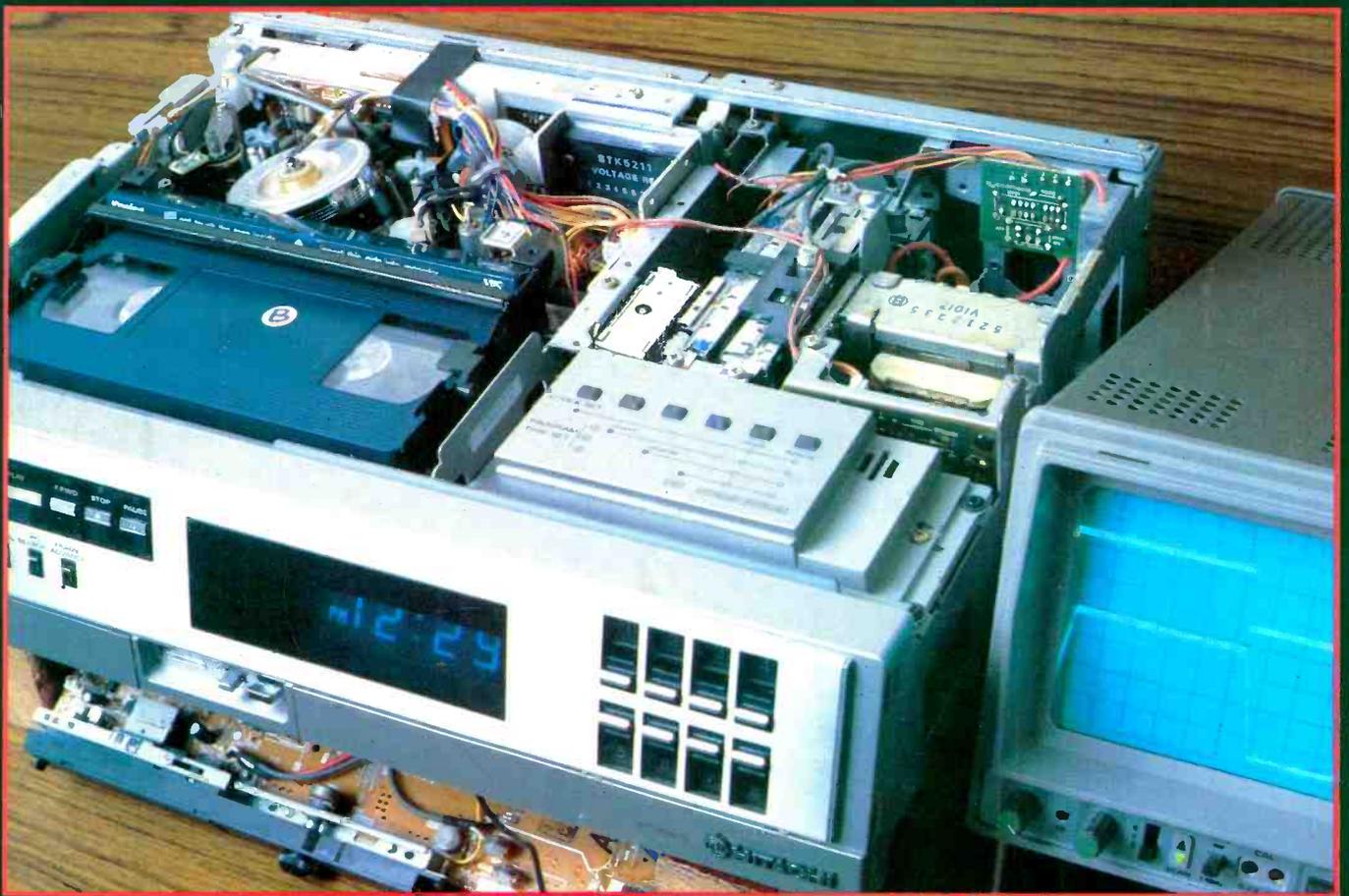


DECEMBER 1986

Australia \$2, New Zealand \$2.75 inc. GST, Malaysia \$5.75 **£1.20**

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

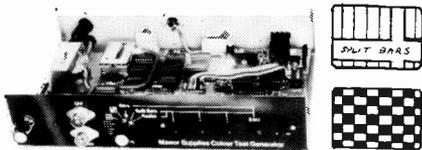


Hitachi VT8000 Series VCRs
Low-cost Teletext Decoder Project
Interference Problems with VCRs
What Word Processing can do for You
VCR Fault Analysis • DX-TV
TV Fault Finding • VCR Clinic

MANOR SUPPLIES

MKV PAL COLOUR
TEST GENERATOR FOR TV & VCR.

TEST
DEMONSTRATIONS
AT 172
WEST END LANE



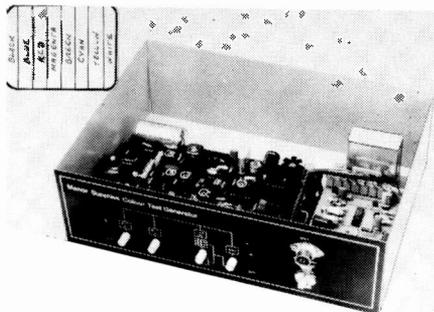
- ★ 40 different patterns and variations.
- ★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
-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

Price of Kit **£70.00**
Case (10"×6"×2¼") app. **£8.60**
Optional Sound Module (6MHz or 5.5MHz) **£3.90**
Built & Tested in Case including Sound Module **£108.00**

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'TELEVISION'
DEC. 1982

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PAL COLOUR BAR GENERATOR (Mk4)



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

PRICE OF MK 4 COLOUR BAR GENERATOR KIT
**£30.00. CASE £8.60. BATT HOLDERS £4.20. MAINS
SUPPLY KIT £4.20 (Combined P&P £2.20).**

MK 4 (BATTERY) BUILT & TESTED **£58.00 + £2.20 P & P.**
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VHF MODULATOR (CH 1 to 4) FOR OVERSEAS **£5.75.**
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

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Mullard Decoder panel + Interface **£35.00** p.p. £1.80
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PHILIPS G11 6 position touch tune channel selector units **£16.00** p.p. £1.80
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PHILIPS G11 PANELS (tested).
Power, frame, IF, decoder **£18.00** each p.p. £2.00. Scan Panel **£28.00** p.p. £2.80.
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PHILIPS HANDSETS Ex rental, Teletext, Untested, KT3, K30, CTX, KT4,
K35 etc. **£3.50** p.p. £1.00.
GRUNDIG COLOUR MANUAL GSC200, 1644GB, 1645GB, 4245GB,
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THORN TX9 Ultrasonic Remote/Control/Receiver panels. **£8.50** p.p. £1.50.
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Modulator, Battery Operated, also gives Peak White & Black Levels, can be
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THORN 8000, 8500, 8800 IF Decoder Panels Tested **£10.00** p.p. £2.30.
THORN 8000/8500 IF/Decoder Panels salvaged **£3.20** p.p. £1.80.
THORN 9000 IF/Decoder Panels Salvaged. For spares **£2.50** p.p. £1.80.
THORN 9000 Frame Time Base **£8.50** p.p. £1.80.
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TRIPLERS Full range available. Mono & Colour.

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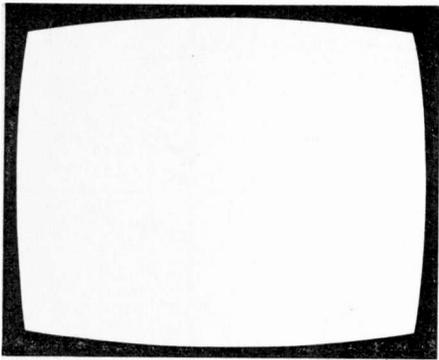
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TELEVISION

December
1986

Vol. 37, No. 2
Issue 434

On sale November 19th

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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., King's Reach Tower, Stamford Street, London SE1 9LS.

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An annual subscription costs £14 in the UK, £17 overseas (by surface mail). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

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Send orders for binders (£4.50) and indexes (vols. 30-35 only, 75p each) to the Editorial Office, Television, IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS. Prices include VAT and postage. Add 60p for overseas orders.

BACK NUMBERS

Some back issues published during the last six months are available from the Editorial Office at £1.40 inclusive of postage and packing. Address as above.

QUERIES

We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television*, but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. All correspondents expecting a reply should enclose a stamped addressed envelope.

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

this month

- 85 Leader**
- 86 Teletopics**
News, comment and developments.
- 88 VCR Fault Analysis** *Steve Beeching, T. Eng.*
First of a new series that will be appearing from time to time. The aim is to analyse some of the less common VCR faults you may encounter, with the emphasis on logical symptom assessment. Red herrings that can make diagnosis difficult will be pointed out.
- 89 TV Fault Finding**
Reports from R. Crockit, Jim Rainey, Philip Blundell, Eng. Tech. and Michael Dranfield.
- 93 VCR Clinic**
Reports from Steve Beeching, T. Eng., Alfred Damp, G. Jackson and Richard Roscoe.
- 94 Tiny Tim's Nightmare** *Les Lawry-Johns*
It's bill time again and Tiny Tim is not charging his customers enough to be able to pay them. Time was when the TV man was rich: Tim's fight against inflation has put an end to that...
- 95 Next Month in Television**
- 96 Servicing Hitachi VT8000 Series VCRs** *Derek Snelling*
A survey of what to expect with these machines, based on rental experience. The models covered are the VT8000, VT8300, VT8500, VT8700 and their Granada equivalents, also the GEC V4000H (VT8000).
- 100 Long-distance Television** *Roger Bunney*
Reports on DX reception and conditions and news from abroad. Also how to use the a.f.c. module from the Philips G8 chassis as a sensitive signal strength/tuning meter.
- 103 Interference Problems with VCRs** *J. LeJeune*
R.F. interference in the 200kHz-30MHz spectrum can cause various problems including patterning, "birdy" noises on sound and servo malfunctioning. Practical checks and cures are outlined.
- 104 The Ins and Outs of Word Processing** *Vivian Capel*
The aim of this article is to make clear exactly what can be achieved with a word processor so that you can decide whether one would be of help with your business or other interests.
- 110 Low-cost Teletext Decoder, Part 1** *Peter Marlow, B.Sc. (Hons.), C. Eng.*
The aim was to make use of the readily available Mullard VM6101 teletext decoder panel as the basis of a simple, no-frills add-on unit. A programmed microcontroller chip makes control of the panel simple while a VCR is used to provide the signal input.
- 114 Letters**
- 116 Service Bureau**
- 117 Test Case 288**

OUR NEXT ISSUE DATED JANUARY WILL
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AC107	35	BC549	10
AC126	34	BC550	10
AC127	34	BC557	10
AC128	34	BC558	9
AC128K	40	BC635	19
AC128K	40	BC637	39
AC141	62	BC639	30
AC141K	39	BC640	13
AC176	35	BCY72	32
AC176K	35	BD115	45
AC186	41	BD116A	90
AC187	38	BD124P	84
AC187K	46	BD131	50
AC188	35	BD132	49
AC188K	46	BD133	60
AD143=OC28	82	BD135	38
AD145	85	BD136	38
AD161	54	BD137	38
AD162	54	BD138	35
AD161/62 MP	1.15	BD139	35
AF106	49	BD140	44
AF114	89	BD144	1.70
AF118	1.20	BD150	60
AF121	75	BD159	65
AF124	48	BD160	1.60
AF125	53	BD166	52
AF126	53	BD179	70
AF127	53	BD182	1.20
AF139	63	BD183	1.18
AF178	1.54	BD201	85
AF239	60	BD202	91
AF279	1.56	BD203	80
AL102	4.90	BD204	99
AU106	7.50	BD222	46
AU110	3.01	BD223	56
AU113	5.20	BD225	47
BC107	20	BD235	63
BC108	20	BD236	63
BC109	20	BD237	65
BC114	12	BD238	65
BC115	17	BD243	85
BC116A	35	BD244	85
BC117	30	BD245	79
BC118	24	BD246	79
BC119	36	BD247	76
BC139	32	BD248	84
BC140	32	BD249	84
BC141	30	BD250	69
BC142	30	BD251	86
BC143	31	BD252	86
BC147	13	BD253	86
BC148	9	BD254	86
BC149	12	BD255	86
BC157	16	BD256	86
BC158	16	BD257	86
BC159	15	BD258	86
BC160	15	BD259	86
BC161	32	BD260	86
BC170B	15	BD261	86
BC171	15	BD262	86
BC172	15	BD263	86
BC173	16	BD264	86
BC174	10	BD265	86
BC177	27	BD266	86
BC178	26	BD267	86
BC182L	15	BD268	86
BC183L	15	BD269	86
BC184L	15	BD270	86
BC186	35	BD271	86
BC187	25	BD272	86
BC204	10	BD273	86
BC208	13	BD274	86
BC209	10	BD275	86
BC212	15	BD276	86
BC212L	15	BD277	86
BC213	15	BD278	86
BC214	15	BD279	86
BC237	14	BD280	86
BC238	14	BD281	86
BC251A	18	BD282	86
BC252	12	BD283	86
BC261	33	BD284	86
BC262	30	BD285	86
BC300	50	BD286	86
BC301	51	BD287	86
BC303	33	BD288	86
BC307	20	BD289	86
BC308	25	BD290	86
BC323	99	BD291	86
BC327	22	BD292	86
BC328	18	BD293	86
BC337	18	BD294	86
BC338	18	BD295	86
BC346	42	BD296	86
BC527	35	BD297	86
BC547	13	BD298	86
BC548	13	BD299	86
BCX32 = BC637	39	BD300	86

SEMICONDUCTORS

BF262	84	OT121	1.91
BF263	81	R2008B	1.90
BF271	24	R2010B	1.92
BF273	24	R2265	1.50
BF274	24	R2322	84
BF336	40	R2323	67
BF337	41	R2461	1.60
BF338	41	R2540	3.20
BF355	56	RCA4558	2.20
BF362	62	RCA16334	90
BF363	78	RCA16029	1.18
BF371	30	RCA16039	1.18
BF392	35	RCA16040	96
BF422	34	RCA16041	84
BF423	36	RCA16334	90
BF435 = BF491	45	RCA16335	90
BF457	35	RCA16957	2.88
BF458	43	TIC45	90
BF459	58	TIC46	60
BF460 = BF462	86	TIC47	72
BF469	63	TIC64	66
BF470	16	TIC75	54
BF597	66	BF758	54
BF598	54	BFR39	27
BF599	30	BFR40	30
BF639	30	BFR79	85
BF640	13	BFT42	42
BF641	13	BFT43	42
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BF704	42	BFT106	42
BF705	42	BFT107	42
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BF707	42	BFT109	42
BF708	42	BFT110	42
BF709	42	BFT111	42
BF710	42	BFT112	42
BF711	42	BFT113	42
BF712	42	BFT114	42
BF713	42	BFT115	42
BF714	42	BFT116	42
BF715	42	BFT117	42
BF716	42	BFT118	42
BF717	42	BFT119	42
BF718	42	BFT120	42
BF719	42	BFT121	42
BF720	42	BFT122	42
BF721	42	BFT123	42
BF722	42	BFT124	42
BF723	42	BFT125	42
BF724	42	BFT126	42
BF725	42	BFT127	42
BF726	42	BFT128	42
BF727	42	BFT129	42
BF728	42	BFT130	42
BF729	42	BFT131	42
BF730	42	BFT132	42
BF731	42	BFT133	42
BF732	42	BFT134	42
BF733	42	BFT135	42
BF734	42	BFT136	42
BF735	42	BFT137	42
BF736	42	BFT138	42
BF737	42	BFT139	42
BF738	42	BFT140	42
BF739	42	BFT141	42
BF740	42	BFT142	42
BF741	42	BFT143	42
BF742	42	BFT144	42
BF743	42	BFT145	42
BF744	42	BFT146	42
BF745	42	BFT147	42
BF746	42	BFT148	42
BF747	42	BFT149	42
BF748	42	BFT150	42
BF749	42	BFT151	42
BF750	42	BFT152	42
BF751	42	BFT153	42
BF752	42	BFT154	42
BF753	42	BFT155	42
BF754	42	BFT156	42
BF755	42	BFT157	42
BF756	42	BFT158	42
BF757	42	BFT159	42
BF758	42	BFT160	42
BF759	42	BFT161	42
BF760	42	BFT162	42
BF761	42	BFT163	42
BF762	42	BFT164	42
BF763	42	BFT165	42
BF764	42	BFT166	42
BF765	42	BFT167	42
BF766	42	BFT168	42
BF767	42	BFT169	42
BF768	42	BFT170	42
BF769	42	BFT171	42
BF770	42	BFT172	42
BF771	42	BFT173	42
BF772	42	BFT174	42
BF773	42	BFT175	42
BF774	42	BFT176	42
BF775	42	BFT177	42
BF776	42	BFT178	42
BF777	42	BFT179	42
BF778	42	BFT180	42
BF779	42	BFT181	42
BF780	42	BFT182	42
BF781	42	BFT183	42
BF782	42	BFT184	42
BF783	42	BFT185	42
BF784	42	BFT186	42
BF785	42	BFT187	42
BF786	42	BFT188	42
BF787	42	BFT189	42
BF788	42	BFT190	42
BF789	42	BFT191	42
BF790	42	BFT192	42
BF791	42	BFT193	42
BF792	42	BFT194	42
BF793	42	BFT195	42
BF794	42	BFT196	42
BF795	42	BFT197	42
BF796	42	BFT198	42
BF797	42	BFT199	42
BF798	42	BFT200	42
BF799	42	BFT201	42
BF800	42	BFT202	42
BF801	42	BFT203	42
BF802	42	BFT204	42
BF803	42	BFT205	42
BF804	42	BFT206	42
BF805	42	BFT207	42
BF806	42	BFT208	42
BF807	42	BFT209	42
BF808	42	BFT210	42
BF809	42	BFT211	42
BF810	42	BFT212	42
BF811	42	BFT213	42
BF812	42	BFT214	42
BF813	42	BFT215	42
BF814	42	BFT216	42
BF815	42	BFT217	42
BF816	42	BFT218	42
BF817	42	BFT219	42
BF818	42	BFT220	42
BF819	42	BFT221	42
BF820	42	BFT222	42
BF821	42	BFT223	42
BF822	42	BFT224	42
BF823	42	BFT225	42
BF824	42	BFT226	42
BF825	42	BFT227	42
BF826	42	BFT228	42
BF827			

SONY SPARES

SEMICONDUCTORS

CV12E		2.34
GH3F		1.42
IS1555		25
U05G	KV1810UB	96
V11N	KV1810UB	25
10E2		4.08
SG-264A		6.42
SG629	KV1810UB	13.20
SG-6533	SG613	4.08
BX342	SLC7UB	5.28
CX104A	KV1810UB	7.74
CX136A		7.20
CX143A	SLC5/7UB	5.28
CX186	SLC6UB	2.34
M51231P	KV2200UB	13.20
STK2129		13.87
TCP4621AF6	SLC6UB	3.24
TDA2578A		2.34
UPC 1394C		16.98
UPD 546C107	SLC7UB	8.94
UPD 547C049	SLC7UB	5.28
TL494CN	SLC7UB	2.34
2SA 771		1.42
2SA 835		25
2SA 1027R		89
2SA 1175	SLC7UB	96
2SB 733		96
2SB 740C		1.42
2SB 856		25
2SC 403C		2.34
2SC 867A		5.28
2SC 1034		2.94
2SC 1061=		5.28
2SC1986		96
2SC 1114		3.18
2SC 1124		25
2SC 1316		3.18
2SC 1362-7		25
2SC 1364		2.34
2SC 1413A		7.38
2SC 1475		1.42
2SC 1962		25
2SC 2009		96
2SC 2278		7.38
2SC 2335 Kit		3.18
2SC 2369		96
2SC 2551		25
2SC 2785		4.08
2SC 3153		2.34
2SD 257		8.94
2SD 725		2.34
2SD 773		2.5
2SD 774		96
2SD 1164		96
2SD 1497-02		4.08
2SD 1497-06		4.08

SONY SPARES SUNDRIES

UHF Tuner BT-871	KV1810UB	37.20
Booster Antenna	SLC7UB	31.38
RF Modulator	SLC6UB	60.30

SONY REMOTE CONTROLS

SLC5UB RM751 (Wired)	19.80
SLC6UB RM-72 (Wired)	17.40
SLC7UB RMT200 (IR)	42.00

SONY SPARES VIDEO/AUDIO HEADS

Ace Assembly	SLC7UB	24.10
Ace Assembly	SLC6UB	
	SYA-676-104-6A	
	rep	47.22
Video Head DR3-21R	SLC9UB	43.20
Video Head DSR-35A	SLC20/30/40UB	41.34
Video Head DSR-36R	SLC5/C6/7UB	42.00
Video Head DSR-43A	SL8000UB	46.74
Head Record-Playback	PP128-3602C/GEN	13.87
Head Record-Playback	181-3602D/TC/HMK	4.12

PHILIPS - KT3

116 40025	Dual Posistor	1.80
124 70347	Main Electrolytic	6.50
101 20519	Focus Control	3.68
140 10161	LOPT	10.06
	Tripler	12.50
276 80198	Select Unit 933	16.67
276 10673	On/Off Switch	3.84
Panels		
212 20648	Lum. Chroma mk.1	31.09
212 37538	Lum. Chroma mk.2	19.80
212 20616	RGB Panel	12.87
212 20647	Sound Panel	12.50
212 21114	Power Panel	21.48
212 20617	Line Frame Sync	26.49
	21164	
212 20649	Mains Input Rect. Panel	17.96
212 27445	I.F. Module(V321)	16.60
212 27522		
212 20646	I.F. Module(2003)	18.63
212 20796	Sound Panel	10.20

SONY SPARES MECH. REP.

Main Drum Assy	SLC7UB	192.52
Rewind Idler Assy	SLC7/C5UB	5.95
Rewind Idler Assy	SLC6UB	3.95
Forward Assy	SLC9UB	3.18
Gear Kit	SLF/C9UB	8.94
Guide Pin Kit	SLF/C9UB	5.28
Pinch Roller	TC-GEN	96
Pinch Roller	TC2045D	1.42
Pinch Roller	HMK44/44B	96
Pinch Roller	TCK55	96
Cass Holder Assy	TCK44	1.42
Lever Fwd. Assy	WM2	96
F.Wheel Assy	WM2	3.18
Limitter Assy	SLC7UB	2.34
Idler Assy	SLC7UB/C5/3000	96
Brake Assy	SLC7UB	1.42
Pulley Load Assy	SLC6UB	96
Thrust Bear. Assy	SLC6UB	3.18
Screw Cass. Lid	WM2	25
Coil Spring	WM2	25
Battery Lid	WM2	96
Lid Timer	SLC7UB	96
Threading Gear	SLT6ME	96
C5 C7 Capstan Motor		34.00
C7 Drive Motor		32.95
Pinch Roller	SLC7UB	0.96

SONY SPARES BELTS

Belt	WMR2	96
Rubber Belt	TC-GEN	96
Take Up	TC-GEN	96
Drive	TC-GEN	96
Midway Pull	TC-GEN	96
Capstan	TC92	96
Capstan	TC135/136SD	96
Flat New	TC186SD	96
Capstan	TC-GEN	96
Capstan	HST300	96
Take Up	HMK3000UK	96
Capstan	HMK3000UK etc	96
Fast Fwd-Rwmd	VO2850P	1.62
Forward	VO2850P	1.02
Motor	VP2000	1.62
Capstan	SLC7UB/SLC5UB	4.32
Forward	SL8000UB	25
Capstan	SL8000UB	96
Extension	SL8000UB	2.34
Drum	SL8000UB	1.52
Fast Fwd Idler	SLC7UB	96
Threading	SLC7UB	25
Capstan	SLC7UB/CS	96
Eject	SLC7UB	25
Counter	SLC7UB	25
Fast Forward	SLT7ME	96
Forward	SL8000UB	96
Belt	SLC6UB	96
Fast Forward	SLC6UB	96
Counter	SLC6UB	96
Threading	SLC6UB	96
Relay	SLC6UB	96
Capstan	SLC6UB	96
Belt	PS-5520 etc	3.18

SONY SPARES SWITCHES

Sw. (Sice wave) Filter	KV2022UB	96
PB Switch Channel	1820/2 & 1340	18.86
PB Power	KV-GEN	1.20
PB Switch	SL8000UB	96
PB Power	KV14/2060UB	3.68
Sw. Slide	KV2022UB	4.08
Sw. Slide Record	SL8000UB	96
Sw. Slide Recpback	SL8000UB	1.42
Sw. On/Off	KV1612UB	4.08
Sw. Power	KV-GEN	5.50
Button Stop/Eject	WM4	96
Control Knob	SLC7UB	96

SONY SPARES MANUALS (Zero VAT)

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

PHILIPS - CTX

CTX EHT Leads 7.36

PHILIPS K30

101 20561	Focus Unit	3.68
	EHT Lead	8.30
140 10283	LOPT	17.94
276 17083	On/Off Sw.	2.60
	276 10781	
310 27455	Prog. Select	13.10
1002 late 1002 early	All Gun Switches	70
Panels		
212 27525	TMS 1000 (1234)	17.03
212 27593	Euro Decoder	46.00
	K30/35 Sound	12.50

PHILIPS - K35

K30/35 Sound		
K35 Tuner Drawer		12.50
K35 Remote Txt.		10.00
Slim		26.51

THORN SPARES

SEMI-CONDUCTORS

GL4850	TX10	74
TC49	TX9	1.18
T90224W	TX9	43
T90534	TX9	1.98
AN6360	3V29	6.81
HA11741	3V32	23.22
M293	TX90	7.10
M50790SP	3V35	6.98
M54544L	3V32	3.80
MC13002	4V32	4.98
MC14493	TX9/TX10	2.74
MN1219	3V36	11.43
TD1236	TX10	3.44
TD3652	TX10	6.00
TD4500	TX90	5.84
SL490	TX9/TX10/TX100	
DTC144WF	3V35	30
R2540	9000	3.20
TIP112H	TX90	69
T5051V	TX9	3.43
T8069V	TX9	38
T8071	TX100	1.46
T9063V	TX9	3.64
T9064V	TX90	1.14
UPD553C 164	3V29	20.76
UPD75196 031 036	3V36	17.13
UPD7538C 020	3V38	11.06
10 Volt TDS	3V29	6.74

THORN MANUALS (Zero VAT)

Service Manual	1690/1691	5.60
Service Manual	1714	1.14
Service Manual	9600	10.05
Service Manual	9800	7.54
Service Manual	TX9	29.04
Service Manual	TX10	40.00
Service Manual	TX90	11.30
Service Manual	TX100	11.20
Service Manual	TX100	17.50
Service Manual	3V16	26.24
Supplement to 3V00	3V22	1.28
Service Manual	3V23	30.62
Service Manual	3V24	28.42
Service Manual	3V29	29.00
Instruction Manual	3V29	3.28
Service Manual	3V00	17.50
Service Manual	3V30	14.91
Instruction Manual	3V30	2.65
Service Manual	3V31	25.84
Instruction Manual	3V25	1.63
Service Manual	3V35/3V36	27.20
Supplement to	3V35 3V38	1.24
Supplement to	3V35& 3V39	90
Service Manual	3V42	23.94
Service Manual	3V43	30.72

THORN BELTS/LAMPS

Counter Belt 1	3292/3V00/3V16/3V22	60
Counter Belt 2	3292/3V00/3V16/3V22	60
Reel Drive Belt	3292/3V00/3V16/3V22	1.00
Relay Belt	3V00	2.78
Capstan Belt	3292/3V00/3V01/3V16/3V22	3.28
Unloading Belt	3292/3V00/3V16/3V22	60
Drum Motor Belt	3292/3V00/3V16/3V22	2.79
Capstan Drive Belt	3V23	60
Capstan Belt	3V29/3V30	1.82
Loading Belt	3V23	60
Loading Belt	3V29/3V30	60
Loading Belt	3V35/3V36/3V38	60
Tape Spool Drive	3V35/3V36/3V38	60
Take Up Clutch	3V29/3V30/3V35/3V36/3V38	60
Capstan Belt	3V35/3V36/3V38	1.21

THORN LAMPS

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

THORN VIDEO HEADS

Upper Drum Assy	3292/3V00	35.94
Upper Drum Assy	3V22	35.94
Upper Drum Assy	3V16/3V23/24/31/35/36/38/39	35.94
Upper Drum Assy	3V29/3V30	35.94

SMILES FROM P.V.

Bridge Transformer		1.97
Decca 30 Width Cont.		5.00
8R Speaker		3.75

DECCA - General Components

Bridge Transformer		1.97
Decca 30 Width Cont.		5.00
8R Speaker		3.75

DECCA - Manuals

Decca 80		5.35
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PHILIPS - G11 Sundries

47 pot with switch	85
Line Lin Coil	3.80
62 pot RGB	6.75
Line Scan Panel	54.00
Power Panel	41.06
Timebase Panel	37.50
Bridge Transformer	2.35
EW Correction Coil	1.95
Final Anode Lead	3.20
Focus Unit	6.80
39R Resistor	70
RGB 10G Diode	69
IF Panel with V321	12.00

PHILIPS - G8 Sundries

Knobs sm. or lg.	50
Rear Convergence Panel	23.00
AFC Unit	8.82

PHILIPS - Video Heads/Tape

Philips V2000 Head	64.00
1700 Head	64.00
LVC1700 Tape 1200	17.50
VCC360	Scotch 6.33
VCC480	Scotch 7.23

V.C.R. MOTORS		
Capstan Motor	3292/3V00/3V01/3V16	51.45
Drum Motor	3292/3V00/3V01/3V16/3V22	43.49
SMP Reel Motor	3V23	32.79
Cassette Housing		
Motor Assembly	3V23	10.32
Capstan Motor	3V23	52.81
Loading Motor	3V23/3V24/3V29/3V30	8.56
Capstan Motor	3V29/3V30	27.32
Reel Motor	3V29/3V30	32.79
Lower Drum Motor		
Assembly	3V29/3V30	78.72
Cassette Motor	3V35/3V36/3V38	6.92
Motor Control Motor	3V35/3V36/3V38	5.95
Capstan Motor	3V35/3V36/3V38	27.93

THORN REMOTE SETS			
T723 Non Text	TX10	3767/3788 38.60	
T725 Non Text	TX9	20A2/2282/3781/37081/37101/37114/37351/37361/37371	19.40
T731 Text	TX9	20A	

P.V. TUBES

0254 36521
32611
390936

HITACHI/GEC - Semiconductors	
LA7801	2.20
STR454	4.73
SN76709	8.00
TDA1870	6.46
TDA4503	5.68
ZSD1453	2.20

HITACHI/GEC - VCR GEC V4000H/Hitachi 8000	
Belt Counter (122)	47
Belt Loading	43
Belt Take Up	30
Idler FF/Rewind	1.87
Lamp Tape Sensor	65
Play Idler Assy V6414221	3.74
Pressure Pinch Roller	5.16
Pulley FF/Rewind V6383531	52
Relay	2.54
Upper Cylinder (Head)	35.62

HITACHI/GEC - VCR GEC V40001H/V4002/Hitachi 9300/9500E	
Belt (259)	47
Belt (289)	47
Belt Take Up (213)	30
Capstan Motor	31.00
Idler FF/Rewind	1.80
Lamp Tape Sensor	91
Play Idler Assy VS861482	3.72
Pulley FF/Rewind V6345173	36
Video Head	35.62
Remote Cont. Handset	9.33

HITACHI/GEC - VCR GEC V4004/Hit.VT33E	
Belt (302)	30
FF/Rewind Arm V6886971	2.90

HITACHI/GEC - VCR GEC V4100/Hitachi VT11E	
Belt 312	30
Belt 313	30
Belt 317	47
Belt 318	40
Capstan Motor	22.18
Upper Cylinder (Head)	33.35

HITACHI - Sundries	
Vertical Output Module	
GEC22286, Hit. CPT2226	3.98
C2067	
C2069	

HITACHI/GEC - Service Manuals (Zero VAT)	
GEC	
V4000H 8000	6.49
V4001H 9300E	6.49
V4002H 9500E	8.62
V4004 VT33E	7.18
V4005E VT63	4.77
V4100 VT11E	6.49

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REMOTE HANDSETS	
PHILIPS	
IR8331 KT3/K30 Mon. Text IR	15.85
218, 20135 KT3/K30 Mon. Text IR Gen.	19.87
Philips	16.70
IR8420 KT3/K30 Text IR	19.87
218, 20291 KT3/K30 Text Gen. Philips	20.85
IR8435 G11 8 Way Text IR	19.50
OS8263 G11 Mon Text US	19.50
TP8431 G11 Mon Text US	18.75
US8518 G11 2 Function US	27.00
691, 17181 G11 31 Button US	26.21
RC5352 K35 Text/Mon Text	
THORN	
T723 (TMMA, 824, 004) TX10 Mon. Text Gen.	38.60
Thorn	19.50
T723 IR8842 TX10 Mon. Text Rep. Type 19.40	
T725 (TMMA, 860, 004) TX9 Mon. Text	23.00
T725 IR8688 TX9 Mon. Text Rep. Type 20.01	
Gen. Thorn	20.01
T731 (TMMA, 904, 004) TX9/10/100 Text Ster.	31.60
Thorn	23.85
T736 (TMMA, 486, 004) TX9/10/100 Text Gen.	
Thorn	
T736 IR8864 TX9/10/100 Text Rep. Type23.85	
GRUNDIG	
RTP20 Teletipilot 12	13.50
RTP05 Teletipilot 8	13.50
RTP06 Teletipilot 160	13.50
RTP07 Teletipilot 300	13.50

DECCA	
VS8513 101 Mon. Text US	20.85
OS8511 80/100 3 Func. US	19.50
J.V.C.	
RTP943 Text IR	13.50
Remote Control Tester	29.94

FIDELITY - Semiconductors	
ML923	2.21
SL490	1.77
TDA2270	1.65
TDA3330	2.21
TDA8180	3.32
BC638	33
BUS080	1.77
TDA3810	3.86

FIDELITY - Switches	
On/Off AVS	94
On/Off Remote Cont.	2.43
On/Off CTV 140	94

FIDELITY - Transformers	
Flyback FCC2015BE up to 22"	12.00
FCC2215AE 22"	12.00
Mod. Kit included	

FIDELITY - Remote Controls	
4 Button CTV20R/22R/140R	9.95
8 Button F14R	11.05
12 Button IS500	11.05
14 Button AVS	9.95
32 Button Teletext	12.16
Tuner Flap CTV 14S	83
Loudspeaker CM14/CTV140R	1.99

FIDELITY - Service Manuals (Zero VAT)	
Audio	
IS500	1.70
IS700	1.70
IS750	1.70
TV	
CM14	1.70
CTM1400	1.70
F14R	1.70
TV140	1.70
ZX2000TV CTV20R	1.70
ZX3000TV AVS1600	1.70
ZX3000TV AVS2000	1.70
ZX3000TV CTV20	1.70
ZX3000TV Teletext	1.70
VCR 2 Parts VCR	2.90

NATIONAL PANASONIC SPECIFIC VIDEO	
VXP0234 Play Idler	1.10
VXP0401 Idler Unit	1.08
VXP0344 Idler Unit	1.22
VXP0331 Idler Unit	1.28
VXP0141 Idler Unit	1.08
VXP0521 Idler Arm Unit	4.08
VXP0325 Loading Gear	1.63
VXP0520 Load Gear Unit	1.36
VDO0016 Action Gear	46
VDO0017 Intern. Gear	43
Direct Rep. Video Bulb	1.00

MAINS DROPPERS	
Decca 20	2.48
Decca 27R/47R	1.40
Decca 56R/68R	1.40
R&M 823 56R/68R	94
PYE 725/31 3R/56R/27R	1.84
PYE 725 56R/27R	1.04
Philips 5050 30R/125R	1.75
Philips 5051 118/14B	1.93
Philips G8 47R	72
Philips G8 2R/68R	1.38
Thorn 1400	1.52
Thorn 1500	1.47
Thorn 1600	1.77
Thorn 3500	1.20
Thorn 8000A	1.24
Thorn 8500	1.36
Decca 2R5	96
Decca Modulohm 3R9	60

EVER READY BATTERIES	
HP2/R20	82
LR20 Gold	39
R20S Silver	27
R20B Blue	2.61
RX20 Rechargeable	
HP1/R14	74
LR14 Gold	33
R14B Silver	24
R14B Blue	2.31
RX14 Rechargeable	
HP7/R6	41
LR6(BC4) Gold	43
LR6(BC2) Gold	21
R6S Silver	15
R6B Blue	1.31
RX6 Rechargeable	
PP3/6F22	1.53
6L F22 Gold	74
PP3S Silver	54
PP3B Blue	4.89
RX22 Rechargeable	
HP16/R03	41
LR03 Gold	18
Blue	30
No. 8 Battery	7.50
Univ. Batt. Charger	9.18
5 Hour Chg.	

