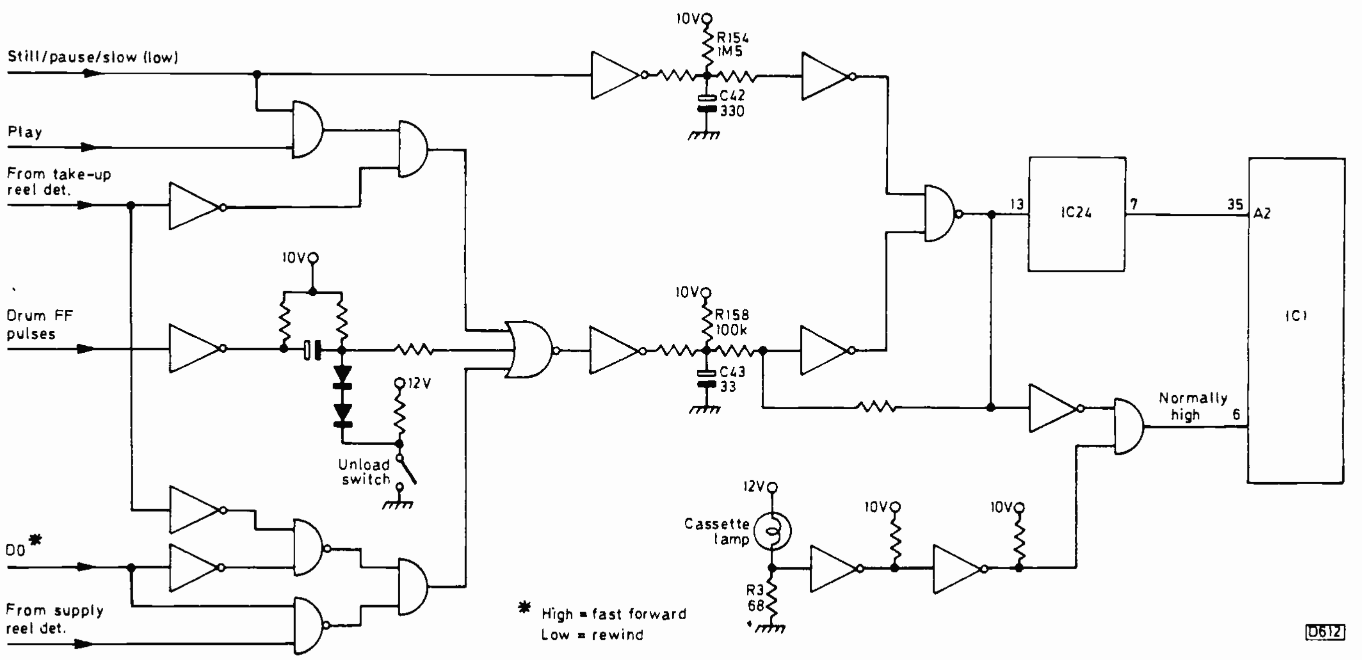


Fig. 79: The tape guard system.

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £1·00 postal order (made out to IPC Magazines Ltd.), the query coupon from page 377 and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.

NATIONAL PANASONIC TC2203

There are two unusual diodes connected across the 160V stabilised h.t. line. When they go short-circuit the set goes dead, but removing them allows things to start up and appear normal. What's going on?

The two items you mention, D809 and D818, are special diacs, type TVSK1V11. They are designed to go short-circuit when the h.t. voltage is excessive, initiating operation of the excess current trip. The usual cause of this trouble is intermittent failure of the 6V zener diodes D808 and D814 (type TVSQA106SBV) — they go open-circuit intermittently. Replace all four diodes with factory supplied replacements.

ITT CVC45/1 CHASSIS

The problem with this set is no results. There's 300V at the switch-mode power supply output instead of 127V, and there doesn't appear to be any drive to the chopper transistor. R3A in the 187V feed to the control panel has sprung.

This symptom is not uncommon with the CVC45 and derived chassis and is caused by the chopper transistor T807 being short-circuit. Use a TE1233 or BU126 as a replacement. The excessive h.t. voltage shuts down the chopper control circuit, at the same time removing the line drive which comes from the chopper transformer. Don't forget to resolder R3A and adjust R828 for 127V at C11.

TELETON C18BS

The width is excessive on this set — about two inches too wide at each side of the screen. Adjusting the horizontal size tappings has no effect and there doesn't seem to be an e.h.t. preset.

First make sure that the output from the h.t. series regulator transistor is not excessive. There should be 120V across C409, adjustable by VR701. If the h.t. is correct the probability is that the line flyback tuning is incorrect. This is controlled by the tuning capacitors C432/3/4 (0·033/0·033/0·047μF). Replacements should be adequately rated.

