

OCTOBER 1988

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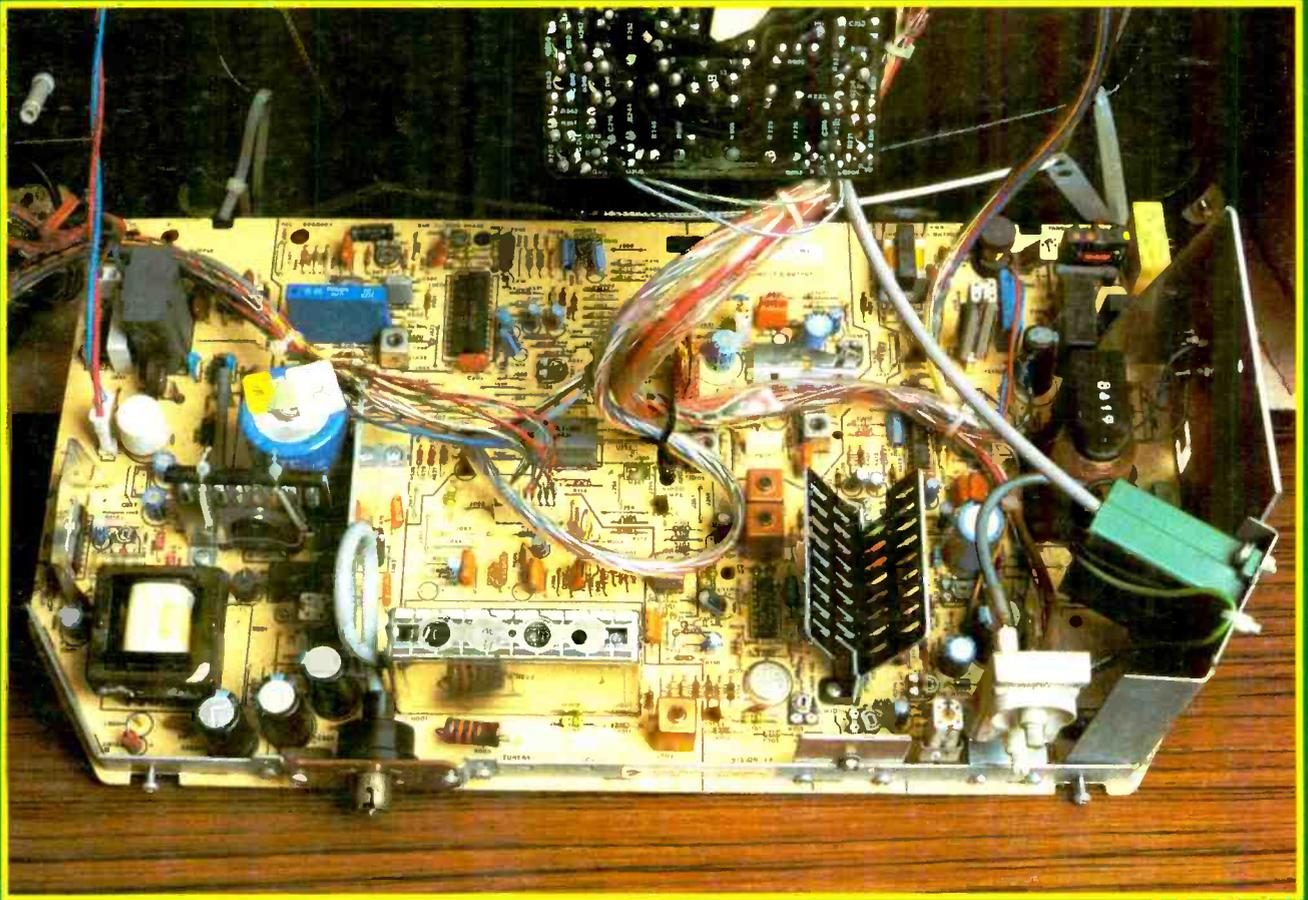
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# TELEVISION

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Clinic • DX-TV • TV Fault  
Finding • Getting to Grips  
with VCR Servo Systems**

# MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR  
FOR DOMESTIC TV & VCR.

TEST  
DEMONSTRATIONS  
AT 172  
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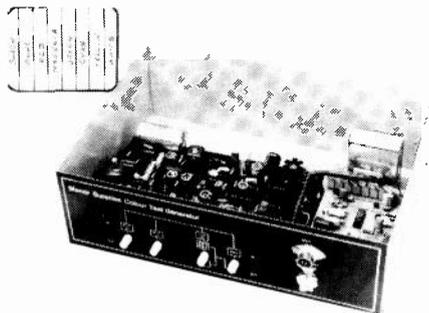
- ★ 40 different patterns and variations.
- ★ Fully interlaced sync pulses with correct picture blanking.
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- ★ Chequerboard.
- ★ Mono outputs with 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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REPORT  
'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.
- ★ Backup service available.

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 £2.80).**

MK 4 (BATTERY) BUILT & TESTED **£58.00 + £2.80 P & P.**  
MK 4 (MAINS) BUILT & TESTED **£68.00 + £2.80 P & P.**  
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS **£5.75.**  
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

ADD  
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15%

TELETEXT DECODER PANELS (TESTED)  
Mullard VM6101 **£25.00**, Philips KT3, K30 **£20.00**, p.p. **£2.30**

PHILIPS G11 PRESTEL, TELETEXT UNIT includes Mullard VM6230, Teletext Decoder, 6330 plus, plus Line Coupler and Interface **£30.00**, p.p. **£2.80**

## TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF  
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LOPTS, TRIPLERS, PANELS, TUNERS, SELECTORS ETC.

PHILIPS KT3, K30 PANELS, tested, exchange, sound power, frame, RGB **£7.50** each. Decoder (Non-text) **£10.00** p.p. **£1.50**.  
THORN TX9 PANELS Complete & tested **£28.00** Exchange. (Shop only).  
THORN 8000 TO 8500 Panels tested exchange. Power **£7.80**. 8800, 9800 power **£8.80** p.p. **£1.50**. Frame **£10.00** p.p. **£2.30**.

THORN TX9, TX10 Facia Control Panel Incl Infra Red Remote Receiver **£8.50** p.p. **£2.00**.

BUSH T20/22 Touch Tune Facia Unit **£7.50** p.p. **£2.00**.

THORN 8800, 9800 Touch Tune Facia Unit **£3.50** p.p. **£1.50**.

PHILIPS G11 PANELS (tested).

Frame, IF, decoder **£12.50** each p.p. **£2.00**. Scan **£20.00** p.p. **£2.80**.

PHILIPS G11 PANELS ex rental (untested).

Scan Frame, Decoder **£5.00** p.p. **£2.00**.

PHILIPS G11 IF PANEL (New) Less Tuner **£2.50** p.p. **£1.30**

PHILIPS HANDSETS (New Replacements) p.p. **£1.50**.

G11 Ultrasonic Nontext **£19.50**, Infra red Text **£19.50**. Others available.

KT3 Non text (RC4001) **£22.50**, KT3, K30 etc. Text **£22.50**.

PHILIPS HANDSETS Ex rental, text. Untested. KT Text/Video Type. **£3.50** p.p. **£1.00**.

PHILIPS COLOUR MANUALS p.p. **80p**.

G11, K30, K35, 2A **£3.50**, KT3 **£4.50**, CTX-E, CTX-S, CFI **£1.50** each.

THORN REMOTE CONTROL HANDSETS

TX9, TX10 Infra red (Non-Text) **£18.00**; TX9, TX10 Infra red Teletext **£19.50**, p.p. **£1.20**. Large selection others available: Sony, Grundig, etc.

TX9 Ultrasonic remote handset transducer **£2.00**, switches 3 for **£1.50** p.p. 50p.

TX Remote panel 1564 (incl. SAA5012) **£5.00** p.p. **£1.80**.

THORN TX9, TX10 Saw Filter IF Panel. **£5.00** p.p. **80p**.

TX9, TX10 Remote & tuning control panel (1515) **£7.50** p.p. **£1.80**.

PAL DECODER KIT (Video to RGB) for Monitors **£27.00** p.p. **£1.00**.

PAL ENCODER KIT (RGB to Video) **£18.50** p.p. **£1.30**.

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GEC 20AX Line Time Base **£18.00** p.p. **£2.00**.

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ITT CVC30 SERIES PANELS SURPLUS (untested) **£2.50** each. CMP31, CMF31, CMA30, CM532, p.p. **80p**; CMD33, p.p. **£1.80**.

ITT CVC20, 30 Series chassis for spares (shop only) **£2.50**.

THORN TX9 Panels ex factory for small spares. Includes I.C.s & Semiconductors etc. **£3.00** p.p. **£2.00**.

THORN TX9 Panels salvaged ex factory for spares incl. Electrolytic & Mains Transformers. **£8.50** p.p. **£3.00**.

THORN 8000/8500 IF/Decoder Panels salvaged **£3.20** p.p. **£1.80**.

THORN 9000 SERIES IF/Decoder **£10.00** p.p. **£2.30**.

THORN 9000 IF/Decoder Panels Salvaged. For spares **£2.50** p.p. **£1.80**.

PHILIPS G9 Power Supply Unit **£5.00** p.p. **£2.30**.

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UHF/625 TUNERS, many different types in stock. DECCA Bradford 5 position, MULLARD 4 position **£2.50**, JAP Rotary **£4.80** p.p. **£1.80**.

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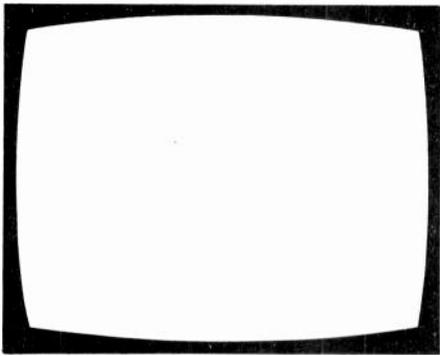
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# TELEVISION

October  
1988

Vol. 38, No. 12  
Issue 456

On sale September 14th

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## BACK NUMBERS

Some copies of issues published during the last six months are available from the Editorial Office at £1.50 inclusive of postage and packing. Address requests to Television, Editorial Office, IPC Magazines Ltd., King's Reach Tower, Stamford Street, London, SE1 9LS.

## INDEXES

Indexes to Vols. 35, 36 and 37 are available at 80p each from the Editorial Office (address 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. Correspondents 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

- 893 Leader**
- 894 Long-distance Television** *Roger Bunney*  
Reports on DX conditions and reception and news from abroad. A MOSFET aerial amplifier circuit.
- 899 UHF Oscillator using SMDs** *Denis Mott*  
A means of obtaining a fixed u.h.f. carrier frequency using a stripline tuned circuit and surface-mounted components to give a compact design.
- 900 Teletopics**  
News, comment and developments.
- 902 Practical Computer Programming, Part 8** *Mike Phelan*  
Guidance on converting your pseudo-code into a computer program, including choice of language.
- 904 Servicing the Decca/Tatung 120/130 Chassis** *Nick Beer*  
A summary of stock and some less common faults experienced with these sets since they first appeared some seven years ago, with guidance on fault finding.
- 907 Next Month in Television**
- 908 Test Report: Hameg HM205 Oscilloscope** *Alfred Damp*  
The advantage of this scope is that it includes digital storage, enabling low-frequency signals to be displayed. This is of particular value in CD player and VCR servicing. It also has a good h.f. performance with a bandwidth of 20MHz.
- 910 VCR Clinic**  
Reports from Philip Blundell, Eng. Tech., Mick Dutton, Ian Bowden, Alfred Damp and Nick Beer.
- 912 Letters**
- 915 The Philips NC3 Chassis** *Harold Peters*  
An introduction to Philips' latest chassis for use in small-screen colour portables.
- 916 TV Fault Finding**  
Reports from Denis Parsons, Dave Dulson, P.J. Roberts, Alfred Damp, Laurence W. Heslop, J.G. Grieve, J.R. Armagh, Hugh MacMullen, M.K. Hayter, Ian Bowden and Nick Beer.
- 918 Panasonic Video Maintenance Kits** *Ian Bowden*  
A useful and economic aid to servicing earlier Panasonic VCRs.
- 918 ECA Semiconductor Reference Books** *Nick Beer*  
The latest pair of books in this series provides data on all types of semiconductor devices including transistors, diodes, thyristors and i.c.s.
- 919 The Temptation of Tiny Tim** *Les Lawry-Johns*  
Tim meets a temptress in the form of Delicious Dora and has trouble with a Philips K30.
- 922 VCR Servo Systems, Part 1** *Joe Cieszynski*  
A guide to the operation of VCR drum and capstan servo systems, covering speed and phase control.
- 926 Service Bureau**
- 927 Test Case 310**

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HA1137	3.20	STK441	11.57	TDA1236	3.44	UPC1230H	4.39
HA1151	3.89	STK465	12.60	TDA1270	3.95	UPC1238H	2.50
HA1175INT	10.82	STK463	14.30	TDA1327	1.70	UPC1245V	1.35
HA1342	5.58	STK2129	17.27	TDA1412	1.60	UPC1277	4.81
HA1306N	2.60	STK4352	6.00	TDA1415	1.40	UPC1350C	4.15
HA1366WR	1.50	STR441	6.50	TDA1470	4.67	UPC1353C	4.76
HA1377	3.65	STR454	4.73	TDA1770	5.60	UPC1365C	6.38
HA11219	4.21	STR451	6.50	TDA1908A	1.95	UPC1367	2.08
HA11244	4.04	STR6020	5.80	TDA1950	2.39	UPC1358H	1.88
HA11741	23.22	STR451	6.50	TDA2002	7.50	UPC1360C	2.20
HA13008	13.58	SW153	3.90	TDA2003	1.10	UPC1363C	2.16
IS1555	43	TA7050P	95	TDA2006	1.60	UPC1368H2	2.15
LA3356	95	TA7051P	95	TDA2006	1.45	UPC1370C2	2.58
LA4031P	3.21	TA7063P	2.20	TDA2010	2.40	UPC1382C	1.08
LA4032P	1.30	TA7074P	3.46	TDA2140	5.95	UPC1384	3.78
LA4102	1.10	TA7108P	3.43	TDA2151	3.25	UPC1394C	3.07
LA4112	3.25	TA7120P	2.43	TDA2200	4.66	UPC1447H	58
LA4422	1.20	TA7129AP	3.76	TDA2202	4.66	UPC41C	2.80
LA7801	2.20	TA7130P	1.93	TDA2270	1.65	UPC577H	2.46
LC7130	5.93	TA7146P	4.67	TDA1870	6.46	UPC585C	1.28
LC7120	5.87	TA7193P	5.67	TDA2523	3.40	UPC1167C2	2.70
LC7137	5.50	TA7171P	8.90	TDA2524	2.25	UPD553C164	20.76
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SAA5080	8.58	TBA570	1.79	TDA8180	6.66		
SAF1032	6.30	TBA690	1.58	TDA8190	8.60		
SAF1039	7.77	TBA700	2.12	TDA8190	3.75		
SASS560S	2.07	TBA720	2.64	TDA9503	4.50		
SASS570S	2.07	TBA750	2.98	TEA1009	6.00		
SAS660	3.25	TBA800	1.60	TDA940C	4.37		
SAS670	3.25	TBA810AS	58	UPC554	5.55		
SAS580	2.90	TBA820	1.70	UPC566H	5.84		
SAS590	2.90	TBA820M	1.25	UPC575C2	5.68		
SG-264A	5.12	TBA890	3.94	UPC576H	6.03		
SG629	8.05	TBA920(Q)	1.20	UPC576H	2.95		
SG-6533	13.20	TBA950(2X)	1.08	UPC585	4.00		
SL901B	7.00	TBA970	4.09	UPC587C2	4.94		
SL917B	9.25	TBA990	1.10	UPC1025H	4.21		
SL1310	1.80	TCA760	2.30	UPC1025H	1.86		
SL1327Q	1.20	TCA270SQ	2.50	UPC1028H	6.57		