PLUGS AND SOCKETS	
Din Plugs	
5 pin 180°/240°/360°	20
6 pin	35
7 pin	56
8 pin	28
Chassis Sockets DIN	28
5 pin din 180°/240°/360°	28
6 pin din	36
7 pin din	30
8 pin din	64
Phono plugs	12
2.5mm Jack plugs	11
3.5mm Jack plugs	15
3.5mm Jack Plugs Stereo	36
6.3mm Jack Plugs Stereo	36
Standard mono jack plugs	20
2 pin speaker plugs	5.90
I.D.C. plugs 36 way conn.	1.15
BNC plugs	18
Car aerial plugs	25
FM plugs	16
Coax plugs metal	16
Line connectors	16
Double ended female socket	1.20
In line socket metal	25
Crocodile Clips	25
Phono line socket	20
Phono chassis socket	10
2.5mm jack line socket	17
2.5mm jack chassis socket	14
3.5mm jack line socket	24
3.5mm jack chassis socket	28
3.5mm stereo line jack socket	28
3.5mm stereo jack chassis socket	28
6.3mm stereo jack socket	25
IDC 36 way socket	6.90
PL259 with reducer	1.30
Reducers for PL259	1.30

Line Sock.	
28	28
36	28
30	30
55	55
12	40
11	Unit TCSU1
15	Antex Stand
35	MLXS Auto Rep. Kit
36	Sundry Irons
20	Cordless Gas Iron
5.00	Tips for Gas Iron
5.50	25 Watt Philips

LEADS	
2mm Fly r/m	70
2mm Fly m/f	70
4m Fly r/m	1.20
10m Fly	1.90
Fig. 8 Mains	62
Computer/TV	97
5 pin din/5 pin din	98
5 pin din/7 pin din	98
TA81 car bat. Thorn 1691	4.47
TA51 car bat. Thorn 1615	3.66
Car battery Philips	3.95
Scart Leads 2m (open end)	3.50

FILAMENT LAMPS	
HES ROUND BULBS	15p
LILLIPUT (L.E.S.) BULBS	12p
CAPLESS LAMPS	28p
WIRE NEONS	9p
TUBULAR LAMPS CAPPED	31p
TUBULAR LAMPS (Wire ended)	31p
WIRE ENDED LAMPS	31p

AUDIO HEADS	
Mono record/playback	4.32
Stereo playback	4.79
Stereo record/playback	4.99
Stereo record/playback (Dolby)	6.90
Mono/stereo erase	2.25

MOTORS ELECTRONIC/ROTATION CLOCKWISE	
6V MD6515	4.95
9V MD9516	4.95
12V MD12517	4.95

EVER READY BATTERIES	
EVER READY BATTERIES	
82	
39	
27	
2.61	
74	
33	
24	
2.31	
41	
43	
21	
15	
1.31	
1.53	
74	
54	
4.89	
41	
18	
30	
7.50	
9.18	

ANTEX	
C15W Iron 240V	6.20
C240 Element	2.75
Bits 102, 106, 820, 821	1.10
CS17W Iron 240V	6.40
CS240 Element	2.75
Bits 1100, 1101, 1106	1.10
XS25W Iron 240V	6.50
XS240 Element	2.75
Bits 50, 51	1.10

Temp. Controlled	
30W Iron CSTC	16.95
40W Iron XSTC	16.95
Unit TCSU1	68.95
Antex Stand	2.10
MLXS Auto Rep. Kit	8.40
Sundry Irons	
Cordless Gas Iron	15.99
Tips for Gas Iron	5.00
25 Watt Philips	5.50

WELLER	
Heat gun	15.95
Heat gun tips	83
3/16" Iron tips 25W	83

SERVISOL	
Freeze-It	1.20
SUPER SERVISOL	1.04
Foam Cleanser	1.02
Plastics Seal	1.14
Silicone Grease	1.30
Tubes Silicone Grease	1.66
Aero Klene	94
Aero Duster	1.28
Excel Polish	96
Video Head Cleanser	90
Super 40	1.66
Fire Extinguisher 640G	3.08
Heat Sink Compound 25G	1.10
Solda Mo standard reel	77
Hyosil Silicone Rubber	2.98

SECURITY EQUIPMENT	
CONTROL PANELS	
1011 Hilclare	29.50
Hilclare Zone Exp.	32.50
BELLS/BOXES	
"C" Type Dummy	3.25
"C" Type Polyprop.	4.55
"C" Type Translux.	7.80
6" MO Bell	5.52

CABLE	
4 Core	5.43
6 Core	7.84
8 Core	10.37

INFRA-RED PASSIVE	
6J Mini	26.15
Invader	24.00

SECURITY LIGHTS	
Floodlights	17.74
Infrascan	62.94

S.A.B. MODULES	
Castle SAB	13.49
P.A. BUTTONS	
Stainless	2.88

CONTACTS	
5 Term Flush M	59
5 Term Surface M	59
4 Wire Flush M	62
4 Wire Surface M	62

RECHARG. BATTERIES	
12V 1.9A	7.06

EXTERNAL SOUNDERS	
712 Ext. Siren 116dB	5.75
1010 Ext. Siren 116dB	5.96
Dinablast 127dB	18.14

PIEZO SOUNDERS	
S81 (140dB)	3.37
S82 (111dB)	5.17
PZ28 (105dB)	4.61
BUZZERS	
HB722	60
TAMPER SWITCHES	
2 1/2 Tamper	50
TRUNKING	
Fused Spur	2.58
XENON FLASHER	
128 PCL	6.75
121 PCL	6.90
JUNCTION BOXES	
6 Way	21
8 way	39
CABLE CLIPS	
3.5m 100	98
4.5m 100	1.08

CASSETTE DRIVE BELTS	
35mm 35	46mm 37
57mm 37	66mm 39
71mm 43	90mm 43
101mm 59	

VIDEO PINCH ROLLERS	
PANASONIC NV7000	4.35
SANYO VTC9300/VS7000	4.35
SONY C7/J7/SL17	4.35
JVC TCE3V00/01/06/16/23/24	
AKAI VS7000	4.35
HITACHI VT5000	4.35
SHARP VC6300/6500	4.35

VIDEO BELT KITS	
VEKIT 1 AKAI JVC VS9300/VS9500/VS9800	
HR3300/HR3320/HR3330/HR3360	
TCE 8903/3V00/3V16/3V22	3.50
VEKIT 2 PANASONIC NV7000B/NV7200B	3.00
VEKIT 3 SONY SLC57	3.75
VEKIT 4 SONY SL8000/8500/8600	4.50
VEKIT 5 SONY SL3000UB	4.00
VEKIT 6 PANASONIC NV3000B	3.00
VEKIT 7 SANYO 9300P	4.25
VEKIT 8 PANASONIC NV2000B	3.75
VEKIT 9 PANASONIC NV8600B/8610/V011	4.25
VEKIT 10 TOSHIBA V8600	3.50
VEKIT 11 SHARP VC7300	3.00
VEKIT 12 SHARP VC300/6600	4.00
VEKIT 13 SANYO VTC5000	1.95
VEKIT 14 SANYO VTC5300	2.50
VEKIT 15 JVC HR7650	2.50
VEKIT 17 SHARP 8300	1.76
VEKIT 18 SHARP 9300	1.47
VEKIT 19 HITACHI VT8000	1.12
VEKIT 20 HITACHI VT11/33	2.15
VEKIT 21 HITACHI 9500	1.12

VIDEO IDLER TYRES			
O.Dia	I.Dia	Width	
SONY 23.7	17.4		

VARICAP TUNERS	LINE OUTPUT TRANS.	RECTIFIER TRAYS	VALVES CONT'D	EQUIPMENT	AERIAL EQUIPMENT				
ELC1043-05 8.40 Philips 104305 Mullard 12.50 ELC1043-06 8.40 ELC2003 16.50 Philips G8/G9 10.50 Philips G11 (U321) 9.90 U322 7.20 U341 9.50 U342 8.50	Philips 320 8.70 Philips 210/300 Mono 10.00 Philips G8 8.75 Philips G9 9.50 Philips G11 10.06 Philips K30 17.94 Philips TX2 13.39 Philips TX3 14.41 Philips G11 15.58 Pye 713/715 10.00 Pye 725 90° 10.50 Pye 169 10.00 Pye 741 8.20 Bang & Olufson (2000,3000) 14.69 DECCA 80 8.58 Decca 100 8.58 Decca 1700 9.00 Decca 1730 8.58 Decca 2230 8.58 GEC 2110 16.75 GEC 2040 9.50 ITT CVC 1/9 10.85 ITT CVC 25/30/32 8.65 ITT CVC 20 8.60 ITT CVC 45 8.60 R.B.M. T20 13.95 R.B.M. A7774 Mono 11.74 R.B.M. BUSHRANGER T16A 10.00 R.B.M. BUSHRANGER T18A 10.00 Thom 3000 EHT 9.95 Thom 3000 SCAN 7.95 Thom 8500 17.50 Thom 3000/3500 Mains 10.00 Thom 1615 12.50 Thom 1691 9.68 Thom TX9 23.85 Thom 9600 21.79	Thom 1500 3 Stick 5.20 Thom 1500 5 Stick 5.99 Thom 3500 7.98 Thom 8000 6.95 Thom 8500/8800 7.15 Thom 9000 8.70 Decca 1730/1830 5.48 Decca 30 6.76 Decca 80 7.12 Decca 100 7.12 Decca/Tatung 120/130 6.50 GEC 2100 7.40 GEC 2200 (20AX) 6.50 GEC 2040/2028 6.60 GEC 2110 (pre or post Jan '77) 7.00 Philips G8 Short Focus Lead 7.12 Philips G8 Long Focus 550 7.12 Philips G9 6.37 Pye/Philips KT3 12.50 Pye 691/3 7.58 Pye 713 4 Lead 8.79 Pye 713 5 Lead 8.79 Pye 731/25 8.75 R.B.M. A823 plug in 7.75 Rank T20/22 8.12 ITT CVC5/9 7.50 ITT CVC20/25/30 (Mullard) 7.12 ITT CVC45 8.65 Universal 6.00 TV 11 Stick 9.00 TV 13 1.26 TV 14 1.29 TV 18 1.10 TV 20 1.43	30FL2 1.70 DY802 98 DY867 66 ECC81 1.08 ECC82 1.98 ECC83 1.07 ECC84 8.0 ECC85 98 ECC88 1.35 EFC80 1.30 EFC82 88 ECH81 1.60 ECH84 1.66 ECL80 84 ECL82 1.30 ECL86 1.99 EF80 95 EF86 2.20 EF183 99 EF184 1.09 EL90 1.75 EL34 3.50 EL84 1.05 EY86/7 68 EY500A 2.25 EY80/81 56 GY501 1.45 GZ34 3.50 KT66 8.50 KT77 8.50 KT88 (alt type) 12.00 PC92 4.50 PC97 1.65 PCC85 85 PCC805 1.40 PCF80 1.00 PCF200 1.35 PCF800 1.38 PCF801 1.13 PCF802 1.12 PCF805 1.80 PCF808 1.63 PCH200 1.45 PCL82 1.20 PCL84 1.20 PCL805 1.09 PCL86 92 PFL200 1.86 PL36 1.87 PL81 94 PL95 2.25 6L6GT 2.30 12HG7 3.20 12BH7A 2.75 PL504 1.65 PL508 2.90 PL509/19 5.30 PY88 81 PY500A 2.30 PY800/1 69 UCH81 2.25 UCL83 1.82 UY85 1.35 PL802T 4.00 40K06 5.30 21LU8 3.00 17DW4A 4.50 3AT2B 5.00 12BY7A 3.75	Testlead Set (AVO Type) 2.20 Degaussing Coil Stick 19.00 Signal Injector 4.00 Electric Circuit Tester 1.50 Probes (x10 or x1) 10.90 Philips Switchcase Probes 13.25 Automatic Wire Strippers 6.95 I.C. Inserters 1.18 Micro Pliers 5.00 Micro Cutters 4.20 Trim Tools Metal Ended 30 Side Cutters sm. 1.20 Long Nose Pliers 1.20 Sm. Neon Screwdriver 4.00 Lg. Neon Screwdriver 65 Quick Set Adhesive (Superglue) 75 Dynascan Tube Reju./testers 299.00 467 model inc. bases 399.00 470 model inc. bases 299.00 available without bases for 50.00 less	Chimney Kits 55 6" pressed bkt. 55 6" bkt. with kit 1.75 9" welded bracket 1.35 9" bkt. with kit 2.90 Double bkt. 2.39 Double bkt. with kit 4.75 13.5" Cradle bkt. 2.25 13.5" Cradle with kit 4.25 Std repair pack 1.10 Double repair pack(2) 2.39 Wall Brackets 6" welded 1.30 12" T&K 3.30 9" welded 1.87 Gutter Brackets 1.00 Clamps 1" x 1" 68 2" x 2" 1.25 Universal No. 1 1.02 1" u bolts 19 J bolts 20 1.25" u Bolts 20 2" u bolts 28 UHF TV Aerial 10 element 1.62 18 element 2.63 UHF TV Aerial 3 element 5.68 4 element 6.50 Masts 3ft crank 7/5 shape 1.00 6ft 1" 1.60 10ft 1.5" 5.25 12ft 1.5" 6.20 16ft 2" 9.00 High Gain Aerials Antiference X68 17.10 Antiference X614 17.10 Set Top Aerials Mercury Olympic 11 2.30 Antiference Super Set Top 5.56 Antiference Caratenna 6.80 Antiference Caravan Kit 11.00 Loop Aerial 1.00 Corner Plates 7 Lashing Wire 75 Lead Wall Nails (100) 4.95 Rawbolts 60 Cable Clips (100) 75 Coax Plugs 18 Line Connectors 12 Attenuators 1.80 Tape 76 Wood Screws 7 Mast couplers 8.92 27Mhz filter 2.10 Outlet Boxes Surface Single 80 Surface Twin 1.10 Y Splitter 85 Flush Single 95 Flush Twin 1.20 TV/FM Flush 1.35 Antiference SB11 Splitter 2.37 CS200 Comb/Split 3.94 COB11 Outlet 96 CS1000 Comb/Split 4.77 PV1240 power 11.65 UP1300 MHA 9.09 XS2 xtraset 14.46 XS04 4way/DA 22.50 XS4/6 43.13 Diplexers 68 Match Trans 2.63 Back Boxes Metal Single 45 Metal Double 80 Budget Range Outdoor Splitter 5.50 Mast Head amp. 5.00 Power Unit 5.00 MULTIMETERS Amprobe Digital Meter AM7 45.00 Amprobe Digital Meter AM9 55.00 Amprobe Volt/Ameter/Ohmmeter RF3 68.00 Philips Meter 2000 R. per V. 20.71				
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R/B/G	FUSES Quick Blow 1.25" 100ma 73 250ma-500ma-750ma-1A 60 1.5A-2A-2.5A-3A-5A 60 Quick Blow 20mm 100ma, 250ma, 315ma, 500ma, 630ma, 800ma 90 1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A 60 Mains Fuses 2A, 3A, 5A, 10A, 13A 1.00 Antisurge 1.25" 250ma, 500ma, 630ma, 750ma, 850ma 1.70 1A, 1.25A, 1.5A, 2A 1.70 2.5A, 3A, 5A 2.70 Antisurge 20mm 80ma 4.80 100ma 2.50 160ma, 200ma 2.20 315ma, 500ma, 630ma, 800ma 1.30 1A, 1.25A, 1.6A, 2A 1.30 400ma, 2.5A, 3.15A, 4A, 5A 1.90	SEND FOR A FULL CATALOGUE includes: ARROW STYLI (special dealer packs) UNISEF AUDIO PRODUCTS (illustrated leaflet available)	T.T.L. 74LS SERIES 74LS00 1.12 74LS37 35 74LS93 65 74LS160 90 74LS251 65 74LS01 1.12 74LS38 35 74LS94 65 74LS161 85 74LS252 95 74LS02 58 74LS39 35 74LS107 80 74LS162 4.04 74LS257 1.20 74LS03 58 74LS40 35 74LS109 58 74LS163 85 74LS258 1.20 74LS04 58 74LS42 80 74LS112 50 74LS164 85 74LS259 1.70 74LS05 58 74LS47 85 74LS113 44 74LS165 1.50 74LS273 1.90 74LS08 58 74LS48 83 74LS114 70 74LS173 1.32 74LS283 1.30 74LS10 58 74LS49 33 74LS122 96 74LS174 85 74LS293 1.20 74LS11 58 74LS51 33 74LS123 80 74LS175 85 74LS352 1.40 74LS11 58 74LS54 43 74LS125 85 74LS191 1.02 74LS353 1.40 74LS13 37 74LS55 60 74LS126 65 74LS192 1.30 74LS365 65 74LS14 46 74LS73 60 74LS132 63 74LS193 1.30 74LS366 82 74LS15 33 74LS74 65 74LS138 83 74LS194 75 74LS367 1.67 74LS20 35 74LS75 65 74LS139 65 74LS197 95 74LS368 65 74LS21 35 74LS76 65 74LS151 85 74LS240 2.20 74LS373 1.40 74LS22 35 74LS78 65 74LS153 85 74LS241 2.20 74LS374 1.55 74LS26 44 74LS83 89 74LS155 65 74LS242 2.20 74LS393 1.20 74LS27 35 74LS85 98 74LS156 1.02 74LS243 2.20 74LS670 1.78 74LS30 35 74LS86 39 74LS157 78 74LS244 2.20 74LS32 90 74LS90 1.22 74LS158 75 74LS245 2.30 CMOS 4026 1.99 4068 22 4510 76 4539 77 4000B Series 4027 39 4069 22 4512 72 4541 96 4001 21 4028 64 4070 22 4513 1.68 4543 1.12 4002 21 4029 90 4071 40 4514 1.88 4551 96 4008 72 4032 1.04 4072 22 4515 1.88 4553 2.40 4011 31 4035 80 4073 22 4516 76 4554 1.20 4012 21 4038 99 4075 22 4518 76 4554 1.20 4013 70 4040 72 4076 80 4519 64 4556 48 4014 34 4042 58 4077 22 4520 75 4560 1.76 4015 76 4043 71 4078 22 4521 1.68 4561 74 4016 42 4044 71 4081 22 4522 88 4566 1.20 4017 56 4046 96 4093 49 4526 88 4580 3.60 4018 72 4047 70 4094 1.56 4527 1.20 4581 1.84 4019 70 4049 32 4099 1.20 4528 88 4582 8.00 4020 76 4050 32 4160 72 4529 1.04 4583 1.00 4021 70 4051 72 4161 72 4530 62 4584 4.00 4022 70 4052 72 4162 72 4531 72 4585 88 4023 21 4053 72 4163 72 4532 1.00 4597 1.84 4024 50 4060 96 4502 72 4536 2.64 4598 2.40 4025 21 4066 43 4505 1.88 4538 1.04 4599 2.00	THORN NEW LIFE TUBES AVAILABLE AT TRADE COUNTER CM7261 Power Unit 12V 11.80 CM7262 Power Unit 12V 12.06 CM7065 VHF/UHF W/B 12V 15.05 CM7066 11.04 CM7067 UHF MHA A/B/C/D 14.25 CM7068 UHF High Gain A/B/C/D 16.74 CM7253 Behind Set (Mains) 13.66 CM7243 Second Set Amp. 12.72 CM7093 Three Set Amp. 16.63 CM7063 Dist. 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Amp. 43.26 CM9700 27mhz CB Suppressor 4.45 CM6011 Outdoor Splitter 7.83 CM9003 Flush Sing. Outlet 1.95 CM9010 Flush Twin Outlet 2.04 CM9034 UHF Filters A/B/C/D 8.07 CM9033 6way Pass Splitter 9.72 CM7042 TV Games Combiner 3.09 CM9009 Flush TV/FM Outlet 3.20 CM9006 VHF/UHF Diplexer 3.78 CM7122 Televista Up. VHF to UHF 36.20 CM7057 Televista Down UHF to VHF 41.01 CM7094 Dist. Amp. UHF/VHF 30.06 CM7271-MHA 15db 8.66 CM7274 4 Way Dist. Amp. 21.45 CM7082 UHF/VHF Dist. Amp. 65.89 CM7080/10 UHF MHA 15.71	EXPORT CM7261 Power Unit 12V 11.80 CM7262 Power Unit 12V 12.06 CM7065 VHF/UHF W/B 12V 15.05 CM7066 11.04 CM7067 UHF MHA A/B/C/D 14.25 CM7068 UHF High Gain A/B/C/D 16.74 CM7253 Behind Set (Mains) 13.66 CM7243 Second Set Amp. 12.72 CM7093 Three Set Amp. 16.63 CM7063 Dist. Amp. VHF/UHF 23.27 CM7108 8+1 Dist. Amp. 43.26 CM9700 27mhz CB Suppressor 4.45 CM6011 Outdoor Splitter 7.83 CM9003 Flush Sing. Outlet 1.95 CM9010 Flush Twin Outlet 2.04 CM9034 UHF Filters A/B/C/D 8.07 CM9033 6way Pass Splitter 9.72 CM7042 TV Games Combiner 3.09 CM9009 Flush TV/FM Outlet 3.20 CM9006 VHF/UHF Diplexer 3.78 CM7122 Televista Up. VHF to UHF 36.20 CM7057 Televista Down UHF to VHF 41.01 CM7094 Dist. Amp. UHF/VHF 30.06 CM7271-MHA 15db 8.66 CM7274 4 Way Dist. Amp. 21.45 CM7082 UHF/VHF Dist. Amp. 65.89 CM7080/10 UHF MHA 15.71	ORDERS CM7261 Power Unit 12V 11.80 CM7262 Power Unit 12V 12.06 CM7065 VHF/UHF W/B 12V 15.05 CM7066 11.04 CM7067 UHF MHA A/B/C/D 14.25 CM7068 UHF High Gain A/B/C/D 16.74 CM7253 Behind Set (Mains) 13.66 CM7243 Second Set Amp. 12.72 CM7093 Three Set Amp. 16.63 CM7063 Dist. Amp. VHF/UHF 23.27 CM7108 8+1 Dist. Amp. 43.26 CM9700 27mhz CB Suppressor 4.45 CM6011 Outdoor Splitter 7.83 CM9003 Flush Sing. Outlet 1.95 CM9010 Flush Twin Outlet 2.04 CM9034 UHF Filters A/B/C/D 8.07 CM9033 6way Pass Splitter 9.72 CM7042 TV Games Combiner 3.09 CM9009 Flush TV/FM Outlet 3.20 CM9006 VHF/UHF Diplexer 3.78 CM7122 Televista Up. VHF to UHF 36.20 CM7057 Televista Down UHF to VHF 41.01 CM7094 Dist. Amp. UHF/VHF 30.06 CM7271-MHA 15db 8.66 CM7274 4 Way Dist. Amp. 21.45 CM7082 UHF/VHF Dist. Amp. 65.89 CM7080/10 UHF MHA 15.71	WELCOME CM7261 Power Unit 12V 11.80 CM7262 Power Unit 12V 12.06 CM7065 VHF/UHF W/B 12V 15.05 CM7066 11.04 CM7067 UHF MHA A/B/C/D 14.25 CM7068 UHF High Gain A/B/C/D 16.74 CM7253 Behind Set (Mains) 13.66 CM7243 Second Set Amp. 12.72 CM7093 Three Set Amp. 16.63 CM7063 Dist. Amp. VHF/UHF 23.27 CM7108 8+1 Dist. Amp. 43.26 CM9700 27mhz CB Suppressor 4.45 CM6011 Outdoor Splitter 7.83 CM9003 Flush Sing. Outlet 1.95 CM9010 Flush Twin Outlet 2.04 CM9034 UHF Filters A/B/C/D 8.07 CM9033 6way Pass Splitter 9.72 CM7042 TV Games Combiner 3.09 CM9009 Flush TV/FM Outlet 3.20 CM9006 VHF/UHF Diplexer 3.78 CM7122 Televista Up. VHF to UHF 36.20 CM7057 Televista Down UHF to VHF 41.01 CM7094 Dist. Amp. UHF/VHF 30.06 CM7271-MHA 15db 8.66 CM7274 4 Way Dist. Amp. 21.45 CM7082 UHF/VHF Dist. Amp. 65.89 CM7080/10 UHF MHA 15.71

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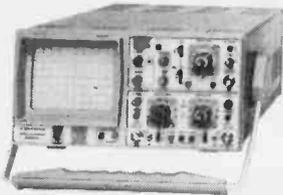
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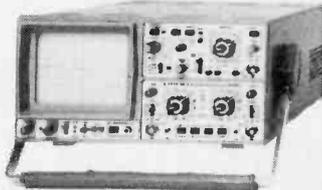
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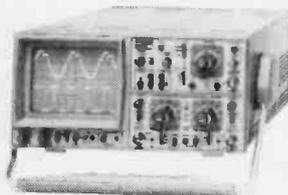
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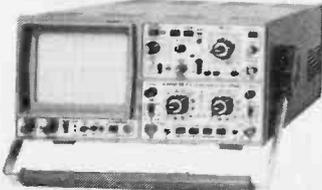
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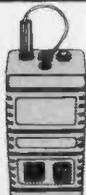
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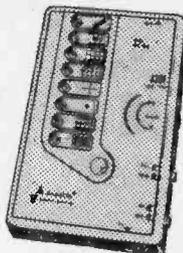
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 Price per pack is £1.00.* Order 12 you may choose another free. Items marked (sh) are not new but guaranteed ok.

MULLARD UNILEX AMPLIFIERS
 We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules - i.e. Mains power unit (EP9002) Pre amp module (EP9001) and two amplifier modules (EP9000) all for £6.00 plus £2 postage. For prices of modules bought separately see TWO POUNDERS.

CAR STARTER/CHARGER KIT
 Flat Battery! Don't worry you'll start your car in a few minutes with this unit - 250 watt transformer 20 amp rectifiers, all parts with data £15 case £4 p&p £2.

OVER 400 GIFTS YOU CAN CHOOSE FROM
 There is a total of over 400 packs in our Baker's dozen range and you become entitled to a large free gift with each dozen pounds you spend on these packs. A classified list of these packs and our latest 'News Letter' will be enclosed with your goods, and you will automatically receive our next news letter.

£2 POUNDERS*

- 2P2 - Wall mounting thermostat, high precision with mercury switch and thermometer
- 2P3 - Variable and reversible 8-12V PSU for stereo control
- 2P4 - 24 volt PSU with separate channels for stereo made for Mullard UNILEX
- 2P6 - 100W mains to 115V auto-transformer with voltage tappings
- 2P8 - Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
- 2P9 - Time and set switch. Boxed, glass fronted and with knobs. Controls up to 15 amps. Ideal to program electric heaters
- 2P10 - 12 volt 5 amp mains transformer - low volt winding on separate bobbin and easy to remove to convert to lower voltages for higher currents
- 2P12 - Disc or Tape precision motor - has balanced rotor and is reversible 230V mains operation 1500 rpm
- 2P14 - Mug Stop kit - when thrown emits piercing scaw
- 2P15 - Interrupted Beam kit for burglar alarms, counters, etc.
- 2P17 - 2 rev pr minute mains driven motor with gear box, ideal to operate mirror ball
- 2P18 - Liquid/gas shut off valve mains solenoid operated
- 2P19 - Disco switch-motor drives 6 or more 10 amp change over micro switches supplied ready for mains operation
- 2P20 - 20 metres extension lead, 2 core - ideal most Black and Decker garden tools etc.
- 2P21 - 19 watt amplifier, Mullard module reference 1173
- 2P22 - Motor driven switch 20 secs on or off after pulse
- 2P24 - Clockwork operated 12 hour switch 15A 250V with clutch
- 2P26 - Counter resettable mains operated 3 digit
- 2P27 - Goodmans Speaker 6 inch round 8 ohm 12 watt
- 2P28 - Drill Pump - always useful couples to any make portable drill
- 2P30 - 4 metres 98 way interconnecting wire easy to strip
- 2P32 - Hot Wire amp meter - 4 1/2 round surface mounting 0-10A - old but working and definitely a bit of history
- 2P34 - Solenoid Air Valve mains operated
- 2P38 - 200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating aerial or a tumbler for polishing stones etc
- 2P43 - Small type blower or extractor fan, motor inset so very compact, 230V
- 2P46 - Our famous drill control kit complete and with prepared case
- 2P47 - Telephone ringing unit reduces mains to 50 volts and changes frequency from 50 hz to 25 hz to give ringling tone
- 2P49 - Fire Alarm break glass switch in heavy cast case
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- 2P55 - Mains motor, extra powerful has 1 1/2" stack and good length of spindle
- 2P62 - 1 pair Goodmans 15 ohm speakers for Unilex
- 2P64 - 1 live bladed fan 6 1/2" with mains motor
- 2P66 - 1 2kw tangential heater 115v easily convertible for 230V
- 2P67 - 1 12v-0-12v 2 amp mains transformer
- 2P68 - 1 15v-0-15v 2 amp mains transformer
- 2P69 - 1 250v-0-250v 60 mA & 6.3v 5A mains transformer + £1 post
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- 2P73 - 1 2 hour timer, plugs into 13A socket
- 2P82 - 9v-0-9v 2 amp mains transformer
- 2P84 - Modern board with press keys for telephone redialler
- 2P85 - 20v-0-20v 1/2A Mains transformer
- 2P88 - Sangamo 24 hr time switch 20 amp S.H.
- 2P89 - 120 min. time switch with knob
- 2P90 - 30 min. time switch with edgewise engraved controller
- 2P95 - 13A socket on satin chrome plate very superior G.E.C.
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- 2P99 - 500 hardened pin type staples for telephone cable
- 2P101 - mains transformer 15V 4A upright mounting
- 2P105 - capillary type thermostat adjustable for air temperatures with 10A coil switch
- 2P107 - membrane keyboard, telephone type superior plug in type
- 2P108 - mains motor with gear box giving 110rpm
- 2P109 - 5" wide black adhesive pvc tape 33m, add £1 post if not collecting
- 2P111 - ITT line output unit
- 2P112 - 6 volt 2000MA Voltage regulated PSU for 13 amp socket
- 2P113 - 9 volt 2000MA Voltage regulated PSU for 13 amp socket
- 2P114 - 12 volt 2000MA Voltage regulated PSU for 13 amp socket
- 2P116 - FM front end with tuning capacitor and F.M. circuitry
- 2P118 - 30rpm mains motor with gearbox
- 2P119 - Under carpet switch mat for burglar alarm etc.

- 1. 5-13 amp ring main junction boxes
- 2. 5-13 amp ring main spur boxes
- 3. surface mounting light switches
- 4. electrical switches intermediate type, will also replace 1 or 2 way switches, white flush mounting
- 7. 4-in flex line switches with neons
- 9. 2-mains transformers with 6V 1A secondaries
- 10. 2-mains transformers with 12V 1/2A secondaries
- 11. 1-extension speaker cabinet for 6 1/2" speaker
- 13. 12-glass reed switches
- 17. 2-ultrasonic transmitters and 2 receivers with circuit
- 19. 2-light dependent resistors
- 25. 4-water switches - 6p 2 way, 4p 3 way, 2p 6 way, 2p 5 way, 1p 12 way small one hold fixing and good length 1/4 spindle your choice
- 28. 1-6 digit counter mains voltage
- 30. 2-Nicad battery chargers
- 31. 1-key switch with key
- 33. 2-aerosol cans ofICI Dry Lubricant
- 34. 48-2 metre lengths colour-coded connecting wire
- 39. 1-long and medium wave tuner kit
- 41. 8-rocker switch 10 amp mains SPST
- 45. 1-24 hour time switch mains operated
- 49. 10-neon valves - make good night lights
- 50. 2-12V DC or 24V AC, 3 CO relays
- 51. 1-12V 2 CO miniature relay very sensitive
- 52. 1-12V 4 CO miniature relay
- 54. 10-rows of 32 gold plated IC sockets (total 320 sockets)
- 55. 1-locking mechanism with 2 keys
- 56. 1-miniature uniselector with circuit for electric jigsaw puzzle
- 60. 5-ferrite rods 4" x 5/16" diameter aerials
- 61. 1-Mullard thyristor trigger module
- 66. 1-magnetic brake - stops rotation instantly
- 67. 1-low pressure 3 level switch can be mouth operated
- 69. 2-25 watt pots 8 ohm
- 70. 2-25 watt pots 1000 ohm
- 71. 4-wire wound pots - 18, 33, 50 and 100 ohm your choice
- 77. 1-time reminder adjustable 1-60 mins clockwork
- 85. 1-mains shaped pole motor 3/4" stack - 1/4 shaft
- 89. 1-mains motor with gear box 1 rev per 24 hours
- 91. 2-mains motors with gear box 16 rpm
- 96. 1-thermostat for fridge
- 98. 1-motorised stud switch (s.h.)
- 101. 1-2 1/2 hours delay switch
- 102. mains PSU 9V
- 103. 1-mains power supply unit - 6V DC
- 104. 1-mains power supply unit - 4 1/2V DC
- 107. 1-5" speaker size radio cabinet with handle
- 111. 2-musical boxes (less keys)
- 112. 1-heating pad 200 watts mains
- 114. 1-1W amplifier Mullard 1172
- 115. 1-wall mounting thermostat 24V
- 118. 1-leak effect extension 5" speaker cabinet
- 120. 2-p.c. boards with 2 amp full wave and 17 other rees
- 121. 4-push push switches for table lamps etc.
- 122. 10-mtrs twin screened flex white p.v.c. outer
- 124. 25-clear plastic lenses 1 3/4 diameter
- 127. 4-pilot bulb lamp metal clip on type
- 128. 10-very fine drills for p.cbs etc.
- 129. 4-extra thin screw drivers for instruments
- 132. 2-plastic boxes with windows, ideal for interrupted beam switch
- 134. 10-model aircraft motor - require no on/off switch, just spin to start
- 140. 10-4BA spanners 1 end open, other end closed
- 142. 2-4 reed relay kits 3V coil normally open or c/o if magnets added
- 146. 20-pilot bulbs 6.5V 3A Phillips
- 154. 1-12V drip proof relay - ideal for car jobs
- 155. 3-varicap push button tuners with knobs
- 169. 4-short wave air spaced trimmers 2-30T
- 172. 10-12V 6W bulbs Philips m.e.s.
- 178. 3-oblong amber indicators with lilliputs 12V
- 180. 6-round amber indicators with neons 240V
- 181. 100-p.v.c. grommets 3/8 hole size
- 182. 1-short wave tuning condenser 50 pf with 1/4" spindle
- 184. 1-three gang tuning condenser each section 500 pf with trimmers and good length 1/4" spindle
- 188. 1-plastic box sloping metal front, 16 x 95mm average depth 45mm
- 193. 6-5 amp 3 pin flush sockets brown
- 195. 5-B.C. lampholders brown bakelite threaded entry
- 196. 1-in flex simmerstat for electric blanket soldering iron etc.
- 197. 2-thermostats, spindle setting - adjustable range for ovens etc.
- 199. 1-mains operated solenoid with plunger 1" travel
- 200. 1-10 digit switch pad for telephones etc.
- 201. 8-computer keyboard switches with knobs, pcb or vero mounting
- 206. 20-mtrres 80 ohm, standard type co-ax off white
- 211. 1-electric clock mains driven, always right time - not cased
- 216. 1-stereo pre-amp Mullard EP9001
- 232. 2-12V solenoids, small with plunger
- 236. 1-mains transformer 9V 1 amp secondary C core construction
- 241. 1-car door speaker (very flat) 8 1/2" 15 ohm made for Radiomobile
- 242. 2-speakers 6" x 4" 4 ohm 5 watt made for Radiomobile
- 243. 2-speakers 6" x 4" 16 ohm 5 watt made for Radiomobile
- 244. 1-mains motor with gear-box very small, toothed output 1 rpm
- 245. 4-standard size pots, 1/2 meg with do switch
- 249. 1-13A switched socket on double plate with fused spur for water heater etc.
- 266. 2-mains transformers 9V 1/2A secondary split primary so ok also for 115V
- 267. 1-mains transformers 15V 1A secondary p.c.b. mounting
- 291. 1-ten turns 3 watt pot 1/4 spindle 100 ohm
- 296. 3-car cigar lighter socket plugs
- 298. 2-15 amp round pin plugs brown bakelite
- 300. 1-mains solenoid with plunger compact type
- 301. 10-ceramic magnets Mullard 1" x 3/8 x 5/16
- 310. 1-12 pole 3 way ceramic wave charge switch
- 304. 1-stereo amp 2W per channel
- 305. 1-tubular dynamic microphone with desk rest
- 310. 1-T.V. turret tube (black & white T.V.)
- 318. 2-oven thermostats
- 319. 5-sub miniature micro switches
- 316. 1-round pin kettle plug with moulded on lead

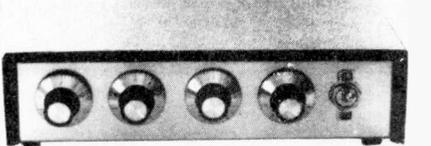


Ex-Electricity Board. Guaranteed 12 months.

VENNER TIME SWITCH

Mains operated with 20 amp switch. One on and one off per 24 hrs. repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95 without case, metal case - £2.95, adaptor kit to tone metal case and has controls for each channel, and a master on/off with the added advantage of up to 12 on/off per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

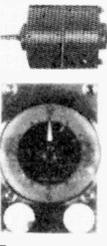
SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by 1/4" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

12 volt MOTOR BY SMITHS

Made for use in cars, etc. these are very powerful and easily reversible. Size 3 1/2" long by 3" dia. They have a good length of 1/4" spindle - 1/10 hp £3.45 1/8 hp £5.75. 1/6 hp £7.50



25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake - switch on lights to ward off intruders - have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. A beautiful unit at £2.50

THIS MONTH'S SNIP
COMPUTER COMPATIBLE V.D.U.
 Jap made by Hitachi, Model No. H9905/11. Has its own power supply and access normal video input. Very little use. Tested before despatch. Special snip price £10.00 + £4 p&p.