FERGUSON 3V16

The plug-in remote control unit's slow-motion button no longer operates – it simply puts the machine into pause, and adjusting the slider has no effect. The slow preset on the servo panel also has no effect when adjusted. The continuity of the remote control system has been checked.

The fact that the tape stops when slow is pressed proves that pin 8 of the control i.c. IC6 on the servo panel is being earthed via the remote hand unit. The fault would appear to lie between pin 29 of IC6 and the base of X15 in the capstan motor control circuit. First check for a pulse at pin 29 with the slow slider half way (this should show on a meter). The pulse goes via X11 and D22 to pin 5 of IC8, which shortens it. The output at pin 6 goes via D24 to X14. X10 feeds another pulse to add to this, the resultant double pulse being fed via D15 to the base of X15. Likely suspects are IC8 (BA222), X11 and X14. If there's no pulse at pin 29 of IC6, this i.c. is defective. Adjust the slow preset with a tape recorded on the machine, and the slow motion at the minimum rate, for least noise on the picture while the tape is stationary, i.e. between shunts.

GRUNDIG 717

There's distorted sound and no raster on this set. The voltage across the h.t. reservoir capacitors C708/9 is only 80V instead of 294V — when the set is first switched on the voltage is 200V, but it then falls to 80V. Disconnect C708/9 and the following smoothing resistor R702 and the result is the same. The diodes (Di701-4) used in the bridge rectifier circuit (three SKE-1/06 plus one C1780) don't seem to be readily available.

Whilst the bridge rectifier diodes or the reservoir capacitors could be faulty, it's more likely that either the anodes of diodes Di701/703 in the bridge are not earthed, the negative terminal of C708/9 is not properly earthed, or there's a fault in the surge limiter resistors R701/711. BY127s can be used in the bridge rectifier circuit.

THORN 8500 CHASSIS

The bottom of the raster creeps up very slowly – it takes several hours to reduce by about three inches. I've replaced the field driver and output transistors, the bootstrap and scan coupling electrolytics, also C432 (32μF) which decouples the supply to the field oscillator. As the fault develops the supply to the field oscillator falls and the driver transistor gets very hot.

If C432 and its associated smoothing resistor R433 (5·6kΩ) are in order we would suspect the 46V supply smoothing electrolytic C714 (2,500μF) on the power supply panel. If the trouble persists, suspect C433 (2·2μF) and W410 in the field charging circuit.

ITT CVC5 CHASSIS

I've seen the following fault on several of these sets – alternate vertical purple and green bars right across the picture. These are not really noticeable at high brightness levels but are pronounced on dark scenes. Changing the 20V line decouplers C152 and C219 in the decoder has failed to provide a cure.

This nasty effect afflicted some early CVC5s. Check the phasing of the subcarrier rejector coils L71 and L72 – these are towards the top of the board and the direction of winding should be clockwise when viewed from above. Ensure that the leads to the convergence box are dressed tightly against the degaussing shield, and that the green lead to the base of the regulator transistor T46 is dressed well away from the filter coil L95.

TELEFUNKEN 709 CHASSIS

The problem with this set is loss of line hold and picture break up when changing channels after the set has thoroughly warmed up. It's necessary to switch off and wait for a couple of minutes before switching on to the

desired channel. The line lock then dithers for a few seconds before settling down. Very occasionally a camera change will trigger loss of line sync, but this will recover after a few seconds. Adjusting the line hold control (oscillator coil) does not seem to make any difference.

First try a new ECH84 line oscillator valve, then if necessary replace the flywheel line sync discriminator diodes (Gr451, in common encapsulation). The latter sometimes go open-circuit intermittently, causing loss of line hold. Another possibility is the coil's tuning capacitor C462 (390pF) which is of a notorious type. Check it for intermittency – the leads sometimes pull loose at the ends. The problem can also be caused by the line output transformer cooking up – when this happens the pulse winding feeding the discriminator tends to go open-circuit, with loss of line hold, usually after an hour or so.

TEST CASE

245

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.

A minor fault can often lurk for years in a set out on rental. On each service call to attend to a more serious problem the visiting technician may notice the defect, but if the trouble is obscure and diagnosis difficult it may well remain there when he's gone! At some stage the set may have to be brought into the workshop. Such faults can then be studied at leisure and, hopefully, cured.

An example of this sort of skeleton in the cupboard condition was provided recently by a 100 series Decca colour set. A major timebase fault had resulted in the set's arrival in the workshop, and when this had been dealt with and the set readjusted the picture was seen to be definitely below par in a difficult to define way – the symptom was rather like that sometimes seen in old monochrome sets when the vision i.f. alignment has been twiddled a bit.