UPC1167C2	2.70	UPC1168C	3.20
UPC1176C	2.53	UPC1177H	3.15
UPC1178C	4.21	UPC1180C	1.84
UPC1181H	1.00	UPC1182H	1.00
UPC1183H	2.48	UPC1185H	2.45
UPC1186H	1.60	UPC1188H	4.99
UPC1190C	1.20	UPC1198C	4.18
UPC1200V	1.00	UPC1211V	2.70
UPC1212V	1.34	UPC1223C	2.00
UPC1225C	1.50	UPC1227E	1.20
UPC1230H	4.39	UPC1238H	2.50
UPC1245V	1.35	UPC1277	4.81
UPC1350C	4.15	UPC1353C	4.76
UPC1365C	6.38	UPC1367	2.08
UPC1368H2	2.15	UPC1370C2	2.58
UPC1382C	1.08	UPC1384	3.78
UPC1394C	3.07	UPC1447H	58
UPC1447H	58	UPC41C	2.80
UPC41C	2.80	UPC577H	2.46
UPC577H	2.46	UPC585C	1.28
UPC585C	1.28	UPC1167C2	2.70
UPC1167C2	2.70	UPD553C164	20.76
UPD553C164	20.76	UPD7519G	17.13
UPD7519G	17.13	UPD7538C020	11.06
UPD7538C020	11.06	UPD546C107	22.28
UPD546C107	22.28	UPD547C049	11.18
UPD547C049	11.18	U05G	1.27
U05G	1.27	V11N	1.27
V11N	1.27	10E2	4.3
10E2	4.3	10V705	8.74
10V705	8.74		

### NEW PRODUCTS

Sanyo 5000 PS3BSF	Video	29.95
Head		25.95
Amstrad 4600 PSF2	Video	25.80
Head		25.80
Amstrad 9000 PSF1	Video	25.80
Head		25.80
Amstrad 7000 3HSSR	Video	25.00
Head		25.00

### BELT KITS

VK32 Sanyo 1100/1300/1500	75
VK33 Ferguson 3V35/6	69
VK34 Ferguson 3V42/5/8	90
VK35 Fisher SVHP 710 716 722	1.20
VK37 Hitachi 9300	85

### TAKE UP IDLERS

Fisher 143-0-4904-00900	3.95
Fisher 143-0-4204-00300	4.50

### SUPERWICK DESOLDER BRAID

2mm x 1.6m	89
1.5mm x 1.6m	89
2mm x 30m	11.99
1.5mm x 30m	11.99

### T.V. WALL BRACKETS

PS245 Telewist (12"-20")	22.12
P6045 Designer Twister	27.00
P6041 Little Twister	12.90
PS218 Swivel and Tilt Bracket	24.67

### GENERAL EQUIPMENT

Degaussing Coil Stick	19.00
Electric Circuit Tester	1.50
Probes (x10) or (x1)	10.90
Philips Switchable Probes	13.25
Automatic Wire Strippers	6.95
I.C. Inserters	1.18
Micro Pliers	4.20
Micro Cutters	5.00
Trim Tools Metal Ended	1.60
Side Cutters sm.	6.20
Long Nose Pliers	1.20
Sm. Neon Screwdriver	1.65

### COMPUTER ICs

74LS260	55
2732	3.30
2764	3.75
27128	4.95
27256	5.90
6264	2.75
6522	4.00
TMS1000	8.95
8271	60.00

### COMMODORE ICs

6510 CPU	7.07
6526 CIA Keyboard	7.72
Int.	5.11
Col.	7.74
20.	20.77
Sound	7.79
Char.	3.37
Basic	6.45
Kernel	9.01
ROM	3.52
ROM	6.20
ROM	4.51
906114 PLA	4.51
4164 RAM	1.95
Timer 555	46
8501	4.18
8701 Clock Chip	5.46
8360	19.61

### NEWS SPECTRUM +3 CASSETTE LEADS £1.95

★ NEW ★  
**WICKMANN WERKE FUSE KITS £33.95**  
 These are a new range of sub-miniature, circuit protection Fuses, and are used in most modern TVs, Videos, etc. This kit has 170 ass'd. plug in Fuses and 10 holders.  
**Q.B.** 250ma 1A, 1.6A, 2A.  
**A.S.** 160ma, 200ma, 315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 4A.

### LABGEAR

CM7261 P.U.	11.88
CM7262 P.U.	12.86
CM7065 UHF/VHF WB	15.05
CM7066 UHF/VHF	14.94
CM7068 VHF H. Gain A/B/C/D	16.74
CM7253 Behind Set (main)	15.06
CM7243 Second Set Amp	14.03
CM7093 Three Set Amp	16.83
CM7063 Dist. Amp VHF/UHF	25.77
CM7108 8 + 1 Dist. Amp	45.42
CM9700 27MHz CB Suppressor	4.90
CM6011 Outdoor Splitter	8.22
CM900300 Flush Sing. Outlet	1.95
CM900301 Flush Sing. Out. Isolat.	2.15
CM9010 Flush Twn Outlet	2.25
CM9034 UHF Filters A/B/C/D	8.88

**VIDEO BELT KITS**

★ PRICES DOWN ★

VKIT 1	AKAI	9300/9500/9800	2.40
VKIT 2	JVC	HR3300/3320/3360	1.70
VKIT 3	TCE	8903/3V00/16/22	1.45
VKIT 4	PANASONIC	NV7000/7200	1.45
VKIT 5	SONY	SL6000/8500/8600/8800	2.25
VKIT 6	SONY	SL3000UB	2.10
VKIT 7	PANASONIC	NV3000B	1.99
VKIT 8	SANYO	9300P	2.75
VKIT 9	PANASONIC	NV2000B	1.45
VKIT 10	PANASONIC	NV6600/8610/VD111.50	1.50
VKIT 11	TOSHIBA	V6600	1.45
VKIT 12	SHARP	VC7300	1.95
VKIT 13	SANYO	VTCS5000	1.50
VKIT 14	SANYO	VTCS3000	1.85
VKIT 15	JVC	HR7650-3V31	2.00
VKIT 16	HITACHI	5000	1.90
VKIT 17	SHARP	9300	1.76
VKIT 18	SHARP	9300	1.47
VKIT 19	HITACHI	VT8000	1.05
VKIT 20	HITACHI	VT11/33	1.05
VKIT 21	HITACHI	9500	1.12
VKIT 22	SONY	SLC6	1.90
VKIT 23	SANYO	NV3000/333	1.05
VKIT 24	PANASONIC	NV3000/333	1.05
VKIT 25	TOSHIBA	V7540	1.55
VKIT 26	JVC	HR7000	0.96
VKIT 27	THORN	3V29/HR7200	1.75
VKIT 28	AMSTRAD	7000	1.45
VKIT 29	PANASONIC	NV777	1.80
VKIT 30	SONY	3V16	2.20
VKIT 31	TOSHIBA	9600	2.29

★ PRICES DOWN ★

**VIDEO PINCH ROLLERS**

PANASONIC	NV7000	3.75
SANYO	VTCS3000/VBS7000	3.75
SONY	C7/J7/SL17	3.75
JVC	TCE3V0001/06/16/23/24	3.75
AKAI	HR2200/3320/3330	3.75
AKAI	3660/1100/7700	3.75
HITACHI	VT5000	3.75
SHARP	VC6300/6500	3.75
SONY	T06 GEN	3.75

★ PRICES DOWN ★

**VIDEO IDLER TYRES**

	O.Dia	I.Oia	Width	
SONY	23.7	17.4	4.1	50p
SONY	24.2	18	5.9	50p
HITACHI	31.8	25	4.9	50p
PANASONIC	37	29	3.9	52p
AKAI	26	20	3.9	50p
JVC	39.3	32.8	4	55p
JVC	33	23.9	4	55p
NATPAN	31.2	25	3.1	55p

**ANTEX**

C15 Iron 240v	6.20
C240 Element	2.75
Bits 102, 106, 820, 821	1.10
CS 174 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
Temperature Control 30W Iron CSTC	16.95
40W Iron XSTC	16.95
Unit TCSV1	66.95
Antex Stand	2.10
MLX Auto Rep Kit	8.40
Cardless Gas Iron	15.99
Tips for Gas Iron	5.00
Turbo Tech Iron Kit	16.99
Philips 25 Watt Iron	4.50

**SERVISOL**

Freeze It	1.34
Super Servisol	1.18
Foam Cleanser	1.18
Plastic Seal	1.26
Silicone Grease	1.46
Silicone Grease (Tubes)	1.46
Aero Kleen	1.04
Excel Polish	1.08
Video Head Cleaner	0.96
Super 40	1.00
Fire Extinguisher	3.50
Head Sink Compound	1.20
Solda Mold Stop	0.78
Hyloal Silicone Rubber	2.98
Aero Duster	1.40
Coddleline 110 Degreasing Solvent	1.78
Antistatic Spray	1.18

**TURBO RECHARGEABLES**

Drill Kit	25.99
Sold Iron Kit	16.99
Rep Tips	2.20
Rep Bulbs	60

**BELLS/BOXES**

A75 SHORROCK ACDRN 75 PANEL	32.50
B1 EUROBELL (No. S.A.B.)	21.90
B2 EUROBELL (with S.A.B.)	26.95
BV 6V BATTERY FOR EUROBELL	3.75

\*Price includes Multi Adaptor to use with "C" type bell boxes

T1 12V BELL (Tan)	12.95
B5 "C" TYPE Polyprop. Boxes (comp)	4.55
B6 "C" TYPE Polyprop. Boxes (comp)	7.98
B12 "C" TYPE DUMMY COVER (no back)	3.25
B13 "C" TYPE Translucent	7.80

**SOUNDERS/SIRENS**

S2 712 EXTERNAL SIREN (116db)	5.75
S4 1010/2010 EXTERNAL SIREN (116db)	5.96
S22 DYNABLAST (127db)	18.14
S13 SOUND BOMB 1 (104db)	3.27
S14 SOUND BOMB 2 (111db)	5.17
S15 SOUND BOMB 3 MULTITONE	4.50
S16 P228 (105db)	4.61
S17 MHR9 (110db)	5.28
S18 362 FREZO (110db)	7.80
M801 722 BUZZER	1.56
M802 PWB27 BUZZER	0.60
M802 PWB27 BUZZER	0.70

**VIDEO SPARES**

WE HAVE A LARGER RANGE LISTED UNDER SPECIFIC MANUFACTURERS IN CATALOGUE FOR THORN, SONY, HITACHI, FIDELITY, NATIONAL, PANASONIC, PHILIPS.

**SUMMER SPECIALS ON VIDEO HEAD PRICES**

**REPLACEMENT VIDEO HEADS**

AKAI	VS1	3HSSV	18.00
AKAI	VS2	3HSSV	18.00
AKAI	VS3	3HSSV	18.00
AKAI	VSS	3HSSV	18.00
AKAI	VS10	3HSSV	18.00
AKAI	VS77	3HSSV	18.00
AKAI	VS88	3HSSV	18.00
AKAI	VS100	3HSSV	18.00
AKAI	VS7200	3HSSV	18.00
AKAI	VS9300	3HSSV	18.00
AKAI	VS9300	3HSSV	18.00
AKAI	VS9500	3HSSV	18.00
AKAI	VS9700	3HSSV	18.00
AKAI	VS9800	3HSSV	18.00

**JVC**

HRD110	3HSSV	18.00
HRD111	3HSSV	18.00
HRD120	3HSSV	18.00
HRD121	3HSSV	18.00
HRD220	3HSSV	18.00
HRD225	3HSSV	18.00
HR2200	3HSSV	18.00
HR3300	3HSSV	18.00
HR3320	3HSSV	18.00
HR3330	3HSSV	18.00
HR3350	3HSSV	18.00
HR3360	3HSSV	18.00
HR3660	3HSSV	18.00
HR4000	3HSSV	18.00
HR4100	3HSSV	18.00
HR7200	3HSSV	18.00
HR7600	3HSSV	18.00
HR7610	3HSSV	18.00
HR7650	3HSSV	18.00
HR7700	3HSSV	18.00

**NAT. PAN.**

NV100	3HSSU1N	25.99
NV230	3HSSU2N	36.97
NV250	3HSSU2N	36.97
NV270	3HSSU2N	36.97
NV270	3HSSU2N	36.97
NV300	3HSSN	18.00
NV322	3HSSN	18.00
NV330	3HSS3N	35.99
NV330	3HSS3N	35.99
NV330	3HSS3N	35.99
NV366	3HSS4NA	43.40
NV370	3HSSU1N	25.99
NV380	3HSSU1N	25.99
NV390	3HSSN	18.00
NV450	3HSSU2N	36.97
NV460	3HSSU2N	36.97
NV600	3HSS3N	35.99
NV730	3HSS4NB	41.95
NV777	3HSS3N	35.99
NV851	3HSSN	18.00
NV2000	3HSSN	18.00
NV3000	3HSSN	18.00
NV7000	3HSSN	18.00
NV7200	3HSSN	18.00
NV7500	3HSSN	18.00
NV7800	3HSSN	19.00
NV7850	3HSSN	19.00
NV8170	3HSSN	19.00
NV8200	3HSSN	19.00
NV8400	3HSSN	19.00
NV8600	3HSSN	19.00
NV8620	3HSSN	19.00

**REFURBISHED HEADS (Exchange) Equivalents Chart in Catalogue**

THORN NEW LIFE (Most VHS types) 19.00  
THORN NEW LIFE (National Panasonic) 21.00

ORDERS WELCOME FROM SCHOOLS, COLLEGES, GOVERNMENT ESTABL.

**FERGUSON**

3V00	3HSSV	18.00
3V01	3HSSV	18.00
3V06	3HSSV	18.00
3V16	3HSSV	18.00
3V22	3HSSV	18.00
3V23	3HSSV	18.00
3V24	3HSSV	18.00
3V29	3HSSV	18.00
3V30	3HSSV	18.00
3V31	3HSSV	18.00
3V35	3HSSV	18.00
3V36	3HSSV	18.00
8903	3HSSV	18.00

**NEC**

PV760	PS3BS	19.00
PV764	PS3BS	19.00
PV774	PS3BS	19.00
N830	3HSSV	18.00
N831	3HSSV	18.00
N832	3HSSV	18.00
N833	3HSSV	18.00
PV2300	PS3BS	19.00
PV2400	PS3BS	19.00

**SONY**

PS4B2S	29.95
PS4B3S	29.95
PS4B4S	29.95
PS4B5S	29.95
PS4B6S	29.95
PS4B7S	29.95
PS4B8S	29.95
PS4B9S	29.95
PS4B10S	29.95
PS4B11S	29.95
PS4B12S	29.95
PS4B13S	29.95
PS4B14S	29.95
PS4B15S	29.95
PS4B16S	29.95
PS4B17S	29.95
PS4B18S	29.95
PS4B19S	29.95
PS4B20S	29.95
PS4B21S	29.95
PS4B22S	29.95
PS4B23S	29.95
PS4B24S	29.95
PS4B25S	29.95
PS4B26S	29.95
PS4B27S	29.95
PS4B28S	29.95
PS4B29S	29.95
PS4B30S	29.95
PS4B31S	29.95
PS4B32S	29.95
PS4B33S	29.95
PS4B34S	29.95
PS4B35S	29.95
PS4B36S	29.95
PS4B37S	29.95
PS4B38S	29.95
PS4B39S	29.95
PS4B40S	29.95
PS4B41S	29.95
PS4B42S	29.95
PS4B43S	29.95
PS4B44S	29.95
PS4B45S	29.95
PS4B46S	29.95
PS4B47S	29.95
PS4B48S	29.95
PS4B49S	29.95
PS4B50S	29.95

**HITACHI**

VT6500	3HSSHA	25.50
VT7000	3HSSHA	25.50
VT8000	3HSSHA	25.50
VT8040	3HSSHA	25.50
VT8100	3HSSHA	25.50
VT8500	3HSSHA	25.50
VT8700	3HSSHA	25.50
VT9000	3HSSHA	25.50
VT9300	3HSSHA	25.50
VT9500	3HSSHA	25.50
VT9700	3HSSHA	25.50
VT9900	3HSSHA	25.50
VT4000	3HSSH	25.50
VT4200	3HSSH	25.50
VT5000	3HSSH	25.50
VT5500	3HSSH	25.50
VT11E	3HSSHB	25.50

**ORION**

VH1	3HSSN	21.95
VH2	3HSSN	21.95

**SHARP**

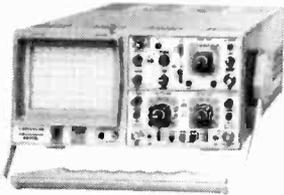
110	3HSSSP	26.95
381	3HSSSP	26.95
383	3HSSSP	26.95
384	3HSSSP	26.95
385	3HSSSP	26.95
386	3HSSSP	26.95
387	3HSSSP	26.95
388	3HSSSP	26.95
389	3HSSSP	26.95
390	3HSSSP	26.95
391	3HSSSP	26.95
392	3HSSSP	26.95
393	3HSSSP	26.95
394	3HSSSP	26.95
395	3HSSSP	26.95

HOW TO INCREASE YOUR PROFITS, IMPROVE YOUR SERVICE, WITH COST EFFECTIVE TEST EQUIPMENT.