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CHOKE AND STARTER for 6" 100uva tube £2, post £1 for 1 or 50p each in quantity.
TUBE HOLDERS Canopy type spring loaded, 4 pairs for £1, 100 pairs £20, 1,000 pairs £150, post paid.

TANGENTIAL HEATERS

We again have very good stocks of these quiet running instant heat units. They require only a simple case, or could easily be fitted into the bottom of a kitchen unit or book case etc. At present we have stocks of 1.2kw, 2kw, 2.5kw, and 3kw. Prices are £5 each for the first 3, and £5.95 for the 3rd. Add post £1.50 per heater if not collecting.
CONTROL SWITCH enabling full heat, half heat or cold blow, with connection diagram, 50p for 2kw, 75p for 3kw.

FANS & BLOWERS

Woods extractors
 5" £5 + £1.25 p&p, 6" £5 + £1.50 post
 10" x 4" Muffin equipment cooling fan 115V £2.00
 4" x 4" Muffin equipment cooling fan 230/240V £5
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 9" Extractor or blower 115V supplied with 230 to 115V adaptor £9.50 + £2.00 post.
 All above are ex computers but guaranteed 12 months.
 10" x 3" Tangential Blower. New. Very quiet - supplied with 230 to 115V adaptor on use two in series to give long blow £2.00 + £1.50 post or £4.00 + £2.00 post for two.

IONISER KIT

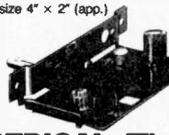
Refresh your home, office, shop, work room etc. with a negative ION generator. Makes you feel better and work harder - a complete mains operated kit, case included. £11.95 plus £2.00 post.

TELEPHONE BITS

Master sockets (has surge arrester - ringing condenser etc) and takes B.T. plug..... £3.95
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 Dual adaptors (2 from one socket)..... £3.95
 Cord terminating with B.T. plug 3 metres..... £2.95
 Kit for converting old entry terminal box to new B.T. master socket, complete with 4 core cable, cable clips and 2 BT extension sockets..... £11.50

MINI MONO AMP on p.c.b. size 4" x 2" (app.)

Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of £1.50 each, or 13 for £12.00



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Motor driven switch bank with connection diagram, used in connection with a set of X-mas lights makes a very eye catching display for home, shop or disco, only £5 ref 5P56.

£5 POUNDERS*

- 5P1 12 volt submersible pump complete with a tap which when brought over the basin switches on the pump and when pushed back switches off, an ideal caravan unit
- 5P2 Sound to light kit complete in case suitable for up to 750 watts
- 5P3 Silent sentinel ultra sonic transmitter and receive kit, complete
- 5P5 250 watt isolating transformer to make your service bench safe, has voltage adj. taps, also as it has a 115v tapping it can be used to safely operate American or other 115v equipment which is often only insulated to 115V. Please add £3 postage if you can't collect as this is a heavy item.
- 5P6 12V alarm bell with heavy 6" gong, suitable for outside if protected from direct rainfall. Ex. GPO but in perfect order and guaranteed
- 5P15 Uniselector 5 pole 25 way 50 volt coil
- 5P18 Motor driven water pump as fitted to many washing machines
- 5P20 2 kits, matchbox size, surveillance transmitter and FM receiver
- 5P23 miniature (appr. 2 1/2" wide) tangential bulb heater, 1.2kw
- 5P24 1/4hp motor, ex computer, 230v, mains operation 1450rpm. If not collect add £3 post
- 5P25 special effects lighting switch. Up to 6 channels of lamps can be on or off for varying time periods
- 5P27 cartridge player 12v, has high quality stereo amplifier
- 5P28 gear pump, mains motor driven with inlet and outlet pipe connectors
- 5P32 large mains operated push or pull solenoid. Heavy so add £1.50
- 5P34 24V 5A toroidal mains transformer
- 5P35 modern board from telephone auto dialler, complete with keypad and all ICs
- 5P37 24 hour time switch, 2 on/off and clockwork reserve, ex. Elec. Board loading up to 50A. Add £1 post
- 5P41 5" extractor fan, very quiet runner sh, grid 12 mths.
- 5P45 pack of 6 cooker clock switches
- 5P48 telephone extension bell in black case, ex-GPO
- 5P50 box of 20 infra red quartz glass enclosed 360w heating elements
- 5P51 200w auto transformer 230v to 115v toroidal
- 5P53 mains transformer 26v 10A upright mounting, add £2 post
- 5P54 mains motor with gear box, final speed 5rpm
- 5P58 Amstrad stereo tuner FM and LM and S. AM
- 5P60 DC Muffin type fan 18w to 27v, only 3w
- 5P61 drill pump mounted on frame, coupled to mains motor
- 5P62 2/2kw tangential bulb heater, add £1.50 post if not collecting
- 5P63 2" diameter light box for viewing PCB's or can be used for shop window sign

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CA301AT	0.80	TD2560	3.20
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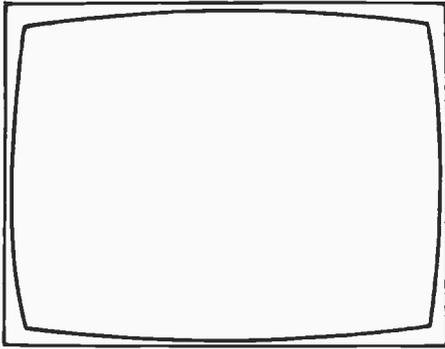
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AC128	0.30	BC119	0.28
AC128K	0.34	BC125	14
AC141	0.58	BC140	0.27
AC141K	0.58	BC141	0.24
AC142	0.56	BC142	0.24
AC142K	0.38	BC143	0.26
AC151	0.45	BC147	0.18
AC152	0.45	BC147B	0.14
AC153	0.57	BC148	0.10
AC153K	0.46	BC148B	0.10
AC176	0.30	BC149	0.12
AC176K	0.38	BC149C	0.14
AC187	0.28	BC157	0.10
AC187K	0.28	BC158	0.12
AC188	0.28	BC159	0.12
AC188K	0.38	BC	0.10
AC189K	1.50	BC160	0.30
AC189K	1.50	BC161	0.30
AD142	0.88	BC168B	0.10
AD143	1.10	BC168B	0.12
AD149	0.72	BC169C	0.20
AD161/162	1.20	BC170A/B/C	0.16
AD162	0.52	BC171A/B/C	0.10
AF114	1.20	BC172/B/C	0.12
AF115	2.10	BC177A/B/C	0.24
AF116	2.10	BC182A/B/C	0.10
AF121	0.56	BC182L	0.12
AF129	0.42	LA LD LC	0.10
AF125	0.58	BC183A/B/C	0.10
AF126	0.58	BC183L	0.10
AF127	0.38	LA LB LC	0.10
AF139	0.40	BC184	0.10
AF178	2.28	A B CL LC LB	0.10
AF239	0.50	BC207	0.20
AF279S	1.40	BC212A/B/C	0.10
AL100	5.40	BC212L	0.09
AL102	4.40	LA LB	0.10
AS780	5.20	BC213A/B/C	0.10
AS717	2.00	BC213L	0.10
AY102	4.40	BC237	0.10
AY102	4.40	BC237	0.11
B40C200	1.03	BC238	0.12
BA110	0.68	BC251A/B	0.14
BA115	0.14	BC262	0.20
BA121	0.40	A B	0.28
BA129	0.38	BC301	0.30
BA148	0.16	BC302	0.30
BA155	0.12	BC303	0.30
BA157	0.28	BC307A	0.18
BB105S	0.30	BC317A	0.12
BB105G	0.48	BC323	0.90
BB110S	0.16	BC327	0.16
BC102	0.10	BC328	0.16
A or B	0.12	BC337	0.12
BC108	0.10	BC338	0.12
A B or C	0.13	BC350A	0.24
BC109	0.10	BC351	0.10
A B or C	0.10	BC440	0.36
BC115	0.12	BC441	0.40
BC116	0.12	BC461	0.58
BC117	0.22	BC478	0.24

Type	Price (£)	Type	Price (£)
BC516	0.48	BF178	0.26
BC547	0.12	BF180	0.26
A or B	0.27	BF181	0.27
BC548	0.12	BF182	0.32
A or B or C	0.10	BF183	0.32
BC549	0.10	BF184	0.30
A or B	0.10	BF185	0.28
BC560	0.10	BF194A	0.15
A or B	0.10	BF195	0.12
BC567	0.10	BF224J	0.20
BC584	0.10	BF240	0.30
BC584	0.10	BF241	0.30
BC584	0.10	BF244A	0.30
BC584	0.10	BF257	0.22
BC584	0.10	BF258	0.26
BC584	0.10	BF259	0.30
BC584	0.10	BF262	0.34
BC584	0.10	BF263	0.38
BC584	0.10	BF270	0.30
BC584	0.10	BF271	0.28
BC584	0.10	BF272	0.22
BC584	0.10	BF273	0.22
BC584	0.10	BF274	0.34
BC584	0.10	BF284	0.46
BC584	0.10	BF287	0.32
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BC584	0.10	BF397	0.26
BC584	0.10	BF398	0.26
BC584	0.10	BF399	0.26
BC584	0.10	BF400	0.26

Type	Price (£)	Type	Price (£)
BU126	1.40	CRP12	0.95
BU133	1.90	R2005B	1.20
BU204	1.30	R2010B	1.20
BU205	1.30	R2540	2.71
BU206	1.50	TIP30A	0.32
BU208A	1.40	TIP31C	0.39
BU236S	1.75	TIP32	0.35
BU407	1.10	TIP33A	0.55
BUX80	3.70	TIP34A	0.70
BUY20	2.75	TIP41C	0.42
BUY69A	2.60	TIP42	0.44
BUY69B	1.98	TIP47	0.42
BY100	0.90	TIP21	0.63



TELEVISION

Making and Missing Opportunities

Now that the junketings to commemorate fifty years of television in the UK have passed it's maybe time to puzzle over what went wrong. Wrong? The UK's television programme standards continue to be by international comparison of the highest order and the technical standards are also first class. Technological developments continue apace. The UK has a dominating position in videotext technology and in the application of digital techniques to TV generally. The digital stereo sound system developed by the BBC is a great deal more sophisticated than the stereo systems developed elsewhere – in the USA, Japan and W. Germany – and promises to be a more effective and robust solution to the problem of squeezing extra sound channels into the spectrum. The same can be said of the IBA developed MAC transmission standard: a sophisticated and technically elegant approach to DBS broadcasting. The UK has been at the forefront of digital TV developments, particularly with standards conversion and video signal processing equipment. But when one looks in the windows of the high street shops what does one see? Mainly the Sony's, Hitachis, Toshiba's, Panasonic's and so on. Domestic TV and video equipment designed and much of it produced elsewhere. Of those seven companies that had TV sets on show at the famed 1936 Radiolympia exhibition how many are still active in the domestic TV field? Only Philips remains as a major presence, all the others having long since withdrawn. Our major indigenous TV manufacturer, Ferguson, didn't enter the TV field till the post-war era. Yet it's not long since that a largely UK owned TV setmaking industry was producing sets as fast as it could for a trade that was roaring for more – back in 1973 dealers were getting really hot under the collar about delivery delays from an over-stretched UK industry. And during this period the UK led the world in the application of solid-state technology to TV sets.

It's intriguing to reflect on the EMI story. What a dominant position they had back in 1936. They'd developed the first practical high-definition standard to come into use and all the technology to go with it. On the setmaking side they could and did produce just about everything required – the cabinets, the c.r.t.s and valves, high-quality speakers and most of the other components. What a start! Yet somehow along the way the whole thing fizzled out. There was a final brief blaze of glory in the late sixties when an excellent colour camera was introduced, but that was more or less the last we were to hear from the original EMI company in the TV field. Setmaking came to an end in the mid-fifties.

It's interesting to compare the EMI story with that of RCA, the other major TV innovator in the English-speaking world. RCA had an all electronic TV system in operation experimentally in the early thirties. For many years colour television meant RCA – NTSC was merely the committee that accepted the RCA system, and RCA developed the shadowmask tube that made colour TV a practical proposition. Yet colour didn't do RCA a lot of good. It was slow to take off in the USA in the fifties and RCA is reputed to have made losses on colour set production for over a decade. More recently RCA's efforts on the video side have been a disaster. It was intended that the CED video disc system, introduced in 1981, would account for fifty per cent of corporate sales by 1990. It was withdrawn after only three years at a loss of some \$550m. A recently published book (*RCA and the Videodisc: The business of research*, by Margaret Graham, published by Cambridge University Press at £25) tells the sad story.

How is it that things can go so badly wrong, and that firms who made such major contributions to the start of TV failed to make the most of the opportunities to be had? There is of course no single answer to this conundrum. Economics certainly plays a major part. The English-speaking world has been set on a course of economic profligacy for twenty years or so, with an almost continuous consumer boom funded by sophisticated lending systems. It's not exactly surprising that inflation and high interest rates have accompanied this set-up. These are not the ideal conditions for thriving industries. Japan and W. Germany have enjoyed lower interest rates and costs and a far greater tendency to save and to invest in industry. Far too much investment in the English-speaking world goes into financing inflation and funding government deficits. At an earlier stage, in the UK, we had the famed stop-go economic policies. Each stop was accompanied by the demise of manufacturing concerns as unsold stocks built up. The final idiocy was the grossly over-valued pound in the early eighties. It's not surprising that industry has lagged in the English-speaking world when this economic background is considered. But that's by no means the whole story.

Has UK industry been adept at getting the product right and judging the market correctly? The answer has to be no. All too often in the past the public has been offered what manufacturers can make with the equipment and components available rather than what the public wants, while marketing has been a matter of clever advertising rather than research into what could be sold and potential markets that could be exploited. Japanese industry on the other hand has been extraordinarily adept at coming up with goods that meet the public's requirements. Reliability and price have been major factors in this – good old fashioned value for money – and this has been helped by favourable domestic economic conditions and strong investment in industry. The Japanese have also had a flair for designing goods that are useful and for developing new markets. Most large Japanese firms go in for what is called "life style research". To date the result has been a string of successes. One can only wonder how the balance of industry between east and west will develop as we approach the nineties.

EDITOR

John A. Reddihough

Please note that the telephone numbers below are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 73.

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COVER PHOTO

This month's cover photograph shows an Hitachi VT8300 VCR with the top cover removed. See servicing article on page 96.

HELD OVER

Due to shortage of space in this issue the concluding article in our series on electric motors has had to be held over till next month.

Teletopics

TV BROADCASTING

The Home Office has commissioned CSP International, a consultancy that specialises in telecommunications, to produce a report on how the Peacock Committee's ideas on using subscription TV systems to replace the BBC's licence revenue could be put into effect. The consultancy has been given six months to produce its report, which will consider the present state and cost of subscription technology and public attitudes to its introduction. Dr Charles Jonscher, CSP International's managing director, holds the view that TV is "hopelessly under-financed" in the UK. He points out that TV costs the viewer two-three pence per hour while far more is spent on videocassette entertainment. He intends to "produce a detailed picture of the broadcasting environment in the early 1990s and see how subscription TV fits in". The consultancy is also at present preparing a report for the Department of Trade and Industry on the possibility of commercial pricing for the use of radio frequencies. Meanwhile the government has decided to extend the current ITV franchises for two years, till 1992, while the future of broadcasting is being considered - the IBA had asked for a four-year extension. A Post Office crackdown on licence fee evasion has increased the number of TV licences by some 300,000. Prosecutions during July-September were fifty per cent higher than a year ago and are expected to reach 180,000 for the whole year.

A joint high-definition TV development programme has been announced by Bosch, Philips, Thomson and Thorn EMI. The aim of the project, which is backed by the EEC's Eureka high-technology initiative, is to develop a compatible system based on the IBA's MAC technology. It's expected that the European broadcasting authorities and universities will become involved in the project in addition to the research departments of the companies concerned. A starting date of some time in 1995 has been suggested for European HD-TV transmissions.

SAMSUNG'S UK PLANT

South Korean manufacturer Samsung Electronics is to invest £17 million over five years in a plant at Billingham, Cleveland. By the middle of next year the plant should be producing 120,000 VCRs and 150,000 microwave ovens a year. If this initial phase is successful the plant will be extended to produce colour TV sets. By 1990 CTV production could be running at the rate of 300,000 sets a year. Products will initially be assembled from parts imported from Korea but UK sourcing is expected to follow. Samsung already has a joint-venture CTV plant in Portugal, some of whose output is exported to the UK.

CES 87

The 1987 Consumer Electronics and Technology Show (CES) will be held at the West Brompton Hall, Earls Court, on May 17-20th. A major feature will be a display of satellite TV.

ZENITH'S FTM TUBE

A new type of colour tube has been announced by Zenith in the USA. The FTM (flat tension mask) tube has the flattest and most square screen yet and will be initially

introduced in an ultra high resolution 14in. version for computer monitor use. The flat shadowmask is glass sealed under tension directly behind the tube's faceplate, making it immune to deformation at high beam currents. Versions for domestic receiver use are expected to follow.

STEREO TV SOUND SYSTEM APPROVED

The government has approved the joint BBC/IBA specification for a digital stereo sound TV system. The system uses a digitally modulated carrier at 6.552MHz above the vision carrier and is at present undergoing experimental testing at the Crystal Palace BBC-2 transmitter. During the next few months the tests will be extended to the BBC-1 transmitter. No date for the introduction of a full service has so far been announced.

VISION-SOUND RATIO CHANGED

The BBC and the IBA are at present altering the vision-sound power ratio at all their transmitters - the change over should be complete by the end of the year. The adjustment is being made to improve transmitter efficiency and save electrical power, and is also a necessary step in preparing the transmitter network for the introduction of a digital stereo TV sound service. Traditionally the vision-sound power ratio has been 5:1. Extensive tests have shown that reception is not affected by changing this to 10:1, the ratio that has been used for the last two years at the BBC-1 and BBC-2 Crystal Palace transmitters and has for many years been used over much of Europe. The dates on which individual transmitters change over will be shown on Ceefax page 195 and Oracle page 597.

4mm VIDEO SYSTEM

Samsung showed their recently developed 4mm video system at this year's S. Korean Radio Show. The system consists of a camcorder with built-in TV tuner and viewfinder/colour monitor. Weight is 1.15kg with dimensions of 104 x 214 x 136kg. The cassette measures 50 x 33 x 8.2mm and has a playing time of 80 minutes. A liquid crystal display is used for the viewfinder/monitor. The version on show, the Viteca Model SV-C41, uses the NTSC colour system and tunes through the US v.h.f./u.h.f. bands. The camera section's minimum light requirement is 10 lux.

AMATEUR TV

A European amateur television organisation called EATWG (European Amateur Television Working Group) has been formed to promote and protect the interests of ATV operators. Its tasks will include dealing with government licensing authorities and the International Amateur Radio Union. The aim is to secure a fair deal for TV amateurs. Other work will include the co-ordination of bandplans and technical standards, and running contests on an international basis. The group claims a healthy financial base and a strong organisation that covers all active European ATV groups. There will be an annual meeting and regular newsletters. Thirty five representatives from the UK, France, Belgium, Holland, Italy, Austria, Germany and Switzerland attended the first meeting which was held in Basel, Switzerland on September 20th-21st. EATWG is represented in the UK by the BATC: enquiries should be sent to Andy Emmerson, 71 Falcutt Way, Northampton NN2 8PH.

Contents of the latest issue of the BATC magazine *CQ-TV* (No. 136, November) include a simple video

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This brand new control panel provides effective and reliable control of all types of security installations. Using advanced electronics, the unit automatically checks the loop circuits every time that it is switched on, thereby reducing the possibility of false alarms and incorrect operation. Using a simple on/off key switch, it is easily operated by all members of the family. Additionally, 24hr personal attack and anti-tamper protection is provided irrespective of whether or not the unit is switched on. Housed in a strong, attractive steel case, the unit is supplied with full operating instructions and 2 keys. Supplied fully built and tested ready for installation.

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Lighting Controller DP 3570

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£13.95 + VAT



This versatile module provides timed switching of loads up to 3A for pre-set times between 10 secs and 5 mins, the timed period being triggered by the opening or closing of an external loop or switch. The built-in 12V 250mA power supply is available for operating external sensors. Priced only £13.95 + VAT. Suitable plastic enclosure, £2.95 + VAT.

500W Quartz Halogen Floodlight FL 500



only **£14.95 + VAT**

Whilst intended for security lighting applications, this unit is suitable for lighting paths, pathways and gardens etc. Supplied complete with 500W lamp, priced only £14.95 + VAT. Protective grill, £1.95 + VAT.

Infra-red System IR 1470



only **£25.61 + VAT**

Consisting of separate transmitter and receiver both of which are housed in attractive moulded cases, the system provides an invisible modulated beam over distances of up to 50ft operating a relay when the beam is broken. Intended for use in security systems, but also ideal for photographic and measurement applications. Size 90 x 50 x 35mm.

HW 1250 - Enclosure & fixings for CA 1250



only **£9.50 + VAT**

This attractive case is designed to house the control unit CA 1250 together with the appropriate LED indicators and key switch (Extral). Supplied with the necessary mounting pillars and punched front panel, the unit is given a professional appearance by an adhesive silk screened label. Size 200 x 180 x 70mm.

Control Unit CA 1250



Price **£19.95 + VAT**

This tried and tested control unit represents the finest value for money in control systems providing the following features:

- Built-in electronic siren drives 2 loud speakers
- Provides exit and entrance delays together with fixed alarm time
- Battery back up with trickle charge facility
- Operates with magnetic switches, pressure pads, ultrasonic or IR units
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Individual Enclosure SC 5063



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Suitable metal enclosure for housing the ultrasonic module type US 5063. Supplied with the necessary mounting pillars and screws etc.

Digital Ultrasonic Detector US 5063



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- 3 levels of discrimination against false alarms
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enhancer, a 10GHz transceiver, a wideband optocoupler, a sync processor and a tunable sound demodulator for satellite TV reception. There are several articles on satellite TV subjects. Details of membership of the British Amateur Television Club can be obtained from Dave Lawton, "Grenehurst", Pinewood Road, High Wycombe, Bucks HP12 4DD (0494 28 899).

AMSTRAD'S TELEVIDEO

Amstrad have introduced a combined CTV/VCR, Model VTR1, for only £399. The comprehensive specification includes infra-red remote control. There's also a new VCR, Model 4600, which offers two-speed operation, HQ circuitry, infra-red remote control and a 14-day, 4-channel timer at just £329.

CATALOGUES AND COURSES

Tandy's latest full-colour, 136-page catalogue features over 2,600 items and is available free from the 360 Tandy stores and authorised dealers throughout the UK.

The Doncaster Metropolitan Institute of Higher Education (Waterdale, Doncaster DN1 3EX - 0302 22 122) is offering a short course, starting in January, entitled Satellite Communications. The course will cover both satellite TV and weather satellites and will include a large element of practical work. It will be held on Tuesday evenings and will last for twelve weeks.

GERMAN DBS AGREEMENT

Agreement has been reached between the West German state governments on the allocation of the four DBS TV channels to be provided by the TV-Sat craft. Launch of the satellite could be next May - the second flight when

the Ariane programme is resumed has been booked. Two of the channels will be operated by the W. German public service broadcasting organisations ARD and ZDF, the other two being commercially operated. There have been seven applications to operate the commercial channels.

TV BRANDS

A range of Zanussi manufactured TV sets is to be launched next year under the Seleo brand name: the brand name is widely used on the Continent for Zanussi sets. Seleo UK's address is Orchard House, Chesham, Bucks.

Sentra Consumer Products (Wood Street, Brighouse, West Yorkshire HD6 1PW, 0484 714 353) has added a Korean sourced VCR and a Hong Kong sourced 14in. colour set to its range.

Two small-screen monochrome sets, one with built-in radio, have been added to the Elftone range (Elftone Electronics Ltd., 4 Beresford Avenue, Wembley, Middx HA0 1YZ. 01 902 6222).

Our thanks to a couple of readers who answered our request for information on Wye monochrome portables. The firm that handled these sets is the Wye Winding Company, 27 Station Road, Brimington, Chesterfield, Derbyshire S43 1JJ.

SATELLITE TV

The one-day technical courses on satellite TV being run by Salora were mentioned in Teletopics last month. The booklet issued free to those who attend the courses is also available from Salora at £10 plus £1 post and packing. Order from Salora (UK) Ltd., Techno Trading Estate, Swindon, Wilts SN2 6EZ. The book runs to 58 pages, is

well produced and easy to follow. The latest issue of *Ferguson Feedback* (no. 27, October) also contains a lot of helpful information on satellite TV, with the emphasis on practical installation work.

The latest satellite TV receiver from Connexions Satellite Systems Ltd. (125 East Barnet Road, New Barnet, Herts EN4 8RF), Model 2460R, features infra-red remote control with 32-channel storage capacity, switchable bandwidth and variable audio subcarrier tuning, a.g.c. and a.f.c. Price of the unit is £345 including VAT – it's available separately or as part of the Connexions' de luxe satellite system which includes a polar mount, dish, feed, stand, polarotor and LNB. Price of the complete system is £995 including VAT.

Salora's latest receiver, Model SRV1150 (see photo last month), features a signal strength display, infra-red re-

mote control, 32-channel memory and four switchable sound systems. It can be used in conjunction with the ACU1160 aerial control unit to give remote actuator and polarizer control with up to thirty pre-programmed satellite positions. This unit incorporates a digital aerial position indicator.

PROFITS SQUEEZE

Several major Japanese electronics firms have recently announced substantially reduced half-year profits, reflecting amongst other things the effect of the yen appreciation. The reduction in net profit reported by Matsushita was 31 per cent, JVC's net profits fell by 45.3 per cent, Hitachi's by 47 per cent, Mitsubishi Electric's by 44 per cent and Toshiba's by 69 per cent.

VCR Fault Analysis

The purpose of this new column is to analyse in greater depth than is usually possible in VCR Clinic various examples of VCR fault conditions. The aim is to outline how the causes of fault conditions can be tracked down.

Panasonic NV366

The fault report with this machine was of a tracking error half way down the screen. As a first step a known good tape was played – half an hour of test card or a film recorded on a new VCR serves the purpose well. The results obtained did not point conclusively to a tracking error. For a start the white noise was not as intensive as that produced by a tracking bar. The top half of the picture was perfect, but from about half way down the picture was covered in white noise spots and there was a slight flickering. Static problems could be ruled out as the spots didn't have the characteristic "tadpole" shape, and anyway the earthing spring and carbon brush were in good order and making contact.

To test for a tape path error it's best to bias the tape down gently with your finger, by lightly pushing down on the top edge between the entry and exit guides. This made matters worse, producing a number of tracking crossover bars. Luck can play a part in VCR servicing: our decision to measure the replayed f.m. signal as the next step probably cut out a lot of headscratching. We found that one head was producing a full f.m. signal throughout the scan while the other one produced a signal only during the second half of the scan. Now the NV366 has four heads, the main two being designated L and R. Mounted at 90° to these are two other heads, R' and R'', which are used for still pictures and picture search. Both sets of heads use the same preamplifiers, with relays used for switching. In this case it could be proved that one of the relays was suffering from contact problems, which is not unusual in very low signal level circuits. The clue was in the half picture. Fig. 1 shows the head switching circuitry. If say the L side was o.k., it would produce a full f.m. signal during the scan. If the other relay was switching to the R'' head, 90° from the L head, it would produce an output for only half a track.

A red herring in this case was that the picture didn't show any severe jumping or flicker as the effect was hidden by the spots. A similar effect can be seen with

Steve Beeching, T.Eng.

Betamax machines when one head has ceased to function. Also note that a mechanical fault could have been easily ruled out by the fact that a recording made on the machine would have played back perfectly on another VHS machine.

The cure was to replace the switching relays RL3501 and RL3502, not the video heads!

Grundig VS200

The problem with this machine was no E-E picture. This could have been a customer finger problem although on Grundig VCRs there's no output signal unless the machine is in record or the programme plus or minus button is stepped on. Checks soon revealed however that not only was there no E-E signal, there was no recording on the tape either (cross-checked with another VHS machine). The screen was clean blank in the E-E monitor mode – no spots. A prerecorded film could be played back with no problems.

The starting point is to check for video output from the tuner/i.f. module. Video was found to be present right up

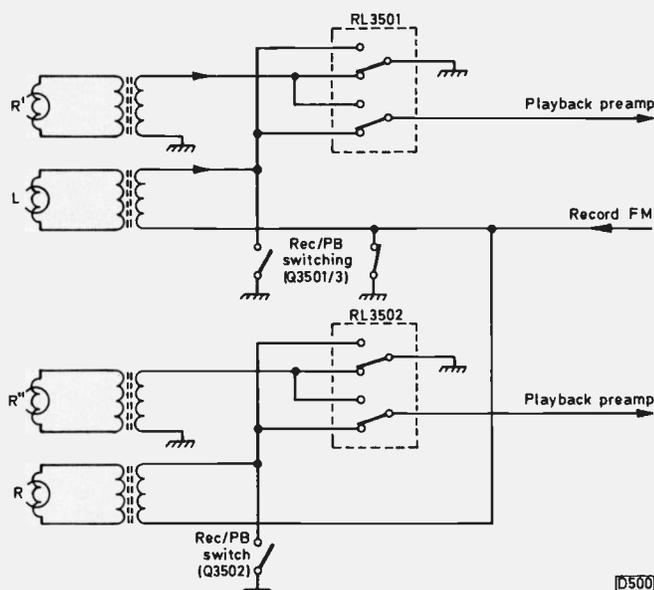


Fig. 1: Head switching arrangement used in the Panasonic NV366, shown in the playback condition.

to pin 4 of IC810 (TDA3771) on the luminance panel. It emerged at pin 18 of this i.c. and went back in at pin 12. That's where it ended. There was no output at the record output pins 15 and 17 or the monitor output pin 6. So it seemed that the chip was faulty, or was it?

It pays to check around such signal i.c.s for pulse inputs. A lot of timing, clamping and gating pulses are used and are easily overlooked. Pin 9 should have been receiving mixed syncs but nothing was present here. Tracing back took us to contact 34 on the chroma panel. The mixed sync signal that should have been present at this point comes from pin 1 of IC1155 (TDA3750). There were no pulses here either. Video was present at pin 3 of this i.c., so it seemed likely that the sync separator within the chip had failed. Several peripheral components were checked, including C1154 (22 μ F) connected to pin 2 and the network connected to pin 4 – both these pins are connected internally to the sync separator part of the chip – but no fault was found here. Replacing the i.c. cured the fault. It would be reasonable to expect some ripple at pins 2 and 4. For future reference pin 2 is at 7V d.c. with an 0.3V p-p a.c. ripple on it at 20msec periods. Absence of ripple at this point tended to confirm that the i.c. was faulty.

Hitachi VT33

A similar fault caused much more trouble with an Hitachi VT33. The symptom was that of head failure – spots with a picture of sorts underneath, flickering vertically. In fact the dealer who'd sent it to us had written "suspect video heads" on the fault report. I decided to try new heads and when doing so was made suspicious by the fact that the wires had been removed previously. New heads didn't provide any improvement so the originals went back in. The next step was to check the f.m.

waveform obtained from the preamplifiers – pin 12 of IC202 (HT4238) would do for this purpose. A good waveform was present here, with no gaps and plenty of f.m. from each head. Back to square one, with the heads apparently eliminated.

Closer scrutiny of the picture showed that there was a lot of colour noise. So the colour was muted by connecting pin 10 of IC203 (HT4239) to chassis. The spots then went away, leaving a clear monochrome picture which was bouncing vertically – so much so that a line of text showed double. This was down to the video heads: someone had moved one of the tips so that they were no longer 180° apart. The bounce was produced by the two heads replaying different fields. New heads cured this and a good monochrome picture was obtained. So far so good.

When the colour mute was disconnected the noise reappeared, giving the impression of head failure. It could be deduced only that something within IC203 was creating the noise, but the fault persisted when a replacement was fitted. It was eventually discovered that there was no sync pulse input at pin 22 of the i.c. This had the effect of putting the a.f.c. loop out of lock. The sync pulses come from pin 27 of IC202 and were not present here either. Since the sync separator in this i.c. appeared to have failed a new chip was fitted, finally restoring normal operation.

So what were the red herrings that led us astray in this case? First the fault symptom was identical to that produced by head failure. Someone had obviously messed about with the heads. Secondly there were reasonable monochrome record/playback pictures with the colour channel inhibited: there were no signs of any luminance problems that could have been caused by lack of clamping or a.g.c. failure. This example illustrates that all is not always what it seems, and that the fault symptoms can be very misleading when timing pulses are missing.

TV Fault Finding

Reports from R. Crockit, Jim Rainey
Philip Blundell, Eng. Tech. and
Michael Dranfield

Rediffusion Mk. 5 Chassis

This set was dead but no fuses were blown. A check on the voltages in the switch-mode power supply revealed that 300V was present at the collector of the chopper transistor Q701 but its base and emitter voltages were at zero. Problem: was the fault in or after the power supply? As suggested in the manual, we shorted between the collector and emitter of the chopper transistor and ran the set with a mains input of 80V a.c. This produced a picture but no sound. Good: the set was o.k., the fault being in its power supply. All the transistors and diodes in the power supply proved to be o.k. when tested. Resistor checks then revealed that R717 (120k Ω) in Q701's base circuit was open-circuit – it's part of the start-up arrangement.

R.C.

Thorn TX10 Chassis

This set was dead with the BU208B chopper transistor TR701 short-circuit. We replaced the chopper transistor and checked to see whether there were any obvious reasons for its demise, then switched on. The set worked and after soak testing for two days it was returned to the owner. A fortnight later we were called back and once more TR701 had gone short-circuit. Return to the workshop, replace TR701 and once again everything seems to

be o.k. We had a niggling doubt about the focus unit, which was of the original type. A very close inspection – for the second time – gave no reason to suspect it however. Anyway we darkened the workshop, turned the brightness down and the e.h.t. up (because of no beam current). No glows or arcs. Repeat exercise two days later and find a very faint glow in the body of the focus unit. A replacement was fitted and we assumed we'd solved the problem. A month later the set was back again – with TR701 short-circuit.

This time many hours were spent soak testing the set after replacing TR701. At last we were rewarded with a splutter and partial line collapse. A careful inspection with a magnifying glass then revealed two fatigued solder joints under the red cover over part of the chopper transformer – at pins 2 and 3. At last we had won! R.C.

Skantic Model 5661

This set was dead with a buzzing noise coming from the switch-mode power supply (Siemens self-oscillating type, discrete component version). The outputs were disconnected and a 100W bulb was connected across the 160V line. Still no 160V. Out came the back issues of *Television*

where, in the January 1982 issue, this power supply was covered in some detail. As suggested RQ17 (1M Ω) on the mains input module was checked – it's part of the start-up circuit. It was high in value but a replacement didn't produce any improvement. DN03/4/5/6 were then checked out of circuit: they tested o.k. but replacing them brought the power supply back to life! **P.B.**

GEC C2087 (Hitachi NP81CQ Chassis)

We've had this fault on a number of occasions now: the set trips after ten seconds but the likely causes (high h.t. or e.h.t.) are not present. Try replacing the crowbar thyristor Q703 – if it's only slightly leaky it will trigger itself. **P.B.**

Mitsubishi CT2227

Some quickies on this set:

- (1) For a small picture with the 115V line low at TP91, check whether R904 (470 Ω) is open-circuit.
- (2) Set dead with no 15V at the cathode of D372 – check whether R371 (2.2 Ω) is open-circuit.
- (3) Set dead with no 140V at F902 or 5V at IC7A2 on the ETS module – check whether R7A0 (1.2 Ω) is open-circuit.