We are fortunate in having a locally generated monochrome test card in the workshop, and when this was displayed the fault condition was better defined. It took the form of an instability effect, with the white verticals of the pattern being reproduced in faint and distorted form at about quarter inch intervals to the right of the main image. As a result, the picture was hazy and badly defined – this sort of thing is sometimes seen on Thorn 3000 series sets when the local-distant control is incorrectly set. The colour reproduction was fair, but not up to the usual standard of this Decca chassis.

Faults like this are never easy to tackle. A start was made by bridging the l.t. supply decoupling capacitors in the i.f. and tuner departments. This had no effect, and careful checks on the earthing of the tuner and i.f. panels and the braid of the coaxial cable linking them brought nothing to light. The supply to the first i.c. in the i.f. strip is stabilised by a 15V zener diode (D101). This sometimes does odd things, but turned out to be o.k. Suspicion then fell on the two i.f. chips, MC1349 and TCA270, but substitution checks proved that they were blameless. So the set was put to one side until an i.f. panel could be robbed from another set to try in our patient.

In due course a known good panel was fitted – and had no effect on the fault at all! Perhaps the tuner was responsible? Another tuner was fitted and whilst the instability took a slightly different form it was still present. It was now becoming clear why the problem had never been sorted out over the years in the customer's home!

By now many hours had been spent on this set, and nearly all possible approaches to the trouble had been exhausted. The cause of the fault was finally traced however – to a component which by its nature is seldom guilty of failure. It was "no' very big and awfu' shy" as an old Scottish song goes. What was it? See next month.

ANSWER TO TEST CASE 244
– page 322 last month –

The key to the solution to John's tale of woe recounted last month lay in the e.h.t. meter reading. It will be recalled that the picture on this ITT monochrome set (VC200 chassis) was ballooning very badly, with normal proportions present at only very low brightness levels. All the tests and substitution checks that had been made assumed that the cause of the trouble was faulty e.h.t. stabilisation in the line output/e.h.t. generator circuit. In fact the e.h.t. voltmeter showed that the voltage applied to the tube was correct and rock steady regardless of the setting of the brightness control. This could mean only one thing, that the tube itself was faulty. Such was the case, and good pictures were obtained after fitting a replacement.

It was only the second occasion in many years that we've had this fault with a picture tube. The e.h.t. voltage is linked to the tube's final anode via an internal conductive strip painted on the inside of the flare, and it's likely that this was very high resistance or open-circuit somewhere. We won't send this one back for regunning!

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TELEVISION MAY 1983

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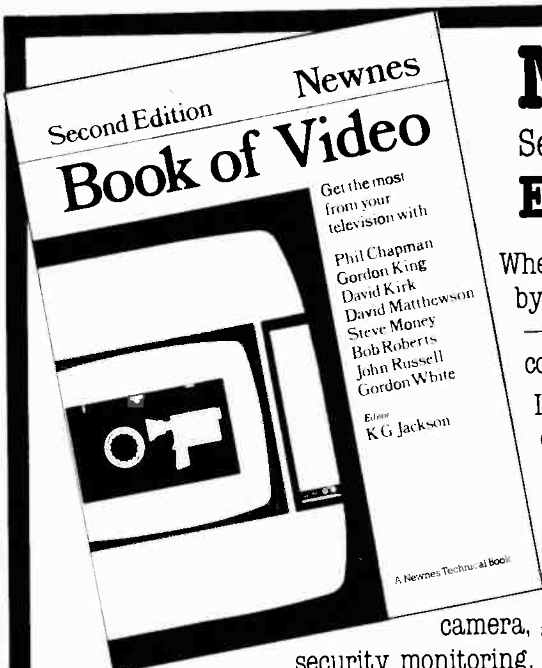

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Second Edition

Edited by Ken Jackson

When first published in 1980 **Newnes Book of Video** was described by **Television** as "a handy book to have around as a reference" — now it has been improved and updated to provide the comprehensive survey of television and other video equipment.

Its clear presentation of material and numerous illustrations enable newcomers, enthusiasts and businessmen to understand and choose equipment and assemble systems to their individual requirements.

All the main areas of video are covered, including the TV set itself, as are the various available add-ons — antenna, recorder, camera, game, computer — and extra uses such as teletext reception and security monitoring. For the budding professional, there is a fascinating explanation of programme making with just a single camera. A directory of manufacturers, agents and trade names rounds off this invaluable handbook.