### HAMEG OSCILLOSCOPES

HAMEG are Europe's top selling DUAL TRACE OSCILLOSCOPES. Select from four superb models. All incorporate a useful COMPONENT TESTER. Size - all models - 285mm x 145mm x 380mm. Clear display 8 x 10cms. Mains supply 110/125/220/240V AC 50/60Hz. **2 YEAR WARRANTY**

#### HM203-6 20MHz Standard FREE Securicor Delivery



- SPECIFICATION**
- Bandwidth DC-20MHz
  - Sens. Ch1, Ch2, 2mV/cm
  - Time Base 0.25s/cm - 20ns/cm
  - Trigger DC-40MHz AC, DC, HF, LF, (TV Frame)
  - Active TV Sinc. Sep.
  - Invert both channels
  - Variable hold-off 10:1
  - Calibrator
  - Plus many more features

Price £314.00 + £47.10 V.A.T.

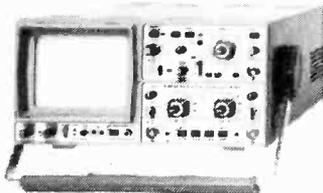
Including two probes

#### FREE Securicor Delivery HM204-2 20MHz Multi-function

**SPECIFICATION**

- Bandwidth DC-20MHz
- Sens. Ch1, Ch2, 1mV/cm
- Delay Line
- Time Base 1.25s/cm - 10ns/cm
- Delayed Sweep 100ns - 0.1s
- Trigger DC-50MHz AC, DC, HF, LF, (TV Frame)
- Variable hold-off 10:1
- Overscan LED indicators
- Calibrator
- Plus many more features

Price £418.00 + £62.70 V.A.T.



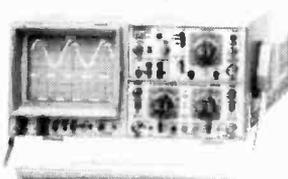
#### HM205 20MHz Digital Storage FREE Securicor Delivery

**SPECIFICATION**

- Digital Storage
- Analogue Real Time (Same as 203-6)
- Bandwidth DC-20MHz
- Sens. Ch1, Ch2, 2mV/cm
- Trigger DC-40MHz AC, DC, HF, LF, (TV Frame)
- Active TV Sinc. Sep.
- 100KHz Sample Rate
- 2 x 1K Storage
- Storage Range, 1ms-5s/cm
- Variable hold-off 10:1
- Calibrator
- Plus many more features

Price £498.00 + £74.70 V.A.T.

Including two probes

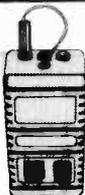
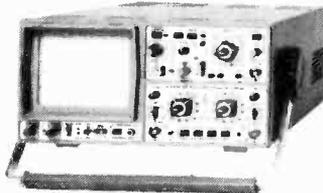


#### FREE Securicor Delivery HM605 60MHz Multi-function

**SPECIFICATION**

- Bandwidth DC-60MHz
- Sens. Ch1, Ch2, 1mV/cm
- Delay Line
- Delayed Sweep 100ns - 0.1s
- Trigger DC-80MHz AC, DC, HF, LF, (TV Frame)
- Variable hold-off 10:1
- Switchable Calibrator
- Overscan LED indicators
- Plus many more features

Price £583.00 + £87.45 V.A.T.



#### B.K.'s CRT TESTER-REJUVENATOR

Tests and rejuvenates blue, green & red guns separately. Fitted with delta and P.I.L. sockets. Compact size 120x65x60 mm. Supply 240V AC

Price £32.00 + £4.80 V.A.T.

#### B.K.'s REVOLUTIONARY DYNAMIC 'LOPT' TESTER

Revolutionary L.O.P.T. tester. Operates in dynamic mode which actually tests the L.O.P.T. under high voltage conditions without de-soldering or removal. Size 75x100x40 mm. Supply 240V AC

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#### THANDAR SC110A PORTABLE OSCILLOSCOPE



Price £195.00 + £29.25 V.A.T.

- Full tng. fac. inc. TV frame etc.
- Battery or mains adaptor
- Size 255mm x 148mm x 50mm

**ACCESSORIES**

- Carry Case £6.25 + £0.93 V.A.T
- Probe £7.50 + £1.30 V.A.T
- Mains Adaptor £7.30 + £1.09 V.A.T

#### DIGITAL LCR METER

- LCD Display
- 18 Ranges
- Inductance 1µH - 2H
- Capacitance 1pf - 200µf
- Resistance 1 ohm - 20Mohm
- High accuracy

Price £95.00 + £14.25 V.A.T.



#### INSULATION TESTER 500V



- Electronic battery operated.
- Measuring Voltage 500VDC
- Measuring Range 0-100Mohm
- Centre scale 2Mohm

Price £65.00 + £9.75 V.A.T.

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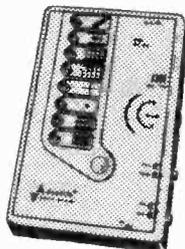
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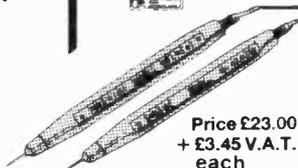
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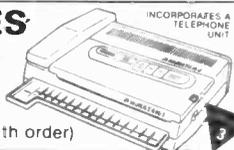
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		LA4440	2.75	TBA800P	85	TDA3541	2.95	ITT CVC40	22.95	BD222	50	BU111AF	2.95	BU111AF	2.95	BU111AF	2.95
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		SAAS050	6.95	TDA1190Z	2.85	TDA8190	2.80			BF470	95	BU111AF	2.95	BU111AF	2.95	BU111AF	2.95
		SAF1039P	2.75	TDA1470	3.25	TDA9503	2.95			BF470	95	BU111AF	2.95	BU111AF	2.95	BU111AF	2.95
		SL4701DP	2.95	TDA1506	4.35	UPC1031H	2.60			BF575	1.45	BU111AF	2.95	BU111AF	2.95	BU111AF	2.95
		SL480	2.85	TDA1510	3.80	UPC1181H	1.70			BF871	1.70	BU111AF	2.95	BU111AF	2.95	BU111AF	2.95
		SL490	2.90	TDA1512	3.50	UPC1182H	1.70			BR103	3.75	BU111AF	2.95	BU111AF	2.95	BU111AF	2.95
		SL1430	1.95	TDA1515	4.50	UPC1185H	2.50			BR303	1.95	BU111AF	2.95	BU111AF	2.95	BU111AF	2.95
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AN337	£3.25	AN7161	£3.75	HA1367	£3.25	LA1365	£1.50	LA7806	£2.75	STK2028	£7.50	TA7269P	£3.50	TA35562	£3.30
AN340P	£1.50	AN7166	£3.95	HA1368	£1.95	LA1368	£1.50	LA7808	£3.95	STK2029	£6.50	TA7270P	£2.75	TA35562	£3.30
AN360	£1.30	AN7178	£2.95	HA1370	£3.70	LA1387	£3.60	LA7910	£2.20	STK1215	£6.75	TA7272P	£2.95	TA35562	£3.30
AN362L	£1.60	AN7213	£1.95	HA1372	£3.50	LA1460	£2.50	LA7920	£1.75	STK1229	£6.75	TA7273P	£3.20	TA35562	£3.30
AN363N	£3.50	AN7218	£1.75	HA1374	£2.50	LA1464	£3.20	LB1405	£2.20	STK2230	£6.50	TA7274P	£2.95	TA35562	£3.30
AN366P	£1.70	AN7222N	£3.50	HA1377	£2.20	LA2100	£2.95	LA2109	£2.95	STK2240	£9.50	TA7280P	£3.50	TA35562	£3.30
AN374P	£2.20	AN7223	£3.95	HA1384	£3.95	LA2101	£3.30	LC4066B	£2.95	STK2250	£9.50	TA7281P	£2.95	TA35562	£3.30
AN377	£2.00	AN7224	£3.50	HA1388	£3.50	LA3160	£1.50	LC730	£3.50	STK3041	£6.50	TA7282AP	£2.95	TA35562	£3.30
AN378	£1.80	AN7256	£2.50	HA1389	£2.20	LA3201	£0.95	LC7131	£3.75	STK3042	£6.50	TA7283AP	£2.95	TA35562	£3.30
AN380P	£1.80	AN7273	£3.95	HA1389R	£2.20	LA3210	£0.75	LC7132	£4.00	STK3044	£5.95	TA7288P	£2.95	TA35562	£3.30
AN512	£4.75	AN7310	£1.20	HA1392	£2.50	LA3220	£2.95	LC7136	£3.75	STK3062H	£6.75	TA7299P	£2.95	TA35562	£3.30
AN510	£6.50	AN7311	£1.20	HA1394	£3.95	LA3300	£1.65	LC7137	£4.50	STK4026	£5.75	TA7317P	£2.75	TA35562	£3.30
AN5265	£3.20	AN7410	£3.00	HA1396	£3.75	LA3301	£1.30	LC7800	£3.95	STK4060	£6.50	TA7328P	£2.20	TA35562	£3.30
AN5410	£3.50	AN7415	£2.95	HA1397	£2.75	LA3310	£2.75	M5134P	£3.25	STK4131H	£6.75	TA7343AP	£2.95	TA35562	£3.30
AN5411	£3.50	AN7420	£2.25	HA1398	£2.75	LA3350	£1.30	M5155P	£1.85	STK4141H	£7.50	TA7348P	£1.60	TA35562	£3.30
AN5430	£2.95	BA301	£0.80	HA1457W	£2.75	LA3361	£1.20	M5102L	£3.95	STK4151H	£7.50	TA7607AP	£2.95	TA35562	£3.30
AN5510	£2.75	BA311	£6.95	HA11251W	£4.35	LA3370	£2.80	M51104L	£3.95	STK4332	£5.75	TA7608CP	£3.95	TA35562	£3.30
AN5512	£2.95	BA313	£0.80	HA11219	£3.25	LA4030P	£2.00	M51513	£1.80	STK4352	£6.50	TA7609P	£2.70	TA35562	£3.30
AN5612	£3.75	BA314	£2.20	HA11221	£2.75	LA4031P	£1.95	M51514	£1.95	STK4392	£7.50	TA7613AP	£2.75	TA35562	£3.30
AN5620X	£3.50	BA318	£1.50	HA1223W	£3.80	LA4032P	£1.90	M51518L	£2.50	STK4803	£8.50	TA7628P	£2.95	TA35562	£3.30
AN5701	£1.80	BA328	£2.50	HA11225	£1.95	LA4100	£1.20	M51516L	£2.80	STK4833	£9.50	TA7640P	£2.95	TA35562	£3.30
AN5722	£1.50	BA333	£1.50	HA11226	£4.50	LA4101	£1.00	M51517L	£2.80	STK4843	£8.95	TA7658P	£1.75	TA35562	£3.30
AN5730	£1.85	BA335	£5.60	HA11235	£2.30	LA4102	£1.40	M51518L	£2.20	STK4843	£8.95	TA7658P	£1.75	TA35562	£3.30
AN5732	£1.85	BA340	£2.50	HA11251	£2.75	LA4110	£1.75	M51521L	£1.90	STK5315	£6.75	TA7662105P	£3.50	TA35562	£3.30
AN5750	£3.75	BA343	£2.75	HA11401	£2.80	LA4112	£1.75	MB3705	£1.80	STK5324	£5.75	TA7662105P	£3.50	TA35562	£3.30
AN5753	£1.85	BA402	£0.95	HA11423	£4.75	LA4120	£2.95	MB3712	£1.50	STK5325	£6.75	TA7662105P	£3.50	TA35562	£3.30
AN6250	£2.30	BA403	£1.95	HA11440	£3.95	LA4125	£2.20	MB3713	£1.60	STK5421	£6.50	TA7662105P	£3.50	TA35562	£3.30
AN6326N	£3.75	BA511A	£1.85	HA11226	£4.50	LA4126	£2.50	MB3714	£2.95	STK5451	£6.75	TA7662105P	£3.50	TA35562	£3.30
AN6327	£4.75	BA514	£1.90	HA11703	£4.50	LA4137	£1.95	MB3722	£3.50	STK5471	£6.50	TA7662105P	£3.50	TA35562	£3.30
AN6328	£4.20	BA516	£1.90	HA11704	£5.20	LA4140	£0.90	MB3730	£2.50	STK5476	£6.75	TA7662105P	£3.50	TA35562	£3.30
AN6330	£2.95	BA521	£1.80	HA11705	£6.95	LA4145	£1.70	MB3731	£3.50	STK5720	£6.80	TA7662105P	£3.50	TA35562	£3.30
AN6340	£7.85	BA524	£2.75	HA11706	£4.75	LA4160	£2.40	MB3756	£2.60	STK5730	£6.50	TA7662105P	£3.50	TA35562	£3.30
AN6341N	£4.00	BA526	£3.50	HA11710	£3.75	LA4170	£3.50	MB3759	£3.30	STK7216	£6.50	TA7662105P	£3.50	TA35562	£3.30
AN6342N	£2.50	BA527	£1.75	HA11711	£9.50	LA4176	£2.50	MB3719	£3.95	STK7308	£6.75	TA7662105P	£3.50	TA35562	£3.30
AN6344	£4.75	BA532	£1.60	HA11713	£6.50	LA4182	£2.20	STK011	£3.95	STK7404	£6.95	TA7662105P	£3.50	TA35562	£3.30
AN6350	£7.50	BA536	£2.50	HA11714	£5.95	LA4183	£2.95	STK014	£7.25	STK8250	£8.95	TA7662105P	£3.50	TA35562	£3.30
AN6356N	£3.85	BA546	£2.20	HA11716	£4.75	LA4192	£1.95	STK015	£5.20	STK8250H	£10.75	TA7662105P	£3.50	TA35562	£3.30
AN6357N	£4.95	BA547	£2.50	HA11717	£5.75	LA4201	£1.60	STK016	£6.25	STK8300	£5.80	TA7662105P	£3.50	TA35562	£3.30
AN6360	£4.50	BA512	£1.80	HA11718	£4.75	LA4220	£1.50	STK020	£3.75	STK8440	£5.80	TA7662105P	£3.50	TA35562	£3.30
AN6362	£5.50	BA631A	£3.75	HA11724	£9.25	LA4230	£2.25	STK025	£7.50	STK8441	£5.80	TA7662105P	£3.50	TA35562	£3.30
AN6363	£4.50	BA636	£4.50	HA11727	£9.50	LA4236	£2.50	STK043	£10.50	STK8451	£5.80	TA7662105P	£3.50	TA35562	£3.30
AN6371	£4.25	BA843	£4.50	HA11745	£9.00	LA4422	£1.75	STK077	£6.50	STK2012	£6.75	TA7662105P	£3.50	TA35562	£3.30
AN6387	£5.95	BA1310F	£1.75	HA11747	£9.50	LA4430	£1.50	STK078	£6.75	STK4090	£6.75	TA7662105P	£3.50	TA35562	£3.30