Note that all these resistors are safety types. **P.B.**

GEC C1408

Most power supplies respond to the use of a 100W bulb as a dummy load – but beware, this one doesn't! A 100W bulb gives a ticking noise and a very low output. A quick read through the circuit description revealed that R920 (2.2k Ω , 15W) is switched into circuit in standby to prevent the output voltage rising. So to test the power supply disconnect the lead linking the 110V to the main chassis and wire R920 in circuit all the time. **P.B.**

ITT CVC1202 Chassis

The problem with this set was intermittent change in the line phasing. The fault seemed to be independent of heat variation or vibration. Voltage checks around the TDA1940F line generator chip were inconclusive as they all seemed to vary – as in fact did the 12.6V supply. D751 (1N4148) in the 7812 12V regulator's earth connection was intermittent. **P.B.**

GEC C1657

A blank raster was the problem with this set, which has the TDA3562 decoder chip that's given me problems in the past (not with the i.c. itself but with the associated auto black level sensing circuit). This time however the path from the RGB output stages to pin 18 was o.k., so the sandcastle pulse came under suspicion. Eureka! The pulse was missing from the battlements! It's generated by Q704/5 from a sawtooth signal provided by the TDA4503 chip. The coupling capacitor C724 was open-circuit. **P.B.**

Ferguson TX90 Chassis

We've had faults on a couple of these sets recently. The problem with the first was line wobble. C125 (68nF) in the flywheel line sync filter network had gone high in value. The second set had a flat picture – no colour, very little brightness and the contrast at minimum with no control. The cause of the problem was that R231 (150k Ω) was

open-circuit. This resistor forms part of a potential divider that provides the supply for the base of the beam limiter transistor TR114. With R231 open-circuit the transistor was hard on, removing the voltages from the contrast and brightness controls. **J.R.**

Decca 100 Series Chassis

The raster was reduced all round and the h.t. couldn't be set to 168V – the maximum voltage obtainable was 150V. The culprit turned out to be R604 (270k Ω , 0.5W 2%) which read approximately 500k Ω . As a result the voltage at the base of Tr602 was high and the firing of the regulator thyristor TY600 was being delayed. **J.R.**

Thorn 9000 Chassis

The trouble with this set was intermittent colour dropout. Due to the fault's sensitivity it was hard to find – you had only to breathe on the decoder panel and the colour dropped out. Many joints on this panel were examined and remade before we brought a 3in. magnifying glass into action. Eventually we found a microcrack around one of the pins that connect the small subpanel to the main decoder panel – the pin that connects through the print to pin 12 of IC5. **M.D.**

ITT CVC8 Chassis

The colour was stuck at full saturation, the colour control having no effect. Replacing the two varicap diodes D23 and D24 in the colour control circuit restored normal operation. **M.D.**

Thorn 8800 Chassis

Some of these sets are fitted with a recycling trip, and in this one it was operating. A scope check revealed that the h.t. was rising well above 220V. R724 (120k Ω) in the set h.t./e.h.t. control circuit had gone high in value. **M.D.**

Grundig CUC220 Chassis

No blue was the fault reported on this set. While making voltage checks in the blue output stage we noticed that the blue would occasionally flash on for a few seconds then go off again. Dry-joints were suspected, but resoldering all the joints in the blue output stage made no difference – neither did heat/freezer checks. We finally got around to removing the transistors in the blue output stage and found that T2566 (BF671) had an intermittent emitter connection. **M.D.**

Thorn 9000 Chassis

The job ticket said "big bang then dead". Removing the back revealed that there had certainly been a bang. After clearing up the mess an empty electrolytic can was found at the bottom of the set. It turned out to be the 90V supply smoothing capacitor C715 (22 μ F). As no obvious fault could be found the capacitor was replaced and the set was switched on. It tripped and continued to do this with the e.h.t. tripler disconnected. A check on the fuses revealed that F4 was open-circuit. This led us to the EW modulator driver transistor VT702 which had an open-circuit collector junction. Replacing these items failed to stop the tripping which was eventually cured by replacing the special diode W702 in series with the syclops transistor. **M.D.**

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VCR Clinic

Reports from Steve Beeching, T. Eng.,
Alfred Damp, G. Jackson and
Richard Roscoe

Ferguson 3V38/JVC HRD110

The problem with this machine was intermittent failure of the front buttons to operate. During one of the rare occasions when the fault was present we found that Q223's base voltage was high – so was the voltage at diode D225. The cause of the trouble was that Q208 was turning on very intermittently – but why? There was a partial short in the audio DIN socket, between the earth pin and the remote data pin. **S.B.**

Intermittent Erasure

When the problem is intermittent sound erasure, which may be accompanied by no sound recording, you may also notice colour flutter due to incomplete erasure of the video tracks. If the machine is a Toshiba V65, a JVC HRD140/150 or a Ferguson 3V44/45 look for C23 on the top right-hand panel and solder a 5.6nF Mylar capacitor across it. If the machine is a Ferguson 3V31 or a JVC HR7650/7655 replace the bias oscillator module with the later type and change both relays. **S.B.**

Sony SLC6

Failure of Q01 in this machine removed the E-E 12V supply and thus the E-E signals. **S.B.**

Head Cleaning

This can apply to any machine, though the two in question were both Fergusons – a 3V31 and a 3V29. The fault was described as picture rolling, with the tracking control not working. A noise bar moved up through the picture and the head switching point was visible in the bottom third of the picture. Use of a scope revealed that the head switching point wandered from approximately thirty lines early right through to the field sync, but this was happening on only one channel. The cure? Clean the video heads – a piece of oxide was causing misalignment of the tape path. **A.D.**

Ferguson 3V31

The complaint with this machine was intermittent speed variations when warm. Checks were made around the AN6341 capstan servo chip IC6 when the fault occurred. A replacement chip failed to provide a cure: all the inputs were found to be correct but the output was varying. The output goes to the TC4066 switching chip IC7. 9V entered this i.c. at pin 1 but only 6V came out at pin 2: control pin 13 was at about 5V. This pin is driven by IC22 (M54519P) which turned out to be the culprit – heating and cooling it made the fault come and go. **A.D.**

Fisher FVHP715

As soon as this machine was plugged in a hum bar appeared on the monitor screen. A scope check revealed a 2V p-p hum ripple on the 9V supply to the combined r.f. modulator/splitter/booster unit – when this was unplugged the supply line ripple disappeared. Having had similar symptoms with a 3V16 I checked the r.f. modulator by substitution. No difference! To cut a long story short –

about changing voltage regulator i.c.s etc. – I eventually arrived at the full-wave rectified 16V line. Each rectifier diode is fed via a separate fuse, one of which was open-circuit. The result of this was that the 16V supply was half-wave rectified. **A.D.**

Philips VR6660

The job card read “clock display faulty”. In fact the bottom right and bottom grids (cA and dA) on the display were continuously on. Replacing IC2 (SN75518N) cured the fault. **A.D.**

Sony SLC7

This machine is well known for its slow rewind and the modification kit to correct this. I've had a machine that developed the same fault again some time after fitting the kit however. The solution seems to be to remove the rubber tyres on the idler wheel (and the drive motor if the modification has not been carried out), turn them inside out and replace them. This has even obviated the need for the modification with two SLC7s. **G.J.**

Sanyo VTC5000

The reel drive motor used in this machine has a tendency to run slow with the result that tapes get tangled. Motor replacement is obviously advised but is neither cheap nor easy. I've found that a single drop of high-quality watch oil applied to the upper bearing, which is just accessible with the cover removed, can double the life of the motor. **G.J.**

Salora SV8200/Mitsubishi HS303

Although the machine was a Salora SV8200 we found a Mitsubishi HS303B underneath the covers. It took several seconds for the drum servo to lock: the picture wobbled and the audible note of the drum motor had a harsh tone. Monitoring the sample and hold at TP4A showed that it was fluctuating up and down. C4B8 turned out to be 100 μ F instead of 47 μ F. **R.R.**

Toshiba V65

The 2A fuse in the power supply failed but, unexpectedly, the machine continued to work after a fashion. To save you confusion, if you have the same trouble the symptoms are as follows: clock o.k.; through signal from aerial to TV set o.k.; E-E signal has bad hum bar; eject and load o.k.; selection of play, rewind, fast forward etc. switches the machine off. **R.R.**

ITT P4833/Ferguson 3V24

One of these portable VHS machines had a fault in the E-E and camera modes. The video signal was badly distorted, with washed out and smeary whites, weak sync and bad vision buzz on sound. The colour content was correct however, as was playback of a test tape. Following through the video input signal path brought us to IC2

(HA11703), part of which forms an a.g.c. stage. The input at pin 12 was correct but the output at pin 11 showed up all the distortions – the sync amplitude varied with picture content, in fact even the overall signal amplitude varied with picture content. So much for the a.g.c.!

From pin 11 the signal path splits. One path is the E-E one to IC3. The other returns to IC2 where after further processing, including a.g.c. circuit drive, the signal becomes the record f.m. for the video heads. This path incorporates a filter to remove the colour subcarrier

information. Just before it re-enters IC2 at pin 16 the luminance only signal is d.c. clamped by X5 (2SC2647C), which is driven by composite sync pulses from the sync separator in IC3. Because of the fault the waveforms were wrong all around this circuit, but the trusty meter showed that the d.c. conditions were correct everywhere except at X5 whose base, collector and emitter were all at the same voltage. An out-of-circuit check confirmed that this transistor was leaky – a BC184L in its place restored normal working.

R.R.

Tiny Tim's Nightmare

Les Lawry-Johns

Tim felt very sad as he sat at his desk, swinging his little feet under his stool – as he had done some two years ago, hoping for a new pair of shoes. He had got some shoes then. Now it was a different matter. The half yearly clutter of bills demanded his attention: hundreds of pounds that would put him back in the red again, and he had only just got out from under the last lot, at a cost.

Why didn't these people realise who they were demanding money from? He fought his one man battle against inflation with extreme dedication. He didn't charge a lot for his services, much the same as he had done years ago. Then he had been rich and could dine out several times a week and drink the best wine. Now he couldn't afford to go out at all, not even once a week at Sunday lunchtime. He and Tinker Bell used to pop into the pub for an hour or two on Sunday and spend his whole week's wages. Now his wages buy a couple of bottles that have to last the whole week while he and Tinker Bell watch TV – and occasionally a film on the video to ensure that when they pass it or them on to Tim's brother he won't get a heart attack. Tim's brother has a very bad heart, much worse than Tim's, and the sight of all those young girls panting away might upset him. Tim didn't think they panted because of the fellow who was standing nearby. More at the thought of the money they'd be paid to pant. And why do they keep kissing their fingers? They must love themselves a lot more than they love the fellow who just stands around. I wonder what he gets paid for? Tim wondered whether anyone would pay him to stand around while . . .

The Collection

Just then a lorry pulled up outside. It had a load of junk in the back and Tim guessed who it was. Tim the Tinker had come to collect his small portable. He came in and Tim handed it to him.

"What was wrong with it then?"

"I've written it all down on the bill sir."

"I can't read."

Tim's mind (our Tim) raced. If he couldn't read, the bill could be upped a bit. Instead of eight pounds fifty he could charge fifty quid.

"Ten pounds" he said.

"It says eight pounds fifty down here."

"Just testing your reading, just testing you see."

"I can read money, don't you worry about that" said Tim the Tinker.

So he paid his eight pounds fifty and walked out. Tim heard him say to the other chap in the lorry "tried to con

me, the twisting old B . . .". Tim felt ashamed of himself. What a nasty fellow he was.

Visit from Keith and Alex

Keith and Alex had come up from Portsmouth mainly to bring me a set of scan coils – you remember the CVC32 (October)? I was so grateful, though I didn't actually need them. I'd already got over the trouble by replacing the scan coupling electrolytic which I'd previously shunted as an inadequate test. As the faulty one was leaky it had to be taken out and a new one put in. Silly me.

Keith gazed around and Alex gazed around the other way.

"Just as we imagined it would be. Beyond belief."

"Sorry, very sorry" I apologised.

"No, we didn't mean it's old fashioned or anything like that. It's just that it all fits into place. The awning outside where Zeb jumped out and earned undying fame, and the inside with all the bits and pieces. It's nice really."

Keith was the one who wrote that first letter (June) about the lack of test cards.

"You'll have to get up earlier" I suggested.

Alex was admiring our till. "Right out of Coronation Street" he commented.

"It's easy to fiddle" I said, "and I like it."

A chap came in for a universal tripler and Keith showed me where to find it on the shelf. The chap wanted to know how to fit it in an ITT CVC32. I explained how to connect the leads, joining the diode and earth leads together and soldering them to one side of the focus control. The chap went out with the diagram I'd drawn for him and Keith commented that it wouldn't last long with the leads joined. I wondered why he said that. I always join them. Am I doing something wrong? When I say always, I mean in the ITT and similar sets.

Anyway they departed in high spirits and I wonder if I'll see them again. All the best. Keep the flag flying and all that sort of thing!

The Siemens Set

A 26in. Siemens set came in the other day and I couldn't make head or tail of it. A new line output transistor was required and the chopper circuit had been tampered with. The line output transistor is a BU600S, which I didn't recognise at all. I tried a BU208A but this didn't work and the open-circuit tracks to the chopper unsettled me. I suggested to the chap that he took it up to Geoff. He did, and Geoff had to suffer too.

Next day Geoff phoned to tell me not to send any more lunatics up to him. He also told me that the correct replacement would have been a BU208D. I keep these in stock and kicked myself for not having tried one.

The joke is that another set of exactly the same type came in an hour later and I was able to oblige my friend

by fitting a BU208D in a couple of minutes, with complete success – the resultant picture was superb. Nice sets these, though the chopper circuit does frighten me a bit. I should read the magazine more thoroughly.

The Cummin of Keith

As I was busily shovelling up what the dogs do in the garden (concrete) I heard Tessa barking her loud, deep bark in the shop. Zeb doesn't seem to bark so much now that the bossy female has taken control. I went in with the shovel of you know what and found a man standing in the shop.

"Won't be a second" I said, "I'll just bung this lot down the toilet then I'll be with you."

"Don't worry Les, you look as though you've a lot on your hands".

I knew that voice, and the Casablanca image. It was Keith Cummins himself.

After I'd disposed of the er stuff we had a chat about this and that and whilst he drank the coffee H.B. had made him (sugar, no milk) he told me about the job he was engaged on. Some sort of secret service matter, which is why he told me all about it. Thanks for calling Keith.

Whatever Happened to Tiny Tim?

Sorry I've been rabbiting on about myself as usual. Actually Tim was put to the test this last Saturday afternoon. He was standing behind the counter talking to young Phil, who pops in on Saturdays to pick up a few tips and dodges. A smart young couple came in and asked Tim if he would mind looking at their set. Tim said he didn't mind looking, went outside to their car and did just that. It was a Grundig set of the 5010 variety. A big 26in. monster. Phil came out to help, and they all struggled in with it.

"There's sound but no picture, and some things have burnt up in the bottom."

Armed with this information, Tim removed the rear cover and swung down the chassis. He noted two burnt out resistors at the bottom right. They appeared to be connected to the tripler. Tim's ice cool brain began to function, under the gaze of the young lady whose amused smile showed that she didn't think Tim knew what he was doing. Tim held his neon near the line output transformer and it lit weakly. He switched off, removed the feed to the tripler, and switched on again. This time the neon lit brightly. Tim announced his opinion.

"The tripler has failed and has burnt out the resistors in the beam limiter circuit."

The circuit was folded up inside the set. Tim removed it and gave it to Phil to check on the resistors. He then went over to the shelf and selected a universal tripler.

"Do you want me to fit this and replace the resistors?" he asked.

The girl still smiled. "Do you think that will do it?"

"Yes dear, with a bit of luck, and provided the transformer hasn't been damaged" said Tim as he fought off the urge to smack her bottom.

"O.K. then" they agreed. Tim fitted the tripler carefully and wired it up. In the meantime Phil had found the resistors and Tim fitted these as well. He switched on and a lovely picture appeared on the screen. The girl's smile faded and Tim was glad.

"Pay up and take the thing away" he said crossly.

They did and Tim and Phil drank their coffee, relieved that the Grundig hadn't wanted more doing to it.

next month in

TELEVISION

● SERVICING THE SONY KV1800UB

Though this was one of the first Sony colour sets to be released in the UK large numbers were sold and many remain in use – still giving good results. Unusual features include a decoder that deals with the PAL signal though not in the conventional way. David Botto provides a detailed report on faults and servicing.

● TV BEHIND THE CURTAIN

This time Keith Cummins' wanderings have taken him behind the Iron Curtain. A report on the different TV conditions in the USSR, including strange aerials and hybrid colour sets with SECAM decoders.

● CRT HEATER VOLTAGE CHECKER

The practice of deriving the c.r.t.'s heater supply from the line output transformer makes it difficult to check the voltage. Yet there are few more important voltages in a TV set since the heater supply has a profound effect on tube life. J. LeJeune's novel checker is simple, easy to use and fairly immune to misuse. It employs a lamp, a preset resistor, a silicon solar cell and a 50µA meter. It will enable you to ensure that the c.r.t. heater conditions are correct – a check that's particularly useful after fitting a regunned tube.

● BRUSHLESS DC MOTORS

The direct-drive, brushless motor has become the most popular type for video use. In the concluding instalment of his series on electric motors Mike Phelan describes this type of motor, the basic drive circuitry and some common fault conditions.

● MORE ON ACTIVE DEFLECTORS

Roger Bunney provides practical guidance on the choice of aerials and amplifiers for use in active deflector systems.

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Servicing Hitachi VT8000 Series VCRs

Derek Snelling

The Hitachi VT8000 series of VCRs comprises models VT8000, VT8300, VT8500 and VT8700. Similar models were released under the Granada name: in addition the mechanics were used in the Fidelity VTR1000. They were amongst the first "electronic" type VHS machines released in the UK, being on sale during the period 1980-2, and have proved to be very reliable. The VT8000 is the basic model, with a one-event, ten-day timer, visual search, freeze frame and frame advance (the noise bar is automatically shunted to the bottom of the screen), audio dub and a ten-function wired remote control system (some early machines had two-function only remote control, but the later units will work with them). The VT8500 was the "luxury" model, with a four-event timer, half and double speed playback without noise bars, a tape index system and infra-red remote control. These two initial models were subsequently replaced by the VT8300 and the

VT8700 respectively. Apart from cosmetics, the main differences with these later machines are a redesigned bottom board to incorporate an improved power supply and the various modifications introduced during the production run of the earlier models, a flashing play light during search, and continuous frame advance while the button is kept depressed. While on the subject of boards, it's worth noting that the component reference numbers on the board and those on the layout diagrams in the manual can differ - in fact the numbers on the top and bottom of the panel for the same component can differ. If in any doubt, it pays to check with the circuit diagram.

Access

Access for servicing is as follows. The top is secured by four screws, three along the back and the other one under

Table 1: System control IC pin data

Pin	Active level	Function	Pin	Active level	Function
HD44801A05 (IC901)					
1	—	Sync pulse to IC902	41	H	Reads in the operate switch mode. When high sets pin 2 low
2	L	Activates 15V and not-PB12V lines when pin 41 is set high	42		Search end
3	L	Sets servo system to search mode	HD44801A19 (IC901)		
4	L	Capstan motor reverse	As above except:		
5	L	Loading operate	2	L	Activates 15V and not-PB12V lines when pin 13 high
6	L	Unloading operate	13	H	Reads in operate switch mode. When high sets pin 2 low
7	L	Fast forward	41	L	Reads camera connected
8	L	Rewind	42	L	Reads in camera data and precedes the camera pause
9	L	Slow reel motor drive to avoid tape slack when unloading	HD38701A06 (IC902)		
10	L	Reel and loading motor braking	1	H	Stop indicator lights
11	L	Take-up reel braking	2	H	Pause indicator lights in frame advance, still, RC pause, dub pause and stop pause
12	L	Main brake operate	3	H	Rewind indicator lights
13	L	Main brake off	4	H	Fast forward indicator lights
15	H	Reset	5	H	Audio dub indicator lights
21	—	5V supply	6	H	Record indicator lights in record and record pause
22	H	Auto rewind at tape end on supply side	7	H	Play indicator lights in play, slow, quick, frame advance, still, record, record pause, dub, dub pause and visual search
23	H	Timer recording operate	8		Sync pulses from IC901
24	H	Forward end sense: detects supply side tape end and stops after unloading	10	H	Reset
25	H	Rewind end sense: detects take-up side tape end and stops after unloading	14		9V supply
26	H	High when safety tab present	15-8	H	4-bit data from IC901
27	H	Set by arrival of pause stand-by instruction	19	H	Activates PB9V line in playback mode
28	H	Set at completion of unloading to stop mechanism	20	H	Activates REC9V line in record mode
29	H	Set at completion of loading to stop loading mechanism	21	H	Activates audio dub
30	H	Set to stop drum after unloading	22	H	Activates pause mode
31	H	Set to stop reels after unloading	23	H	Inhibits servo and signal systems during loading
32	H	Cassette holder: clears memory when pin 30, 31 or 33 is high during a timer recording	24	H	Drum rotate
33	H	Set when dew detected or bulb fails: stops after unloading. Stop indicator will flash at 3Hz	25	H	Puts servo in frame advance mode
36-9	H	4-bit data	26	H	Tuner channel selection
40	H	Key signal AD conversion	27	H	Activates slow play mode
			28	H	Activates fast play mode

the clock set flap. The bottom is secured by six screws. The front is secured by three screws along the top, revealed when the top is removed, and three screws along the front, two behind the tuner flap and one behind the memory switch flap. Removing these three items will give access to most of the machine. Note that the operate board is screwed and clipped to the front, so take care when removing this.

The audio board on the left-hand side of the machine is secured by two white nylon clips along its top edge. When these clips are released the board can be hinged down for service. The two panels sandwiched together at the rear of the machine are the visual search board (the smaller, outer one) and the luminance-chroma board (the larger, inner one). The visual search board is fixed to the other one by a white nylon hinge: just undo the two screws that secure its upper edge to the chassis and hinge it down to work on it. The luminance-chroma board is held in place by two nylon clips along its top edge, in a similar manner to the audio board, and can be hinged down in the same way. To the right of the machine are the tuner and i.f. boards, which are fairly inaccessible, and to the right of them there's the small rectifier board. Underneath there's the large servo/system control board. Access to this is by removing the four fixing screws located near each corner, then hinging the board up and rearwards. When refitting this board take care not to trap any of the wiring or distort the board too much. This leaves just a small panel tucked away to the left of the i.f. panel. This contains two regulator transistors in the VT8000/VT8500 and a large regulator i.c. in the VT8300/VT8700. The VT8500/VT8700 have an extra panel on the left-hand side of the bottom board – this is the remote receiver panel.

Booster and RF Lead

We'll start at the r.f. end. What sort of problems can you expect? Well, I've never had a booster fail on these machines and the sockets are of a robust construction which the manufacturers of many more recent machines would do well to copy. The r.f. lead supplied with these machines has a built-in isolator which often gives problems. Repair is a simple matter however: just undo the two screws and resolder the isolating capacitors to the cable.

Tuner, IF and Converter Sections

The tuner and i.f. sections rarely give trouble. The tuners occasionally go low gain at one end of the band or suffer from dry-joints which are made more difficult because of the number of thick-film type components used in the construction of the unit: replacement is usually necessary. The only problem with the i.f. section seems to be dry-joints at the earths where the case is soldered to the print, usually near the centre of the board, though I have had a couple of cases of dry-joints on the larger electrolytics. This board cannot be worked on in situ and has to be removed. I find that the best way of doing this is to remove the fixing screw and nylon clip from the top of the panel, open up the bottom board, then unsolder it from the small mother board it shares with the tuner. The alternative is to remove the tuner/i.f. assembly complete then remove the i.f. module from the board.

The r.f. converter (u.h.f. modulator) is reliable though I have had a couple of cases of no signals at the output. The range of the sound coil is sufficient to change from

6MHz to 5.5MHz – in fact if you get one from Hitachi it may be a German one with instructions to retune it to 6MHz.

Video-chroma Board

Most of the circuitry on the video-chroma board at the rear is contained in three hybrid modules – IC201 for the f.m., IC202 for the video and IC203 for the chroma. Be careful here when reading the circuit diagram: the individual components within the hybrid modules and their values are shown although they are not repairable – in fact the area covered by a particular hybrid circuit is not immediately obvious. Faults on this panel tend to be confined to IC203 giving no/intermittent colour. Other failures I've had include IC202 giving no video and failure of various filters giving colour or luminance problems, also one case of no playback due to failure of IC201. I've never had to adjust any of the presets on this board although the record chroma current control should in theory be set when the heads are changed.

Visual Search Board

The visual search board performs several functions. It shunts the noise bar off screen in pause, times how long the machine is in the pause mode, switching pause off after about ten minutes, and provides VD pulses during the various non-standard speeds. These are artificial field sync pulses that are necessary to prevent the picture rolling in the non-standard play modes. This board differs slightly from model to model. The VT8500/VT8700 have additional components for half and double speed playback. The VT8300/VT8700 have continuous frame advance while the frame advance button is depressed, unlike the VT8000/VT8500 which advance only one field until the button is released and then pressed again. The circuitry consists entirely of various logic chips so if you like these fault finding should present no problems. As yet I've not had a fault on this board. There are three or five adjustments on the board. With the VT8000/VT8300 there are controls for the speed of the frame advance (set for about one frame per second) and for the position of the noise bar (set for off screen at the bottom). Remember to advance the frame after each adjustment to check the effect. The third control is for VD pulse timing adjustment. Set this for minimum frame jitter in pause. The VT8500/VT8700 have these same three adjustments plus two extra VD pulse timing adjustments for half and double speed. The VD pulse adjustments are accessible through the rear of the cabinet, being behind a rubber plug. Different settings may be required with different TV sets.

Audio Board

The audio board on the left of the machine contains all the audio circuitry with the exception of the microphone input amplifier which is on the bottom board. In addition, in the VT8500/VT8700 it includes the tape index system. This superimposes the SW25 pulses on the full erase head during lacer-up in record. The pulses thus put on the tape can be detected during fast forward or rewind by the tape index head fitted to the end of the tape tension arm. Faults on this board seem to be confined to the relays. There are two, one for audio dub and the other for record/playback. The "rest" position for the latter is in

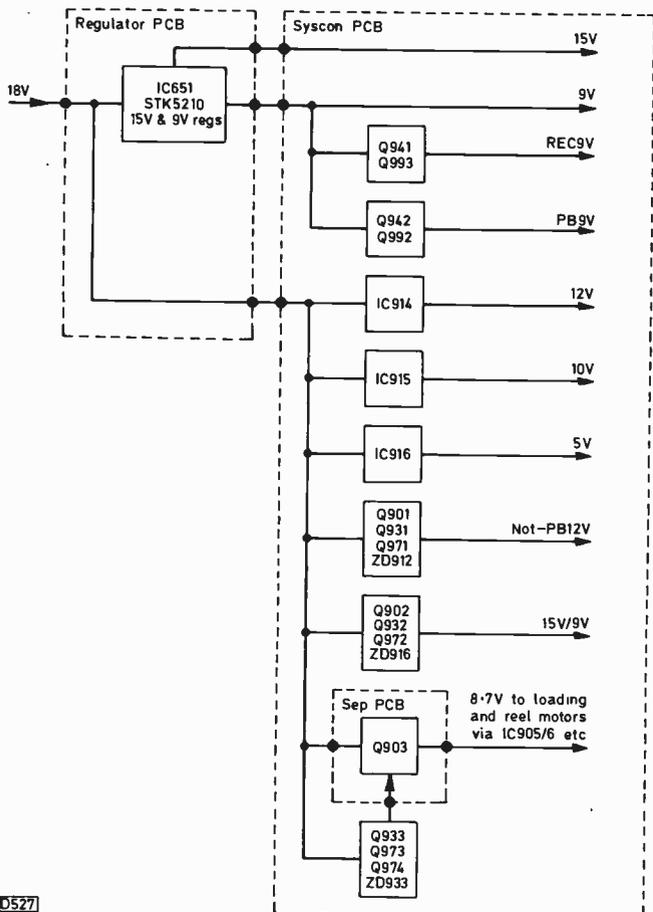
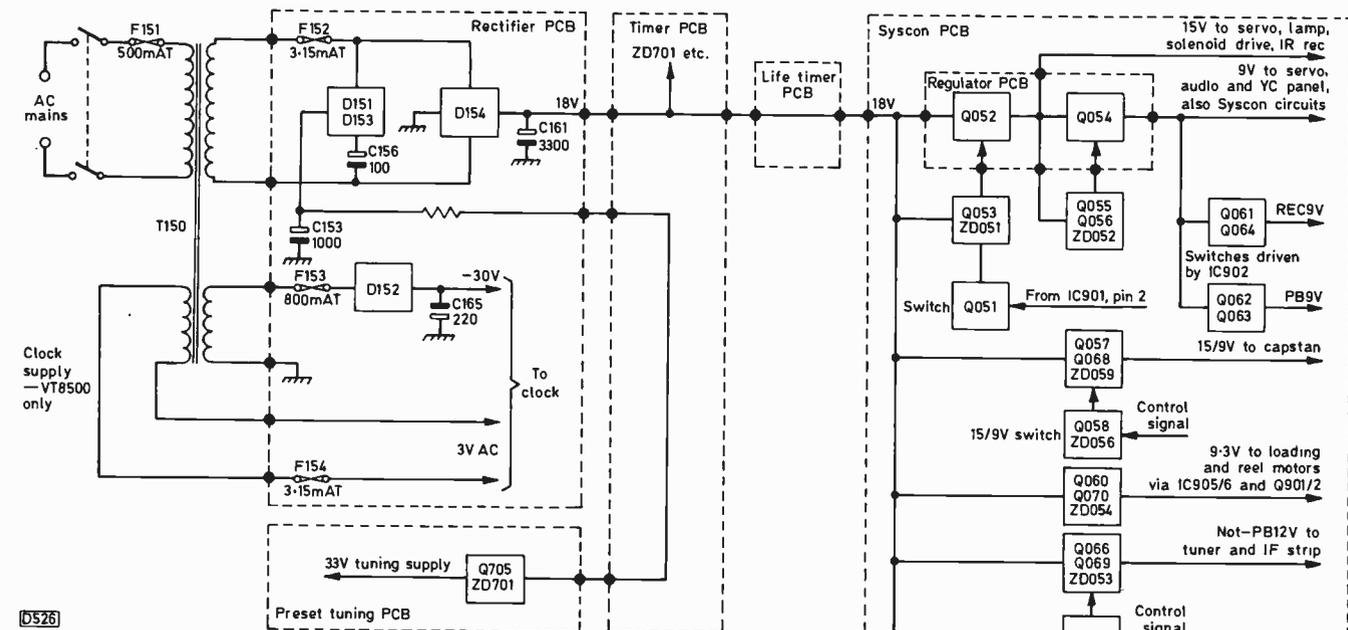


Fig. 1: Above, block diagram of the power supply arrangements used with the earlier VT8000/VT8500 machines. Left, changes introduced with the later VT8300/VT8700 machines.

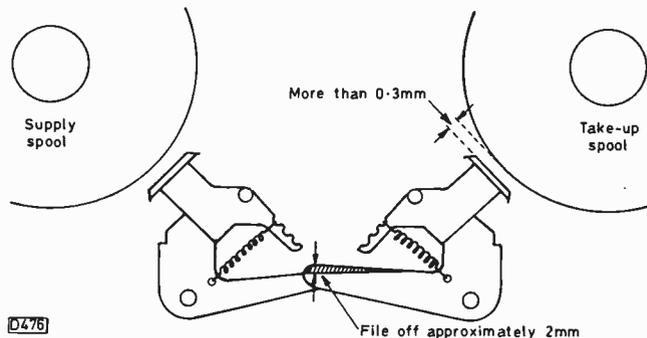


Fig. 2: Mechanical modification to cure tape damage due to looping when the machine stops after rewind.

record, so when it plays up it's usually playback that's affected, giving motorboating and other signs of instability. Sometimes switch cleaner works, sometimes the relay has to be replaced. The plastic covers just clip on, but remove them carefully.

Operate Board

The operate board at the front contains the various operation switches, LEDs and associated resistors, and in addition in the VT8300/VT8700 there's a transistor and diode to make the play light flash in visual search. A

trouble-free board. With the VT8300/VT8700 however a problem sometimes encountered is failure of one of the hinged buttons on the front. Luckily these are part of a separate detachable unit that can be bought and fitted without the need to replace the whole front.

Clock-timer Board

The clock/timer board differs completely between the VT8000/VT8300 and the VT8500/VT8700. With the latter models there's a battery back-up and an extra -30V supply is required for the display. Faults on these panels are confined to the microcomputer chip or the various setting switches. A customer problem can arise on the VT8500/VT8700 due to the 50/60Hz switch: if this is put in the 60Hz position nothing happens until the machine is unplugged, whereupon next time it is connected the clock will assume 60Hz mains and lose time accordingly. This can sometimes happen due to a spike down the mains. In this case the cure is to unplug the machine, count to ten

and then reconnect it. Note that the battery back-up works only when the time switch is on.

Power Supply Arrangements

Most of the faults with these machines occur in the power supply. This is spread over three boards. First the board which contains the rectifiers – three in the case of the VT8000/VT8300, four in the case of the VT8500/VT8700 – and the smoothers. Secondly the power transistor or regulator board, which with the VT8000/VT8500 contains the 9V and 15V series regulator transistors and with the VT8300/VT8700 contains an encapsulated 9V/15V regulator, also the bulb feed resistor and open-circuit detector. The rest of the power supply circuitry is on the bottom board, mainly along the left-hand edge. Fig. 1 shows block diagrams for the two versions of the supplies.

When dealing with a power supply fault remember that most of the lines are derived from other supplies so check for the highest missing voltage and sort this out first – the others will then usually be o.k. Common power supply faults with the VT8000/VT8500 are as follows. R054 (1.5k Ω , 0.5W) goes open-circuit or high in value, giving no switched 15V or derived supplies. R069 (1.5k Ω , 0.5W) goes open-circuit or high in value, removing the not-playback 12V supply. Q051 or ZD051 faulty gives no switched 15V or derived supplies. ZD055 faulty results in no microcomputer chip 5V supply. R081 (2.2 Ω , 0.25W) open-circuit gives no 10V supply for the reel or loading motors – this resistor was replaced with a posistor in the VT8300/VT8700 to overcome the problem. In addition to these common faults I've had most of the zener diodes fail at one time or another and a colleague had a faulty bridge rectifier which had the effect of extinguishing the clock display whenever play was selected. The different power supply arrangements in the VT8300/VT8700 result in greater reliability. IC651 on the regulator board can sometimes fail, removing the switched 15V and 9V supplies. R653 (220 Ω , 0.5W) on the same board can fail with the result that the cassette lamp is without a supply although the machine will continue to operate because of the nature of the detection circuit.

When the switched supplies are missing I usually check first at the microcomputer chip (IC901) to make sure that the power control pins 41 and 2 (13 and 2 with the VT8300/VT8700) go up and down with the operate switch. If pin 2 does but pin 13/41 doesn't, the i.c. could be faulty but the problem is usually with one of the associated components. Check all voltages carefully, referring to Table 1.

Servo and System Control Circuits

The rest of the bottom board is occupied by the system control and servo circuits. The servo circuits are essentially the same on all models although the layout differs and the VT8500/VT8700 have a few additional components for the two extra capstan speeds and a slow tracking control. Faults are usually confined to failure of the tracking control to operate correctly, caused by either the HA11711 chip or slight misadjustment of the drum servo. Capstan faults are usually due to the motor.

System control is largely carried out by two chips, IC901 and IC902. The smaller one (IC902) is the same throughout the range but there's a different version of IC901 in the later models. There are also two versions of the system control circuit for the VT8000. Faults here are

usually caused by the various diodes, especially the 5V zener diode previously mentioned (ZD055), or IC901. Failure of the index system was in one case traced to Q917. IC905 or IC906 can fail, giving no loading motor or reel motor operation respectively.

IR Remote Control Receiver Board

The VT8500/VT8700 have an extra board next to the bottom main board. This is the infra-red remote control receiver board. Faults in this area are confined to dry-joints/cracks – also check for dud batteries in the handset.

Solenoid Drive Board

The only board not mentioned so far is a small one present in the VT8000/VT8500. This is the solenoid drive board containing the drive transistors for the two brake solenoids – these transistors are on the main board in the VT8300/VT8700. Failure of the brakes was in one case traced to Q54.

The Mechanics

We now move on to the mechanics. As previously mentioned the capstan motor is a source of trouble, the usual symptom being wow on sound. The video heads give very little trouble even though some machines are now approaching five years old. The audio/sync head does wear however, giving low, muffled sound or varying sound level. There was at one point a bad batch of heads bearing the number 671. They produced vibration which affected both the sound and picture. Most other faults are only now beginning to show up, as wear sets in. These are mainly failure to complete loading due to a worn loading belt, poor rewind due to a worn tyre on the supply turntable (this can usually be roughened with a needle file then cleaned with methylated spirits), and tape looping after rewind – this means that the brakes and turntables need cleaning. Ejecting at high speed or jamming whilst ejecting is usually caused by failure of the eject damper mechanism – the nylon cog tends to fall in half. This is the same mechanism as fitted to the Ferguson 3V29/30. Failure to complete loading can also occasionally be caused by incorrect setting or failure of the two loading switches located to the rear of the mechanics.

Modifications

Finally, don't forget the various modifications that were introduced on this range. Though they've been mentioned in VCR Clinic we are repeating them here for the sake of completeness.

A hum bar on record with the VT8500/VT8700 – it can sometimes be seen in the E-E mode – can be cured by fitting a low-voltage (Mylar type suggested) 0.1 μ F capacitor across C760 on the tuner board and cutting the pink lead (chassis connection) between the tuner board and the tuning preset board.

The brake modification applies to all models. The problem is tape damage after rewind, caused by the fact that the supply spool brake comes on fractionally before the take-up spool brake, or the latter slips slightly, when the machine stops after rewind. The result is a tape loop which gets trapped in the cassette flap when the cassette is removed. There are two modifications for this, a mechanical one and an electronic one. The former consists of filing

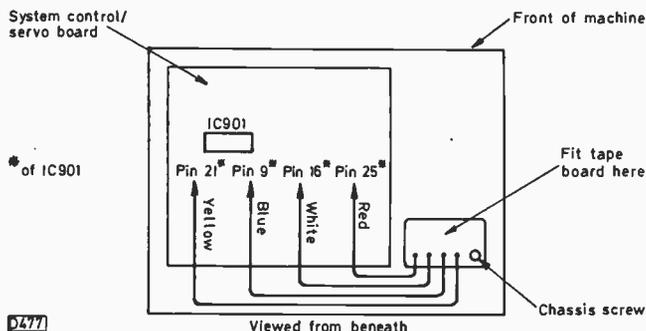


Fig. 3: Electronic modification to prevent rewind looping.

a piece off one brake arm (see Fig. 2) to ensure that this brake comes on fractionally before the other. The latter

consists of fitting a small panel called the tape board next to the main board at the bottom, wiring this to IC901 as shown in Fig. 3. This is a very neat solution but requires the rewind end sensor to detect the tape end: with the VT8500/VT8700, which incorporate the tape index system, if this is switched on during rewind the tape stops when the next index pulse arrives so the modification doesn't operate. With these machines it's best to carry out both modifications.