Contents: The Video Centre • TV Receivers • Tape Recorders • Disc Players • Cameras • Programmes with a Single Camera • Antennas • Cable Distribution • Teletext and Viewdata • TV Games and Computers • Security and Surveillance •

Softcover 128 pages 246 × 189 mm Illustrated 0 408 013192 £6.95 May 1983

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(TV/5.83)

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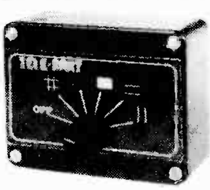

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- *Exceptionally light and durable*
- *Pocket size for outside service*
- *PP3 battery power source*
- *Five different test patterns for colour and mono TV*
- *Cross hatch grid*
- *Dot matrix*
- *White raster*
- *Horizontals*
- *Verticles*

A lightweight, extremely portable and versatile pattern generator for black/white and colour T.V. alignment and service at the customers home. At the turn of a switch, the generator can provide five essential test patterns for correct installation, fast checks and repairs. Pattern stability is first class and compares favourably with other more costly bulky generators only suitable for bench work. The generator is pocket size measuring 10x7.5x4 cm and weighs only 190 grams.

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- *Sound*

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1250MF 40V	50p
1250MF 50V	50p
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2200MF 40V Thorn 4K	95p
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100+50+150	350V	58p
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32+32+16	350V	52p
200+32+300+100	350V	70p
225+25	350V	50p
200+200+100	350V	70p
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200+200+100	350V	55p
200+200+75+25	350V	60p
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100+50+100	350V	55p
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22MF 10V	20/£1	470MF 10V	10/£1
22MF 63V	20/£1	470MF 25V	10/£1
22MF 160V	10/£1	470MF 40V	10/£1
32MF 275V	10/£1	680MF 40V	10/£1
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33MF 50V	20/£1	1000MF 18V	10/£1
33MF 250V	10/£1	1500MF 16V	10/£1
33MF 350V	10/£1	1500MF 35V	10/£1
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15R 17W	23p	270R 7W	16p	2K2 7W Fus.	25p	10K 7W	15p
22R 9W Fus.	25p	280R 17W	23p	2K7 9W Fus.	25p	10K 9W	16p
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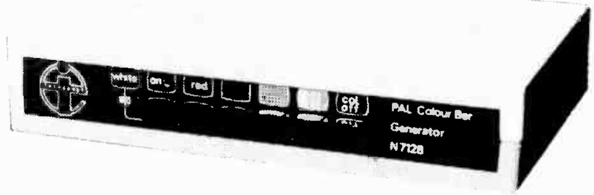

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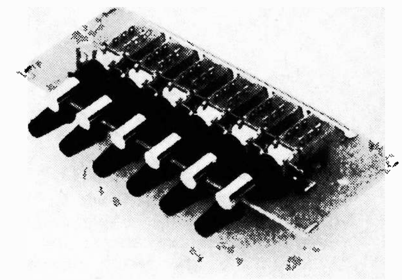

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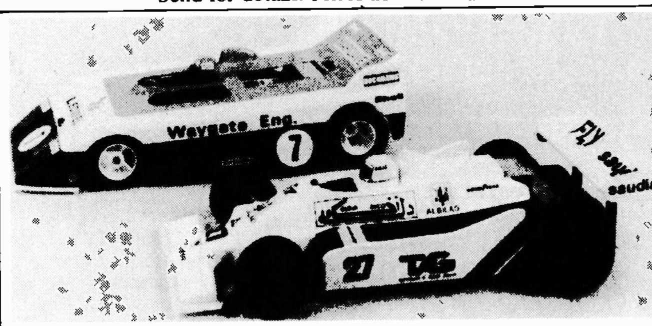

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BF181	20p
BF182	20p
BF184	20p
BF194	20p
BF195	10p
BF196	10p
BF198	10p
BF199	10p
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BF222	10p
BF224	15p
BF238	20p
BF240	20p
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BF257	20p
BF258	25p
BF259	25p
BF262	15p
BF263p	25p
BF264	15p
BF271	10p
BF273	10p
BF274	10p
BF301	10p
BF324	25p
BF336	30p
BF337	25p
BF338	25p
BF355	30p
BF362	20p
BF363	15p
BF367	15p
BF391	15p
BF394	10p
BF419	30p
BF423	15p
BF448	30p
BF450	20p
BF457	10p
BF458	30p
BF459	30p
BF468	30p
BF469	30p
BF470	30p
BF480	50p
BF594	10p
BF597	10p
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BC139	10p
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BC142	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
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BC157a	10p
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BC159	10p

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BC171	10p
BC172	10p
BC173	10p
BC174	10p
BC182L	10p
BC183	10p
BC184	10p
BC187	10p
BC204	10p
BC207	10p
BC212	10p
BC213	10p
BC214	10p
BC237	10p
BC238	8p
BC239	10p
BC245	8p
BC250	8p
BC251	10p
BC252	10p
BC257	30p
BC262	10p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC337	10p

BC338	10p
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BC349b	10p
BC350	20p
BC365	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
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BC455	10p
BC456	10p
BC460	25p
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