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Thorn TX 10 Stereo	£110.00	<b>Ferguson (Late Model)</b>	
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Philips KT30	£50.00	Sharp 383/381/481/9100/9300	from £90.00
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Hitachi T.V.'s	from £50.00	Hitachi 8300/8700/9300/VT11	from £80.00
Sony T.V.'s	from £60.00	Amstrad 7000	£70.00
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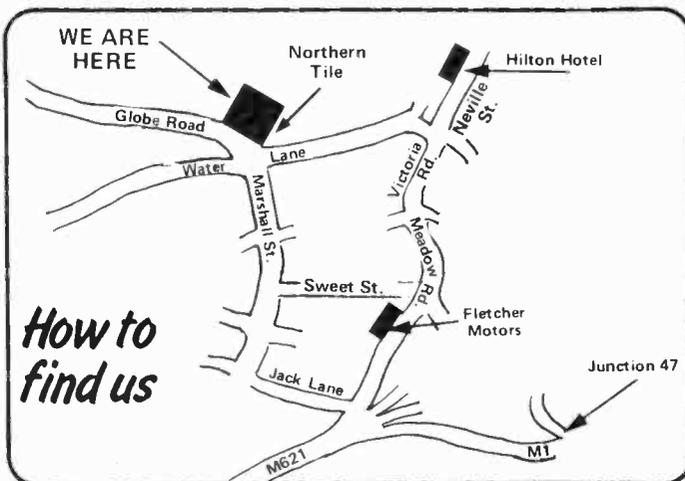
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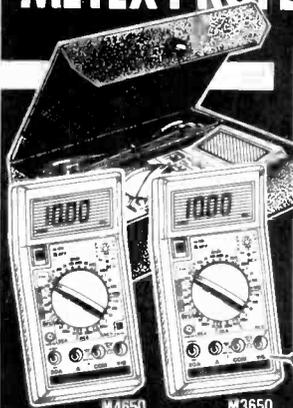
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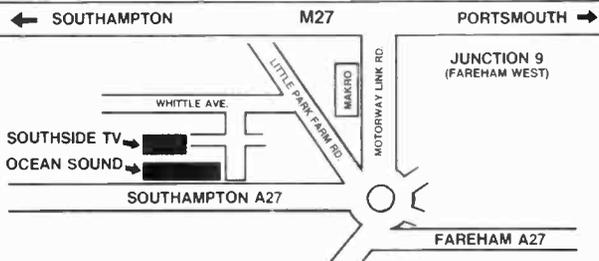
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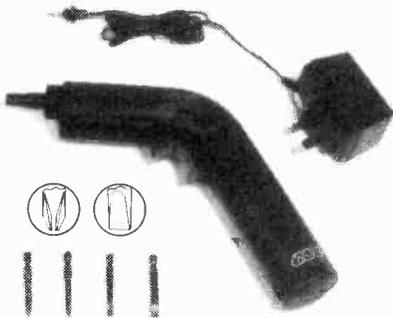
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Rechargeable Screwdriver



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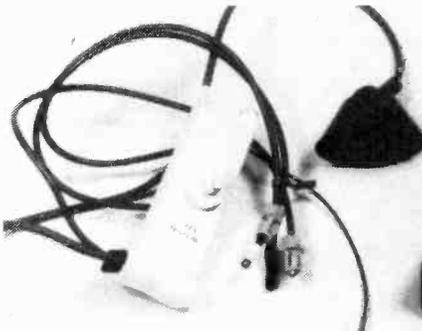
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Uniross Nickel Cadmium Batteries



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RX6 AA	MN1500 1.2V	0.5Ah	BTRX6	0.95
RX14C	MN1400 1.2V	1.2Ah	BTRX14	1.75
RX20D	MN1300 1.2V	1.2Ah	BTRX20	1.90
RX22PPE	MN1604 8.4V	0.11Ah	BTRX22	3.75

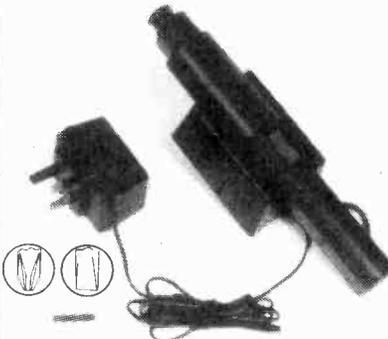
### Focus Unit Thorn TX10



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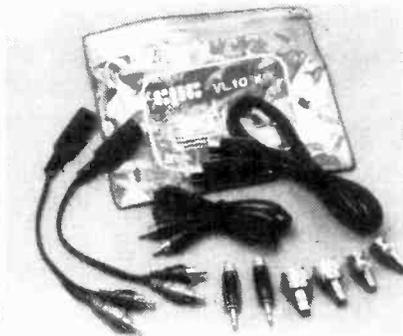
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**EPSON MINI PRINTER 15011.** This is a till roll size printer and uses plain paper. £15.00 each. Order ref. 15P14.

**2764 EPROM.** 65K BITS. BBC micro compatible. £3.00 each. Order ref. 3P48.

**PIEZO SOUNDER.** Reference PKM11 3-30volt operation 90dB output. 2 for £1.00. Order ref. BD647.

**MINI PIEZO SOUNDER.** Only 12mm diameter 2 for £1.00. Order ref. BD648.

**SUB-MIN TOGGLE SWITCH.** Body size 8mm x 4mm x 7mm SBDT with chrome dolly living nuts. 4 for £1.00. Order ref. BD649.

**SUB-MIN PUSH SWITCH.** DPO7. 3 for £1.00. Order ref. BD650.

**PIEZO SOUNDER COVER** for 22mm hole. Black perforated and slightly curved. 4 for £1.00. Order ref. BD651.

**PM SPEAKER.** 90mm x 60mm 16ohm. 5-watt Japanese made. 2 for £1.00. Order ref. BD652.

**MINIATURE DRIVER TRANSFORMER.** Reference LT44. Impedance ratio 20K ohm to 1K ohm centre tapped. Size approx 19.5mm x 2.2 for £1.00. Order ref. BD653.

**LINEAR IC.** LM324N. Quad operational amplifier. 4 for £1.00. Order ref. BD654.

**HIGH VOLTAGE POWER TRANSISTOR.** TIP3055 High voltage NPN. 2 for £1.00. Order ref. BD655.

**3-40pF TRIMMER CAPACITOR.** Mullard reference 808-11409. 4 for £1.00. Order ref. BD656.

**DOUBLE ENDED BT LEAD** is light grey and 3m long and terminates each end with normal flat BT plug. £1.00 each. Order ref. BD657.

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**DISPLAY 16 CHARACTER 2 LINE.** As used in telephone answering and similar machines. Screen size 85mm x 36mm x 9.3mm. Alpha-numeric. dot matrix module with integral C-MOS micro processor. LCD display. Made by the EPSON Company. reference 16027AR. Price £10.00. Order ref. 10P50.

**HEAT SINK COMPOUND.** 1 tube. Price £1.00 each. Order ref. BD659.

**CLEAR LACQUER.** Quick drying for the protection of transfers, markings, maps, etc. Also protects wood and metal. Exceptionally clear. Large can for £1.00. Order ref. BD660.

**500 VOLT BRIDGE MEGGER.** Made by the famous Evershed and Vignoles Company 500volt Meggers are the only reliable instrument for measuring the state of electrical wiring installations, but the Bridge Megger has the additional feature of being able to measure low ohms so can be used for finding and localising faults. The instruments we have are complete in a leather carrying case and they have been re-calibrated and tested and are in perfect order. Price is £9.50 plus £6.00 insured delivery.

**9v-9v 400mA.** PCB mounting mains transformer. Price £1.00. Order ref. BD661.

**V3 MICRO SWITCH.** 10A 250v change over contacts, screw terminals. 3 for £1.00. Order ref. BD662.

**DOUBLE PSU.** Voltage regulated. Exact voltage not known, but the smoothing capacitors of one section are rated at 24,000uf at 15v and the other section 21,000uf at 20v. There are two of each. Also two full-wave rectifiers with heat sinks and two voltage regulators, ref. 8133, all mounted on a metal panel. Size approx 10in long x 8in wide. Also on the PCB are power resistors SCR, etc. PCB size approx 6in x 5 1/2in. You need only a transformer to use this as a power supply. Alternatively, you have excellent value as a stripper. These are new and unused. Price £5.00 plus £2.00 postage. Order ref. 5P120.

**VERY HIGH PRESSURE GAS BOTTLES.** We have acquired a quantity of Soda Stream gas cylinders. They look capable of well over 1,000PSI, so should do for a hydraulic system, or if you need a spare for your fizzy drinks maker these are standard. Approximately 100 available. Our price £5.00 each, plus £1.00 postage. Order ref. 5P121.

**ACORN GAMES.** We have big stocks of the Acorn games and we do not seem to be able to sell them, probably because most Acorn owners already have them, so we are offering these at a very low price, hoping that you will think they are worth buying for re-programming. They are new and in their original pictorial holders. Price: 3 for £1.00. Order ref. BD645.

**PIEZO ELECTRIC FAN.** Mains driven, works on electro-static principle and uses virtually no current. Ideal for computer and instrument cooling. Price only £1.00 each. Order ref. BD658.

**COMPUTER TO FDD LEAD.** Made for the BBC. Enables this to drive one or two FDDs. Price £5.00. Order ref. 5P112.

**LIGHT BOX.** Measures approx 15in x 12in x 4in deep. Uses Philips 'W' fluorescent tube and a sheet of fibre glass, through which there should be sufficient light to enable you to follow the circuit on a PCB. Kit of everything you need to make the light box. Price £5.00. Order ref. 5P69. Post and special packing is another £3.00.

**8 TRACK CASSETTE DECK.** Complete with cassette holder. In fact, if you have any 8 track cassettes then with the addition of 2 speakers this unit would play them. As 8 track cassettes are no longer made the units have become surplus, however, they do contain lots of useful parts: motor, tape head and drive, pulley wheels, etc., and a stereo amplifier. Mains driven. Brand new in makers packing. Only £3.00 each plus £1.00 additional postage. Order ref. 3P46.

**RUBBER 13amp EXTENSION LEAD SOCKET.** Virtually unbreakable, made by Duraplug. £1.00 each. Order ref. BD641.

**PAPST AXIAL FAN. MANUFACTURERS REF NO TYP4580N.** This is mains operated 15watt rating and in a metal frame with metal blades so OK in high temperatures. Body size approx 434in square x 158in thick. £6.00 each, plus £1.00 postage. Our ref. 6P6.

**PRICE REDUCTION FOR THAT MODERN CONNECTOR.** Standard BT flat plug and 3 metre lead. Price now reduced to 50p. 2 for £1.00. Ref. BD0552.

**COMPUTER BARGAIN - MEMOTECH MTX 512 64K RAM.** Full size QWERTY keyboard with 57 professional keys and additional 12 dual function keys arranged as a separate key pad with cursor control and editing keys. Auto repeat is standard on all keys. This is a very superior home computer and comes complete with power supply, cassette lead, TV lead and 3 cassette programmes. Brand new in manufacturer's original packing with 250 page Operator's Manual. Price £45.00 plus £4.00 postage.

**VERY POWERFUL MAGNETS.** Although only less than 1in long and not much thicker than a pencil these are very difficult to pull apart. Could be used to operate embedded reed switches, etc. Price 50p each, 2 for £1.00. Our ref. BD642.

**MOTOR TO WORK OFF SOLAR CELLS.** Could drive a fan or other device. Speed would depend upon the number of cells used. Six of our BD631's in series would cause it to rev at a reasonable speed. With twelve it would be quite fast and current would be 25-30mA depending on load. Price of the motor is £1.00. Our ref. BD643.

**4.5v 150mA PSU.** Full wave, rectified and smoothed. Encased. Plugs into 13amp socket and has DC output lead with push in socket. British made to BS APP2383. Order ref. 2P208.

**9v 150mA PSU.** Full wave, rectified and smoothed. Encased. Plugs into 13amp socket. Price only £2.00. Order ref. 2P209.

**12v 400mA PSU.** Rectified, smoothed and voltage regulated. Encased. Plugs into 13amp socket with output lead. Price £3.00. Order ref. 3P29.

### LASER POWER SUPPLIES

Both mains and battery operated will be available September. Ring for details.

## F.D.D. BARGAIN

3 1/2 Floppy Disk Drive, made by the Chinon Company of Japan. Beautifully made and probably the most compact device of its kind as it weighs only 600g and measures only 104mm wide, 162mm deep and has a height of only 32mm, other features are high precision head positioning - single push loading and eject - direct drive brushless motor - Shugart compatible interface - standard connections - interchangeable with most other 3 1/2 and 5 1/4 drives. Brand new with copy of makers manual. Offered this month at £28.50 post and VAT included.

**CASE** - adaptable for 3" or 3 1/2" FDD, has room for power supply components price only £4 includes circuit of PSU. Our Ref 4P7

**POWER SUPPLY FOR FDD** - 5V and 12V voltage regulated outputs, complete kit of parts will fit into case 4P7 price £8 or with case £11. Our ref 11P2.

## 9" MONITOR

Ideal to work with computer or video camera uses Philips black and white tube ref M24306W. Which tube is implosion and X-Ray radiation protected. VDU is brand new and has a time base and EHT circuitry. Requires only a 16V dc supply to set it going. It's made up in a lacquered metal framework but has open sides so should be cased. The VDU comes complete with circuit diagram and has been line tested and has our six months guarantee. Offered at a lot less than some firms are asking for the tube alone, only £16 plus £5 post.

## CASE FOR 9" MONITOR

We have arranged with a metal worker to make cases for the 9" Monitor. Delivery promised for the end of May and the price £12 plus £2 post. The case will be made from coated sheet steel, overall size approx 10in x 10in x 7in high which will give ample space for the Power Supply and external controls if you fit them.

**FLIP-OVER DIGITAL CLOCK** - Quite an eye catcher, this is mains operated. The figures flip-over per minute and per hour and give a larger than usual visual display. Supplied complete with front and perspex panels to glue together to make its case. £2.00 each. Our ref 2P205.

## 3" FDD HITACHI 3055XA

This has standard Shugart connections and will work with most computers but is particularly suitable for Amstrads, in fact it was recommended in a recent "Computing with Amstrad" Price £30 + £3 post.

**TORROIDAL MAINS TRANSFORMER** with twin outputs. 6 3v 2amps and 12v lamp. so ideal for FDD power supply. Price £5.00. Our reference 5P122.

**DOUBLE MICRO CASSETTE DECK** made by the Japanese ABS Company. This takes two micro cassettes and is complete with motors, solenoids to select the deck to use and record and playback heads. Price £10.00. Our reference 10P49

## THIS MONTH'S SNIP

**LASER TUBE.** Made by Philips Electrical. New and unused. This is helium-neon and has a typical power rating of 9mW. It emits random polarised light and is completely safe provided you do not look directly into the beam when eye damage could result. Do not use in the presence of children unless a diverging lens is fitted. DON'T MISS THIS SPECIAL BARGAIN! Price £29.95 plus £3.00 insured delivery.

**QUICK FIX MAINS CONNECTOR** - A must for your workshop. Saves putting on plugs as you just push the wires under the spring clips. Automatically off when lid is up. Price £7.50. Our reference 7P5/1.

**BT HANDSET** with curly lead terminating at BT plug. Colour cream. Price £5.00. Our reference 5P123.

**STEREO SPEAKERS** - Each 10watts 8ohm and twin speakers mounted in Walnut-finish cabinets. Size 16in high x 10in wide x 6in deep. Front is black Dacron and the finish is very pleasing. Price £7.00 per pair. Extra postage and packing £3.00. Our reference 7P6.

**DO YOU WANT TO MEASURE AC AMPS?** - We have found a few more of the 50Hz 0-40amp AC 2 1/2in diameter panel meters, made by RAF equipment these are very reliable and robust. Price £5.00 each. Our reference 5P105.

## GPO TEST METER 12/C1

20,000 opv. 19 AC/DC ranges, including all the usual ones and a very useful in ohms range, also shunt provision for reading up to 10a. DC. It is in a real leather carrying case and comes complete with leads, prods and croc clips. Price £7 Ref. 7P5.

## 8" GREEN SCREEN MONITOR

Complete and in a case with optional tilt stand for improved viewing angle. A very compact unit measuring only 10 1/2" x 10 1/2" x 7 1/2" high operates from a 15V DC supply - composite input so ideal for use with Electron or similar computers. Used, but we test before despatch and guarantee 6 months. Price £17.50 - Our Ref: 17P1 - please add £3 post.

**CAMERA TUBE** - Mullard PLUMBICON ref XQ1020G. Believed unused. Few only at £50 each.

**UNUSUAL MAINS MOTOR** - Quite small, measures only 2in x 2in x 1in approx., but is surprisingly powerful. It revs at 3,000rpm and is reversible. It has good length 1/8in diameter spindle. Price £1.00. Order ref. BD640.