The final modification applies to the VT8000/VT8500. The problem is that when play or record is selected the machine fails to lace up and switches off after a few seconds. The cure is to replace R081 (2.2Ω) on the bottom panel with a posistor, part number 0249794. Mount it in contact with the transistor heatsink on the edge of the main board.

Long-distance Television

Roger Bunney

September 1986 was an extremely rewarding month for long-distance TV reception in the UK and western Europe generally. Sporadic E conditions were active, with several periods of really strong signals, and from mid-month an almost stationary high-pressure system produced magnificent tropospheric propagation. The collated UK SpE log is as follows:

- 5/9/86 TSS (USSR) chs. R1, 2; MTV (Hungary) R1, 2; TVP (Poland) R1; NRK (Norway) E2, 3, 4; SR (Sweden) E2, 3, 4; DFF (East Germany) E4; RAI (Italy) IA; TVE (Spain) E2, 3.
- 6/9/86 TVE E2, 3, 4; TVE-2 E2; RTP (Portugal) E2; RUV (Iceland) E4.
- 7/9/86 TVE E2, 4; CP+ (Canal Plus - France) L3; ARD (West Germany) E2; ORF (Austria) E2a; RAI IA, B; MTV R1; CST (Czechoslovakia) R1, 2; TSS R1, 2; NRK E2, 3.
- 8/9/86 TVE E2; TVE-2 E2.
- 9/9/86 TVE E2; +PTT (Switzerland) E3.
- 10/9/86 TSS R1.
- 11/9/86 TSS R1, 2; MTV R1; TVP R1; JRT (Yugoslavia) E3; RAI IA; EPT (Greece) E3; TVE E2, 3, 4; RTP E2, 3; SR E3.
- 13/9/86 SR E2; TVP R1; TVE E2.
- 14/9/86 TVE E3; RAI IA, B; JRT E3; NRK E2, 3, 4; SR E3, 4; RUV E4.
- 16/9/86 TVE E2, 3, 4; TVE-2 E2.

- 17/9/86 NRK E2; RAI IA; TVE E2.
- 20/9/86 TSS R1, 2; TVP R1, 2; CST R1, 2; TVR (Rumania) R3; ORF E2a, E4; ARD E2, 3, 4; +PTT E2; RAI IA, B, C; JRT E3, 4; TVE E2, 3, 4; TVE-2 E2; RTP E3; NRK E2.
- 25/9/86 TSS R1, 2; NRK E2, 3; SR E2, 3, 4; ARD E4.
- 2/10/86 TVE E3.

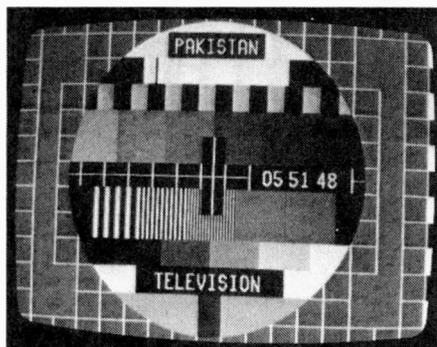
The Italian ch. IC reception on the 20th was RAI-1 from Torino at 16kW.

Auroral activity was noted in Scotland on the 15th, 16th and 26th (evening), with Scandinavian Band I signals putting in an appearance. Good MS (meteor shower) activity was logged on the 16th.

Tropospheric Reception

Improved tropospheric propagation became evident from about the 19th, when a virtually stationary high-pressure system became established across southern UK. Although the conditions lasted for many days there were two specific peaks. Greatly enhanced reception occurred over the 19th-22nd, with E. German Band III signals, Swiss Band III/u.h.f. signals and the usual multiplicity of W. German Band III/u.h.f. signals. In the south/south east Dutch/Belgian stations provided signals of excellent entertainment quality daily! For many of those inland, as far as the Midlands, RTL+ (Luxembourg) provided good signals on ch. E7. Naturally the various French TV services, from Canal Plus in Band III through to TV5 and TV6 at u.h.f., provided consistently strong signals throughout the period.

The second, possibly more intense peak occurred on September 30th/October 1st. Danish Band III signals on chs. E5 through to E11 were received as far west as mid-Wales, together with DFF (E. Germany) ch. E6. Cyril



Photographs of 4GHz satellite TV reception from Frank Lumen in Colorado, USA. Right: the Pakistan PM5534 test card. Centre: International satellite feed to Australia and South Africa. Right: Another example of international programme exchange, this time with origination from the USSR. The signals were received from transponder 11 on the Domsat F1 satellite.

Willis managed a rather rare logging, Plzen ch. R10 (Czechoslovakia), while those on the east coast received fair quality signals from Norway on various Band III channels.

Dieter Scheiba (Belgium) noted a mystery signal on ch. E10 – a standard FUBK pattern with identification “NDS”. This is being investigated. W. German SSV (formerly BFBS) u.h.f. signals were also noted at reasonable strengths during the openings. RTE (Ireland) was well received over much of central/southern UK and the west country.

In all then a very encouraging start to the autumn! Unfortunately I had no access to cable feeds from the 24th due to building works at home, so loggings after this date are entirely from correspondents. My thanks to the following for sending in reports: Ryn Muntjewerff (Holland), Bill Cotterill (Tipton), Iain Menzies (Aberdeen), Simon Hamer (Powys), Dave Shirley (Hastings), Roger Fussell (Torpoint) and Cyril Willis (Norfolk).

Reception of scrambled vision/sound late at night from Crystal Palace, on ch. 26, was mentioned in this column last month. We understand that the tests were for the evaluation of a decoder for domestic use. It has also been suggested that the tests were for a future business data transmission service that could be operated outside normal broadcasting hours. Can anyone provide further information?

New EBU Listings

France: La Roche-Sur-Yon ch. L4 12W horiz.; Quimperle L4 1W horiz.; Mulhouse L5 300kW horiz.; Metz L5 33kW vert.; Niort L6 400kW vert.; Dieppe L9 300W horiz.; Strasbourg L10 20kW vert. These transmitters are all used for the TDF-4 service – the first two should be “possibles” via SpE.

Jordan: A third service (JRTV-3) is now in operation, though with relatively low powers from u.h.f. transmitters. The Suweilih ch. E3 and E6 transmitters are to be closed – the former has been well received in Europe via SpE.

Sweden: Stockholm ch. E38 1,000kW e.r.p. (this may relay Finnish YLE-1 programming); Vislanda SR-1 ch. E39 1,000kW e.r.p. Polarisation horizontal in both cases.

Syria: Salkhad ch. E4 640W; Abou-Kmal E3 increased to 200kW; Nabi-Saleh E3 increased to 100kW; Hassakeh E4 increased to 200kW. All polarisations horizontal.

News Items

UK: Broadcasters are beginning to use a Sony Broadcast radio-microphone system that operates in the u.h.f. TV spectrum, giving six audio channels per 8MHz channel bandwidth. Granada (Liverpool) and HTV (Cardiff) are already using the system, which is at present restricted to broadcasters. The 175-180MHz spectrum has traditionally been used for radio-microphones but increasing interference has led to the adoption of this u.h.f. system.

Digital stereo TV sound is now operational with the BBC, the aim at present being staff familiarisation and decoder development in conjunction with the setmakers. For further details see Teletopics September (page 709). The DTI is evaluating the use of the 30-60GHz spectrum for fixed terrestrial radio use.

Gibraltar: A review of broadcasting is under way – various interests would like to use the location as a transmitting base to cover the region, especially the Costa del Sol.

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New Zealand: The BCNZ is opposing plans to take part of its v.h.f. allocation for use by a commercially operated third TV channel: it claims that all v.h.f. channels are required for its two services. A temporary service via a satellite link was tried recently between Christchurch and the Cook Islands. The experiment may lead to the establishment of an islands TV service.

Satellite TV: China is using an Indian Ocean Intelsat craft to network its Central-1 programmes to stations as far as Lhasa, Tibet.

Many of the AUSSAT transponders are now being booked - NZ has taken one of the 30W downlinks. Scrambling has been discussed but the use of low-power (12W) transponders that make domestic reception on an "average" dish impossible is preferred.

The Intelsat craft at 27.5°W is now carrying a Libyan service with a strong downlink signal estimated at 29dBW. A zonal beam is now being used by SEB (AFRTS) to prevent viewing in South Africa.

From our Correspondents . . .

Ray Howgego (Caterham) has written to us describing his DX-TV activities over a period of some twenty years. He started back in the early sixties when he modified a Bush Model TV53 for 625-line, negative-going vision reception in Bands I/III, using a government surplus RF24 unit feeding an R1155 receiver for sound. Later a Bush TV125 was put into service and a number of home constructed aerial amplifiers were built, ending up with a m.o.s.f.e.t. (3SK88) design for v.h.f. and a bipolar transistor (BFR34a) design for u.h.f. His current receiver system uses commercial modules arranged on a single PCB, giving 1V p-p video output to a 12in. monitor. Every possible refinement has been incorporated in the system, including switched selectivity, variable sound offset tuning ± 7 MHz of the vision i.f., and with the devices in the front-end replaced to improve the noise performance. The aerial system consists of a combined Band I/III array and a large home constructed log-periodic u.h.f. array. Ray is fortunate in being at a site 550ft a.s.l. with a clear take-off through 270°. Interference from 27MHz CB operators in Band I has gradually decreased, the main problem now being illegal 49MHz cordless phones.

Ray mentions that the Philips G8 chassis a.f.c. module (U700) can be used as an extremely sensitive tuning/signal strength meter (see Fig. 1). The unit contains a high-gain, single-stage i.f. amplifier with some selectivity and a discriminator circuit which produces an output across pins 7 and 8. This output can be used to drive a small, high-resistance $100\mu\text{A}$ f.s.d. meter (the module's output is of high impedance). Connect the input pin (2) via a 5-10pF

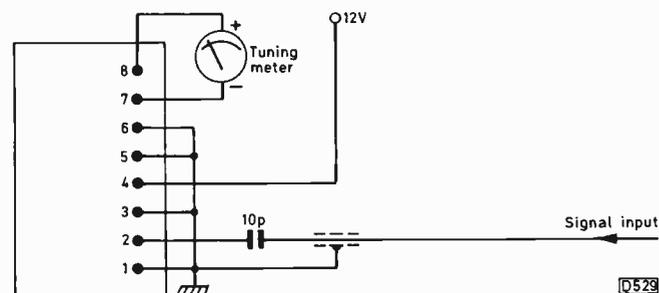


Fig. 1: Method of using a Philips U700 a.f.c. module (from the G8 chassis) as a signal strength/tuning meter. Pins viewed from below. Use a short length of coax for the input. Meter $100\mu\text{A}$ f.s.d., $1\text{k}\Omega$ or more.

capacitor to a point in the later stages of the i.f. strip, prior to detection (in the G8 chassis the connection is to pin 7 of the U300 vision gain/detector module). In sets other than the G8 this could cause some slight detuning. The module's output has a logarithmic S-meter characteristic, i.e. weak signals produce a large change in the meter needle deflection but the strongest signal will not drive the needle to the end stop. Receiver noise will produce a few μA of needle deflection. A series potentiometer of say $220\text{k}\Omega$ can be added to give variable meter sensitivity. Alignment is simple: tune to a weak, non-fading signal then adjust the two cores accessible through the top of the can for maximum deflection - don't tune on receiver noise. Ray uses a meter with a $100\mu\text{A}$, $1.3\text{k}\Omega$ movement. Our thanks to Ray for passing on this extremely useful information - the U700 module is available from Aerial Techniques, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH.

Hugh Cocks, who is now living in the Algarve, Portugal, writes that he is erecting a 12m mast with a five-element Band I array, an eleven-element wideband Band III array and a 90-element wideband u.h.f. array. Using just the Band I array (fixed) he receives Izana, Canary Is. chs. E3 and E10 daily at 750 miles when the pressure is high. Moroccan ch. E4 and M11 signals are similarly received in the evening during tropospheric openings. RTM-2 chs. 21, 25 and 26 have at times been seen on test but never on programme. SpE reception produces ch. E3 signals from Sokoto, Nigeria and ch. E3 and E4 signals from Ghana. Algeria ch. E6 is commonly received before a local RTP transmitter comes on air. One mystery reception occurred on August 27th when the old 1956 RETMA card with no identification was seen on ch. E2. During the summer, cordless UK phones were received via SpE using an SX200 scanner. With no local Band I transmitter (or interference) the Algarve sounds like a good place to be!

Following an article in the US satellite magazine *STV* Frank Lumen of Denver, Colorado has been inundated with letters from North American 4GHz TVRO owners seeking more information on international TV signals and reception potential. Quite a number of expatriate UK viewers receive ITN News via its trans-US linking onwards to the Australian TV station TCN9. During the recent hijacking crisis the Pakistan test card appeared.

Quick Commercial

The familiar white two-way indoor signal splitter of Taiwan origin is now available from your friendly aerial supplier in an aerial switching version. There's a single male output, the switch selecting between the two female input sockets. Very compact and cheap at approximately £2.95. It's listed as the "Ant/Game switch EU-AB17".

405-line Corner

Terence Burnett (Lee on Solent) is seeking a 405-line (or 405/625 line) solid state camera for use with his collection of 405-line equipment.

H. McKinnon (Southport) has for disposal to a good home a Murphy Model V659X monochrome set dating from the fifties.

H.V. Bennett (Portsmouth) has for disposal to a good enthusiast home a 405/625-line Bemex crosshatch/dot pattern generator (Bemex Instruments Ltd.).

If you are interested in any of the above, please write in with a stamped s.a.e. Your letter will be passed on. If you are thinking of throwing out any old 405-line equipment, pause - then write in!

Interference Problems with VCRs

J. LeJeune

Whilst the domestic VCR is undoubtedly a bargain, for some users the purchase soon turns sour when the results are spoilt by patterning on the picture, loss of servo lock or interference breakthrough on sound.

The domestic VCR is unfortunately prone to interference pickup from nearby radio transmissions in a band of frequencies from 200kHz to over 30MHz when in the playback mode. Interference between 200kHz and around 14MHz causes patterning: at higher frequencies the interference may affect only the operation of the servo systems. Before the interference can be neutralised it's necessary to make checks to discover where and how the unwanted signals are entering the machine and the part of the circuitry most vulnerable.

The source of the interference can occasionally be an amateur radio transmission. With very few exceptions amateurs operate strictly within the relevant regulations, their signals are monitored, their equipment is available for examination by the appropriate regulatory body and they show no wish to allow their hobby to inconvenience others. To eliminate interference from a radio amateur's transmissions successfully his/her co-operation must be sought. Interference can generally be eliminated without calling upon the Department of Trade and Industry who will charge the complainants £21 to tell them what you can tell them for little or nothing! The DTI should however be brought in where the regulations are being broken or a flagrant violation of the law, e.g. pirate operation, is discovered. Otherwise a few intelligent questions and a logical approach are the best approach to solving the problem.

VCRs are prone to interference in the playback mode because the machine is then in its most sensitive condition. The chrominance, luminance, audio and sync track signals read from the tape will be at levels of only a few hundred microvolts at the heads. A high degree of amplification is required to produce usable signal levels.

Types of Interference

Chroma interference is characterised by diagonal coloured lines, frequently green and magenta, which disappear when the recorder is switched to monochrome playback or the viewing receiver's colour control is turned to minimum. The interfering frequencies are usually in the range 200kHz to 1.5MHz.

Luminance interference is characterised by patterns that vary from the herringbone type to what can only be described as small hoops or interlocked circles. The effects cannot be removed by switching to monochrome and occasionally appear at only certain times of day. The interference frequencies are in the 1.8-14MHz range.

Experience has shown that only hi-fi machines are subject to audio interference from transmissions in the upper end of the medium waveband, from 1.4MHz to 1.8MHz. The linear sound track is not affected but the hi-fi sound on one channel may be marred by "birdy" noises or the modulation of the unwanted signal.

Servo interference is much more difficult to diagnose but is characterised by intermittent loss of synchronism during playback. It may be accompanied by picture

patterning but due to the loss of servo action this will not be seen. Unwanted signals of sufficient strength to cause blocking of the circuits reading the sync track or direct entry of r.f. into the servo printed circuits, motor leads, etc. are the most common causes. Frequencies over the range 200kHz to 30MHz, including CB transmissions, can cause trouble.

Initial Tests

Much diagnostic time can be saved by carrying out some simple checks when a suspected case of interference is reported. The outer braid of the u.h.f. aerial lead will act as a long-wire aerial and present low, medium and high frequency signals at the machine's rear connector panel. Most modern machines are fitted with a metal wrap-round case and a connecting bottom screen but leave the front and rear panels unshielded. Check number one therefore is to disconnect the aerial from the rear of the machine. If the interference ceases it's likely to be entering the machine via this route. The best solution is to fit a braid-breaker in the aerial lead to attenuate all signals below 400MHz on both the outer screen and the inner conductor. Although braid-breaker filters may appear to be simple enough to make, and one or two empirical designs are in circulation, the use of these requires care as they may have a poor voltage standing-wave ratio and the resultant mismatch between the feeder and the machine's input circuit will cause teletext corruption with sets equipped for teletext reception.

A second useful check is to rotate the VCR through 90°. A null-point can frequently be found when this is done and will to some extent indicate the direction from which the unwanted signals are coming. Disconnect the aerial for this test.

Additional Screening

Once you've established that disconnecting the aerial doesn't clear the trouble the covers should be removed from the machine. The most vulnerable places for interference pickup are the head drum, the rotary transformer, the signal leads to the preamplifier box and the preamplifier itself. It should be said right away that effective screening is the only real answer to this problem. Traps have sometimes been inserted in the relevant signal paths within the machine but unless very great care is taken over the design of such rejectors there'll be a marked effect on the luminance-chrominance timing, with resultant misregistration.

Some engineers suggest that earthing the machine is a useful way of removing interference. It generally doesn't work unless a screened earth is used, and even then it's rarely 100 per cent effective. Unless they are already there, don't go to the bother of drilling holes in window frames to install an earth wire – the odds are against this doing any good.

The screening material used should provide magnetic as well as electrostatic shielding, so aluminium baking foil won't do. The easiest material to obtain and use is sheet tinfoil, such as that used in packaging instant coffee, fruit in syrup and some vegetables. The tinfoil can be

cut, bent and soldered with ease. Once the final shape of the screen has been fixed, sharp edges and corners should be tamed with a flat file.

The human body acts as a fairly efficient aerial. Thus it's an easy matter to locate points that are vulnerable by deliberately introducing interference via one's index finger. Running your fingers round a circuit can show up the sensitive spots where screening is most desirable. This method can also be used to good effect on wiring looms within the machine.

Where interference is being induced in a wiring loom, the wire acting as a short aerial, it will be necessary to screen the bundle of cables. A straight run can be covered by a tube of tinfoil formed from a strip. The seam can be tack closed by the judicious use of a soldering iron every inch or so along it. The sharp ends should be covered with adhesive PVC tape to prevent the cables within getting cut.

Many machines already incorporate head drum screens.

They tend to be inadequate however, so further screening should be contemplated. Beware of fouling the head drum with any extra metalwork you introduce and remember that the video heads are very delicate and expensive. Since the leads from the rotary transformer to the preamplifier are highly sensitive to unwanted r.f. they should be included under any screens you fit.

In Conclusion

The remarks in this article might suggest inadequacies in the original design of VCRs, but the cost of incorporating additional anti-interference measures that are not generally required would make the price of the machines uncompetitive. The incidence of interference complaints of this nature is not unduly high, though it does present a less common problem for the service engineer. His ability to deal with it effectively will greatly improve his standing – and that of his company – within the community.

The Ins and Outs of Word Processing

Vivian Capel

It's difficult to learn. You can lose half a day's work if you press the wrong button. It can give you eye strain. And it's far too expensive. These are some of the comments one hears when the subject of word processors is discussed. There's some truth in all these comments though the problems are not as bad as they sound. But what exactly is a word processor?

A word processor basically does the same job as a typewriter. It doesn't compose the text for you – you have to do that. But you can manipulate, rearrange, copy, delete, insert, edit, layout and do a whole lot more to your text before you ever load a sheet of paper in the printer. Furthermore mechanical operations such as page numbering, returning the carriage at the end of each line, centring titles, locating specific passages in a long manuscript, inserting oft-repeated phrases, rearranging text after an alteration and many others are done automatically.

The word processor itself is a simple program that can be run on any suitable computer. You need a computer with keyboard, a VDU, a disc drive and a printer. If you already have some or all of these all you need are the items you lack and the software to run on them. There are many word processing programs, each with its own particular features: some examples are New Word, Word Star, Tasword and LocoScript.

The various commands for carrying out word processing are initiated by using combinations of letters and signs on a standard computer keyboard. A dedicated word processor is a computer that's been specifically designed for word processing, though it will also work as a normal computer. The advantage is that it has a number of keys which provide specific word processing functions and are more convenient to use than the combinations required with the non-dedicated variety.

Learning

Before going further let's deal with the objections mentioned at the start. Is word processing difficult to learn? If you can use a typewriter – and most prospective word

processor users probably can – much of the keyboard will already be familiar. Also familiar will be such functions as tabulation, shift and shift-locks, margin setting and line spacing. The basic functions are no more difficult to perform than with a typewriter – in fact some are easier. After loading the software and getting into the mode for creating a new document, as described in the system's instruction manual, you're ready to start. A small, flashing rectangle the size of a single character, called the cursor, indicates where the next character you type will appear – the cursor can be moved about the screen by using four keys. Also on the screen will be a ruler at the top and bottom, indicating the margins and tab stops.

The first thing you notice when you start typing is that the cursor automatically jumps to the next line when it reaches the end of a line. If you're in the middle of a word the whole word is transferred to the next line. So you can forget about end-of-line carriage returns and split words, the bane of manual typewriters – it's all done for you.

A "return" key is pressed to start a new paragraph, to introduce a line space or to reparagraph text if desired. When this is done the text is automatically reshuffled. As you work down the page the text scrolls upwards and off the top of the screen, leaving the last twenty or so lines displayed. Page endings can also be forgotten – the processor will start a new page and insert the number according to a preset paper size. If you object to having just one or two lines of a new paragraph at the bottom of a page some processors will automatically transfer them to the next page if told to do so in advance. Split paragraphs can be avoided in the same way.

Erasure of any text is simple, either one character at a time or by defining the beginning and end of the unwanted passage then eliminating it with a single key-stroke. The rest of the text is automatically relayed to close the gap. Similarly, extra text can be inserted at any point, the rest opening out to accommodate it. There's no limit to the number of changes that can be made. That's far easier, quicker and cheaper than using correcting fluid on paper – and the result looks a whole lot better!

So the basic functions are easier to perform than with a

manual typewriter. A word processor will make life much easier for anyone who produces or organises words even if only these basic operations are used. Learning is quite painless, though the full capabilities may take a while to master. As with an electric typewriter the keys need little pressure.

Expense

Word processors have been expensive in the past but if you already have a computer, VDU, disc drive and printer you can get into word processing by purchasing software costing £50 or less. A TV set with a modulator can serve as a VDU, though it may not have adequate resolution. But the price objection has been well and truly overcome with the advent of the Amstrad PCW8256. This complete word processor consists of a VDU with built in disc drive, a high quality matrix printer and the keyboard, along with the LocoScript program on disc. In addition CP/M Plus with utilities and Logo software are provided so that the instrument can be used as a powerful computer. At a price of £399 plus VAT it costs less than many typewriters.

While it has some deficiencies and snags the system can hold its own against many that are several times the price. It has some features that are lacking in higher priced models. So for most prospective users the choice has become something of a one-horse race. Our comments in the rest of this article will therefore be based on the Amstrad PCW8256.

Eye Strain

Any VDU can produce eye strain. Being somewhat long-sighted I suffered from this to start with, so I tried increasing the viewing distance by pulling out a shallow drawer at the front of my desk and operating the processor with the keyboard resting inside the drawer. This extends the effective desk width and enables me to view the VDU at a distance of some four feet. I've had no further trouble since, but this might not work for others. Not staring at the screen for too long and keeping the brightness fairly low can also help.

Losing Work

As to losing work before it's printed, this possibility is the most serious snag with word processing. At the end of a working session the work is recorded on disc. While working the text is stored in a volatile internal memory and will be lost if the processor is switched off or the mains power is otherwise interrupted. Precautions can be taken: avoid loose mains wires and fuses and badly fitting plugs! With earlier versions of LocoScript the most likely way of losing the text is when the disc is too full to accommodate it. An attempt to record produces a "fault" message on the screen, then pressing any key makes the text scroll off the screen and disappear for ever. More recent versions (V1.20) allow you to erase some unwanted file from the disc to make room for the new one. More on this later.

Another way of losing material is to erase it from the disc accidentally. An erase command is always followed by a screen request for confirmation however, showing the title of the document. Even if you change your mind after erasure it's not too late. The text is sent to limbo, where it remains until the space is taken by new material. Provided

it's not left there too long it can be reclaimed. So accidental erasure is not a major hazard.

Further Features

So much for the objections and the basic functions which can be quickly mastered. The word processor can offer many other features which may take some time to absorb – not because of their complexity but because of their number and extent. It's these that probably give word processing the reputation of being hard to learn. Try mastering them one at a time so that you extend your skills as you use the machine. Some of these extra facilities are as follows.

Copy: Any section of text can be defined at its beginning and end, then copied as many times as required into any other positions in the text or saved for use in other texts.

Move: Same as copy but the original portion of text is deleted.

Phrase storage: Frequently used phrases or sentences can be permanently stored and recalled when required by a single keystroke plus the phrase code letter.

Find: A word or phrase can be typed in when this mode is selected: the cursor searches through the current document and stops each time the given phrase is recognised.

Exchange: Similar to find. Two phrases are typed in, the first being the one in the document and the other the text with which it is to be replaced. The processor will either replace the text every time it occurs or will stop each time for a command either to replace or go on to the next one.

Template: Templates can be laid out for each of many types of document, say business letters, private letters, memos, invoices, reports, etc. Details can include margin positions, type style, tabulation, line spacing, line justification and paper size. When a new document is started in any of these categories the appropriate template is automatically selected. Thus no resetting is required when going from one type of document to another. Template details can be changed at any time if required.

Layouts: Different layouts can be set up within each template, with different margins, tabulation etc., each readily selected as required. This enables different types of material, such as text and columns of figures, to be easily combined in one document.

Proportional spacing and right justification: With typewritten script the spaces occupied by letters are all of equal width, so that the letter i occupies the same space as w. Word processors can also print in this manner but proportional spacing can be selected if desired. With this mode each letter takes only the amount of space it needs. This can be further enhanced by right justification – words at the right-hand end of each line are aligned vertically.

Print style: Different width, italic, half-height or bold characters can be selected. They can be mixed in one document with no trouble. The Amstrad processor provides many Greek letters and accented letters as well as the dollar and yen signs. Various mathematical signs are provided – but not, strangely enough, the square root.

Underlining: Whole sentences or paragraphs can be underlined by defining the start and end with the cursor. There's a choice of complete underlining or underlining each word separately.

Storage and Indexing

The index, termed the disc manager, appears as soon as the system disc is loaded. It displays all the documents on the disc side, arranged alphabetically in groups. Each

document is placed in the appropriate group by the user, the processor carrying out the alphabetical order. Space used and available are also shown. A document is selected for revision or printing by placing the cursor over it then pressing the appropriate key. Documents can be copied or moved to another group or disc, and both groups and documents can be renamed. Each disc side has its own index which can be inspected by loading the disc and pressing the disc-change key.

Word processing thus enables you to keep tidy, systematic and compact file copies. They are always in alphabetical order, none get lost or mis-filed, and are much easier to manage than a load of carbon copies. Any number of print-outs can be made of any one at any time.

Sensitive or confidential material need not be recorded on disc if a copy is not required. It can be created and printed using the internal memory facility. All traces then disappear when the processor is switched off. Alternatively it can be created normally, using the disc, then immediately erased along with its "ghost" in limbo.

Obsolete documents can be erased to make room for new ones, or a disc can be kept until most of the material is obsolete then bulk erased after transferring any active items to another disc.

The capacity of the three-inch discs used with the Amstrad processor is 180 Kbytes per side: 7K is used for the index and 173K is available for storage. With single sheet letters and invoices averaging 2.5K this gives up to 70 items per side, 140 per disc. An optional extra disc drive can be fitted for 3.25 or 5.25 inch discs with 720K capacity per side. The latter are half the price of the three-inch discs and are compatible with the IBM format. This is a worthwhile extra for larger businesses.

Spelling and Mailing

Some word processors incorporate a built-in dictionary that checks spelling. It compares each word in the text with its many thousands of entries and if it doesn't find the word points this out and suggests one with the nearest spelling. Thus "necesary" would produce "necessary". Words not contained in the dictionary can be added by the user so that they become part of the lexicon. This facility is useful even for good spellers: it spots typing errors, which are easier to make with a sensitive keyboard.

A dictionary isn't included with the Amstrad LocoScript but one can be added. There are several available including Word Plus, Tas-spell and Prospell. The latter is available in disc or ROM form and has a 32,000 word vocabulary expandable by the user. It checks up to 2,000 words a minute and costs £29.95.

Another useful feature for the business user or club secretary is Mailmerge. If a standard letter and a list of names and addresses is supplied to the processor it will print out copies with individual addresses and salutations. LocoScript does not have a Mailmerge facility but the Amstrad machine will run software that does have this facility. Some of these are Tasword 8000 and Word Star. New Word and Superwriter have both spelling checkers and Mailword. Tasword 8000 costs £24.95, the others £49.95.

Printing

The two main types of printer are the daisywheel and matrix types. The daisywheel gives the higher quality but

is less versatile than the matrix type which can mix various styles of type in the same document. The PCW8256 uses a matrix printer that gives very good quality printing – you need a magnifying glass to distinguish it from daisywheel printing. Printing speed is twenty characters per second but it will also print a draft quality at 90 c.p.s.

The Amstrad Printer

Unlike many printers the PCW8256 doesn't bristle with controls. Apart from the internal pressure adjustment the only controls are for feeding in the paper. Emphasis, style and all the other printer control commands are embedded in the LocoScript text and the printer can be stopped and put on standby from the main keyboard. Another useful feature for busy people is that work can proceed on one document while the printer is printing another one. This is not a common facility even amongst word processors that cost several times the price of the PCW8256.

Snags

It would be miraculous if any product, especially one as technically complex as a word processor, had no snags. Despite its many good features and excellent value the PCW8256 and LocoScript combination have their share.

One concerns the printer. In common with many others it doesn't like envelopes. It will print on them but refuses to move them up so that all lines are superimposed. Now I know you're supposed to use labels for addressing, but to set up a roll of labels and adjust the printing parameters then tear them off and stick them on the envelopes for the sake of half a dozen letters or less takes far more time than typing the addresses directly on the envelopes. The cause of the problem is insufficient pressure on the bail bar that holds the paper against the roller. This could be increased by fitting a stronger spring but I wouldn't recommend this as it could place undue stress on the associated plastic parts. A simpler solution is to apply slight finger pressure at both ends of the bar while the envelope is being addressed. This is not a major inconvenience as the addressing takes only seconds. Alternatively go into the direct-print mode: in this you can type a line at a time, moving the envelope up manually as you would with an ordinary typewriter.

Another snag is that you have to set the paper size twice, once in the template for the document group and again when the document is printed. If you forget to set the printer and you are using a longer size than A4 the printer will stop before the end of the page, leaving a blank area.

A limitation with early versions of LocoScript (V1.0) was inability to select pages to be printed. You could abandon the printing at any stage, or reprint the current or the previous page if the printing went wrong, but you couldn't select any one or more pages of a document if that was all you wanted. So if you wanted to change something on one page after printing you had to reprint everything up to that page. This has been corrected with the latest V1.20 version: any one or more pages can be selected for printing.

Text preparation with LocoScript has the disadvantage that you can't change capitals to lower case or vice versa (you can with some other word processors). If you decide to capitalise a word or sentence you have to erase and retype it. This isn't a major problem as the option isn't often required, but it could be useful at times.

It's desirable to be able to see on the screen exactly what the printer will print, italics, bold type etc. appearing as such on the screen. With LocoScript however the style being used is indicated in the header to the page as the cursor passes over the relevant portion of the text. Once the cursor has passed on and the style has changed the header shows this new style. There's a keystroke that makes the style code visible at the beginning and end of a section of text but you normally work without displaying embedded codes as they muddle up the appearance and change the display from what's actually being printed. The danger with this is that a particular style could be set for a passage then not cancelled. The screen would look the same but the unwanted style would persist to the end of the print-out. So you should always check the header when you go into or leave a new style. If you make a habit of this you shouldn't get any surprises when the work is printed.

The PCW8256 instruction manual warns of the danger to a data disc of switching the processor on or off with it in the drive. Though you take care to avoid doing this a moment's inattention could be disastrous. It would have been easy to arrange a mechanical link to prevent the power switch being operated with a disc in place.

Full Disc Work Loss

Back now to work loss with a full disc. If you are creating a new document you can proceed up to the remaining length available as indicated by the disc manager. If you are editing an existing document however you need twice that space. It appears that the new edited version is recorded then the old one is discarded so that both are on the disc for a few moments. As a result you get a "disc full" notice on the screen when attempting to finish and record your edited version even though you thought you'd plenty of space for it.

When a disc is nearly full it's best to create and complete a new document rather than partly finish one and go back to it later. As there's no running total of document length in the header (another unfortunate omission) it's easy to exceed the available space even with a new document.

So what do you do if the screen displays "disc full" when you exit from creating or editing a document? This is where you need to be careful. A wrong step and you lose all you've done in a session. If you have the V1.0 version of the LocoScript it's already too late - with this version you must always ensure that there's enough space. The more recent V1.20 version displays a menu which suggests that you return to the disc manager. Press the enter key but don't touch cancel or your text is lost. Having summoned the disc manager you can make space in one of two ways. The first is simply to erase an unwanted document of sufficient length. Alternatively if you want to keep the recorded material move one document into the M drive. This is a section of the internal memory for temporary storage - like the working memory, its contents disappear when the processor is switched off. Then go back to your new document by pressing "exit". It will now be recorded on disc. When completed, replace the disc with a suitable one to hold the document you put in M drive and press key £1. Then move it from M drive into an appropriate place on the disc in the usual way.

I've dealt with this process in some detail because, although the instruction manual gives detailed instructions

on how to fit the mains plug, it's completely silent about avoiding work loss when a disc is full!

Write Protection

There's another manual shortcoming that could be baffling to beginners (it baffled me). The LocoScript disc supplied is write-protected to prevent accidental erasure of the program. You're advised on the disc case to make a copy to work with and to store the original safely. There's no mention of this at the start of the manual however.

Having bought and set up the outfit you probably haven't got a spare disc, so you use the original in the "first twenty-minute" exercises described in the manual. All goes well until you try to print out the result - and find that the printer won't work. Instead a meaningless (at this point) message comes up on the screen "error in drive to A". I eventually deduced that the machine records your text before it prints the text: if it can't record because the disc is write-protected it won't print. In the absence of a recordable disc you could use the M drive and get a print out, but the manual says nothing about this.

Ruler Calibration

Ruler calibration can be rather confusing. Each division represents one character in the twelve characters per inch mode, the standard character pitch. Proportional spacing also averages out to this figure. When 10, 15 or 17 c.p.i. is used however the ruler markings in the header remain the same. This isn't too bad because the line endings adjust, so that the screen layout is what is printed. The confusion arises when one tries to correlate the ruler with the markings on the paper bail bar. This is calibrated in tenths of an inch and thus bears no relation at all to the ruler markings. Any attempt to set up the margins or tabs using the bail bar as a guide, or to use it for precise print positioning on the paper, results in inaccuracy. It would have been a useful guide had it been calibrated in twelfths.

Summing Up

These then are the main features of word processors in general and the PCW8256 in particular. Readers should be able to judge from this whether such a machine has a place in their home or work.

Apart from the features that physically aid word production there's a more subtle factor. When you use a typewriter you compose your prose carefully because you know that alterations can mean a messy page or a retype. You're inclined to use standard phrases and the result is likely to be rather stilted. Second thoughts or minor improvements will probably be ignored provided the original is passable. The work has to be really bad to justify revision and retyping. Any such inhibitions are lost with a word processor since anything can be changed at any time up to printing. Writing is faster and freer and you can rearrange and polish the result at will. The result is a generally higher standard of work.

Finally, although this is beyond the normal use of a word processor a considerable amount of software that can produce graphs, pie-charts, graphics, diagrams, extended print fonts (up to sixteen different ones in one case), pictures from video signals and magazine page composition is available. You can even produce a complete magazine with text and graphics or posters in sections.

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

15/80H	3.30	2SA940	1.81	2SC535	0.79	AF180	0.55	BA656	8.99	BC560C	0.14	BDX63A	1.96	BFY52	0.27	BYX71-350	1.40
15/85R	3.30	2SA940-2	2.14	2SC536	0.61	AF181	0.53	BA7100	10.85	BC635	0.36	BDY20	1.21	BFY79	0.49	BYX94	0.16
16039	0.79	2SA950	0.72	2SC537	0.54	AF186	0.53	BA841A	28.98	BC636	0.42	BDY81	1.18	BFY90	0.61	BYX96	1.20
16181	1.04	2SA951	1.26	2SC605L	1.16	AF239	0.43	BA843	3.96	BC637	0.24	BF115	0.40	BLY49	2.20	BZY33C30	1.86
16182	1.04	2SA966-Y	1.16	2SC620	1.46	AF279	0.88	BA854	3.76	BC639	0.20	BF117	0.66	BR00	0.22	BZY88 RANGE	0.10
16334	0.98	2SA999	1.36	2SC643A	1.54	AN113	1.36	BAV18	0.21	BC640	0.24	BF118	0.67	BR01	0.75	BZX61 RANGE	0.18
16335	0.94	2SB774	1.15	2SC668	0.67	AN115	1.96	BAV19	0.11	BC679	0.39	BF121	0.25	BR03	0.75	BZX79 RANGE	0.10
16446	0.98	2SB185	1.13	2SC681	4.40	AN155	1.89	BAV20	0.31	BC680	0.31	BF123	0.21	BR03	1.26	C106D	0.46
16500	1.38	2SB375	3.87	2SC682	1.88	AN206	2.58	BAV21	0.34	BCX34	0.40	BF127	0.13	BR116C	0.67	C106M	0.76
16802	1.27	2SB400	0.40	2SC684	1.65	AN208	3.55	BAW62	0.19	BCY70	0.30	BF137	0.29	BR300C	2.01	C1129	0.58
17052	5.61	2SB405	1.03	2SC693	0.63	AN210	2.28	BAX12	0.44	BCY71	0.40	BF153	0.58	BRC5296	0.77	CA3046	2.06
17053	9.30	2SB407	3.24	2SC710	0.69	AN211	3.25	BAX13	0.11	BCY72	0.20	BF154	0.26	BRC6109	0.83	CA3089	0.83
17074	9.30	2SB449B	6.96	2SC711A	0.50	AN214Q	0.50	BAX16	0.11	BD115	0.46	BF157	0.33	BRC82	1.08	CA3090AQ	3.25
17089	1.51	2SB511	2.50	2SC717	1.28	AN231	14.65	BC107	0.13	BD116	0.70	BF158	0.18	BRC83	2.19	CA3094	2.20
17127	3.51	2SB54	1.39	2SC734	1.43	AN234	5.92	BC107A	0.11	BD124	1.31	BF159	0.18	BRC84	2.08	CA3131EM	3.12
17376	1.58	2SB546	3.75	2SC761-Y	0.95	AN236	3.78	BC107B	0.18	BD124P+KIT	0.69	BF160	0.31	BRX44	0.53	CD4001	0.38
17523	1.32	2SB56	2.80	2SC783	3.98	AN239	6.95	BC108	0.15	BD131	0.54	BF167	0.38	BRX49	0.60	CD4002	0.27
17524	1.32	2SB618A	2.22	2SC790Y	1.64	AN240P	1.52	BC108B	0.15	BD132	0.42	BF173	0.35	BRX39	0.69	CD4008	1.35
1N4001	0.06	2SB631	3.25	2SC828	0.28	AN241	1.71	BC109	0.12	BD133	0.53	BF177	0.34	BSS38	0.87	CD4008	1.27
1N4002	0.06	2SB643	0.61	2SC867A	3.05	AN245	4.49	BC109B	0.15	BD135	0.36	BF178	0.40	BSTB0140G	5.25	CD4011	0.29
1N4003	0.06	2SB669	3.67	2SC876	0.96	AN253	2.97	BC109C	0.12	BD136	0.26	BF179	0.36	BSTC0246	7.25	CD4012	0.24
1N4004	0.06	2SB681	3.96	2SC930	0.54	AN260	3.85	BC113	0.14	BD137	0.36	BF180	0.36	BSTC0233	3.25	CD4013	0.47
1N4005	0.08	2SB695	1.98	2SC935	4.13	AN262	1.98	BC119	0.36	BD138	0.46	BF181	0.32	BSTC00143	7.07	CD4016	0.46
1N4006	0.08	2SB75	1.04	2SC936	8.66	AN272	7.92	BC126	0.23	BD139	0.34	BF182	0.34	BSTD1043	2.85	CD4017	0.82
1N4007	0.07	2SB774	0.72	2SC940	4.68	AN281	6.65	BC132	0.14	BD140	0.37	BF183	0.39	BSV578	3.49	CD4020	1.23
1N4148	0.06	2SB819	0.89	2SD1128	2.90	AN295	5.52	BC135	0.14	BD144	1.70	BF184	0.43	BSW68	0.60	CD4021	0.39
1N4448	0.05	2SC1034	6.75	2SD1138	1.07	AN301	5.55	BC137	0.18	BD150	1.25	BF185	0.39	BSX19	1.29	CD4023	0.28
1N5401	0.14	2SC1050	5.06	2SD1273	1.25	AN302	3.99	BC138	0.34	BD157	0.67	BF194	0.14	BSX20	0.34	CD4025	0.64
1N5402	0.15	2SC1096	1.16	2SD1453	0.75	AN303	4.39	BC139	0.28	BD160	1.60	BF195	0.14	BSY52	0.50	CD4028	0.84
1N5403	0.16	2SC1104	3.98	2SD152K	2.64	AN305	9.47	BC140	0.45	BD163	0.71	BF196	0.17	BSY79	0.51	CD4040B	0.85
1N5404	0.15	2SC1106	4.54	2SD198	3.87	AN315	2.46	BC141	0.34	BD165	0.82	BF197	0.18	BT100A	1.61	CD4047	1.06
1N5408	0.35	2SC1114	6.75	2SD234	0.49	AN316	5.53	BC142	0.33	BD166	0.42	BF198	0.17	BT106	1.55	CD4049	0.46
1N5409	0.25	2SC1116	4.95	2SD235	0.60	AN318	6.27	BC143	0.34	BD168	0.73	BF199	0.17	BT108	1.45	CD4052	0.75
1N914	0.04	2SC1124	1.26	2SD24	2.29	AN320	5.47	BC147	0.10	BD175	0.60	BF200	0.37	BT119	1.76	CD4066	0.38
1R3403	5.00	2SC1129	0.34	2SD257	2.94	AN321	2.25	BC148A	0.08	BD179	0.49	BF218	0.36	BT120	2.17	CD4069	0.29
1S1555	0.20	2SC1131	0.64	2SD292	2.59	AN322	5.85	BC148B	0.13	BD181	0.99	BF224	0.17	BT121	2.48	CD4070	0.66
1S44	0.10	2SC1158	3.33	2SD313	2.59	AN331	4.09	BC148C	0.11	BD182	0.99	BF237	0.65	BT123	1.98	CD4081	0.35
1S5012A	0.81	2SC1162	1.05	2SD325D	1.95	AN337	5.37	BC149	0.11	BD183	0.99	BF240	0.17	TBA970	3.06	CD4093	0.72
1S921	0.10	2SC1172	2.22	2SD348	16.13	AN340P	1.37	BC149B	0.13	BD184	1.21	BF241	0.17	BT151-800R	1.15	CD4511	1.10
2N1303	0.38	2SC1195	3.26	2SD350	5.20	AN355	5.95	BC153	0.14	BD187	0.53	BF245	0.50	BT16018	2.42	CD4528	2.04
2N2219A	0.40	2SC1212A	1.97	2SD350A	2.80	AN362	1.78	BC154	0.14	BD189	0.69	BF245A	0.52	BT18124	4.89	CD4556	1.47
2N2222	0.38	2SC1213	0.89	2SD353	7.50	AN370	3.95	BC159	0.36	BD190	0.69	BF245B	0.49	BU106	2.48	CR02AM-8	1.55
2N2646	0.80	2SC1226	1.46	2SD389	2.41	AN5010	5.70	BC160	0.40	BD201	0.53	BF246A	2.52	BU108	1.50	CV12E	3.07
2N2904	0.36	2SC1283	0.90	2SD401	2.55	AN5111	4.92	BC161	0.28	BD202	0.60	BF255	0.20	BU109	2.65	CX095D	3.14
2N2905	0.43	2SC1306	1.98	2SD414	1.98	AN5120N	2.50	BC168	0.36	BD203	0.50	BF256	0.28	BU110	5.69	CX104	9.64
2N2906	0.38	2SC1316	4.10	2SD471	2.13	AN5132	4.39	BC169C	0.16	BD204	0.61	BF256LB	0.42	BU111Y	4.18	CX108	10.50
2N2926	0.15	2SC1317	0.87	2SD560	2.95	AN5250	3.98	BC170	0.16	BD207	1.79	BF256LC	0.42	BU125	2.46	CX109	7.86
2N3053	0.27	2SC1364	0.49	2SD588A	2.36	AN5435	3.08	BC171	0.11	BD208	0.34	BF257	0.34	BU126	1.55	CX130	8.76
2N3054	0.99	2SC1383	1.20	2SD600	3.25	AN5610	7.43	BC172	0.13	BD222	0.49	BF258	0.36	BU137	6.53	CX134	11.04
2N3055	0.61	2SC1391	2.45	2SD601R	0.65	AN5612	4.12	BC172B	0.17	BD225	0.49	BF259	0.34	BU205	1.08	CX136	11.49
2N3442	1.56	2SC1398	0.94	2SD613	1.03	AN5613	4.63	BC173	0.27	BD228	0.63	BF262	0.57	BU206	1.27	CX139	11.83
2N3702	0.14	2SC1413A	3.05	2SD621	12.85	AN5630	3.95	BC174B	0.35	BD229	1.05	BF263	0.57	BU207	1.65	CX157	4.84
2N3703	0.14	2SC1446	1.25	2SD636	0.55	AN5701N	1.66	BC177	0.20	BD232	0.50	BF271	0.34	BU208	1.12	CX158	4.10
2N3705	0.16	2SC1447	2.07	2SD639-R	0.85	AN6250	7.95	BC178	0.26	BD234	0.42	BF273	0.20	BU208/02	1.97	CX177	6.75
2N3706	0.14	2SC1475	0.37	2SD655	0.98	AN6300	2.00	BC179	0.26	BD237	0.47	BF274	0.20	BU208A	1.12	CX187	5.26
2N3707	0.16	2SC1505	1.00	2SD657	3.25	AN6310	8.74	BC182	0.09	BD238	0.39	BF324	0.35	BU208D	1.95	CX755	12.95
2N3711	0.11	2SC1514	1.41	2SD661A	0.80	AN6320N	4.28	BC182L	0.10	BD239	0.45	BF336	0.33	BU209	1.93	CX885A	6.85
2N3711	2.04	2SC1573Q	1.25	2SD731	2.45	AN6340	11.00	BC182LB	0.14	BD240	0.37	BF337	0.40	BU226	2.95	DEC1	2.20
2N3772	1.71	2SC1578	8.74	2SD773	0.33	AN6341	5.98	BC183L	0.11	BD241	0.39	BF338	0.44	BU207	1.62	DEC2	2.20
2N3773	2.29	2SC1583	1.17	2SD811	5.54	AN6342	16.01	BC183LB	0.26	BD242	0.39	BF355	0.49	BU326A	2.20	DS3486N	4.33
2N3819	0.22	2SC1617	3.89	2SD823	1.98	AN6363	1.61	BC184	0.13	BD243A	0.37	BF362	0.66	BU326S	2.20	DS3487N	4.33
2N3823	1.17	2SC675	1.41	2SD837	1.56	AN6371	9.24	BC184L	0.14	BD243C	0.79	BF363	0.60	BU406	1.49	E1222	0.40
2N3904	0.62	2SC1678	1.98	2SD841	3.65	AN6387	7.95	BC184LB	0.26	BD244	0.51	BF371	0.50	BU406D	1.79	E5024	0.28
2N3908	0.62	2SC1741	1.25	2SD856	2.25	AN6531	1.95	BC186	0.27	BD244C	0.79	BF391	0.25	BU407	0.82	E5386	0.25
2N4101	1.73	2SC1810	1.70	2SD857Q	1.84	AN6551	1.35	BC187	0.28	BD245C	0.99	BF417	0.84	BU407D	1.09	E9003	0.46
2N4240	3.30	2SC1815	0.66	2SD882	1.50	AN6552	0.68	BC204	0.16	BD246C	1.25	BF418	1.87	BU412	9.15	E9005	0.50
2N4444	0.50	2SC1826	0.65	2SD894	1.50	AN6610	2.40	BC207	0.14	BD253	1.05	BF422	0.29	BU426	1.67	ESM310BP	4.15
2N5293	0.50	2SC1829	2.22	2SD898	5.45	AN6677	8.95	BC212	0.11	BD278A	0.80	BF423	0.52	BU500	1.95	FN0500	5.78
2N5294	0.49	2SC1875	5.19	2SK105H	2.15	AN7111	1.45	BC212B	0.26	BD317	2.60	BF450	0.35	BU508A	1.75	GC374	1.65
2N5296	0.50	2SC1881K	2.98	2SK152	2.95	AN7114E											

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HA1374	4.80	LR3419	9.37	NE565N	1.33	SKE4F2/08	1.24	STK3042	11.05	TA7312P	2.45	TDA3360	5.25	TUA2000	8.98
HA1377	4.98	LR3471	9.37	NE645BN	3.35	SKE4F2/06	0.85	STK3044	5.75	TA7313AP	1.50	TDA3371Q	2.97	TV106	1.86
HA1389R	2.05	LU1141	7.27	NP1106	8.60	SKE4F2/10	1.25	STK3019	4.50	TA7314	5.94	TDA3376	7.09	TY60108	2.97
HA1389	2.39	LU52012	5.95	OA202	0.11	SKE4G2/02	0.96	STK430	11.75	TA7323P	3.15	TDA3390	5.79	U05G	1.14
HA1392	3.98	LU52011	14.95	OA47	0.14	SKE5F3/10	1.50	STK433	4.95	TA7325P	1.15	TDA3391	6.45	ULN2204	11.45
HA1394	3.95	LU03112	12.37	OA91	0.09	SKS1/10	2.15	STK435	8.25	TA7339P	1.60	TDA3395	5.00	UPA35C	4.94
HA1397	3.76	M193	12.75	OA95	0.12	SL1310	1.94	STK4352	5.94	TA7340P	5.06	TDA3395A	5.44	UPC1003	5.95
HA1398	3.98	M21C	1.00	OC28	2.95	SL1430T	3.18	STK436	7.21	TA7607AP	13.90	TDA3395IAQ	4.25	UPC1009C	6.32
HA1406	2.07	M23C	0.83	OC29	2.15	SL414	3.99	STK437	7.80	TA7611AP	3.28	TDA3395IA	2.98	UPC1025H	5.20
HA1452	1.63	M293	9.15	OC36	1.28	SL432A	3.44	STK4372	3.05	TA7616P	4.80	TDA3395IA	1.25	UPC1026C	1.24
HBFA030AF	2.48	M51102L	6.25	OC44	0.35	SL439	2.48	STK4372	8.31	TA7622AP	5.25	TDA3395IA	3.25	UPC1028H	2.00
HD14538	2.07	M5115P	5.24	OC72	0.44	SL471	4.78	STK439	11.28	TA7628P	8.94	TDA4050B	7.20	UPC1028H	2.77
HD38702-A2	7.95	M51203L	3.15	OC75	0.44	SL480	3.98	STK443	10.29	TA7629P	7.50	TDA4280	3.95	UPC1032H	0.62
HD38750A53	8.50	M51231P	3.04	ON236	1.06	SL490	2.37	STK443	13.45	TA7630P	2.98	TDA4290	4.47	UPC1042C	8.95
HD38750A-7	7.25	M5134-9341	4.13	ON782	1.98	SL901B	1.98	STK460	14.83	TA7640AP	1.55	TDA4400	2.27	UPC1042C	2.96
HD38800A50	14.09	M51353P	5.25	OT121	1.45	SL918A	6.95	STK461	9.68	TA7640AP	2.25	TDA4420	4.02	UPC1158	5.84
HD44801A05	18.25	M51381P	4.50	PT6042	2.45	SN16861ANO	4.95	STK463	11.53	TA7672P	2.81	TDA4422	2.15	UPC1161C	1.82
HEF4001BP	0.87	M51393AP	7.78	PT8504	4.98	SN16862AN	2.98	STK463	11.77	TA7726P	10.25	TDA4427S	4.60	UPC1182H	1.05
HISH1010	8.50	M51394P	11.97	R1038	2.19	SN16966H	10.25	STK4833	16.95	TAA320A	1.27	TDA4440	2.87	UPC1181H	1.25
HISH1004	6.99	M5142P	5.49	R1039	2.19	SN29717N	7.19	STK501	6.32	TAA350A	6.45	TDA4442	4.75	UPC1181H	2.94
HISH1002	9.50	M5144P	4.25	R2008B	1.33	SN29716N	3.66	STK502	5.74	TAA570	1.74	TDA4500	6.30	UPC1188	6.95
HM6231	9.81	M51513L	2.55	R2009	1.98	SN29715N	6.04	STK5314	9.48	TAA621AX1	4.85	TDA4600	2.84	UPC1213C	0.99
HM6232	8.89	M51515BL	3.23	R2010B	1.33	SN29722	11.95	STK5730	3.95	TAA621A12	2.14	TDA4610	4.78	UPC1212H	1.72
HM6251	5.70	M51517L	3.71	R2029	1.33	SN29723AN	7.65	STK7216	12.67	TAA661B	2.62	TDA4620	4.80	UPC1225C	3.25
HM7103	2.46	M5192	2.20	R2030	1.33	SN29764AN	1.38	STK772	6.95	TAA691	8.58	TDA4650	4.78	UPC1230	5.24
HM9032	3.22	M5194AP	5.74	R2257	3.71	SN29767	4.98	STR1096	5.20	TAA700	3.75	TDA4700	2.60	UPC1238	3.15
HM9012	3.22	M5231L	1.95	R2265	1.49	SN29770BN	4.24	STR4090	11.98	TAA930	4.87	TDA4720S	3.25	UPC1263	3.45
HT4207	17.16	M53274P	1.33	R2305	1.18	SN29772BN	4.91	STR440	7.85	TAA970	2.83	TDA48190	1.50	UPC1277H	5.85
HT4208	18.25	M54532P	2.15	R2322	0.59	SN29771BN	3.65	STR441	6.50	TAA110	2.52	TDA4903	3.15	UPC1278H	4.85
IN5401	0.11	M54544L	4.75	R2323	0.76	SN29791	1.27	STR451	4.95	TAG232-600	0.73	TDA4903	3.50	UPC1315C	1.81
IR2403	4.25	M54787P	6.75	R2354A	2.01	SN29798N	5.56	STR453	8.16	TAG626-100	1.06	TDA4913	1.33	UPC1350C	1.40
IR2C05	4.25	M54885P	12.45	R2354B	2.01	SN2709	0.46	STR454	7.50	TBA120AS	1.24	TDA4913	6.68	UPC1353	7.85
IR3P06	2.25	MA05	1.07	R2443	0.88	SN7400N	0.34	STR6020	8.31	TBA120SB	1.05	TDA4920	2.65	UPC1355C	2.13
IR3P08	4.95	MA8001	0.82	R2461	1.50	SN7401N	0.36	T6029P	5.75	TBA120T	0.95	TDA4930	1.49	UPC1363	4.20
IR94558	6.25	MA8003	1.16	R2540	2.31	SN7402N	0.65	T6035V	0.73	TBA120U	2.50	TDA4940	3.47	UPC1362	2.98
IS751	2.85	MB3705	1.98	R2540X	3.30	SN7404N	0.24	T6036	0.67	TBA120A	1.05	TDA4970P	4.15	UPC1365C	6.98
IT1425	0.18	MB3712	1.85	R2615	0.67	SN7408N	0.27	T6037	2.11	TBA1400	2.03	TEA1014	3.20	UPC1366	7.25
I2003GE	5.37	MB3713	1.69	RCA16029	2.01	SN7410N	0.77	T6044V	0.97	TBA1441	1.62	TEA1020SP	8.31	UPC1368C	4.51
I20020GE	5.93	MC13002	3.25	RCA16600	1.38	SN74121	1.60	T6045	1.20	TBA1440G	5.20	TIC106C	0.61	UPC1378H	4.25
K174YP	3.46	MC1310P	2.25	RCA17074	6.60	SN74141N	2.85	T6049	1.45	TBA1441	2.80	TIC106M	0.77	UPC141C	3.75
KA2101	2.92	MC1327P	1.33	RCA17376	1.58	SN74151AN	1.01	T6052V	3.07	TBA240A	3.99	TIC116Y10L	2.07	UPC1458	8.66
KC581C	6.32	MC1330P	1.69	RCA17524	0.83	SN74154N	1.27	T6059	0.65	TBA395L	1.10	TIC44	0.72	UPC151C	2.96
KC582C	3.97	MC1350P	1.61	RCA17529	0.83	SN74190	2.00	T9003V	1.25	TBA396	2.90	TIC45	0.77	UPC2002	1.48
KC583C	5.64	MC1351P	3.96	RCA2060	2.00	SN7420N	0.43	T9005V	2.39	TBA400	2.39	TIC47	0.35	UPC300C	2.51
L200CV	1.59	MC1352P	2.50	RGP01-15	0.70	SN7430	0.94	T9011V	2.48	TBA440P	2.45	TIP120	1.06	UPC324C	4.70
LA1201	1.02	MC1357P	2.15	RGP10	0.50	SN7440N	0.27	T9013V	7.96	TBA480Q	1.30	TIP110	0.53	UPC324C	5.25
LA1210	1.56	MC1358P	1.55	RGP30M	0.59	SN7472	1.54	T9014V	2.60	TBA500	6.58	TIP112E	0.88	UPC339C	4.90
LA1230	2.87	MC14001	2.40	RT402	1.58	SN7474N	0.44	T9016	1.98	TBA510	2.11	TIP117	1.17	UPC455C	4.10
LA1320	2.87	MC14013	0.41	RT905A	2.38	SN7490AN	0.93	T9019W	1.98	TBA520	1.84	TIP121	0.95	UPC474	5.15
LA1352	1.17	MC14493P	11.95	SI1299	5.74	SN74L526N	1.53	T9034V	1.68	TBA520Q	1.68	TIP126	0.73	UPC554C	1.85
LA1357N	1.05	MC14494P	2.15	SI75	31.48	SN76001N	1.65	T9035V	2.43	TBA530	1.30	TIP132	1.40	UPC568C	2.96
LA1363	3.02	MC14497	3.65	S2062D	2.07	SN76013ND	2.48	T9051	7.15	TBA530	1.30	TIP137	1.50	UPC574	3.25
LA1364	1.36	MC14510BAL	1.75	S2800D	5.54	SN76023N	5.15	T9054V	1.45	TBA540	1.15	TIP229	0.84	UPC575C2	2.58
LA1365J	3.44	MC14511BCP	1.10	S2802	3.47	SN76023ND	3.96	T9057V	0.70	TBA540Q	1.15	TIP295	0.95	UPC578H	1.25
LA1385	1.94	MC14528BCP	2.70	S2818	4.05	SN76033N	4.15	T9062V	4.49	TBA560C	1.40	TIP29A	0.46	UPC579H	7.35
LA1387	1.25	MC1712	3.88	S3072S	6.15	SN76115AN	0.90	T9064	1.51	TBA560QC	1.60	TIP29B	0.63	UPC578C	4.13
LA3155	1.65	MC5192	13.50	SA0W	10.89	SN76110N	1.61	TAG002	4.35	TBA570A	1.71	TIP29C	0.40	UPC587C2	2.15
LA3301	1.43	MC7724CP	3.49	SA0R0B	8.80	SN76131	1.92	TA7027	1.74	TBA641A12	4.13	TIP29D	0.75	UPC587C2	1.34
LA3350	1.23	MC7818C	2.18	SA0K63	5.17	SN76227N	1.33	TA7050	4.80	TBA641B72	3.03	TIP305	0.16	UPC592H	2.95
LA3361	1.98	MCR1007	0.95	SA01006	1.75	SN76226ND	1.98	TA7051	2.55	TBA651	1.76	TIP30A	0.41	UPC595	1.98
LA3365	1.23	MCR106-5/6	1.65	SA01020	4.76	SN76228N	3.27	TA7056	1.24	TBA673	2.60	TIP30B	0.16	UPC599	1.98
LA3390	4.25	MCR2207	2.28	SA01025	4.40	SN76242	8.95	TA7060AP	0.71	TBA673	2.60	TIP31A	0.34	UPD1514C	8.95
LA4030P	4.20	ME0402	0.17	SA01024	2.81	SN76243	5.23	TA7061AP	1.27	TBA700	1.85	TIP31B	0.38	UPD2819C	4.98
LA4031P	3.20	ME0404/2	0.47	SA01075	6.25	SN76396	2.90	TA7069	3.13	TBA720	1.55	TIP31C	0.53	UPD4013B	4.95
LA4032P	2.35	ME0411	0.28	SA01121	5.14	SN76533N	2.47	TA7070P	1.83	TBA730	3.96	TIP32A	0.53	UPD4066B	4.95
LA4100	1.25	ME0412	0.28	SA01124	3.25	SN76532N	2.95	TA7072P	2.57	TBA750Q	2.90	TIP32B	0.69	UPD553-164	19.25
LA4101	1.30	ME0413	0.28	SA01130	4.99	SN76545	4.87	TA7073P	5.86	TBA760	1.71	TIP32C	0.40	UPD8049C-1	10.85
LA4102	2.81	ME0414	0.34	SA01174	7.77	SN76546N	3.47	TA7074P	1.98	TBA800	2.30	TIP33	0.85	X00077A	4.68
LA4112	1.56	ME0415	0.75	SA01250	4.25	SN76549	2.59	TA7076P	7.80	TBA810	1.61	TIP33A	0.50	X00222C	5.75
LA4125	2.25	ME0416	3.30	SA01251	9.85	SN76570	3.08	TA7089P	3.10	TBA810T	1.50	TIP33C	0.80	X00299C	7.09
LA4138	3.45	MAJ2501	1.76	SA01135E1	4.95	SN76611	2.59	TA7092P	8.65	TBA810AS	1.50	TIP34	3.54	X00312C	4.95
LA4140	1.15	MAJ3001	1.53	SA03027P	10.03	SN76620	2.59	TA7093P	3.99	TBA820	1.52	TIP41A	0.49	X00325A	5.98
LA4192	4.20	MAJ481	5.45	SA05000	2.95	SN76660N	2.48	TA7102P	5.88	TBA820M	0.82	TIP41B	0.65	X00407A	4.50
LA4220	1.62	MAJ2955	1.89	SA05010	5.39	SN76666N	1.41	TA7108P	1.61	TBA890	2.50	TIP41C	0.49	X00424C	4.35
LA4250	6.75	MAJ3055	1.65	SA05012	5.20	SN76708N	4.86	TA7109	3.71	TBA920	1.89	TIP42A	0.89	X00433C	2.75

Low-cost Teletext Decoder

Part 1

Peter Marlow, B.Sc. (Hons.), C.Eng.

Whilst browsing through the advertisements in *Television* recently I noticed that the Mullard VM6101 teletext decoder module could be purchased from Sendz Components for only £10. It occurred to me that this could form the basis of a simple, compact, low-cost, "no-frills", set-top teletext decoder. Ready-built set-top teletext adaptors have been on sale but are quite expensive at around £150. The aim I set myself was to produce a unit costing £50 or so, with the setting up operations reduced to an absolute minimum.

The VM6101 board contains the standard Mullard teletext chip set with a one-page memory. The individual chips have been described before in these pages – see for example Mike Phelan's articles in the January–April issues earlier this year. Suffice it to say that the board requires a 2.4V peak-to-peak video input and IBUS data signals for control (see below). The red, blue and green video outputs are open-drain field-effect transistors which can be pulled up to 5V for TTL interfacing. Power consumption is 5V at 350mA and 12V at 100mA. The input circuitry is factory aligned, thus avoiding the need for complicated test equipment and setting-up procedures.

Preliminary thoughts about the interfacing circuits required to drive the VM6101 board revealed a number of problems. The first was to find a suitable video/teletext signal source. Tuner and i.f. strips are expensive, so I decided to try using the auxiliary video output from my video recorder, switched to receive u.h.f. transmissions. It was a good use for the VCR, which seemed to spend most of its time lying idle. The auxiliary output was found to be a standard 1V peak-to-peak signal at 75Ω. A few enquiries revealed that all VCRs incorporate such an output via either a BNC or a phono socket. The bandwidth of the signal didn't appear to be limited to exclude the teletext information, and it later proved to be entirely satisfactory. To interface with the teletext board a simple voltage amplifier with a gain of 2.4 was required.

The next problem was to control the teletext decoder by generating the correct IBUS signals (see Fig. 1). These consist of a switched 62.5kHz clock line called DLIM and a seven-bit serial data line called /DATA. Each data bit lasts for two clock periods and must be valid on the rising edge of the second clock cycle. The /DATA signal consists of numbers and commands. Those relevant to the teletext mode are listed in Table 1: the list includes instructions (identified by an asterisk) that are not required in a teletext only receiver – they are included in the list for the sake of completeness.

Mullard manufacture a remote control chip set that

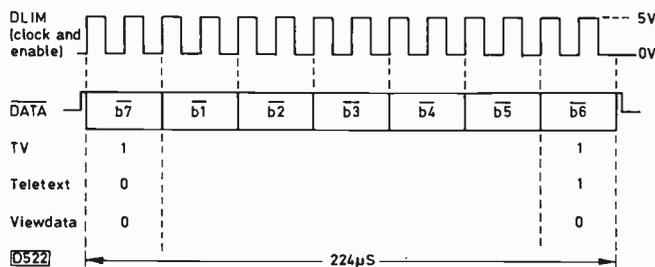


Fig. 1: The Mullard IBUS data signals.

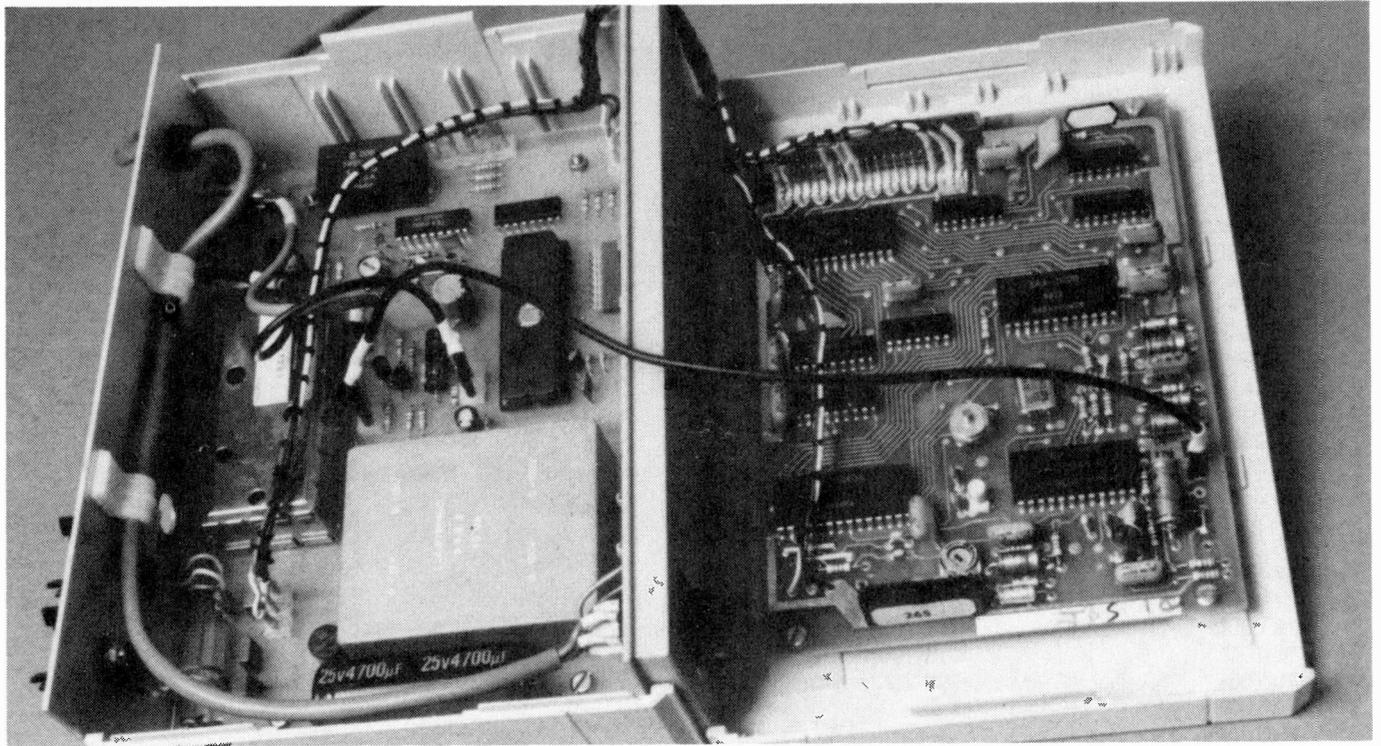
produces the IBUS signals required. The chips are the SAA5000 keyboard encoder/transmitter and the SAA5010 or SAA5012 receiver/decoder (described in the September issue, page 729 on). I thought that I might be able to use this system by picking up a remote control handset reasonably cheaply and using the SAA5012 receiver. But the TX9/10 handsets cost about £18, which was rather a large chunk of my £50 budget. After thinking long and hard about the input requirements it occurred to me that a keyboard mounted on the unit would be quite adequate, requiring just a little more effort to operate than remote control. I programmed an 8748 microcontroller chip to scan the keyboard and provide all the basic IBUS functions and "recall last page". The microcontroller provided a "one chip" solution that saved a great deal of PCB space.

The 8748 is a self-contained microcontroller chip from Intel, second-sourced by NEC. It's a member of the 8048/9 family which are used as supervisory controllers in many TV receivers. It has 1K of program memory (EPROM), 64 bytes of data memory (RAM), a timer, two eight-bit ports and a bidirectional data port. Its instruction set is similar to most other eight-bit microprocessors. Software

Table 1: Decoder control signals.

No.	Function	Data code						
		b7	b6	b5	b4	b3	b2	b1
1	Reset (on)*	1	0	0	0	0	0	0
2	Mute*	1	0	0	0	0	0	1
3	Standby*	1	0	0	0	0	1	0
4	TV on*	1	0	0	0	0	1	1
5	Status*	1	0	0	0	1	0	0
6	Hold	1	0	0	0	1	0	1
7	Reveal	1	0	0	0	1	1	0
8	Text cancel	1	0	0	0	1	1	1
9	Analogue 1+*	1	0	0	1	0	0	0
10	Analogue 1-*	1	0	0	1	0	0	1
11	Analogue 2+*	1	0	0	1	0	1	0
12	Analogue 2-*	1	0	0	1	0	1	1
13	-*	1	0	0	1	1	0	0
14	-*	1	0	0	1	1	0	1
15	Timed page off	1	0	0	1	1	1	0
16	Timed page on	1	0	0	1	1	1	1
17	Number 1	1	0	1	0	0	0	0
18	Number 2	1	0	1	0	0	0	1
19	Number 3	1	0	1	0	0	1	0
20	Number 4	1	0	1	0	0	1	1
21	Number 5	1	0	1	0	1	0	0
22	Number 6	1	0	1	0	1	0	1
23	Number 7	1	0	1	0	1	1	0
24	Number 8	1	0	1	0	1	1	1
25	Number 9	1	0	1	1	0	0	0
26	Number 0	1	0	1	1	0	0	1
27	Full Page	1	0	1	1	0	1	0
28	Top	1	0	1	1	0	1	1
29	Bottom	1	0	1	1	1	0	0
30	Viewdata on*	1	0	1	1	1	0	1
31	Superimpose (mix)	1	0	1	1	1	1	0
32	Teletext on	1	0	1	1	1	1	1

*See text.



Case opened to show the interface panel on the left and the Mullard VM6101 teletext decoder panel on the right.

can be hand-assembled or developed on a microcomputer system (IBM and BBC computers have software available for this). Fig. 2 shows the 8748's inputs and outputs.

The last problem was the interface with the TV set. I didn't think the decoder needed the superimpose, timed page or subtitle functions: the display of teletext data on a spare TV channel would be quite adequate and reasonably cheap to realise using a straightforward PAL encoder and a modulator. The modulator's output would be tuned to a spare TV channel and mixed with the VCR's output (on channel 36) before being fed to the TV set's aerial input socket. I decided to use a modulator with a sound channel (Astec UM1287) to eliminate the "buzzing" of text video normally associated with microcomputers. If

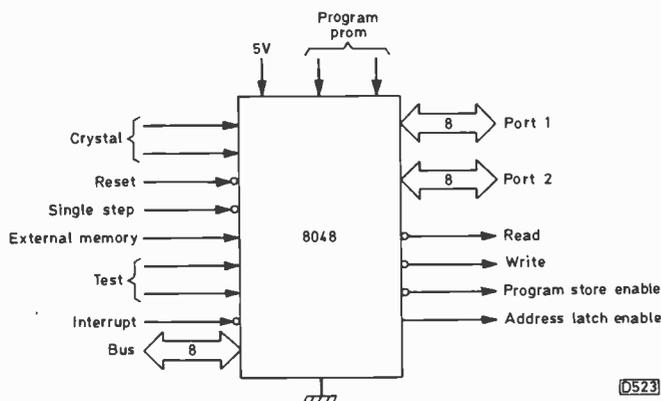


Fig. 2: Connections to an 8048 series microcontroller.

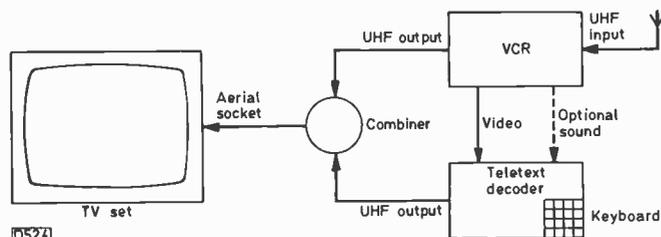


Fig. 3: The items forming the complete system.

desired a sound signal could be piped from the VCR to accompany the teletext picture. A cost reduction could be achieved however by using a vision only modulator (Astec UM1233) – see later.