## POWERFUL IONISER

Generates approx. 10 times more IONS than the ET1 and similar circuits. Will refresh your home, office, shop, workroom etc. Makes you feel better and work harder - a complete mains operated kit, case included £11.50 + £3 P&P.

## J & N BULL ELECTRICAL

Dept. T.V., 250 PORTLAND ROAD, HOVE, BRIGHTON, SUSSEX BN3 5QT.

MAIL ORDER TERMS: Cash, P.O. or cheque with order. Orders under £20 add £1 service charge. Monthly account orders accepted from schools and public companies. Access & B/card orders accepted. Brighton (0273) 734648 or 203500.

## BARGAINS STILL AVAILABLE

**RE-CHARGEABLE NICADS 'D' SIZE** these are tagged for easy joining together but tags can easily be removed, virtually unused, tested and gndd. £2.00 each ref 2P141. 6 for £10 ref 10P47.

**BRIGHT LIGHT SWITCH** will control mains circuits up to 10 amps, gets its switch pulses from car headlights, night daylight, etc, so it does not use batteries and its sensor is completely isolated from the mains, with full instruction supplied. Price £10 ref 10P46.

**POWERFUL 12V MOTOR** was intended for Sinclair Electric Car, rating approx. 1/3 HP. Price £15 plus £2 post.

**3 INCH FDD Hitachi ref. HFD 2055XA.** Ideal replacement or second drive in most computers, especially Amstrad 6128, etc. Price £30 plus £3 post.

**SOLAR POWERED NI-CAD CHARGER.** 4 NI-CAD batteries AA (HP7) charged in eight hours or less in only 4 hours. It is complete, boxed ready to use. Price £6. Our ref. 6P3.

**50v 20A TRANSFORMER 'C'** Core construction so quite easy to adapt for other outputs - tapped mains input, only £25 but very heavy so please add £5 if not collecting, order Ref. 25P4.

**FREE POWER!** Can be yours if you use our solar cells—sturdily made modules with new system bubble magnifiers to concentrate the light and so eliminate the need for actual sunshine—they work just as well in bright light. Voltage input is 45—you join in series to get desired voltage—and in parallel for more amps. Module A gives 100mA, Price £1, Our ref. BD631. Module C gives 400mA, Price £2, Our ref. 2P199. Module D gives 700mA, Price £3, Our ref. 3P42.

**SWITCH AC LOADS WITH YOUR COMPUTER** This is easy and reliable if you use our solid state relay. This has no moving parts, has high input resistance and acts as a noise barrier and provides 4kV isolation between logic terminals. The turn-on voltage is not critical, anything between 3 and 30V, internal resistance is about 1K ohm. AC loads up to 10A can be switched. Price is £2 each. Ref. 2P183.

**METAL PROJECT BOX** Ideal size for battery charger, power supply etc. sprayed grey, size 8" x 4 1/4" x 4" high, ends are louvered for ventilation other sides are flat and undrilled order Ref. 2P191 price £2.

**BIG SMOOTHING CAPACITOR.** Sprague powerfytic 39,000uf at 50V. £3. Our Ref. 3P41.

**4-CORE FLEX CABLE.** Cores separately insulated and grey PVC covered overall. Each copper core size 7/2mm. Ideal for long telephone runs or similar applications even at mains voltage. 20 metres £2. Our ref. 2P196 or 100 metres coil £8. Order ref. 8P19.

**TWIN GANG TUNING CAPACITOR.** Each section is 0005uf with trimmers and good length 1/4in spindle. Old but unused and in very good condition. £1 each. Our ref. BD630.

**13A PLUGS.** Good British make complete with fuse, parcel of 5 for £2. Order ref. 2P186.

**13A ADAPTERS** - Takes 2 13a plugs, packet of 3 for £2. order Ref. 2P187.

**20v - 0 - 20v** - Mains transformers 2 1/2 amp (100 watt) loading, tapped primary. 200-245 upright mountings £4. order Ref. 4P24

**BENCH ISOLATION TRANSFORMERS 500 watt** - 230v in and out with plenty of tappings to give exact volts. £12. + £3

**BURGLAR ALARM BELL** - 6" gong - OK to fix outside in the rain and shelter - mains operation. £8. Ref. 8p2

**24 HOUR TIME SWITCH** - 16A changeover contacts, up to 6 on/off per day. Nicely cased, intended for wall mounting. Price £8. Ref. 8P6

**CAPACITOR BARGAIN** - axial ended - 4700uf @ 25v Jap made. Normally 50p each, but you will get 4 for £1. Ref. 613.

**PIEZO ELECTRIC FAN** an unusual fan, more like the one used by Madame Butterfly, than the conventional type, it does not rotate. The air movements is caused by two vibrating arms. It is American made, mains operated, very economical and causes no interference. So it is ideal for computer and instrument cooling. Price is only £1 each. Ref. BD605

**SPRING LOADED TEST PRODS** - heavy duty, made by the famous Bulgin company. Very good quality. Price four for £1. Ref. BD597

**CURLY LEAD** - four core, standard replacement for telephone handset, extends to nearly two metres. Price £1 each. Ref. BD599.

**TELEPHONE BELLS** - these will work off our standard mains through a transformer, but to sound exactly like a telephone, they then must be fed with 25Hz 50v. So with these bells we give a circuit for a suitable power supply. Price 2 bells for £1. Ref. BD600.

**ASTEC PSU.** Mains operated switch mode so very compact (6 1/2" x 4" x 2" approx.) Outputs +5 Volts 3.5 amp +12 Volts 1.5 amp. -5 Volt 1.5 amp. Brand new. Normal price £30 + Our price only £10. Ref. 10P34

**APPLIANCE THERMOSTATS** - spindle adjust type suitable for convector heaters or similar. Price 2 for £1. Ref. BD582

**3 CORE FLEX BARGAIN No.1** - Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. order Ref. 2P189

**3 CORE FLEX BARGAIN No.2** - Core size 1.25mm so suitable for long extension leads carrying up to 13 amps - or short leads up to 25A. 10m for £2. order Ref. 2P190.

**CASE WITH 13A PRONGS** - to go into 13A socket, nice size and suitable for plenty of projects such as car battery trickle charger, speed controller, time switch, night light, noise suppressor, dimmers etc. Price - 2 for £1. Ref. BD565

**ALPHA-NUMERIC KEYBOARD** - this keyboard has 73 keys with contactless capacitance switches, giving long trouble free life and no contact bounce. The keys are arranged in two groups, the main area held is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" x 4" - brand new but offered at only a fraction of its cost namely £3, plus £1 post. Ref. 3P27

**TELEPHONE EXTENSIONS** - it is now legal for you to undertake the wiring of telephone extensions. For this we can supply 4 core telephone cable, 100m coil £3.50. Extension BT sockets £2.95. Packet of 50 plastic headed staples £2. Dual adaptor for taking two appliances from one socket £3.95. Leads with BT plug for changing old phones 3 for £2

**WIRE BARGAIN** - 500 metres 0.7mm solid copper tinned and pvc covered. Only £3 + £1 post. Ref. 3P31 - this is well under 1p per metre, and this wire is ideal for push on connections.

**INTERRUPTED BEAM KIT** - this kit enables you to make a switch that will trigger when a steady beam of infra-red or ordinary light is broken. Main components - relay photo transistor, resistors and caps etc. Circuit diagram but no case. Price £2. Ref. 2P15.

**3-30V VARIABLE VOLTAGE POWER SUPPLY UNIT** - with 1 amp DC output. Intended for use on the bench for experimenters, students, inventors, service engineers etc. This is probably the most important piece of equipment you can own. (After a multi range test meter). It gives a variable output from 3-30 volts and has an automatic short circuit and overload protection, which operates at 1.1 amp approximately. Other features are very low ripple output, a typical ripple is 3mV pk-pk, 1mV rms. Mounted in a metal fronted plastic case, this has a voltmeter on the front panel in addition to the output control knob and the output terminals. Price for complete kit with full instructions is £15. Ref. 15P7.

**TRANSMITTER SURVEILLANCE (BUG)** - tiny, easily hidden, but which will enable conversation to be picked up with FM radio. Can be housed in a matchbox. All electronic parts and circuit. Price £2. Ref. 2P52



# EAST CORNWALL COMPONENTS



CATALOGUE available - range of components greatly increased - over 136 pages fully illustrated. Price £1.00 per copy (free upon request with orders over £15). Credit Tickets (3), Special Offer Sheets, Order Form and Pre-Paid Envelope. Order your copy now.

## OCTOBER SPECIAL OFFER

12V Twin Fluorescent Lamp  
12" Double Tubes



Ideal for Boats, Caravans, Vans, etc. Attractive white fitting, ribbed perspex diffuser. On/off switch. 3ft cable. Transistorised circuitry. Keyhole fixing. 12V D.C. 8W Tubes. 368 x 67 x 43 mm.

**ONLY £4.99**

## TERMINAL BOX

Terminal Junction Box for powering D.C. accessories. Gives three pairs of pillar screw terminals colour coded red and black. 90cm lead fed from cigar lighter plug. Current: 3A max. Dimensions: 84 x 55 x 32 mm. Order Code: SO/158.



1+ £1.50 10+ £1.25

## LOGIC PROBE

Simple to use - good quality - logic probe. Displays the logic state of each gate of TTL, C-Mos, etc. devices. Logic state displayed in light and sound. Pulse enlargement capability allows pulse detection down to 25ns. Supplied complete with comprehensive instruction manual.

## 12 VOLT RECHARGEABLE UNIT

Working Voltage: 4-16 Vdc Thresholds: Hi 70% Vcc LO - 30% Vcc Input impedance: 1 Mohm Max. input frequency: 20MHz. Order Code - TEST/LOGIC. PRICE - £7.99

## NI-CAO BATTERY CHARGER

Universal. PRICE: 1+ £4.50 each 10+ £4.25 each 100+ £3.75 each

## NI-CAO BATTERIES

AAA	E241	£1.25	£1.20 ea/10
AA	E242	90	85 ea/10
C	E243	£2.10	£1.90 ea/10
D	E244	£2.50	£2.20 ea/10
PP3	E245	£4.10	£3.90 ea/10

## 20mm FUSES

QUICK BLOW - 80mA, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1A, 1.25, 1.5, 1.6, 2, 2.5, 3.15, 4, 5, 6.3 45p/10  
TIME DELAY - 50mA, 60, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1A, 1.25, 1.5, 1.6, 2, 2.5, 3.15, 4, 5, 6.3, 10 90p/10

## 1 DOMESTIC MAINS FUSES

2A, 3A, 5A, 13A £1.00/10

## 1 1/4 QUICK FUSES

500mA, 1A 1.25A, 2A, 12A 50p/10

## BT APPROVED EQUIPMENT

Master Socket (Flush) £2.90  
Master Socket (Surface) £2.75  
Secondary Socket (Flush) £1.90  
Secondary Socket (Surface) £1.70  
B.T. Cable (per metre) 15p  
Per 100 metres £12.00  
Line Jack Cord with Plug £1.25

Extension Lead 5 Mtr £2.90  
Wiring Tool 35p  
Plug - 41A 25p  
Simult. Phone £17.35  
Viscount Phone £26.04  
AF116 2.10  
Conversion Kit & Wiring Diagram £5.90  
100K 3W W/W/ 1.50



## INTEGRATED CIRCUITS (IC) EACH

DAF96	1.05	K188(G.E.C.)	19.00	TD42532	2.80
DF96	0.80	PC88	1.80	TD42960	3.20
DK96	2.70	PC32	3.05	TD42960	3.20
DM71	3.00	PC900	1.45	741	0.16
DY86/87	0.70	PC88	0.80	CA8100M	1.20
DY802	0.95	PC88	0.80	CA3020	1.20
CV850	2.55	PC189	1.90	CA3085	1.60
CV4015	2.85	PCF80	0.95	HA1366V/8	1.59
E180F	6.55	PCF82	1.00	LA4422	3.20
EAB3C80	0.85	PCF84	0.80	LC1131	4.80
EAF42	1.55	PCF86	1.30	LM324N	0.40
EB91	1.35	PCF87	0.60	LM380N8-P	0.80
EB41	3.50	PCF200	2.00	LM380N11N	1.80
EBF90	0.80	PCF201	2.00	LM1011N	1.20
ECC81	1.05	PCF800	1.25	LM1458N	1.35
ECC82	0.95	PCF801	1.10	LM3900N	0.50
ECC83	1.20	PCF802	1.10	M51513L	2.30
ECC84	0.85	PCF806	1.75	M51515L	3.15
ECC85	1.90	PCF806	1.25	MC1307P	1.99
ECC88	1.25	PCF808	1.65	MC1327P	1.50
ECC189	0.90	PCF82	2.55	ML237B	2.30
ECCF80	0.85	PCF83	2.55	SA5501	1.50
ECCF82	0.90	PCF84	1.05	SA5560S	1.85
ECCF83	1.95	PCF86	1.95	SA5570S	1.85
ECCF85	3.00	PCF88	2.55	SA5580	2.85
ECCF81	1.45	PCF805	1.05	SA5590	2.85
ECCF84	1.55	PD500	2.95	SN76226DN	1.30
ECL85	0.80	PL200	1.80	SN76227N	1.10
ECL86	1.80	PL3	1.55	SN76533N	1.75
EF90	0.80	PL52	1.80	ST1015	6.20
EF96	1.85	PL82	2.00	TA7203P	2.50
EF91	2.05	PL95	2.05	TA7204P	2.50
EF99	1.70	PL504	1.55	TA7205AP	1.80
EF183	0.95	PL508	2.75	TA9582	0.50
EF184	1.05	PL519/509	5.20	TA9611A12	3.50
EH30	1.00	PL802	5.55	TA120B	1.30
EL44	3.45	PV817800	1.15	SA50	1.30
EL36	2.30	PY82	1.80	TBA520	1.50
EL81	2.00	PY88	1.80	TBA530	1.20
EL84	2.40	PY500A	2.25	TBA540	1.64
EL85	5.00	PY801	0.75	TBA560C	1.50
EL86	0.95	UAB3C80	0.90	TBA810S	2.20
EL509	7.90	UAF42	1.30	TBA9502A	3.05
EL519	8.00	UBC41	4.35	TCA2705Q	4.02
EM80	0.90	UBC81	1.75	TD1A1006A	2.45
EM84	1.00	UC35	1.80	TD1A1035S	1.50
EM87	0.90	UCF90	1.25	TD1A1170S	1.99
EY51	0.95	UHC42	5.65	TD1A1352A	1.80
EY86/87	0.70	UHC81	2.05	TD2A2030	1.80
		UCL82	1.85	TD2A2530	2.20

## RESISTORS - CARBON FILM 5%

1/4W 1R0 to 10M (E12 Range) 2p each 15p/10, 75p/100  
1/2W 2R2 to 10M (E24 Range) 2p each 15p/10, 75p/100  
1W 10R to 2M2 (E12 Range) 5p each 40p/10, 3.00/100  
2W 10R to 2M2 (E6 Range) 8p each 60p/10, 5.00/100

## RESISTOR KITS - each value individually packed

1/4W pack 10 each value E12 - 10R to 1M 610 pieces 4.50  
1/4W pack 5 each value E12 - 10R to 1M 305 pieces 2.95  
1/4W pack Popular - 10R to 10M 1000 pieces 6.50  
1/2W pack 10 each value E12 - 2R2 to 2M2 730 pieces 7.75  
1/2W pack 5 each value E12 - 2R2 to 2M2 365 pieces 4.70  
1/2W pack Popular - 2R2 to 10M 1000 pieces 6.50  
1W pack 5 each value E12 - 2R2 to 1M 353 pieces 13.75  
2W pack 5 each value E6 - 10R to 2M2 317 pieces 21.75

## ADDITIONAL KITS

DISC CERAMIC 50V 125 pieces £3.50  
ZENER DIODES Sea 55 pieces £3.50  
ELECTROLYTICS R 100 pieces £7.25  
FUSES 0/BLOW 20mm 80 pieces £3.75  
FUSES T/DELAY 20mm 80 pieces £7.50  
PRE-SET POTS-H 120 pieces £6.75  
PRE-SET POTS-V 120 pieces £6.74