Fig. 3 shows the connections between the various items forming the complete system.

Design of the power supply was easy. A 10VA mains transformer used in a conventional circuit produces 5V at 450mA and 12V at 150mA.

The complete decoder unit is housed in a standard plastic box.

Having worked out the initial design I could at last get to work with pencil (and rubber) and a soldering iron. The idea was to produce a PCB about the same size as the VM6101 board to contain all the necessary interfacing circuitry and the power supply. This interface PCB would reside in the top of the case with the VM6101 board in the bottom. The keyboard would be fixed to the outside top of the box, with input and output connectors and the mains input on the rear panel. The front panel would contain just the on/off switch and a LED indicator.

The case chosen for the design is the Vero Apollo (size 5) which measures 146 × 206 × 74mm. Fig. 4 shows the circuit of the interface panel and the connections to it.

Circuit Operation

Operation of the circuit is as follows. The 1V peak-to-peak video signal from the VCR's auxiliary output enters

Table 2: Keyboard functions.

Key	Function	Key	Function	Key	Function
1	No. 1	7	No. 7	A	Top
2	No. 2	8	No. 8	B	Bottom
3	No. 3	9	No. 9	C	Full page
4	No. 4	0	No. 0		Last page
5	No. 5	#	Hold		recall
6	No. 6	*	Reveal		

Components list

Resistors:

R1 270Ω
 R2 680Ω
 R3 680Ω
 R4 270Ω
 R5 33k
 R6 12k
 R7 75Ω
 R8 36k*
 R9 1k
 R10 910Ω
 R11 39k
 R12 680Ω
 R13 2.2k
 R14 2.2k
 R15 2.2k
 R16 820Ω†
 R17 470Ω†
 R18 680Ω
 R19 100k
 R20 100k
 R21 100k
 R22 100k
 Plus 4.7k required
 on VM6101 board
 All CFR 0.33W 5%
 except R8
 * 2% metal film
 † See text

Capacitors:

C1 33p ceramic plate†
 C2 33p ceramic plate†
 C3 1μF 63V el. radial
 C4 1,000p ceramic plate
 C5 100μF 6.3V miniature el. radial
 C6 4,700μF 25V el. radial
 C7 0.47μF polyester
 C8 0.22μF polyester
 C9 0.22μF polyester
 C10 1,000p ceramic plate
 C11 100μF 16V el. radial
 C12 100μF 16V el. axial
 C13 100p ceramic plate
 C14 10n ceramic plate
 C15 5.6p ceramic plate
 C16 5.6p ceramic plate
 C17 330p ceramic plate, 1% or 2%†
 C18 100μF 6.3V miniature el. radial
 C19 100μF 16V el. axial†
 TC1 2-22p trimmer
 † See text

Semiconductor devices:

IC1 8748 (preprogrammed) ★
 IC2 4040
 IC3 TEA2000 ★
 REG1 7812
 REG2 7805
 Tr1 BC558
 Tr2 BC548
 D1 1A 50V bridge
 D2 BZY88C5V1
 5.1V 400mW zener

Miscellaneous – electrical:

X1 KBR6-0M resonator†
 X2 8.867238MHz crystal
 L1 15μH, Q=80 (100 preferably),
 Toko 119ANA5873HM
 (Cirkit 35-58731) ★
 L2 DL270 (Philips) ★
 MOD1 Astec UM1287† ★
 LED1 Red, panel mounting
 T1 10VA 15V encapsulated.
 (Verospeed 289-41617A)
 Mullard VM6101 teletext module
 † See text

Miscellaneous – hardware:

Keyboard – 4 × 4 Membrain (Rowland Automation,
 Verospeed 259-41380C)
 Video input – BNC panel mounting socket (75Ω)
 Audio input – 5-way, 180° DIN socket
 Keyboard input – 10-pin header (0.1in. pitch) cut to 8
 (Verospeed 901-71320A)
 Connection pins – 0.2in. pitch pins (4 × 2-way, 2 × 3-
 way, 1 × 5-way)
 Switch S1 – Double-pole paddle switch
 Heatsinks for REG1 and REG2
 40-pin socket for IC1
 PCB ★
 Apollo case size 5 (Verospeed grey 75-38119A, beige
 75-39244D)
 Pillars: self-adhesive boss (Verospeed 75-38126H, pack
 of 10) with self-tapping screws
 Nuts and bolts for heatsinks, 2 countersunk 6BA 3/4in.
 bolts and nuts for board support, 6 Veropins for
 REG1 and REG2 wiring, miniature coaxial cable,
 stranded wire
 Splitter and cabling (external to units)

Availability:

Parts marked ★ can be obtained from Video Interface
 Products Ltd., Charlton House, 32 Charlton Lane,
 Cheltenham, Glos., GL53 9DX (0242 581383). Other
 parts available from suppliers mentioned and usual
 dealers.
 Video Interface Products Ltd. can supply parts/kits as
 follows:
 8748 microcontroller only (programmed) £10
 PCB only £7.50
 Parts indicated by ★, i.e. IC1, IC3, modulator
 (UM1287), L1, L2 and PCB £28
 PCB plus parts kit (including 4 × 4 keyboard and
 heatsinks – no decoder) £52
 PCB plus parts kit as above, built and tested £65
 Complete kit (including splitter but not video
 cables) £85
 Complete kit as above, built and tested with
 guarantee £105
 Add VAT to above prices at 15% plus £2 post and
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 Access accepted.

the unit at PL2 and is terminated by R7. Tr1 and Tr2 are connected as a simple two-stage voltage amplifier to increase the signal amplitude to 2.5V peak-to-peak (the maximum is 3V). The output is delivered direct to the VM6101 module's video input – a 1μF input coupling capacitor is already present on this board but its polarity must be reversed (see later for details).

The keyboard and IBUS interfacing is done by the 8748. The four-by-four keyboard is scanned by the low-order bits from port P1, the keyboard output being read via the data bus. A 6MHz resonator (X1) is used as the timing element, to reduce cost – an ordinary 6MHz crystal can be used, but the values of C1 and C2 then have to be

reduced to 22pF. As the 8748 is too slow at 6MHz to produce the DLIM clock by software means alone a 4040 counter (IC2) is brought in to help, dividing down the 2MHz output from T0. A 62.5kHz clock is thus generated, being turned on and off by the P14 line. The data is inverted and serially clocked out at P20 in the order /b7, /b1, /b2, /b3, /b4, /b5, /b6. Provided the two series 470Ω resistors in the DLIM and /DATA lines are shorted out (see later for details) the 8748 can be connected directly to the VM6101 module.

The 8748 is available from Video Interface Products Ltd. (see parts list) with the software already programmed in. The mode of operation is that the microcontroller

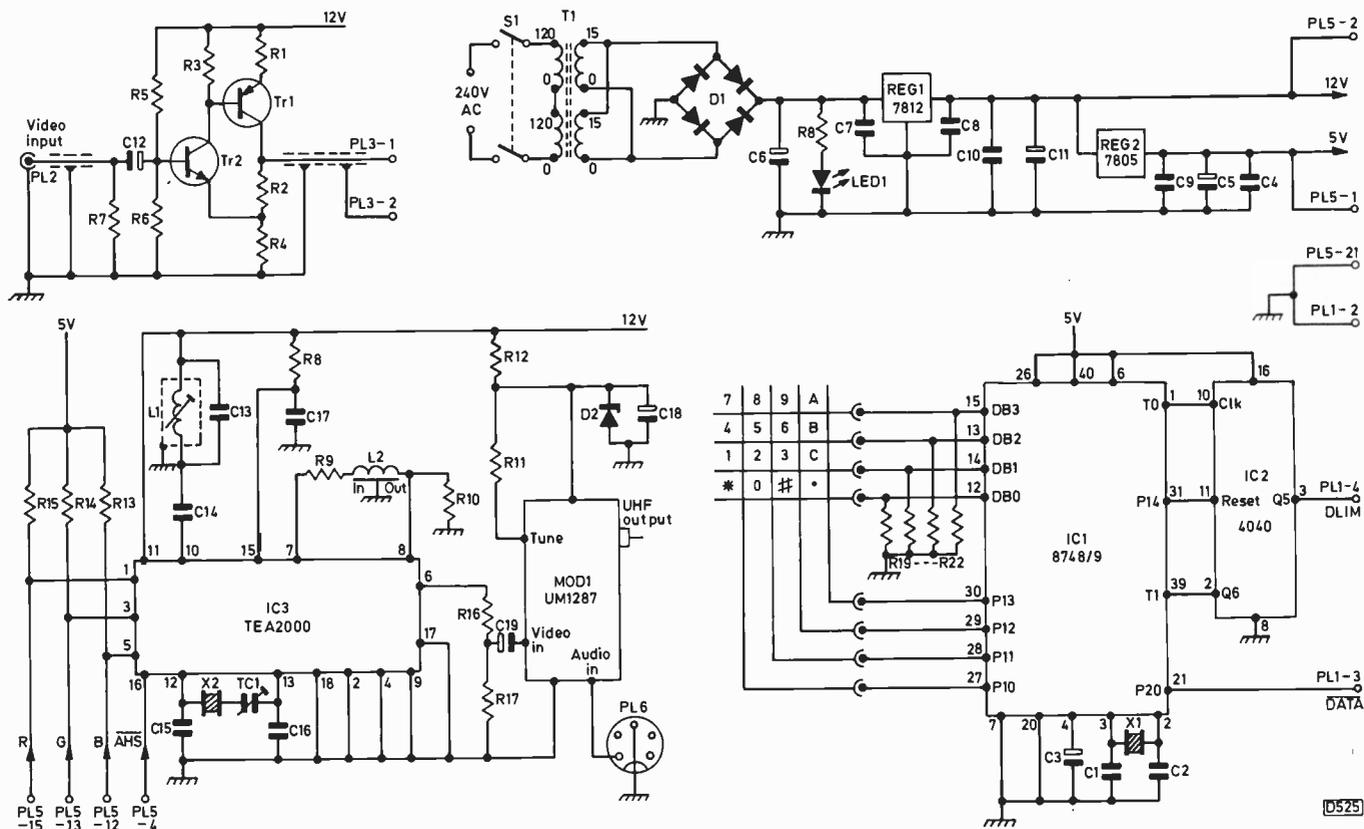


Fig. 4: Interface panel circuit diagram.

sends page "100" at power up to get the decoder into the teletext mode. It then scans the keyboard for a valid input, decodes it, reviews a look-up table and sends the appropriate command. Page numbers are stored on an eight deep stack to allow page recall. The reveal command (key *) is sent continuously until the next command. Table 2 lists the keyboard functions.

The PAL encoder circuit uses the recently introduced Mullard TEA2000 chip. The chip's colour inputs allow for intensity by providing four levels on each. These inputs are digital, so two binary input lines per colour are required. There is only one output level from the VM6101 board, so I experimented to observe the picture quality at different input levels. Use of R1, G1 and B1 with R0, G0 and B0 connected to chassis seemed to give the most pleasing result. Because the outputs from the VM6101 board are from open-drain f.e.t.s the inputs are pulled up to 5V by the 2.2kΩ resistors R13-15. The sync input is provided by the /AHS signal from the SAA5020 chip on the VM6101 board. This is brought across to the PCB via a connector. As the R, G and B signals from the VM6101 board are already blanked the CBLANK pin (17) is connected to chassis.

An external 8.867238MHz crystal fine tuned by TC1 sets the colour subcarrier frequency. Chrominance filtering is accomplished by the combination L1, C13 which acts as a 4.43MHz tuned filter with connection to pin 10 via the blocking capacitor C14. This filter helps to remove the observable beats between the line frequency and the subcarrier (moving diagonal lines on the picture). The coil should have a Q of 100 but the only part I could find is a Toko coil with a Q of only 80. This turned out to be satisfactory. Use of the chrominance filter means that a 270 nanosecond delay line (Philips DL270) must be incorporated. To save money it's possible to run the circuit without the filter and delay line but the results are

not too good. If you want to experiment with this option, omit L1, C13 and C14, link across the delay line and change the value of R9 to 1.2kΩ and R10 to 1kΩ.

R8 and C17 are the colour burst timing components. The data sheet specifies close tolerance components here - two per cent and one per cent respectively. The best ceramic plate capacitor I could find (Mullard) had a tolerance of two per cent but didn't seem to give any problems. If colour stability is poor, try changing C17.

The chosen u.h.f. modulator is the Astec UM1287. This includes a sound channel, without de-emphasis, which can be connected to the VCR's auxiliary sound output via the DIN socket PL6 or earthed. In either case the annoying buzz associated with low-bandwidth computer graphic pictures is eliminated. In computer systems the sound can be turned off, but with TV the sound would normally be left on. If desired some money can be saved by using the Astec UM1233 modulator which does not have a sound facility. In this case change R16 to 510Ω, R17 to 430Ω and omit C19. The sound and vision signals can be fine tuned using the adjustment cores provided (see later). To avoid digital interference appearing on the picture the modulator is powered from the 12V line, not the digital 5V supply.

The power supply is conventional, using a 10VA PCB mounted encapsulated mains transformer (T1). This supplies 5V at 450mA and 12V at 150mA. The 7805 and 7812 regulators are mounted on the rear panel (aluminium) of the case on flying leads. Heatsinks are attached to the regulators on the outside of the rear panel to aid heat dissipation.

Coming Next Month

Constructional and board details will be given next month.

Letters

TELETEXT DECODING ERRORS

Recent correspondence on teletext decoding errors led me to look back at the results of my research in 1978 into the effects of teletext on TV receiver design. I find that I experienced similar data errors on first acquisition of a page, often page 100 and often on BBC-1 (ch. 50). XM11 decoders were more prone to the problem than the XM12 or VDP12 (Prestel set) or an early Mullard decoder. I also noted that excessive signal strength could produce as many errors and reduced eye-heights as an inadequate signal. Use of a u.h.f. attenuator showed that for zero errors and best eye-height the optimum input signal level was around 1-1.5mV. Increasing the signal to 3.5mV produced almost the same results as reducing the signal to 600 μ V.

At first different effects were experienced on all channels. This was found to be due to the fact that the signals were arriving from different beam headings despite originating from the same transmitter site only fifteen miles away. Signal refraction or perhaps tree effects were assumed to be the cause. This effect makes it difficult to optimise a fixed beam heading, particularly when trying to cover chs. 50-66.

The large-signal errors suggested receiver overloading. The problem was investigated using three different makes of receiver, all with forward a.g.c. It was found that the -6dB i.f. response (skew symmetry point) drifted by almost 500kHz as the input signal level varied over the range 600 μ V to 3.5mV. The cause of this was taken to be the variable damping effect of the i.f. amplifier transistors on their tuned load circuits as the a.g.c. action varied the collector currents. Applying the full input signal to the receivers via a 6dB line attenuator improved the position considerably.

I've often thought I should repeat this exercise with modern receivers that use i.c. i.f. amplifiers and SAW filters to see if anything has changed, but to date time has defeated me. I hope someone may find these observations of help.

*Geoff Lewis,
Canterbury, Kent.*

TELETEXT SERVICES

L.D. Sears made some very pertinent points on the Ceefax/Oracle services in his letter in the October issue. After reading it I reached for my handset and started to think about them. Having selected BBC-2 I called up page 150 and lo and behold the newsflash appeared. It seems that the BBC has taken notice and that here in London at any rate we now have a standard page for the newsflash. It seems inept however that after clearing the page by way of the update mode it still appears from time to time with the same information.

Ceefax access times can be extremely slow, particularly in the early morning. On certain pages, i.e. 100, 102, 150 and 300, the BBC has attempted to improve the access time. But the average time for any other page is still around 15.2 seconds, with a maximum of anything up to 25 seconds, compared to Oracle's 6.5 seconds. The time was checked by selecting BBC-2 page 700 and ITV page 170 twenty times. Access time obviously depends on the amount of information being broadcast at any time but

should surely remain constant regardless of the time of day.

Oracle is another story – how I wish I was one of the exclusive 26 “eagle eyes”! I'd give 'em hell! Did Oracle check whether those people actually knew how to use the system? In view of the poor service, the computers at Oracle should be allowed to update daily information automatically rather than relying on human fallibility.

On one of my regular hunts around Oracle I discovered a page which is not advertised and is updated on the minute – page 298. This mystified me so I phoned IBA Engineering Information who were extremely helpful but didn't know what the page contained. They suggested I phone Oracle but the only reply I got was that it was “none of my business”. A fine public relations exercise for an information service! I should also like to know about another page, 296. Any ideas? Page 298 appears to contain information on all the ITV regions.

*Stephen Walker,
Orpington, Kent.*

FERGUSON 3787/NORDMENDE 8180

Here's another fault I've come across recently on one of these sets (see servicing article in the October issue). The symptom was an apparently blank but dim raster with just a bit of picture at the top of the screen. Closer examination revealed that this bit (about half an inch) was actually the bottom of the field. The height and linearity controls had some effect, as did the field hold control, but the picture stayed off-screen. A study of the circuit diagram provided the answer: if the field scan coupling capacitor CM30 (1,000 μ F) goes short-circuit the output will sit on a 10.5V bias which will shift the picture off the screen! This turned out to be the cause, a new electrolytic restoring normal results.

*Colin Boggis,
Woking, Surrey.*

UNUSUAL HUM PROBLEM

I was most interested in Mr. Sparks' hum problem with a set using the Rank A823 chassis. It's likely that there was a loose connection somewhere in the ring main (the ring was also broken at one point). The power supply in the offending G8 takes its current in huge “gulps” on every positive half cycle of the mains supply. This would modulate the supply to some of the sockets, probably in the form of a regular “kink” in the waveform. Closing the break in the ring would bypass the loose connection – it would be a good idea as a safety precaution to remove each socket in turn and check its connections to the ring main.

The fact that the hum bar could be made to come and go on a portable TV set by moving it is puzzling. If the set was used with its integral aerial the varying signal strength may have been affecting the set's immunity to mains hum via the action of the a.g.c. system.

*S. Pearson,
Chipping Norton, Oxon.*

DEFECTIVE RING MAIN

Here's a possible explanation for J. C. Sparks' problem (October) of magnetically induced hum caused by a Philips G8 set via the mains wiring. As the ring main was not complete, with probably only the live or neutral wire looping round to complete the ring on one side and both live and neutral connected to the other side (see Fig. 1), a

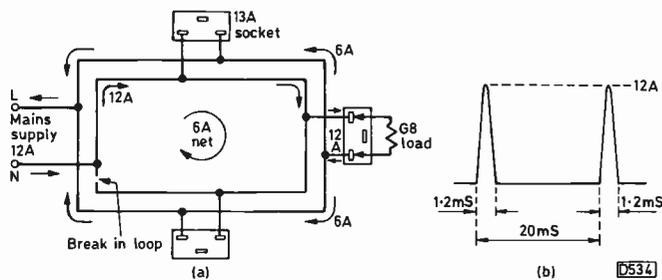


Fig. 1: Ring main with break at one side (a), G8 mains current consumption (b).

net current would flow around the ring main circuit. In the Philips G8 this current is drawn as 12.5A unidirectional spikes with a duration of about 1.2msec, repeated every 20msec. This would cause a pulsating 50Hz magnetic field to be radiated by the faulty house wiring, with hum induced in nearby TV sets. It's not surprising that the electricity supply industry dislikes thyristor power supplies of the type used in the G8.

Inserting an 0.47Ω resistor in the neutral wire will enable the current drawn to be measured. Use a scope to monitor the voltage drop across this resistor. You'll get a reading of about 6V peak drop, which is equal to a peak current of 12.76A.

M. J. Edis, GARP, Broughton, Northants.

FAULTY MAINS SUPPLY

Mr. Sparks' letter (October) on an unusual hum problem reminded me of a struggle I had with a G8 one Saturday morning a few years ago. The symptom was a small, pulsating picture. All the usual checks – except for one vital test! – were made on the power supply to no avail. Even a replacement panel produced the same results. A great deal of time was wasted on various receiver checks.

By chance a small boy was helping out with the housework. He plugged a vacuum cleaner into the mains socket across the room and switched on. The TV fault then cleared! I asked him to switch off for a moment – and the fault returned! A check on the mains supply revealed that it was fluctuating wildly between 150-240V. Moral: always make sure that the mains input is up to standard.

Malcolm Burrell, Maldon, Essex.

TEST CARD TRANSMISSIONS

I've been following the correspondence in recent issues on the lack of satisfactory test card transmissions by the BBC. On the suggestion of Keith Hamer I wrote a letter of protest to the Head of BBC Presentation and would urge other dealers who, like myself, are frustrated by the day in, day out waste of air time devoted to teletext information to do the same. More pressure should be brought to bear to produce at least a 50/50 split of air time between teletext information and the test card.

The point to emphasize is simple. The BBC wants the viewing public to enjoy its programmes, and for many years the TV trade has struggled to do its best to assist in this respect. Why shouldn't the broadcasters assist us in endeavouring to maintain the high standards of television performance that have always been associated with the UK? Surely after ten years most people in this country know about teletext and what it has to offer?

I also agree with Keith Hamer that the music standard

has fallen – particularly in the last few years.

I do hope that something will be done about this, and should mention that I wrote to the BBC in the early seventies when the hours of test card transmissions were cut. Let's hope we see some results from the current campaign.

C. J. Churcher, C & S Electronics, Gosport, Hants.

PANASONIC TC202G

With reference to J. K. Potts' problem of teletext lines on the Panasonic TC202G (letters, October), we've had similar difficulties with a number of these sets. The cause has in each case been deterioration of C412 ($3.3\mu\text{F}$), sometimes to such an extent that the body of the capacitor can be plucked from the board.

If channel eight instead of channel one is present at switch on C53 has probably dried up – it's on the front control panel.

When working on this chassis it's worth resoldering all the line output transformer pins.

Ray Dunleavy, Raphoe, Co. Donegal.

SERVICING SCENE

Here are a few recent incidents that might be of interest to others. A VCR came in with a fairly straightforward tuner fault. On playing a test tape however there was a regular band of noise every six seconds or so. It looked vaguely like a capstan servo fault, but switching to record showed that it was also present in E-E. No source of interference could be found either inside or outside the workshop, but while driving home along the seafront that evening the cause suddenly became clear. Next morning the shipping forecast improved and the oil tanker left – taking its radar with it.

A customer reported that his Sanyo VTC5300 VCR worked well but wouldn't make timed recordings. Since he'd just acquired the machine we confidently asked him to pop round so that we could show him how to set the timer. Surprise, surprise: the machine stopped after about two seconds, as if the reel rotation sensor was faulty, though non-timer recordings were faultless. As we'd a second machine in the workshop we swapped the timer panel complete, but the fault remained. Sanyo were consulted but couldn't suggest anything. We eventually found that replacing the tape counter/reel sensor panel cured the fault, which turned out to be due to a low-strength magnet giving a reduced output from the magnetoresistive element – but why did it affect only timed recordings?

Finally, if you think you have trouble with nutty customers, just listen to this! On calling to install a colour set I carefully placed it on its side to fit the stand.

"That's not the set I asked for" she squawked.

"Which one did you ask for?" I enquired, checking that the model number on the set was the same as that on the job sheet.

"The one I wanted had a wider picture than that one."

Trying hard to keep a straight face I picked up the set, still on its side, took it out to the van, turned it upright and brought it back in.

"Yes, that's the one I ordered" she said.

Beat that one Les!

Phil Ireland, Servatron Ltd., Paignton, Devon.

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THORN TX10 CHASSIS

The picture tears horizontally when the brightness is increased (similar to the effect of a faulty tripler). With the brightness and contrast control settings kept almost at minimum there's no tearing. The focus unit and the chopper/e.h.t. transformer have been replaced and the h.t. is correct. Any ideas?

This symptom is often caused by faulty capacitors in the power supply. Check, preferably by substitution, C729 (100 μ F), C802 (100 μ F), C804 (1 μ F) and C807 (47 μ F), also the value of R813 (120k Ω) which provides the error feedback.

SANYO VTC5300

The function controls on the front panel have no effect. When power is applied the head rotates at a constant speed. A cassette is loaded but the tape drive motor doesn't work - the only operational parts are the clock and programme selector buttons.

A very common cause of this problem is incomplete delacing, i.e. the loading ring has not fully retracted - prove this by turning the ring fully by hand. If no belts are broken, failure of the loading belt and loading roller are usually responsible.

SONY KV2704UB

At switch on, using the receiver's on/off switch, the channel light comes on until the switch is released but the set doesn't always power up. In fact the switch has to be depressed three-four times, with an interval between, before everything comes on. Once powered up the set usually behaves perfectly except on very rare occasions when the sound and vision cut out then on again immediately.

At switch on the power supply comes into operation and the momentary contact in the mains switch (wires 66 and 67) resets the remote control chip IC001 (M58485P)

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to "on" and "ch. 1" by applying a pulse to pin 1. Check that the pulse is present at switch on and that the chip immediately receives its 12V supply at pin 14. If so check the "standby" line at pin 20 of the chip and its routing via Q001 to switching transistor Q804 on board D.

ITT VC200 CHASSIS

The problem with this old monochrome set is faint vertical pillars of shading across the screen, gradually decreasing in intensity from left to right. The pillars number about six and are each about an inch wide. We've tried the official modifications of transistor change and emitter resistor value increase in the video output stage without success.

First make sure that the line linearity coil damping resistor R162 is correct in value (1.5k Ω) and that the line output valve's screen grid decoupling capacitor C136 is present and correct. Check C64 (100 μ F) in the a.g.c. circuit, then D11/R167/R164/C139 - ringing waveforms can sometimes reach the tube's cathode via this blanking circuit (disconnect the coupling capacitor C139 as a check or use a scope). If six times line rate ripple cannot be monitored at the c.r.t.'s electrodes velocity modulation of the scanning beam is possible. This is a ringing effect on the scan current and could even be due to the line output transformer itself.

FERGUSON 3V23

There are display faults on this machine. When it's in the off position only the word clock is shown. When it's switched on only the word clock and the channel number are shown. The machine records and plays back all right but there's no counter available on the display. I've tried the wet finger test along the display connections and they glow at random. In addition the cassette won't eject fully.

The display fault is commonly due to failure of either or both of the ceramic filters CF1 and CF2 on the tuner/timer control board (not the upper panel connected to the display itself). The modified and improved filters should be ordered (part no. 01X0-033-974, two off). At the same time change R13 to 560k Ω , C1 to 120pF, C2 to 470pF and C3 to 120pF. Roughening the surface of the cassette rollers will usually cure the poor eject operation.

PHILIPS G11 CHASSIS

The problem with this set is a loud pop from the speaker. It usually occurs only once, at different times after switching on, and there is no effect on the picture.

This sort of thing is often caused by bad joints on the legs of the audio output transistors Tr5048 and Tr5052. Check all the joints in this area. If the trouble persists change these two BD131 devices, also the speaker coupling capacitor C5055 (150 μ F).

ITT CVC20 CHASSIS

The problem with this set is a very annoying buzz or hum that seems to vary according to whether the chassis is hinged up or down. The noise is much worse with the chassis in its up position. I understand that the i.f. panel's top fixing screw can cause an earth loop and should be insulated from the print. Doing this decreased the buzz a bit but it's still far too prominent - sometimes almost unbearable. I'm told that the chassis is particularly prone to this problem.

This chassis does suffer from buzz which is due to field-

rate radiation from the scan yoke into the i.f./audio department. Unfortunately little can be done about it. All depends on the level of buzz. If this is really excessive it's likely that some other fault is present. Check that the quadrature coil L312 is correctly adjusted and the integrity of capacitors C333 (4.7 μ F) and C331 (100 μ F) associated with the intercarrier sound chip. If necessary try a substitute i.f. module.

TEST CASE

288

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

The modern TV technician is expected to be able to deal with much more than just TV sets! VCRs, cameras, disc players and even audio equipment are all likely to come his way. So by way of a change this month we've got a camera conundrum for you. Not too sophisticated a camera, and not such a complex fault that it would be necessary to consult the service manual to arrive at the solution. The camera was a Sharp XC30, a very basic (and not too new) camera with none of the "bells and whistles" fitted to expensive, modern cameras. The XC30 has a 2:1 zoom lens and a fixed-focus optical system. No monitor tube either – the viewfinder is of the optical through-the-lens type. The reported fault was "no picture". Could anyone ask for an easier introduction to camera servicing?

The camera was powered up on the bench and tested via its partnering Sharp VCR. What we found was that the sound channel worked fine and that the camera produced sync pulses and a burst. A locked, clean raster was displayed on the monitor. It was virtually free of noise and shading, though a small amount of colour shading was visible with the monitor's colour control turned up fully – similar (but "noisier") to the effect on a white raster of slight impurity in a TV tube.

The camera's covers were off in almost no time. A close examination of the works (we've found that many camera faults are due to physical defects and impact damage) failed to reveal anything obvious. Time to start with the multimeter then. Our first theory was that the vidicon's heater was out. But the heater was seen to be glowing – if you turned out the workshop lights and peered from just the right angle. Theory number two was that the line timebase had failed, robbing the vidicon of its operating voltages – as in a TV set these are all derived from the line output transformer. The most accessible points – the deflection panel terminations of the vidicon's connecting leads – were found and checked: all voltages, from -40V to 1.6kV, were present. The field timebase's output was next monitored, in case a scan-failure blanking circuit was

in operation, but the field scan coil was passing the correct current.

Finally we turned to the signal circuits. Using the oscilloscope and working upstream from the camera's video output socket we found that the correct sync pulses, black level and burst were present at the final stage but that there was virtually nothing at the preceding luminance amplifiers. The circuitry here is in discrete component form on a double-sided PCB – with a welcome absence of surface-mounted devices. Moving back we found that there was no output from the signal preamplifier.

Time for a coffee break! The hot brown stuff stimulated our thoughts, and on resuming the battle two important checks were made. Was the iris closed? No, its motor could be heard rumbling as driver transistor Q401 was turned on and off by artificial means. Was the target voltage present? There was plenty of voltage at the entry point to the preamplifier board. So it was next into the preamplifier. This is in a screened box that's strapped to the tube's neck. With the top cover removed and the camera running the expected instability didn't occur. We were even able to put a test prod on the series coil between the target and the preamplifier's input. There was zero target voltage at either end of the coil. Some disturbance was visible on the monitor's screen when the prod was touched on the inner (preamplifier) end of the coil but absolutely none (surprise!) when the prod was touched on the camera output (target) end. What was the trouble? Normal picture will be resumed next month . . .

ANSWER TO TEST CASE 287 – page 48 last month –

The Rediffusion Mk. 3 chassis that was featured in last month's test case has a thyristor line output stage and a reverse-current thyristor regulator arrangement. The symptoms indicated that the regulation circuit wasn't operating, and this was proved by running the set via a variac. At about 60 per cent of normal mains voltage the set would work, though an excessive degree of picture "breathing" was evident.

The circuits that generate the trigger pulse for the regulating thyristor were found to be working normally. What was significant however was the fuzziness of the scope trace at the gate of the thyristor. When the scope's sweep rate was reduced to 10ms/div it could be seen that a great deal of 100Hz hum ripple was present. The same waveform – a mixture of line-rate pulses and 100Hz ripple – was also present at the thyristor's cathode. This was why the thyristor was not being triggered: with identical pulses at its gate and cathode no gate current was flowing. The normal route for the thyristor's triggering current is via the h.t. smoothing capacitor 6C15 (220 μ F), 6R1C (2.7 Ω) and the device's cathode-gate junction. The problem was that 6C15 was virtually open-circuit, which accounted for the high 100Hz ripple as well as the lack of regulating action. A replacement electrolytic – and a new resistor in the slow-start circuit (6R3, 10k Ω) since this overheats when the regulator fails – put matters to rights.

Published on approximately the 22nd of each month by IPC Magazines Limited, King's Reach Tower, Stamford Street, London SE1 9LS. Filmsetting by Trutape Setting Systems, 220-228 Northdown Road, Margate, Kent. Printed in England by the The Riverside Press Ltd., Thanet Way Whitstable, Kent. Sole Agents for Australia and New Zealand – Gordon and Gotch (A/sia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions: Inland £14, overseas (surface mail) £17 per annum, payable to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH. "Television" is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever. ISSN 0032-647X.