## SOLOER: 60% TIN 40% ALLOY

22g Non-corrosive Multi-core Solder. 500gm Reel £4.99 each

## SOLDERING SECTION

Soldering Station complete with 30W or 60W Iron (total) which 72.50  
XS25 W Iron kit/complete with stand, 1m lead & plug attached 8.20  
C15 Iron Kit 7.90  
XS25 W Iron kit/complete with steel & plug attached 11.00  
CS 18W, as above 10.90  
Antex 15W iron 5.40  
Antex 18W iron 5.60  
Antex 25W iron 5.80  
Antex elements 1.20  
Antex tips 2.20  
Soldersucker 2.99  
Spare nozzles for Soldersucker 0.80

## ORVX PORTASOL GAS SOLDERING IRON

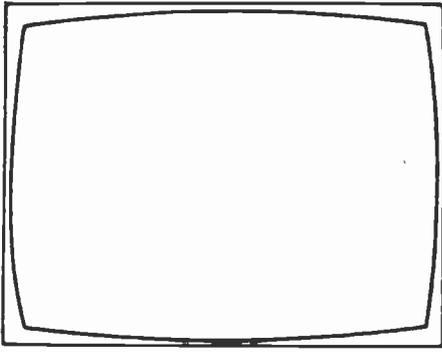
PRICE £16.00 each  
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SLC60 39.45  
SLK95 39.45  
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AC128K	0.38	BC238	0.12	BF194A	0.15
AC141	0.58	BC251A/B	0.14	BF240	0.20
AC141K	0.62	BC252	0.25	BF241	0.15
AC142	0.40	A	0.29	BF257	0.22
AC142K	0.38	BC301	0.36	BF258	0.26
AC152	0.48	BC302	0.36	BF259	0.30
AC153K	0.42	BC303	0.42	BF262	0.34
AC176K	0.32	BC307A	0.15	BF265	0.38
AC187	0.40	BC317B	0.15	BF270	0.28
AC187K	0.42	BC323A	0.10	BF271	0.30
AC188	0.24	BC327	0.10	BF273	0.34
AC188K	0.38	BC328	0.10	BF274	0.46
ACY22	1.50	BC337	0.08	BF294	0.40
AD142	0.88	BC338	0.16	BF336	0.40
AD149	0.95	BC350A	0.24	BF338	0.28
AD161/162	1.20	BC351	0.16	BF338	0.28
AF114	0.88	BC516	0.35	BF355	0.42
AF115	0.47	A	0.36	BF371	0.27
AF116	2.10	BC440	0.10	BF450	0.20
AF121	0.66	BC548	0.08	BF457	0.36
AF124	0.70	A B or C	0.10	BF457	0.36
AF125	0.60	BC549	0.30	BF457	0.36
AF126	0.50	A or B	0.10	BF461	0.32
AF127	0.50	BC550	0.10	BF461	0.32
AF139	0.56	A or B	0.10	BF474	0.38
AF178	0.65	BC557A	0.10	BF475	0.32
AF239	0.65	BC558A	0.10	BF475	0.32
AF279S	1.40	BCY70	0.36	BF475	0.32
AS990	5.20	BC210	3.21	BF490	0.80
AS217	1.20	BC211	3.60	BF490	0.80
AU110	4.90	BD124P	1.20	BR100	0.20
AV102	2.32	BD129	0.76	BR101	0.76
B40C200	1.43	BD130	0.58	BR103	0.60
BA115	1.30	BD131	0.62	BR103	0.60
BA121	0.40	BD132	0.50	BR139	0.80
BA148	0.16	BD135	0.26	BRY56	0.42
BA155	0.12	BD136	0.26	BSX20	0.20
BA157	0.30	BSY52	0.57	BSY52	0.25
BB105G	0.32	BD138	0.30	BSY95A	0.25
BB105G	0.30	BD139	0.30	BT100A/02	2.70
BB110B	0.42	BD140	0.25	BT101/300	2.75
BC108	0.10	BD142	1.60	BT101/500	3.25
BC109	0.14	BD145	1.82	BT102/300	3.60
BC110	0.10	BD150B	0.50	BT106	2.05
A B or C	0.14	BD160	0.45	BT116	1.20
BC115	0.15	BD165	0.45	BT116	1.20
BC117	0.28	BD183	0.70	BT138/600	0.98
BC118	0.20	BD201	0.52	BT151/560R	0.98
BC119	0.43	BD202	0.57	BT179/400R	2.80
BC125	0.14	BD222	0.80	BU105	1.40
BC140	0.48	BD225	0.40	BU105	1.40
BC141	0.36	BD232	0.52	BU108	1.50
BC142	0.26	BD234	0.30	BU126	1.60
BC143	0.36	BD235	0.30	BU126	1.60
BC147B	0.16	BD236	0.36	BU204	1.60
BC148	0.16	BD237	0.38	BU205	1.40
BC148B	0.12	BD410	0.46	BU206A	1.50
BC149	0.12	BD438	0.64	BU206A	1.50
BC149C	0.14	BD439	0.85	BU407	1.75
BC159	0.14	BD441	0.85	BUX80	2.90
BC	0.16	BD507	1.05	BUY20	2.75
BC160	0.38	BD520	1.20	BUY69A	2.90
BC161	0.30	BD587	0.88	BUY69B	1.98
BC168B	0.25	BD707	0.88	BUY100	0.88
BC170A/B/C	0.12	BD148	1.00	BY103	0.35
BC171A/B	0.10	BDX32	1.75	BY122	0.60
BC172/B/C	0.12	BF115	0.32	BY126	0.10
BC177/B/C	0.24	BF117	0.50	BY127	0.08
BC182A/B/C	0.10	BF119	0.42	BY131	0.10
BC182L	0.10	BF125	0.42	BY135	0.10
LA LB LC	0.12	BF127	0.44	BY164	0.45
BC183A/B/C	0.12	BF154	0.14	BY179	0.60
BC184	0.10	BF157	0.16	BY182	0.54
LA LB LC	0.12	BF160	0.23	BY184	0.38
BC184	0.08	BF167	0.32	BY187	0.65
LA B CL LC LB	0.10	BF177	0.44	BY189	0.65
BC212A/B/C	0.10	BF178	0.27	BY190	0.64
BC212L	0.10	BF180	0.27	BY199</	



# TELEVISION

## Deregulation and its Consequences

Deregulation has been the order of things ever since retail price maintenance was abolished many years back. It has brought the consumer great benefits in the form of cheaper goods and greater variety. It has also brought about great changes in the way in which industry, in particular the consumer electronics goods industry, is organised. We have seen the takeover of the indigenous UK consumer electronics industry by, in particular, Japanese setmakers. It had always been assumed that a major reason for Japanese interest in establishing plants in the UK was to obtain a secure base to serve the EC countries. That remains an interest of course but more recently those who run the Japanese plants have been expressing concern at the way in which things are going as a new wave of competition develops. First we had own-brand goods sourced from various Far Eastern countries – a continuing development – then the major Korean manufacturers (and not to forget Taiwan's Tatung) decided to enter the market directly. What next? Well, there are consumer electronics manufacturing plants dotted throughout the Far East, but it does come as a bit of a surprise to find that China looks set to become a major force in the market. The Chinese TV setmaking capacity has been expanding rapidly, and in 1987 well over nineteen million sets are understood to have been produced in the People's Republic. Concern is being expressed over the fact that quite a lot of these seem to be entering the UK via Hong Kong.

The Chinese manufacturer Huanyo has gone one better in establishing a UK base at Corby, where production is scheduled to reach over 70,000 sets in the first year – the plant has been in operation for some ten months, producing 14 and 20in. models almost entirely from imported kits (including the c.r.t.): 16 and 18in. models are expected to be introduced next year. This operation is actually a joint effort run in conjunction with UK distributor Treatlink. The two companies have invested some £300,000 in the venture, but the know-how comes from Huanyo which has provided the works manager and three technicians. Twenty two unskilled UK workers have been taken on and, according to works manager Chen Shu Dong, are "beginning to do well". "After some months the British workers are coming up to standard" he added, and apparently some are to be sent to China for training. That comes as a bit of a shock when you consider the UK's tradition of TV development and manufacture. But, it seems, that's the way things are going. Huanyo is planning a similar operation in the USA, where the last indigenously owned manufacturer Zenith is seriously considering pulling out.

Deregulation has certainly given free rein to entrepreneurs but, true to the UK's reputation of being a nation of shopkeepers, it seems that far more effort is going into sale and distribution than manufacture. We have of course commented before on the problems manufacturers face in the UK – the recent sharp rise in interest rates is yet another example of government unhelpfulness in this respect.

That rise in interest rates comes as a result of balance of payment problems fuelled by a massive credit expansion. And where did that credit growth come from? You guessed it, deregulation in the banking industry. The latest figures from BREMA, for the first quarter of 1988, show the way in which consumer electronics goods are contributing to the balance of payments problem. Imports of TV sets, VCRs and audio equipment were all substantially higher than in the same quarter of 1987 and the signs are that the trend has continued. The 490,000 TV sets imported during the first quarter accounted for 51 per cent of the market compared with 34 per cent during the equivalent months in 1987. Nowadays of course this means a loss of market share by the UK's Japanese manufacturers. At the large-screen end of the market 70 per cent of sets are still UK made, but this falls to 32 per cent with small-screen sets. VCR imports increased by 65 per cent and it's no wonder that the J2T operation came to an end in the UK. Spokesmen for Japanese manufacturers in the UK have talked of "serious market destabilisation" and "total commercial irresponsibility", but in the context of deregulation what can you expect? The consumer benefits in the short run but the consequences of total deregulation are much greater volatility in markets and economic conditions, with long-term damage to industry. It's of course impossible to draw up a balance sheet in the midst of such chaos.

Where is deregulation going to strike next? Well as you know the government would like to see the principle applied to broadcasting. Keep the BBC as a sop to those who want to see quality and the public service principle retained but abolish the IBA, replacing it with a toothless Commercial Television Authority, and let a new generation of broadcasters get on with it seems to be the view, with Sir William Rees-Mogg's Broadcasting Standards Council to make some appropriate noises when things get out of hand. The trouble is that we all know where this could lead. The consequences of all this deregulation are not pleasant to contemplate.

### INDEX TO VOLUME 37

The index to Volume 37 is now available from the magazine's editorial office (see page 881 for the address). Copies can be supplied for 80p each. Indexes for Volumes 35 and 36 are also still available, at the same price.

### QUESTIONNAIRE COMPETITION

The draw has now been carried out for the prizes offered to those sending in completed questionnaire forms (June issue). The winners were A. F. Stark, Newport (first prize), S. E. Stratton, Huntingdon (second prize), A. J. Paxton, Derby (third prize) and A. Sherifali, Dunstable (fourth prize). We received several thousand completed questionnaires which are at present undergoing computer analysis. Our thanks to all those who returned questionnaires.

### 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 881.

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### COVER PHOTO

This month's cover photograph shows the Decca/Tatung 130 chassis – see servicing article on pages 904-8. Observant readers will have noted that a tripler modification kit has been fitted!

# Long-distance Television

Roger Bunney

Few exotic signals were received during July, but there was certainly a lot of DX-TV about. Both SpE and tropospheric conditions were very active. First the SpE diary for the month:

- 5/7/88 TVE (Spain) ch. E3; DR (Denmark) ch. E3.
- 6/7/88 TVE E2, 3, 4; RTP (Portugal) E2, 3; C+ (Canal Plus — TDF, France) L4; NRK (Norway) E3.
- 7/7/88 TVE E3, 4; RTP E2, 3; RAI (Italy) IA; TVE-2 E2; NRK E2, 3.
- 8/7/88 TVE E2, 3, 4; RAI IA, B; RTP E3; ORF (Austria) E2a; CST (Czechoslovakia) R1; TSS (USSR) R1; NRK E3; TVA IA (Italian free station); JTV (Jordan) E3.
- 9/7/88 TVE E2, 3, 4; RTP E2, 3; RAI IA, B; Tele Uno (Italian free station) E3; C+ L4; JRT (Yugoslavia) E3; +PTT (Switzerland) E2, 3; MTV (Hungary) R1, 2; TVP (Poland) R1; ARD (West Germany) E2, 3, 4; CST R1; RTSH (Albania) IC; TSS R1, 2, 3; NRK E2, 3, 4; RUV (Iceland) E3; JRT E3.
- 10/7/88 TVE E2, 4; RAI IA, B; C+ L3, 4; ARD E2, 3; ORF E2a, E4; DR E3; MTV R1, 2, 4; JRT E3, 4; CST R1, 2, 3, 4, 5; NRK E2; TVP R1; RUV E4. Sporadic E propagation was present this day at up to 144MHz at least.
- 11/7/88 RAI IA, B; TVE E3; ARD E2; JRT E3, 4; MTV R1; TVR (Rumania) R2, 3; +PTT E3; TVP R1, 2; TSS R1, 2.
- 12/7/88 SVT (Sweden) E2; TSS R1, 2; CST R1, 2; MTV R1, 2; TVR R2; JRT E3, 4; RAI IA, B; +PTT E2, 3; ARD E2.
- 13/7/88 NRK E2, 3, 4; SVT E2; TSS R1, 2; DR E4; YLE (Finland) E3; JRT E3; TVE E2, 3, 4.
- 14/7/88 RAI IA, B; RTP E2; TVE E2, 3, 4; TVE-2 E2; +PTT E2; C+ L3, 4; JRT E3, 4; ORF E4; CST R1, 2; TVP R2, 3; TSS R1, 2.
- 15/7/88 TVE E2, 3; RAI IA; DFF (East Germany) E4; TVP R2; TSS R1, 2; CST R2.
- 16/7/88 NRK E2; TVE E3.
- 17/7/88 TSS R1.
- 18/7/88 TVE E3; RAI IA; CST R1; TSS R1, 2; RTM (Morocco) E4.
- 19/7/88 ARD E4; SVT E4; TSS R1, 2; TVP R1.
- 20/7/88 TVE E2, 3, 4; TVE-2 E2; RTP E3; RAI IA, B; TVA IA; TVR R1; CST R1; TVP R1, 2; JRT E3, 4; EPT (Greece) E3; +PTT E2, 3, 4; C+ L3, 4; TSS R1, 2, 3; YLE E3; NRK E2, 3, 4; ARD E2; RUV E4.
- 21/7/88 TSS R1, 2, 3, 4; CST R1, 2; TVP R1, 2, 3; SVT E2; NRK E2, 3; RUV E3, 4; MTV R1, 2; EPT E3; CST R1, 2; C+ L4; RAI IA, B; TVE E2, 3, 4; TVE-2 E2.
- 22/7/88 TSS R1, 2; NRK E2, 3; SVT E3; CST R2; TVE E2, 3, 4; RAI IA.
- 23/7/88 RUV E4; BRT (Belgium) E3; DR E3; YLE E3; RAI IA; TVE E2, 3, 4; +PTT E2; TSS R1, 2; NRK E2, 3, 4.
- 24/7/88 ARD E2; CST R1, 4; RTSH IC; DR E3; JRT E4; EPT E3; +PTT E2, 3; MTV R1; TVR R2, 3; TVP R1, 2, 3; TSS R1, 2, 3; C+ L4; NRK E2, 3; SVT E2, 3, 4; RUV E4; TVE E2, 3, 4; RAI IA, B; RTP E2.
- 25/7/88 ARD E2; SVT E2, 3, 4; CST R1, 2; TSS R1; TVP R1, 2; ORF E2a; RAI IA.
- 26/7/88 NRK E4; YLE E3; TVE E2, 3.
- 27/7/88 YLE E3; TVP R2.
- 28/7/88 DR E3; SVT E2, 3, 4; NRK E4; TVP R1; TSS R2;

- RUV E4; RAI IA; TVE E3, 4.
- 29/7/88 TVE E2, 3; RTP E2; RAI IA; NRK E4; SVT E2; TSS R1; TVP R1, 2.
- 30/7/88 TVE E2, 4; RAI IA; NRK E3, 4.
- 31/7/88 TVE E2, 3, 4; RTP E2, 3; RAI IA, B; also free stations TVA IA, Videolina IA and Telemarket ch. E2 (measured at 47.69MHz video carrier!); CST R1; ORF E2a; JRT E3, 4; C+ L3; ARD E2; EPT E3; RTSH IC; TVR R2; YLE E3; TSS R1, 2; TVP R1, 2; NRK E2.
- 1/8/88 ORF E2a; RTP E2, 3.