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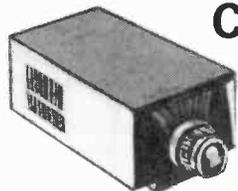
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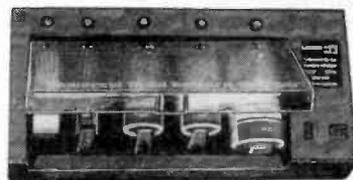
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LINEOUT TRANSFORMERS		4666 ELC 104306 EXCH TUNER		6.00		5127 PHILIPS G8 CHASSIS		6.00	
3520	DECCA 100	7.95	4665 ELC 104308 NEW TUNER	6.25	2965 DEC 1401 CHOPPER TX	16.55	5126 PHILIPS G8 CHASSIS	6.00	5852 TV23 GUIDE ROLLER ASSY
3601	DECCA 110	9.80	4972 ELC 2003 EXCH TUNER	12.50	2964 DEC 1401 INPUT CHDKE	9.63	5135 PHILIPS KT3 SERV.	5.00	5856 TV23 CONNET HOOK TYRE
3604	DECCA 1730/1830	11.00	5534 GEC 2100 TYPE REPAIR CHGE	10.25	5531 GEC 1501 MAINS TX	5.25	5135 PHILIPS TR-E	2.00	5862 TV23 PINCH ROLLER ARM AS
3599	DECCA 80	7.90	4675 PHILIPS G8 EXCHANGE TUNER	7.25	4758 GEC 2100 3R SH+V SLDERS	1.26	5136 PVE 725 73R GER	2.00	5869 TV23 REEL MOTOR ASSY
3722	DECCA MS1700-2420	18.13	4679 RRI RANGER12 EXCH TUNER	9.75	4759 GEC 2100 SH2 ZV CAPS	2.45	5143 PVE 725 73R GER	2.00	5879 TV23 TU REEL DISK ASSY
3723	FIDELITY FTV12/FTV120	9.90	4680 RRI R120 NEW TUNER	12.40	2959 GEC 2100 ETC FOCUS VDR	1.90	5146 REDIFFUSION MK1	3.00	5880 TV23 TAP UP REEL ASSY
3728	FIDELITY ZX2000/2000	15.20	4678 RRI RANGER23 NEW TUNER	13.15	2958 GEC 2100 THICK FILM CUT OUT	0.57	5146 REDIFFUSION MK3	3.00	5882 TV23 UPPER DRUM ASSY
3708	FIDELITY ZX2000/3000	14.50	4688 U321 EXCH TUNER	6.50	4760 GEC 2100 FOCUS CONTROL	1.00	5147 REDIFFUSION MK4	5.00	5885 TV23 WORM GEAR SPROCKET
3731	GEC 2100/2040	5.50	4667 U321 TUNER NEW	6.25	4771 GEC 2110 LUM. DELAY LINE	1.83	5148 REDIFFUSION MK5	4.00	5886 TV23 WORM GEAR SPROCKET
3732	GEC 2104	3.50	4670 U322 EXCHANGE TUNER	6.50	4728 GEC 2110 MAINS CHOKE	0.50	5187 THORN 1500	1.00	5888 TV24 BRAKE SHOE
3734	GEC 3133	3.60	4669 U322 NEW TUNER	7.95	4796 GEC 2110 NEONS	0.20	5198 THORN 1600	1.50	5896 TV24 CASSETTE LAMP
3733	GEC M1201/M1501H	13.25	4673 U323 EXCHANGE TUNER	7.25	4551 GEC 2114 VOL+SWITCH CONT	1.00	5171 THORN 1815	3.00	5898 TV24 WORM GEAR SPROCKET
3814	GRUNDIG 5010R101D/ETC	12.95			4656 GEC 22K MILLI TURN POT	0.90	5172 THORN 1830-1631	5.00	5902 TV24 FERASE HEAD ASSY
3755	INDESIT 24E6B	11.25	VALVES			0.75	5184 THORN 38030	2.00	5908 TV24 LOADING GEAR ASSY
3617	ITT CV330	8.75	3883 DY920 VALVE	1.45		5187 THORN 3V01	12.00	5909 TV24 LOADING MOTOR	
3618	ITT CV35	9.75	3832 PCF802 VALVE	1.00	GRINDING SPARES			12.00	5912 TV24 PINCH RFLR LVYR ASSY
3615	ITT CV45-8	10.25	3835 PCL82 VALVE	1.00	2949 GRUNDIG 5010 FOCUS VDR	3.35	5188 THORN 3V16	6.00	5920 TV24 SERVICE MANUAL
3620	KORTING A21100 30" HYBRID	14.85	3836 PCL84 VALVE	0.85	4633 GRUNDIG 5010 CONTROL TX	4.76	5178 THORN 3000	5.00	5912 TV24 SERVICE MANUAL
4538	PHILIPS E2 CHASS	10.00	3837 PCL86 VALVE	0.85	2948 GRUNDIG 5010 L515 CHOKE	3.75	5192 THORN 3805	10.00	5946 TV29/30 BRAKE SHOE
2862	PHILIPS G9	10.95	3940 PR230 VALVE	1.20	4635 GRUNDIG 5010R100 LID	2.52	5190 THORN 3V01	1.65	5961 TV29/30 CAPSTAN BELT
5305	PVE 691 WIRED	5.80	3943 PL504 VALVE	1.50	4745 GRUNDIG 5011 LID	1.50	5189 THORN 3V16	36.00	5952 TV29/30 CAPSTAN MOTOR ASSY
3628	PVE 725 90"	14.65	3944 PL508 VALVE	2.06	4637 GRUNDIG 5011 SH+SLDERS	2.20	5189 THORN 3V01	1.05	5957 TV29/30 CASSETTE LAMP
3629	PVE 731 110"	12.28	3945 PL509 VALVE	6.25	2952 GRUNDIG 6010 MIXIE MOO	13.28	5189 THORN 3V01	1.05	5962 TV29/30 EJECT LCK ARM
3632	RANK A823	5.50	3946 PL519	5.56	3500 GRUNDIG 6011 MAINS SH	3.60	5189 THORN 3V01	6.00	5974 TV29/30 LEAD MOTOR
3634	RANK T16	13.95	4670 PL802 VALVE	1.25	4631 GRUNDIG 6011 MAINS SH	4.88	5189 THORN 3V01	78.72	5976 TV29/30 LOCH DRUM ASSY
3635	RANK T20A	12.95	3950 PYS90A VALVE	2.25	2947 GRUNDIG A6400 MAINS SH	4.85	5189 THORN 3V01	8.06	5980 TV29/30 PINCH RLLR ASSY
3726	RANK T26A	15.90	3951 PY901 VALVE	0.95			5189 THORN 3V01	18.15	5981 TV29/30 PINCH RLLR SLNO
3637	RANK T27A	11.25			PLEASE STATE MODEL NUMBER				
3639	RANK T210 22"	21.75	THORN SPARES			9.00	4301 DECCA 100 NONTXTC RCU	21.50	5982 TV29/30 REEL MTR ASSY
3770	REDIFUSION MK1 CHAS	28.80	2887 T1600 MAINS TRANSFORMER	7.50	4311 DECCA 100 NONTXTC RCU	7.54	4314 DECCA 80/100 SERIES RCU	22.50	5983 TV29/30 REEL MTR ASSY
3771	REDIFUSION MK3 CHAS	15.50	4300 T1600 MAINS TX UNIT	7.92	4312 DECCA 80/100 SERIES RCU	9.00	4315 DECCA 90/100 N/TXTC RCU	28.70	5984 TV29/30 TAKE UP CLUTCH
3775	SANDY CPT501	18.90	4590 T1600 MAINS TX	3.99	4324 GEC 2100 N/TXTC RCU	3.99	4324 GEC 2100 N/TXTC RCU	20.25	5985 TV29/30 TAKE UP CLUTCH
3643	THORN 1400 SERIES	5.85	5430 T1600 MAINS TRANSFORMER	9.00	4325 GEC C2057H/2087H RCU	21.43	4326 GEC TELEMASTER 12 RCU	20.43	5986 TV29/30 TAKE UP CLUTCH
3644	THORN 1500 20"	5.95	4973 T1600 SLOW MOT. TUN. POT	1.00	4326 GEC TELEMASTER 12 RCU	20.43	4327 KORTING 2 CHANNEL RCU	22.50	5987 TV29/30 TAKE UP CLUTCH
3645	THORN 1500 24"	5.95	2936 T3000/3500 A1 SWITCH	4.25	4327 KORTING 2 CHANNEL RCU	22.50	4328 GEC TELEMASTER 8 RCU	20.43	5988 TV29/30 TAKE UP CLUTCH
3646	THORN 1500 SERIES	10.05	2934 T3000/3500 METAL CUT OUT	2.34	4328 GEC TELEMASTER 8 RCU	20.43	4329 GRUNDIG TELEPILOT 12 RCU	25.85	5989 TV29/30 TAKE UP CLUTCH
3647	THORN 1810 SERIES	10.20	2930 T3000/3500 METAL CUT OUT	2.34	4329 GRUNDIG TELEPILOT 12 RCU	25.85	4330 GRUNDIG TELEPILOT 16 RCU	24.85	5990 TV29/30 TAKE UP CLUTCH
3648	THORN 1815 SERIES	8.95	4587 T3500 100R CONVERG POT	0.85	4330 GRUNDIG TELEPILOT 16 RCU	24.85	4331 GRUNDIG TELEPILOT 7	20.43	5991 TV29/30 TAKE UP CLUTCH
3649	THORN 1850/91 SERIES	10.50	3277 T3500 200R CONVERG POT	0.56	4331 GRUNDIG TELEPILOT 7	20.43	4332 GRUNDIG TELEPILOT 7	20.43	5992 TV29/30 TAKE UP CLUTCH
3713	THORN 1790	8.95	3278 T3500 500R CONVERG POT	0.56	4332 GRUNDIG TELEPILOT 7	20.43	4333 GRUNDIG TELEPILOT 7	20.43	5993 TV29/30 TAKE UP CLUTCH
3714	THORN 3787	15.23	4585 T3500 500R CONVERG POT	0.85	4333 GRUNDIG TELEPILOT 7	20.43	4334 GRUNDIG TELEPILOT 8 RCU	20.43	5994 TV29/30 TAKE UP CLUTCH
3652	THORN 3K 3K5 EHT TX	7.90	2935 T3500 500R CONVERG POT	1.17	4334 GRUNDIG TELEPILOT 8 RCU	20.43	4335 PHILIPS G11 2 FJUNC RCU	18.95	5995 TV29/30 TAKE UP CLUTCH
3651	THORN 3K	8.95	4589 T3500 SPARK GAP 1/500	0.51	4335 PHILIPS G11 2 FJUNC RCU	18.95	4336 KORTING 16 CHANNEL RCU	21.85	5996 TV29/30 TAKE UP CLUTCH
6172	PHILIPS G8 SPECIAL	7.90	2907 T3500 THICK FILM VOLT LOAD	1.35	4336 KORTING 16 CHANNEL RCU	21.85	4337 PHILIPS G11 T/EXT BCU RCU	7.60	5997 TV29/30 TAKE UP CLUTCH
2868	PHILIPS G8 SPECIAL	10.95	4563 T3800 MAINS ON/OFF SW.	3.10	4337 PHILIPS G11 T/EXT BCU RCU	7.60	4338 PHILIPS G11 T/EXT BCU RCU	2.10	5998 TV29/30 TAKE UP CLUTCH
EHT TRAYS				4412 T4000 FOCUS CONTROL UNIT	2.10	5403 PHILIPS G11 T/EXT BCU RCU	2.10	4339 PHILIPS G11 T/EXT BCU RCU	17.45
5403	BG1895-641	7.50	3273 T6018 220K BRIGHT CTRL	2.10	5403 PHILIPS G11 T/EXT BCU RCU	2.10	4340 PHILIPS G11 T/EXT BCU RCU	17.45	
5400	BG1897-642	7.50	2889 T8500 FOCUS CONTROL UNIT	1.75	5403 PHILIPS G11 T/EXT BCU RCU	2.10	4341 PHILIPS G11 T/EXT BCU RCU	17.45	
5404	BG2097-642/333	7.50	2911 T8500 MAINS CHOKE	17.45	5403 PHILIPS G11 T/EXT BCU RCU	2.10	4342 PHILIPS G11 T/EXT BCU RCU	17.45	
3663	DECCA 100	7.25	4415 T8500 MAINS TX	12.75	4342 PHILIPS G11 T/EXT BCU RCU	17.45	4343 PHILIPS G11 T/EXT BCU RCU	17.45	
3665	DECCA 1830	3.50	2910 T8500 PLASTIC CUT OUT	3.72	4343 PHILIPS G11 T/EXT BCU RCU	17.45	4344 PHILIPS G11 T/EXT BCU RCU	17.45	
3662	DECCA 80	3.50	2918 T9000 FOCUS UNIT	4.95	4344 PHILIPS G11 T/EXT BCU RCU	17.45	4345 PHILIPS G11 T/EXT BCU RCU	17.45	
3667	GEC 1028/CS108	3.50	4556 T9000 FRI THICK FILM	1.65	4345 PHILIPS G11 T/EXT BCU RCU	17.45	4346 PHILIPS G11 T/EXT BCU RCU	17.45	
3677	ITT CV345	7.95	2919 T9000 OVER VOLT THICK FILM	1.17	4346 PHILIPS G11 T/EXT BCU RCU	17.45	4347 PHILIPS G11 T/EXT BCU RCU	17.45	
3675	ITT CV35	9.50	4555 T9000 T701 CHOPPER TX	13.75	4347 PHILIPS G11 T/EXT BCU RCU	17.45	4348 PHILIPS G11 T/EXT BCU RCU	17.45	
3678	KORTING HYBRID	7.95	4982 T9600 33K 2KV CAP	2.30	4348 PHILIPS G11 T/EXT BCU RCU	17.45	4349 PHILIPS G11 T/EXT BCU RCU	17.45	
3679	PHILIPS 520 G8	6.90	2914 T9600 CHOPPER TX T512	0.11	4349 PHILIPS G11 T/EXT BCU RCU	17.45	4350 PHILIPS G11 T/EXT BCU RCU	17.45	
3684	PHILIPS 570 (5 LEAD)	4.50	2916 T9600 FOCUS UNIT	2.95	4350 PHILIPS G11 T/EXT BCU RCU	17.45	4351 PHILIPS G11 T/EXT BCU RCU	17.45	
3684	PHILIPS G9	4.00	2913 T9600 SWITCH MOOEE TX T511	5.95	4351 PHILIPS G11 T/EXT BCU RCU	17.45	4352 PHILIPS G11 T/EXT BCU RCU	17.45	
3685	PHILIPS KT3	6.95	4429 T9800 MAINS CHOKE	11.03	4352 PHILIPS G11 T/EXT BCU RCU	17.45	4353 PHILIPS G11 T/EXT BCU RCU	17.45	
3686	PVE 691/697	6.95	4427 TX10 0022 ZK	0.25	4353 PHILIPS G11 T/EXT BCU RCU	17.45	4354 PHILIPS G11 T/EXT BCU RCU	17.45	
3688	PVE 725/731/741	8.50	4658 TX10 100K TUNING POT	0.64	4354 PHILIPS G11 T/EXT BCU RCU	17.45	4355 PHILIPS G11 T/EXT BCU RCU	17.45	
5395	SEIMANS TVK180/6	9.50	2938 TX10 CHOPPER DRIVER TX	3.27	4355 PHILIPS G11 T/EXT BCU RCU	17.45	4356 PHILIPS G11 T/EXT BCU RCU	17.45	
5393	SEIMANS TVK52	8.50	5427 TX10 SW NONTXTC CONT.	2.32	4356 PHILIPS G11 T/EXT BCU RCU	17.45	4357 PHILIPS G11 T/EXT BCU RCU	17.45	
4686	SEIMANS TVK196/17	11.95	2922 TX10 SW NONTXTC CONT.	2.32	4357 PHILIPS G11 T/EXT BCU RCU	17.45	4358 PHILIPS G11 T/EXT BCU RCU	17.45	
5406	TCE 1400 LARGE SCRNB	4.95	4859 TX9 4R 150 R/SPEAKER	6.95	2970 6 WAY T3500	2.75	4907 PHILIPS KT4 THICK FILM UNIT	14.95	
5408	TCE 1500 23"82X4	5.05	2973 TX9 INPUT CHOKE L65	12.05	2978 6 WAY PVE 713	15.75	4564 PHILIPS KT3 MAINS SWITCH	12.95	
3690	TCE 1600 SERIES	4.95	2936 TX9 L64 BILUFAR CHOKE	4.25	2882 4 WAY T3500	7.25	4564 PHILIPS KT3 MAINS SWITCH	12.95	
3700	TCE 1900	4.50			2882 4 WAY T3500	7.25	4564 PHILIPS KT3 MAINS SWITCH	12.95	
3703	TCE 3000	7.85	DECCA SPARES			10.83	2982 PVE 189 4LINE OSCIL	0.90	
3699	TCE3000/3500	7.75	4616 DECCA 100 001 2KV CAP	0.90	2884 6 WAY MOO CV35	12.85	4839 PVE 313 3K3 50W RESISTOR	5.25	
3706	TV11 EHT STICK	7.00	2933 DECCA 100 BEOIGE TX	2.35	2886 6 WAY PHILIPS 550	21.25	4839 PVE 313 3K3 50W RESISTOR	5.25	
3709	TV20 EHT STICK	0.95	2932 DECCA 100 FOCUS CONTROL	2.77	2888 6 WAY PHILIPS 550	21.25	4839 PVE 313 3K3 50W RESISTOR	5.25	
5275	TV28 EHT STICK	0.95	4615 DECCA 100 LINE DRIVE TX	2.15	2887 1TP SWITCH UNIT PHILIPS G11	27.50	4839 PVE 313 3K3 50W RESISTOR	5.25	
3705	UNIVERSAL EHT TRAY U.K.	4.95	2928 DECCA 100SER 470K SH+VOL	2.15	2888 6 WAY PHILIPS G11	27.50	4839 PVE 313 3K3 50W RESISTOR	5.25	
TV ELECTROLYTICS				4603 DECCA 2200 10R FUSIBLE	0.70	2889 PIANO KEY MOO DECCA 2631	22.40	4839 PVE 313 3K3 50W RESISTOR	5.25
3547	DECCA 1030 400K/250V	2.80	2930 DECCA 2233 PSH PSH SH	5.14	4835 7 WAY ITT CV35	12.90	4839 PVE 313 3K3 50W RESISTOR	5.25	
4949	DECCA 100 400-800 350/250V	4.95	2929 DECCA 30 SER 399 RESIS.	4.20	5278 6 WAY T3500	12.90	4839 PVE 313 3K3 50W RESISTOR	5.25	
5346	DECCA 80/100CHAS 300 300V	2.90	2929 DECCA 30 SER 47K SH+VOL	12.25	5279 ITT 6 WAY +VCR	10.70	4839 PVE 313 3K3 50W RESISTOR	5.25	
3504	FIDELITY ZX2000 330 300V	4.95	2939 DECCA 80 470R SH+VOL	2.45	5280 6 WAY BUSH T20	13.81	4839 PVE 313 3K3 50W RESISTOR	5.25	
3503	FIDELITY ZX3000 220 385V	3.90			THORN VIDEO SPARES (OVER 450 PARTS)				
3507	ITT CV28/RR1 T20 220/400V	1.20	RESISTORS			2972 ITT CP240 PB ASSY	32.90	5622 TV32 BOOSTER	46.62
3556	ITT CV325 200K2+25+75ETC	3.25	CARBON			2973 ITT CP240 SLOER ASSY	1.50	5662 TV32 CAPSTAN MOTOR	51.16
3550	PHILIPS G11 470U/250V	1.70	STANDARD RANGES			4683 ITT CV40 FOCUS UNIT	1.95	5662 TV32 CAPSTAN MOTOR	4.10
3559	PHILIPS G8 2200/63V	1.55	1/4 WATT X 10	0.25	5543 ITT CV20 LINE ORIVE TX	3.85	5662 TV32 CASSETTE LAMP	1.00	
3554	PHILIPS KT3 200+25/2385V	2.65	1/2 WATT X 10	0.29	4787 ITT CV20S 6N2 2KV CAPS	1.35	5662 TV32 CASSETTE LAMP	1.00	
3551	PHILIPS G8/SEC 210 600/300V	3.16	2 WATT X 10	0.45	4786 ITT CV25 8A2 2KV CAPS	2.15	566		

AA117	9p	BC37	6p	BF184	20p	BFV57	25p	TP32A	24p	2N1131	28p	BY296	20p	7818	35p	PCL805	55p	LA-4461	180p	TBA560	100p	74LS22	17p
AA119	9p	BC38	6p	BF185	20p	BFV64	25p	TP32C	24p	2N1132	28p	BY298	20p	7824	35p	PFL200	55p	LA-5112	120p	TBA750	100p	74LS24	38p
AA120	9p	BC39	6p	BF186	20p	BFV69	25p	TP33	24p	2N1133	28p	BY299	20p	7936	35p	PFL200	55p	LA-5112	120p	TBA800	100p	74LS26	38p
AC107	28p	BC57	6p	BF195	5p	BL446	85p	TP34	50p	2N1711	24p	BY476	50p	7912	40p	PLB2	45p	LM311	35p	TBA8105	60p	74LS27	17p
AC126	17p	BCY3	150p	BF196	6p	BL449	85p	TP41A	22p	2N12102	50p	BY476	15p	7915	40p	PLB3	45p	LM324	35p	TBA820	75p	74LS28	17p
AC127	17p	BCY4	150p	BF197	7p	BR100	14p	TP41C	25p	2N12103	50p	BYX56350	30p	7918	40p	PLB4	50p	LM325	45p	TBA920	100p	74LS30	17p
AC128	15p	BCY5	150p	BF198	7p	BR101	14p	TP42A	22p	2N12104	50p	BYX56300	30p	7924	40p	PLB5	50p	LM329	45p	TBA990	100p	74LS32	17p
AC128K	23p	BCY20	20p	BF199	7p	BR103	37p	TP42C	25p	2N12109	24p	BYX56900	32p	78L05	28p	PL500	110p	LM339	40p	TBA990	100p	74LS32	17p
AC141K	30p	BCY70	16p	BF200	16p	BSX20	15p	TP47	40p	2N2221	23p	BYX70300	22p	78L12	28p	PL504	90p	LM348	60p	TCA270	40p	74LS33	17p
AC142K	30p	BCY71	16p	BF240	16p	BSX26	18p	TP48	40p	2N2222	23p	BYX70500	32p	78L15	28p	PL508	90p	LM380	100p	TCB800	200p	74LS37	17p
AC153K	20p	BCY25	25p	BF245	12p	BSX29	18p	TP51	40p	2N2369	15p	BYX0800	40p	78L15	28p	PL510	150p	LM381	20p	TCB900	100p	74LS38	17p
AC176	18p	BCY72	16p	BF241	10p	BT106	90p	TP51	120p	2N2494	20p	BYX71600	80p	78L24	28p	PY81	70p	LM382	130p	TD41170	100p	74LS40	17p
AC176K	20p	BCY26	25p	BF255	12p	BT109	90p	TP52	120p	2N2646	40p	OA47	6p	79L05	40p	PY88	40p	LM387	100p	TD4142	100p	74LS42	38p
AC187	15p	BD124	110p	BF257	18p	BT116	80p	TP53	120p	2N2904	20p	OA90	4p	79L12	45p	PY90A	180p	LM7090L	30p	TD42002	80p	74LS47	70p
AC187K	20p	BD131	25p	BF258	18p	BT119	100p	TP54	120p	2N2905	25p	OA91	4p	79L24	45p	PY95	180p	LM722	40p	TD42003	150p	74LS48	60p
AC188	17p	BD128	35p	BF258	18p	BT120	100p	TP105	65p	2N2906	18p	OA200	7p	LM309K	100p	LNEAR IC'S		LM741DIL	18p	TD42020	140p	74LS51	70p
AC188K	23p	BD132	25p	BF258	18p	BU100A	110p	TP106	65p	2N2907	18p	DA202	7p	LM317K	220p	AN-240P	150p	LM741 MET	45p	TD42030	140p	74LS54	17p
ACY19	148p	BD135	20p	BF263	25p	BU104	100p	TP107	65p	2N2926	8p	IN 914	2p	LM317T	180p	AN-360	120p	LM747	58p	TD42522	90p	74LS55	17p
AD162	22p	BD136	20p	BF270	18p	BU105	80p	TP110	47p	2N3019	28p	IN 4005	4p	EM32K	420p	AN-7114	160p	LM748	35p	TD42530	100p	74LS57	28p
AD140	40p	BD137	20p	BF270	18p	BU108	100p	TP111	50p	2N3053	18p	IN 4002	4p	LM723	32p	AN-7110	140p	LM749	35p	TD42532	100p	74LS58	28p
AD149	45p	BD138	20p	BF311	21p	BU110	110p	TP112	40p	2N3054	35p	IN 4003	4p	ZBHGC	870p	AN-7115	160p	LM749	35p	TD42532	100p	74LS58	28p
AD181	22p	BD139	20p	BF324	25p	BU111	140p	TP115	45p	2N3055	35p	IN 4004	4p	ZBHGC	870p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AF124	25p	BD140	20p	BF336	20p	BU124	50p	TP116	45p	2N3058	50p	IN 4005	4p	ZBHGC	870p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AF125	25p	BD144	90p	BF337	20p	BU126	70p	TP117	50p	2N3440	58p	IN 4006	4p	ZBHGC	870p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AF126	25p	BD154	90p	BF338	20p	BU204	75p	TP120	43p	2N3442	85p	IN 4007	6p	ZBHGC	870p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AF127	25p	BD155	38p	BF355	28p	BU205	70p	TP121	46p	2N3702	9p	IN 4148	7p	VALVES		AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AF129	22p	BD158	38p	BF362	30p	BU206	70p	TP122	47p	2N3703	9p	IN 5401	10p	DAF96	60p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AF129	22p	BD158	38p	BF362	30p	BU208A	80p	TP125	47p	2N3704	9p	IN 5402	10p	DAF96	60p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AL112	70p	BD177	30p	BF414	18p	BU208B	100p	TP126	58p	2N3705	9p	IN 5403	11p	DY86	50p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AL113	90p	BD179	32p	BF420	18p	BU325	55p	TP127	58p	2N3706	9p	IN 5405	12p	DY86	50p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
ASZ15	100p	BD181	45p	BF421	18p	BU326	55p	TP127	58p	2N3706	9p	IN 5405	12p	DY86	50p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
ASZ17	100p	BD183	60p	BF423	18p	BU406	85p	TP142	90p	2N3708	9p	IN 5405	12p	DY86	50p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AU110	110p	BD183	60p	BF423	18p	BU406	85p	TP142	90p	2N3708	9p	IN 5405	12p	DY86	50p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
AY106	180p	BD187	30p	BF440	16p	BU406	85p	TP142	90p	2N3708	9p	IN 5405	12p	DY86	50p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
BA145	10p	BD203	42p	BF458	19p	BU408	85p	TP295	42p	2N3819	29p	IN 5406	13p	E891	44p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
BA148	10p	BD204	42p	BF458	19p	BU408	85p	TP295	42p	2N3819	29p	IN 5406	13p	E891	44p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
BA154	6p	BD204	42p	BF458	19p	BU408	85p	TP295	42p	2N3819	29p	IN 5406	13p	E891	44p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
BA157	12p	BD222	31p	BF461	60p	BU408	85p	TP295	42p	2N3819	29p	IN 5406	13p	E891	44p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
BA157	12p	BD222	31p	BF461	60p	BU408	85p	TP295	42p	2N3819	29p	IN 5406	13p	E891	44p	AN-7120	140p	LM749	35p	TD42532	100p	74LS58	28p
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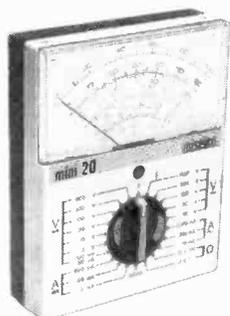
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AN301	£3.50	BA403	£1.95	HA1457W	£1.75	LA4030P	£2.00	S 40W	£10.50	TA7130P	£1.00	UPC1001H	£2.20	2SB405	£0.80
AN302	£3.30	BA511A	£1.80	HA112W	£3.75	LA4031P	£1.95	SI-1125H	£7.50	TA7136P	£1.00	UPC1009C	£2.20	2SB426	£2.95
AN303	£2.75	BA514	£1.90	HA1211	£2.30	LA4032P	£1.90	STK011	£3.95	TA7137P	£1.00	UPC1016C	£1.95	2SB471	£3.50
AN305	£3.50	BA521	£1.80	HA1215A	£4.35	LA4051P	£2.20	STK013	£7.25	TA7139P	£2.50	UPC1025H	£2.30	2SB492	£0.75
AN313U	£2.95	BA526	£3.50	HA1219	£3.25	LA4100	£2.20	STK014	£7.25	TA7140P	£1.75	UPC1026C	£1.00	2SB509D	£1.95
AN315	£2.30	BA527	£1.60	HA1221	£2.75	LA4101	£1.00	STK015	£5.20	TA7142P	£2.95	UPC1028H	£0.90	2SB536	£0.95
AN316	£4.75	BA532	£1.60	HA1223W	£3.80	LA4102	£1.40	STK020	£5.75	TA7145P	£2.50	UPC1031H	£1.95	2SB546	£1.50
AN318	£4.95	BA536	£2.40	HA1225	£1.95	LA4110	£1.75	STK022	£5.30	TA7150P	£2.75	UPC1032H	£0.60	2SB561	£1.35
AN331	£2.95	BA547	£2.50	HA1226	£4.50	LA4112	£1.75	STK025	£7.50	TA7152P	£2.50	UPC1035C	£1.95	2SB598	£0.40
AN340P	£1.50	BA612	£1.80	HA1227	£2.50	LA4120	£2.95	STK028	£9.70	TA7157P	£2.50	UPC1037H	£1.95	2SB633	£0.70
AN360	£1.30	BA631	£5.75	HA1244	£4.60	LA4126	£2.60	STK027	£6.50	TA7193P	£4.00	UPC1158H	£0.95	2SC380	£0.35
AN362L	£1.60	BA656	£4.50	HA11401	£2.80	LA4140	£0.80	STK078	£6.75	TA7202P	£4.50	UPC1165C	£1.30	2SC458	£0.35
AN366P	£1.70	BA843	£4.50	HA11423	£4.75	LA4160	£2.40	STK080	£7.50	TA7203P	£1.90	UPC1168C	£1.30	2SC460	£0.35
AN374P	£2.20	BA847	£3.75	HA11440A	£3.95	LA4170	£3.50	STK082G	£7.75	TA7204P	£1.75	UPC1170H	£1.60	2SC461	£0.35
AN377	£2.00	BA853	£7.50	HA11701	£3.50	LA4182	£2.10	STK086	£9.70	TA7205AP	£1.00	UPC1171C	£1.50	2SC503Y	£0.70
AN610P	£1.80	BA1310F	£1.75	HA11703	£4.50	LA4192	£1.95	STK430	£5.50	TA7207P	£1.75	UPC1176C	£1.75	2SC536	£0.35
AN612	£1.80	BA1320	£1.25	HA11704	£5.20	LA4200	£1.50	STK431	£5.95	TA7208P	£1.75	UPC1177H	£1.60	2SC537	£0.35
AN613	£3.25	BA1330	£1.75	HA11705	£6.95	LA4201	£1.60	STK433	£5.25	TA7210P	£2.50	UPC1181H	£1.10	2SC710	£0.35
AN625	£5.00	BA1360	£1.80	HA11706	£4.75	LA4220	£1.50	STK435	£5.25	TA7211P	£2.60	UPC1182H	£1.10	2SC732	£0.35
AN6510	£2.75	BA5102A	£2.75	HA11710	£3.75	LA4230	£2.25	STK436	£5.25	TA7215P	£3.30	UPC1183H	£2.20	2SC733	£0.35
AN6520X	£3.50	BA5102A	£2.75	HA11711	£9.50	LA4250	£2.75	STK437	£5.50	TA7217AP	£1.60	UPC1186H	£2.50	2SC782	£0.35
AN65701	£1.80	BA5406	£3.25	HA11713	£6.50	LA4420	£1.60	STK439	£3.95	TA7220P	£2.50	UPC1186H	£0.90	2SC840	£1.50
AN65722	£1.60	BA6137	£2.75	HA11714	£5.95	LA4422	£1.40	STK441	£7.95	TA7222AP	£1.30	UPC1187V	£1.75	2SC900	£0.35
AN65730	£1.85	BA6209	£3.75	HA11715	£6.25	LA4430	£1.40	STK443	£7.95	TA7223P	£2.30	UPC1215V	£1.35	2SC929D	£0.35
AN65732	£1.85	BA6304	£2.50	HA11716	£4.75	LA4440	£2.50	STK457	£6.50	TA7225P	£3.25	UPC1223C	£2.20	2SC930D	£0.35
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AN6310	£6.25	COX758	£2.75	HA11727	£9.50	LA4461	£1.80	STK463	£8.40	TA7229P	£3.25	UPC1263C	£2.50	2SC1096	£0.70
AN6341N	£4.75	COX95C	£2.95	HA11745	£9.50	LA4500	£2.60	STK465	£8.50	TA7230P	£3.95	UPC1277H	£2.75	2SC1364	£0.35
AN6350	£7.50	COX100	£6.75	HA11747	£9.50	LA4505	£2.80	STK501	£6.25	TA7232P	£2.95	UPC1278H	£2.75	2SC1815Y	£0.45
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AN6360	£4.50	COX130	£4.75	HA11750	£5.00	LA5112	£1.80	STK0029	£2.75	TA7241AP	£1.65	UPC1353C	£1.95	2SC1952	£3.25
AN6362	£5.50	COX136A	£7.50	HA11751NT	£8.50	LA6458D	£1.20	STK0040	£6.25	TA7270P	£1.85	UPC1363C	£2.20	2SC1957	£0.60
AN6363	£7.50	COX143A	£7.50	HA11753NT	£8.50	LA7016	£2.75	STK0049	£6.50	TA7312P	£1.50	UPC1378H	£2.40	2SC2078	£0.95
AN6387	£5.95	COX157	£4.25	HA11758NT	£8.50	LA7215	£2.75	STK0059	£7.00	TA7313AP	£1.50	UPC1382C	£1.10	2SC2166	£0.95
AN6610	£1.80	COX158	£3.75	HA11768	£4.50	LA7751	£4.75	STK0080	£7.75	TA7314P	£2.50	UPC1384C	£2.85	2SC2335	£1.50
AN6677	£6.30	COX160	£3.50	HA11769	£4.50	LA7855	£3.20	STK0208	£1.50	TA7315P	£2.50	UPC1391H	£2.50	2SC2577	£1.95
AN6811	£1.60	COX161A	£3.50	HA11816NT	£9.50	LA7800	£1.95	STK0209	£5.75	TA7317P	£2.75	UPC1391H	£1.50	2SC2578	£2.75
AN6873	£4.50	COX162	£3.95	HA11828NT	£9.50	LA7801	£2.95	STK2129	£6.75	TA7324P	£2.50	UPC1403CA	£5.75	2SC2579	£2.75
AN6884	£2.75	COX170	£6.75	HA12001W	£9.50	LA7806	£2.75	STK2230	£6.50	TA7325P	£1.00	UPC1420CA	£5.50	2SC2580	£2.75
AN7105	£2.30	COX181	£8.75	HA12002	£2.95	LA7808	£2.95	STK3042	£5.50	TA7328AP	£2.20	UPC1458C	£0.95	2DA1515	£4.50
AN7110	£1.50	HA1124A	£2.75	HA12017	£2.75	LB1287	£2.75	STK4069	£6.50	TA7331P	£2.20	UPC1533HA	£2.75	2DA2002	£0.80
AN7111	£1.50	HA1125	£3.50	HA12035	£3.50	LB1405	£2.20	STK4141H	£7.50	TA7343P	£2.95	UPC457C	£1.50	2DA2003	£0.50
AN7114E	£1.75	HA1137W	£1.75	HA12038	£6.75	LC4066B	£2.95	STK4191H	£8.95	TA7607AP	£2.95	UPC4586C	£0.90	2DA2004	£2.20
AN7155	£1.60	HA1144	£4.25	HA12413	£2.75	LC7120	£2.95	STK4332	£3.75	TA7608CP	£3.95	UPD1514C	£5.75	2DA2005	£2.75
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AN7130	£1.30	HA1167	£3.75	HA13403	£7.50	LC7136	£2.75	STK5421	£6.50	TA7614AP	£2.75	X0077GE	£9.95	2DA2030	£1.40
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Demonstration Offer

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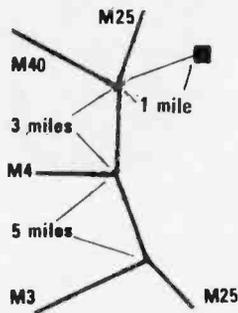
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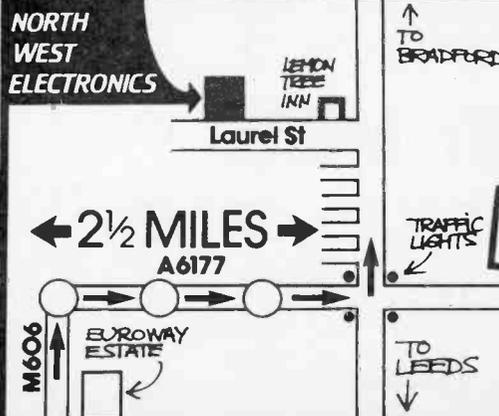
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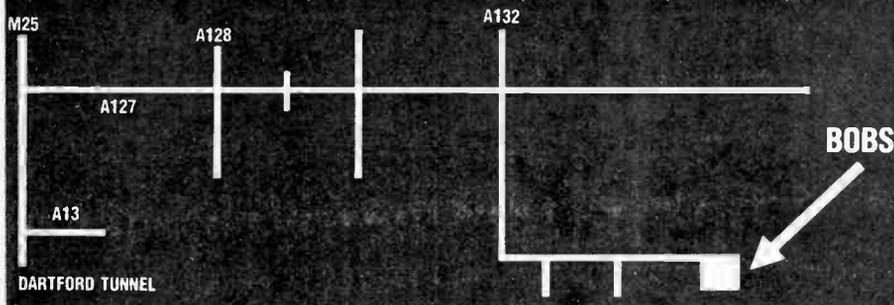
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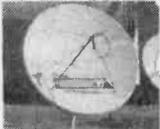
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INDEX TO ADVERTISERS

ADM Electronics Supplies	141
Aerial Techniques	101
Alcon Instruments Ltd.	126
Apollo	133
ASJAA International Ltd.	131
Avon Meters	138
A-Z Electronics	137
Barry TV Services	134
Besco T/A North West Electronics	136
B.G. Components	137
Billington Valves	92
B.J. Electronics	137
B.K. Electronics	80
Bob's Television Warehouse	139
Boiten Ltd.	126
Bull, J & N, Electrical	83
Carter, John (Electrical) Ltd.	129
Cetel	81
Centrevision	132
Chromavac Ltd.	78
Chromavision	128
Coles Harding Co.	137
CPC	81
Crewe Wholesale TV	125
Cricklewood Electronics Ltd.	82
Crofton Electronics	119
Data-Go	141
Devonics	140
Display Electronics Ltd.	130
East Cornwall Components	84
East Croydon Discount Electronics	120
Economic Devices	108, 109
Electric City	78
Electronic Mail Order	140
Electrovalue	125
Eurolec (UK)	137
Euro Sat	140
Express T.V. Supplies	119
Flintdown Channel 4	142
Ford, Frank	130
Fyde T.V. and Video Distributors	135
General Factors	137
G.G.L. Components	82
Gogglebox	135
Grandata Ltd.	124
Halton TV Trade Disposal	135
Harrison Electronics	92
Hilliers	138
Hockley Discount Televisions	132
Holmes, D.J.	138
Hussain Central T.V. Ltd.	79
ICS	81
Independent Television & Video	134
Junction 11 T.V. Trade Disposals Ltd.	127
Kent Ledgerwood Wholesale Ltd.	133
Kesh Electronics Ltd.	140
K.T. Electronics	139
London Electronics College	92
LRC (Spares) Ltd.	124
Mannion, R.B.	142
Manor Supplies	Cover II
Mantel	131
Micro-X Ltd.	118
Monolith Electronics Co. Ltd., The	82
Network Satellite Systems Ltd.	140
N.F.P.C.	134
N.G.T. Electronics Ltd.	133
Papworth Transformers	143
Philex Co. Ltd.	78
Post A Part Electronics	91
Powell, T.	127
Pro-Vision	119
P.V. Tubes	74, 75, 76, 77
Quick Save T.V. Spares	123
Repossessed T.V. Centres Ltd.	143
Riscomp Ltd.	87
Sabaco	140, 141
Sandhurst TV Services	141
Semple Service	119
Senz Components	120, 144, Cover III, Cover IV
Sight and Sound	119
Smiths Electronics	135
South London Television	132
Sparkworld Ltd.	122
Starlite Electronics	135
Stewart of Reading	126
Supersat	128
Supertel	121
Technical Information Service	141
Telepanels	133
Tele-part	92, 132, 143
Teletraders	129
Televideo Services	122
Television	134
Tidman Mail Order Ltd.	101
Trading Post, The	138
Trent Tubes	137
TVS Trade Services	125
T.V. Trade Sales	142
Universal Electronic Distributors	120
Universal Semiconductor Devices Ltd.	129
U-View Tubes	135, 139
Vincent, J.	139
Wellview	130
Willow Vale Electronics Ltd.	142
Wiltsgrove Ltd.	134
Wing Electronics	135
Wizard Distributors	138
Woodsdale Components	134

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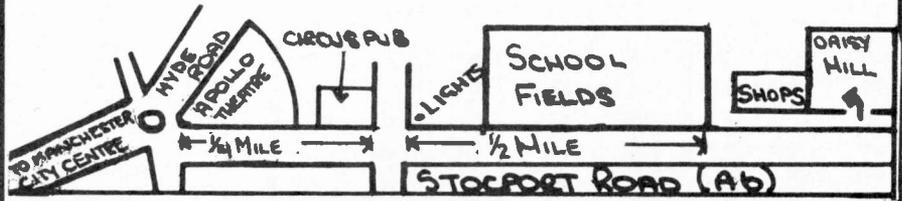
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