Despite the poor weather, with record rainfall, there were two major spells of tropospheric propagation during July. The 11th produced Band III and u.h.f. signals over most of the UK from the nearer Continental countries — Belgium, Holland, Luxembourg and France. The major event however was over the 18-20th, when quite remarkable results were seen. Apart from the usual signals, such as those received on the 11th, DXers in the south/south west were rewarded with Band III and u.h.f. signals from TVE while TVE ch. E3 was received via tropospheric propagation in St. Leonards! Countless TDF transmitters were received, including many L5 and M6 outlets. W. German Band I/III/u.h.f. signals were noted and there was the bonus of French/German/Italian language reception from Switzerland on chs. E4, 6, 7, 9, 10, 31, 34 and 35. Reception extended as far as the Midlands, where French stations predominated.

Cyril Willis excelled himself as usual, in particular with ZTV (Zimbabwe) ch. E2 (Gwelo) at 1811 BST on the 21st, followed shortly after with an unidentified short-duration ch. A2 (system M) signal. Cyril thinks that the often received ch. E2 (or just I.f. of ch. E2) CNN programme originates from the Telemarket/TV Ercalano Italian free station. In connection with System M signals, we gather from the BDXC that a ch. A5 (77.25MHz vision, same as ch. R3) transmitter is currently in operation at Le Plessis-Robinson radiating CNN at 16W e.r.p. and that a ch. A5 transmitter at Tower des Lavezzi in the south of Corsica is radiating AFRTS programmes at 110W e.r.p.

An excellent month then for DX-TV reception in the UK. My thanks to David Oliver (Birmingham), Brian Renforth (Newcastle), Peter Schubert (Rainham), Roger Fussell (Torpoint), Cyril Willis (King's Lynn), Tim Anderson (St. Leonards), Bill Cotterill (Tipton), Simon Hamer (Powys) and Iain Menzies (Aberdeen) for sending in reception reports and comments.

The RSGB reports that on July 15th at 2100 GMT Brian Sheepwash, a radio amateur in Co. Antrim, N. Ireland, succeeded in establishing two-way contact at 144MHz with IA8 BEX in the Canary Islands. At some 3,065km this is a record. A remarkable feat, and our congratulations.

More information has been received on the dramatic transatlantic SpE opening on June 6th. It seems that the 50MHz amateur band was active from 1650-0231 GMT, two-way contacts being established as far west as Kansas and Illinois. Using only 7W, one amateur made 111 contacts from Indiana down to South Carolina, while on the 7th he made contact with Puerto Rico to the south west. The opening was remarkable for the distances and duration of signals. The type of SpE propagation — double- or multiple-hop — is currently in question. A single 50MHz station in Chicago managed a UK contact through the noise, signals and general confusion! At the same time US amateurs in the west established 50MHz communication across the Pacific, as far as Japan. It was a

truly historical v.h.f. opening, and much thought is being given to the theoretical aspects of the propagation.

Hugh Cocks reports transatlantic SpE reception of several ch. A2 transmitters in Portugal during June/July. Stations identified include San Juan (Puerto Rico), WGBH Boston, WCBS New York, WCBD Charleston, WPBT Miami and CBFT Montreal. Ch. A3 signals were present on many days. Hugh comments that he's been able to contact the UK on most days at around 0800 BST using the 27MHz CB band (chs. 30-36).

A letter from Anthony Mann in Perth, Western Australia, reports on reception during the last six months. Up to about May signals were mainly in the 30-40MHz band, with various US pagers etc., though an amateur radio contact was established between Australia and Japan in mid-April at 144MHz. TV signals were received on chs. E2, R1 and C1 (China) during May/June, but Anthony experienced problems with the opening of a new ch. 10 (Band III) transmitter nearby — the station signs itself "NEW 10".

### News Items

**Europe:** At a recent meeting in France the EBU confirmed its intention to strive for a common world-wide HDTV standard — also a common transeuropean standard for satellite broadcasting.

**Israel:** There are doubts over the future of the TV-2 service. Due to religious and commercial considerations the Knesset has not passed legislation to provide funds for the service. The treasury had anticipated that it would by now, after two years, be self-funding and has made no budgetary allocation for the present year.

**Gibraltar:** There is controversy over the transmission of the ITN International News via Superchannel by the GBC. Locals say that the service is too European orientated and pressure is being brought on the GBC to revise its news policy.

**Spain:** During the summer season TVE-2 is offering foreign news commencing at 1230 local time — there's seven minutes of news in English, French and German, with items from ITN, Antenna-2 and ZDF linked via the ECS satellite at 7°E.

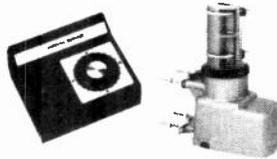
**North America:** A remarkable device called the "Ad Zapper" is on sale, designed to pause your VCR while recording films etc. in order to remove the commercials. The unit recognises a change in video information on a blank frame and, via its infra-red remote control link, actuates the pause mode which continues until the unit recognises the resumption of programme material. A



RTA (Algeria) ch. E5 received by Garry Smith (Derby) via SpE propagation on June 7th, 1988. The signal is from the M. Cid transmitter.

## AERIAL TECHNIQUES

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feature of this remarkable unit is the "pause jog" which overcomes the problem that some machines shut down after two and a half minutes in the pause mode — the zapper instructs the machine to record for one second before such a shut-down, then resume pause. The zapper can be programmed to switch the VCR over a four-cycle, two-week slot, in conjunction with the machine's timer system. Sonatel Communications Research Ltd. of 502-815 Hornby Street, Vancouver, B.C., V6Z 2E6 markets the zapper at \$150.

**Ireland:** RTE has announced the adoption of the EBU approved NICAM 728 digital dual-channel sound system for use in its TV broadcasting network. Regular dual-channel sound transmissions are not expected to start until the 1990s. Details of the system, also the latest (July 1988)

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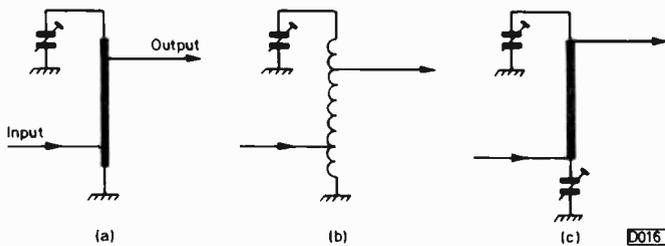


Fig. 1: Input/output tuned circuit arrangements. (a) Quarter-wave u.h.f.; (b) quarter-wave v.h.f.; (c) half-wave u.h.f.

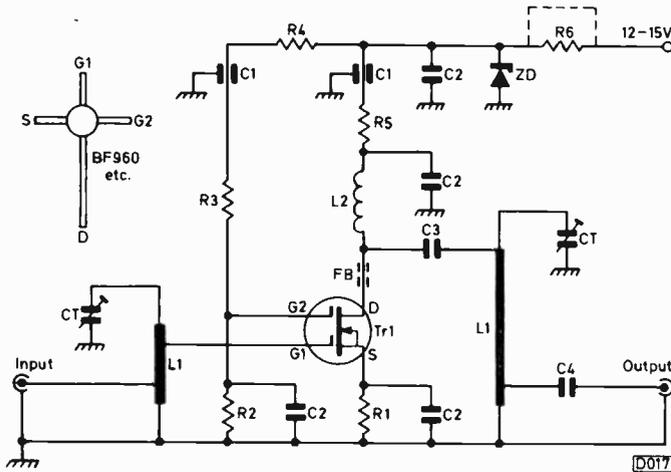


Fig. 2: MOSFET/MESFET aerial amplifier circuit. For the MOSFET version R1 120-470 $\Omega$  (see text), R2 82k $\Omega$ , R3 39k $\Omega$ , R4/5 10 $\Omega$ , R6 and ZD omitted, CT 2-10pF trimmer, C1 1kpF feedthrough, C3 22pF, C4 4-9pF, L1 coil to suit frequency, L2 10-12 turns 4mm diameter over 25mm (v.h.f./u.h.f. choke), FB ferrite bead/toroid. Differences for the MESFET version: R1 68-180 $\Omega$ , R2 18k $\Omega$ , R3 27k $\Omega$ , add ZD 7.5V and R6 270 $\Omega$ , CT 1-5pF trimmer, C2 470pF, C4 2.2pF, stripline L1 35mm long at 700MHz, 45mm at 500MHz (width 2.5mm), L2 6 turns 4mm diameter over 25mm (u.h.f. choke).

RTE-1 and RTE-2 transmitter list and a frequency/channel allocation chart, are available from Reception Investigations, RTE, Donnybrook, Dublin 4, Ireland.

**Satellite TV:** Micro-X intends to supply Astra receiving systems for £190 and a model with tracking for £380.

### Transmitter Information

The Danish Aabenraa ch. E27 and Hedensted ch. E30 TV-2 transmitters are now on air from 0800-1800 weekdays, using the PM5534 pattern with appropriate identification. The RTL+/Tele 5 Hamburg outlet is now on air with full power (15kW) in W. Germany; a new SSSVC outlet at Goch on ch. E23 (vertical polarisation) is also now operational. The Swedish Vasterass ch. E44 transmitter is in full service at 1,000kW e.r.p. YLE (Finland) is seeking to open a relay station at Tartu in Estonia.

### Narrowband Preamplifiers

The June 1988 issue of the Polish magazine *Amaterske Radio* contained much information on v.h.f./u.h.f. aeri- als and amplifiers. While we are not able to follow the Polish text in detail the diagrams are self-explanatory and much basic information can be gleaned from the articles. The amplifiers are all for narrow-band use, featuring input/output tuned lines or coils with the input/output at 75 $\Omega$  tapped down at the earthy end. Quarter- or half-wave tuned lines are used, trimmed by a small capacitance (see Fig. 1). Fig. 2 shows a basic MOSFET circuit. The v.h.f. version employs f.e.t.s such as the BF961/963/964/965/981/982/991/992 while the u.h.f. version uses the BF960/966/

980 series. Circuits for v.h.f. and u.h.f. operation are similar, the difference being in the input/output tuned circuits. The noise figure quoted is typically less than 2dB with gains of 15-18dB. It seems that the main advantage claimed is the selectivity when just a few channels are amplified.

Use of a MESFET transistor in this circuit, e.g. the S3000 or S3030 (Texas Instruments), MRF960 or MRF966 (Motorola), CF300 or CF400 (Telefunken), or the Hitachi 3SK97/3SK121/3SK124, gives operation at up to some 1.25GHz with typical noise figures of 0.5-1dB at a gain of 24dB with a 20MHz bandwidth.

While we pass on the circuit, anyone intending to adopt it would have to be experienced in u.h.f. techniques. Screening between the input and output sides of these transistors is essential. Low-noise components should be used, with lead lengths kept to a minimum.

For the MOSFET version the source bias resistor should be selected for a current drain of 10mA, and will be within the range 120-470 $\Omega$ . The equivalent MESFET bias resistor will be in the 68-180 $\Omega$  range.

### TV Memorabilia

Andrew Emmerson of 71 Falcutt Way, Northampton NN2 8PH is marketing a two-sided audio cassette, TV1, which consists of old and some not so old recordings of UK TV station identifications, jingles, several opening sequences and close downs and real 405-line memorabilia. You can relive the first day of Thames TV on July 24th 1968, 1964 BBC Schools' music, the opening days of TVS, ABC-TV, Rediffusion and even the whole Southern Television "Southern Rhapsody" opening sequence (fond memories of that one!). There are many such items on side one. Side two consists of longer sequences such as the sound track of the "Tale of a Tower", the story of the collapse and rebuilding of the transmitting tower at Emley Moor. All good stuff that I listened to with pleasure. The technical quality is only fair since much of the material was recorded domestically. Pity that most of the recordings of station identification jingles tend to have the final note decay cut off abruptly. Otherwise it's a fine tape, recorded on a BASF LH-EI cassette. The cost for fifty minutes of nostalgia is a mere £5 including postage. If you order, allow two-three weeks' delivery time — overseas orders should include the appropriate postage. Hopefully other tapes will follow.

I've also recently viewed a VHS tape that discusses the history of UK test cards. It takes the form of an illustrated interview with a well known BBC engineer — Andrew Emmerson is the interviewer. The tape covers development from Test Card A through to the present. It should be available shortly, once duplication has been arranged — we'll provide details as soon as these are known. One point that arose during the interview is that the early BBC Test Card B is "lost". If anyone has a copy of this card or a photograph of it please let us know — it's a variation on Test Card A dating from the pre-World War Two era.

It has also become apparent that there's a lack of recorded 405-line material for the growing number of enthusiasts who collect 405-line equipment. If you have 405-line recordings, pattern generators, etc. for disposal, please drop us a line.

To conclude on this memorabilia theme, a friend recently obtained a quantity of brand new Emerson 17in. 405-line TV sets that had been stored in a warehouse and forgotten about many years ago. Only in June 1988 were they rediscovered!

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# UHF Oscillator using SMDs

Denis Mott

A reasonable selection of u.h.f. signals is required in my company's development laboratory. The cost of a commercially built video-modulated signal generator was considered to be excessive, especially as various equipment modulators are available. The most useful of these is the Mullard REMO 201 which is available from Sendz Components and Manor Supplies. Its drawback is the upper carrier frequency limit, at approximately ch. 55.

We decided to overcome the problem by building a stripline oscillator, using surface mounted devices (SMDs) to make the design as small as possible. The size of the PCB depends on the length of the stripline of course – in our case the final PCB measured 20 × 30mm, fitting neatly into the space left after careful removal of the original oscillator. We obtained the SMDs, including the transistor, from some faulty Telefunken tuners. They were carefully removed using a hot-air gun and fine tweezers. All components were tested after removal, especially the chip capacitors as these have no value markings – I'm fortunate in having access to a digital capacitance meter.

The oscillator is of the type used in most TV tuners, but is not tunable (see Fig. 1). The tuning element consists of the PCB etched stripline – this arrangement was adopted for simplicity and mechanical stability. For our particular application we chose the ch. 68 carrier frequency (847.25MHz), but the length of the stripline can be extended for the lower frequencies (see Table 1). Fig. 2 shows the print pattern and Fig. 3 the component layout. Fine tuning is quite simple: just short out to earth part of the stripline and if necessary alter the value of C4.

Two main types of SMDs are available, MELFs and rectangular. MELF resistors are basically miniature tubular types with end caps instead of wire leadouts: the value is usually indicated by means of coloured bands. The rectangular types are usually smaller physically, have end coated connections and are marked with numerals. Capacitors and other components are also available in both physical styles. The surface-mounted BF579 (or G7) transistor is made by Siemens and Mullard. A pnp device was chosen since it's easier to get the circuit working with the collector returned to chassis. You could use a plastic encapsulated type such as the BF970.

The first prototypes were built before I acquired solder paste, so the components were soldered in place using a 40W iron with a very fine tip.

The r.f. loop output coupling coil is not earthed as the modulator chip in the Mullard unit requires a balanced input. If the oscillator is required as just an r.f. source one

end of the loop can be earthed.

The finished unit was mounted in the corner of the Mullard modulator, with two sides soldered to the external screening can. The r.f. output wires are stout enough to provide physical support, going through both sets of holes and being soldered in place.

## RF Output

The modified modulator's r.f. output is between 10-20mV. A greater output may be required if a passive combiner is being used. This can be provided by an amplifier based on the Mullard OM361 thick-film circuit or a similar unit, see Fig. 4. If the amplifier is near the modulator, with a common supply, careful screening of the output will be required to avoid instability.

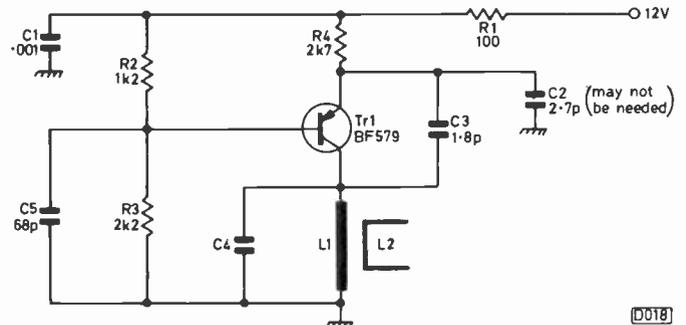


Fig. 1: Circuit diagram of the stripline u.h.f. oscillator. See Table 1 for details of C4.

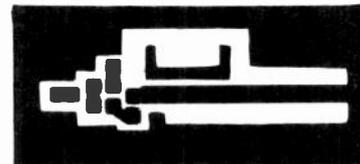


Fig. 2: The original PCB artwork, reproduced same size.

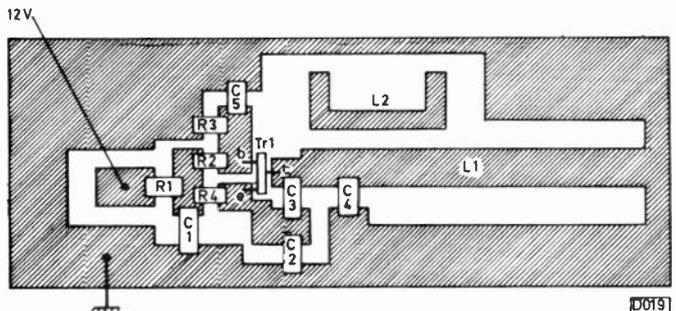


Fig. 3: PCB component layout, not to scale.

Table 1: Tuned circuit details

Channel	Stripline (mm)	Value of tuning capacitor (C4)
21	28	4.7pF
30	28	3.3pF
40	21	2.2pF
50	21	1.8pF
60	13	—
68	10	—

Notes: Stripline width 2.5mm. C4 not required at the higher frequencies.

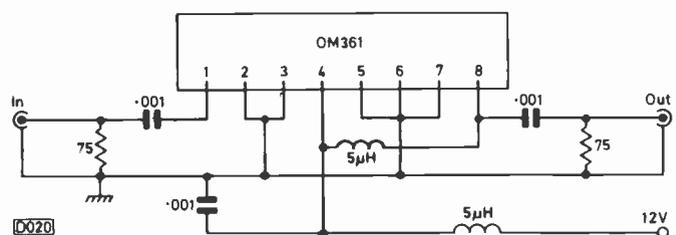


Fig. 4: OM361 r.f. amplifier circuit.

# Teletopics

## SATELLITE TV

British Satellite Broadcasting (BSB), holder of the IBA DBS franchise, has signed contracts with Ferguson, Nokia (ITT/Luxor/Salora) and Tatung for the manufacture of set-top tuning units capable of receiving the BSB transmissions. Under the terms of the contract the units will be able to handle the Eurocypher encryption standard and will include pay-to-view operation, stereo sound capability and remote control. The aim is to make available to the public a receiving system, including the aerial and installation charge, at a cost of about £250. This compares with the £199 that Amstrad has announced for equipment, without encryption and remote control, to receive the Sky satellite TV services. BSB hopes that over 400,000 installations will be sold during the first year of the new services, starting in late 1989.

Prototype units able to decode the D-MAC signals for feeding to a standard PAL receiver via a scart socket have been demonstrated by BSB. The Philips-Plessey consortium has also announced the successful development of a prototype unit. ITT has announced chip type numbers: the DMA2280 will decode the D-MAC signals while the DMA2285 will handle unscrambling. These VLSI devices are housed in 68-pin packages and use 1.5µ CMOS technology. BSB has also announced that it intends to make available a 25cm flat, square aerial which has been named the Squarial. It's presumed to use microstrip elements phased and linked to an in-built head unit, with a plastic housing.

Alba has bought an eighty per cent interest in Satellite Technology Systems, a Bristol based firm that produces satellite TV receiving equipment, and hopes to have on sale by Christmas receiving equipment for the Astra satellite. This equipment will be sold under the Alba brand name and will be price-competitive with Amstrad's £199 equipment. Alba also hopes to produce receivers under the Bush brand name for reception of the BSB transmissions. In a separate development Alba has bought a 96 per cent interest in its French distributor which will be renamed Alba France.

Micro-X, which claims to be Europe's largest satellite TV equipment distributor, has introduced a training scheme for satellite TV installers aimed at professional electrical and aerial installation engineers. The company plans to train upwards of 1,000 people a year, a substantial proportion of the 2,500 installation engineers it's projected will be needed in the UK. As well as a grounding in the theory of satellite TV reception, engineers will be given practical, hands-on experience of a wide variety of systems. The cost of the scheme is £89 plus VAT and enrolment details can be obtained from Micro-X Ltd., 16 Beresford Avenue, Wembley, Middlesex HA0 1QR (telephone 01-900 2333).

Micro-X has launched the new Chaparral Cheyenne satellite TV receiver unit in the UK. It's believed to be the most sophisticated unit on the market, being able to handle up to 720 channels on 30 satellites entirely via remote control. A single auto-tune button controls both channel selection and aerial tracking. For ease of use the system displays "help" menus on the TV screen. The receiver is expected to sell at around £1,000 and comes preformatted for all known existing and future satellites including Astra, Eutelsat, Intelsat etc. Each channel has

four selectable bandwidths and when tracking between satellites the Cheyenne cuts out the sound and blanks the screen apart from a message to indicate that tracking is in progress. NEC has announced that its 2022 satellite TV receiver has been made compatible with the Astra transmissions.

British Telecom International reports that the Intelsat VA F11 satellite's spot beam has been repositioned to centre on the Birmingham area as planned – the beam had been misdirected at the Bay of Biscay, giving weak signals in northern Europe. Further tests are being carried out to monitor the new beam position. The satellite is at 332.5°E. RAI-Uno transmissions are being transferred from Eutelsat I-F1 at 13°E to Eutelsat I-F4 at 10°E. Other channels carried by F4 include TVE (Spain) and NRK (Norway). RAI-Duo transmissions are expected to start shortly. The loss-making Super Channel is likely to be sold: offers are understood to have been made.

## CDV LAUNCH

Compact disc video (CDV) software and hardware is being launched by Philips and PolyGram in the UK on October 3rd. There will be a £2.5m advertising campaign. PolyGram is to make an initial catalogue of 80 titles available, with a further 80 before Christmas. Philips' first machine will be a combi player at around £500, capable of playing all three sizes of the gold CDV discs, the 3 and 5in. silver audio discs and the old LaserVision discs. A player for the 5in. CDV discs and audio-only discs will follow by the end of the month at around £350. Pioneer will be introducing a CDV combi player at £580 while Marantz is to market an up-market model at £600. Disc prices will range from £5 for the 5in. size up to £20.

## LCD SCREEN DEVELOPMENT

Sharp has developed a high-quality 14in. colour LCD screen for TV use. The display has 308,160 pixels, but the definition has been improved by dividing each pixel into four light points, giving an effective 1,232,640 dots. A newly developed active matrix drive system is used, each pixel being controlled by a thin-film amorphous silicon transistor (a-SiTFT). Thanks to the very fast response time the contrast ratio is claimed to be 100:1. Flicker is reduced by a drive system that reverses the voltage direction on each scanning line. High-density chip mounting has resulted in a module thickness of 27mm, with back light, and the total weight is 3.9lb (1.8kg). Mass production of the screen is expected to start next summer. PAL versions may appear in the autumn of 1989.

In the meantime Sharp plans to upgrade its 3in. LCD pocket TV with a 4in. model whose display has 115,200 pixels compared to the previous 92,160. The new model will be launched in Japan this month. No UK launch date has been announced.

## SKILL

The hunt is on for the UK's most talented young radio/TV service engineer to take on the rest of the world at the 1989 International Skill Olympics. The domestic electronic industry, national rental companies and manufacturers are being asked to enter technicians for the National Elimination Competition which is being organised by the Radio, Television and Electronics Examination Board. The winner will represent the UK at the Olympics being held at the National Exhibition Centre, Birmingham in August 1989. This is the thirtieth of

these prestigious events, at which competitors from over twenty countries will compete in up to forty craft skills. The UK has an excellent record, and during the last event the radio/TV servicing entrant came fifth. Applicants must be under 23 years of age on January 1st, 1990. Nomination forms can be obtained from the Organiser, RTEEB, 57-61 Newington Causeway, London SE1 6BL.

A new UK award, for the best Grundig television service engineer, has been presented to Neil Martin of Sarnia Radio, Guernsey. Grundig has been holding regular training sessions to keep dealers in touch with the constantly changing technology in television and video, and attendees have recently been given a questionnaire to test what they've learnt. This is the first year that the award has been presented.

### **CHANNEL FIVE FEASIBLE**

A government study has confirmed the feasibility of a fifth UK TV network covering up to seventy per cent of UK households via terrestrial transmitters. The study was carried out by an interdepartmental steering group of officials, with participation by the BBC, the IBA and the Civil Aviation Authority. It concluded that a service could be started by about 1992, using Band V frequencies.

### **CPC CELEBRATES 21 YEARS**

Karel Horton, the current Miss Beautiful Britain, helped officiate at the CPC twenty first birthday celebration free competition which was run in conjunction with *Television* magazine (see July issue). Thousands of entries were received, the first prize of a Hameg 203-6 dual-trace oscilloscope being won by J. R. Graham of Wallsend, Tyne and Wear. Winners of the digital multimeters were: J. Savva, Fleet, Hants; C. M. Cutler, Christchurch,



Karel Horton with entries to CPC's 21st birthday celebration competition which was run in conjunction with *Television*.

Dorset; Mr. Woodhouse, Sheffield; K. Khan, Tottenham, London; L. Morgan, Maidstone; A. Gall, Arbroath; J. Bennett, Plymouth; I. Farrington, Northampton; and R. J. Craig, Bexley, Kent.

CPC would like to thank all those readers who took part in the competition.

### **RETROFIT NICAM DECODER**

Audio-Visual Technical Support of Shelson House, 67a Shelson Avenue, Feltham, Middx TW13 4QS (01-890 3010) is to introduce this autumn a retrofit Nicam 728 stereo decoder that can be used with most modern TV sets, older stereo TV sets and some monochrome sets when routed through a hi-fi system. Basic components of the unit are a Toshiba QPS decoder and a chip manufactured by Texas Instruments. The trade price will be £50-£60. Dealers may have to adapt the unit to the set concerned, though AVTS is prepared to undertake this work on request.

### **EXHIBITIONS**

This year's Photokina Professional Media exhibition is being held at Cologne on October 5-11th. High-definition television will be a theme of the show.

The date of the Frankfurt "Broadcast '89" exhibition has been changed to October 25-28th 1989.

### **CHINA'S CORBY PLANT**

The Huanyo Electrical company has been assembling 14 and 20in. colour TV sets at Corby, Northants for some time now and expects to complete 70,000 units during its first year. At present 85 per cent of the components used, including the c.r.t., are imported from China via Felixstowe. Hitachi technology was initially used by Huanyo Electrical but the licence has now expired. A number of UK workers are to be sent to China for additional training.

China is at present limited to the export of 25,000 sets a year to the UK, but it seems that thousands more have been coming via Hong Kong. This has been confirmed by a recent Hong Kong court case in which Luks Industrial was found guilty of 21 cases of deception. It seems that most of the 293,000 sets that entered the UK from Hong Kong last year were manufactured in China. Exports during the present year are said to be well up.

### **VIDEO NEWS**

Sony intends to launch a PAL version of its 8mm Video Walkman in the UK early next year, at a price in the region of £550-£800. The Video Walkman has a 3in. LCD screen, tuner and timer which can record one programme of up to three hours. It weighs 1.1kg.

TDK has developed an Extra High Grade (EHG) tape whose BET value of 40m<sup>2</sup>/g and coercivity of 700 Oersteds makes it comparable with many of the pro-grade tapes on the market. Performance has been further enhanced by using a newly developed orientation technique that improves the particle alignment and thus the packing density.

Fuji has released details of its European S-VHS tape and claims to be the first company to be granted a licence to produce such tape. Its "Pro-S" tape has a particle size of 0.14 microns and a coercivity of 900 Oersteds. Retentivity is 1,700 Gauss. The tape uses the same binder and back coat as the metal tape used for the professional MII system. It will be made available as soon as S-VHS

equipment is released in Europe.

JVC is to release a camcorder aimed at the lower mid-range market: the GR-A30 is a stripped-down version of the GR-45 designed to meet the growing demand for a sub-£1,000 camcorder that allows limited creativity with a high degree of automation. The GR-A30 has a 420,000 pixel CCD image sensor that operates at down to 10 lux, a single-speed  $\times 6$  zoom, auto focus, auto iris and auto macro but no back-light compensator. It also has a high-speed shutter with 1/50th and 1/1,000th per second speeds, and a flying erase head. There's no long-play facility. The GR-A30 weighs 1.3kg with battery and tape and measures 105  $\times$  142  $\times$  271mm. Launch date is October and the price will be around £850.

Pentax is launching a new 8mm camcorder, Model PV-C840E, which has a 320,000 pixel CCD image sensor sensitive down to 7 lux and a digital auto focus system for precise focusing. Also included are a 1/1,500 per second shutter, extra fast visual search and instant review. Weight is 1.3kg with battery and tape and the dimensions are 110

$\times$  160  $\times$  275mm. The price will be around £1,200.

Team (Audio) Ltd., Haverscroft Industrial Estate, Attleborough, Norfolk NR17 1YE (0953 456 070) has introduced in the UK the W. German manufactured Freitag 2952 VCR comparator which enables five VCRs to be demonstrated via one TV set, with the picture switched automatically (via remote control or manually) from one recorder to the next as each is put into the play mode. By using several 2952 amplifiers up to twenty machines can be demonstrated. Crosstalk attenuation is 80dB. The Freitag 2952 is powered by a 12V 300mA mains adaptor and all connections are via 21-pin scart leads.

The Indian government has announced that large-scale VCR production is to start in the country. Three private-sector companies will be allowed to produce up to 900,000 units a year and there will also be a fourth public-sector plant. Previously the government had been reluctant to licence the use of foreign exchange for the import of components for use in consumer electronic equipment.

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# Practical Computer Programming

## Part 8

Mike Phelan

Having designed the *system* we now have to design the *program*. The borderline between the two may be difficult to see but is well defined. Program design defines how the job is to be done once the job itself (the system) has been defined in detail, the latter process being done in stages, i.e. you first broadly define the problem then expand each stage into further stages, the end result being the pseudo-code we described last month. Each block of pseudo-code is finally a clearly defined module that does one job or a number of related jobs. It can thus be used in several places or even in future pieces of software (re-usable code). This makes good sense — there's no point in writing even pseudo-code from scratch. At each stage in expanding the system design there may be alternative ways of solving the problem. Selecting the best one determines how the problem is broken down and must therefore be done before the next level of expansion. Just for the record, this is known as meta-stepwise refinement.

Translating your pseudo-code into a high-level language syntax is not a difficult process. It may be necessary to test small portions of code to determine the best way in which to approach a particular process. Design by producing and testing the lowest level modules first, then writing the broader programs that control them, is known as "bottom-up" programming and may be the best method to use in some circumstances. With a language such as Forth this is the easiest way. The alternative "top-down" approach is the preferred method for, in particular, menu-driven applications. With this approach the main program is written first, with "dummy stubs" as the subroutines. A dummy stub is a line or two of code that does no more than announce that a particular subroutine has been called. You may also want it to display the values of some variables. These can be rewritten and tested individually as the design proceeds.

### Interpreters and Compilers

Actual program coding will of course depend on the language used. The considerations also differ depending

on whether a compiler or an interpreter is used. What we require of a program, apart from the fact that it does the job it's designed to do, are speed, economy of disk and memory use and ease of maintenance. It's necessary to seek a compromise between these factors: this is often more of a problem when an interpreter is used, especially Basic.

To clarify this, we'll take the last item first — ease of maintenance. Surely, you may ask, once a program is complete and working, and you've written it for yourself, that's it? Unfortunately this would be so only in Utopia! A program is a living thing and sooner or later something will have to be changed or added. If this is done more than six months after the program was originally written, and it's anything but the simplest of software, it's unlikely that you'll remember how any of it works.

There are several ways in which this difficulty can be alleviated, as follows:

- (1) Make your code easy to read — we will say something about structured programming later.
- (2) Put plenty of remarks into your code.
- (3) Don't use "tricky" code. By this we mean obscure and clever ways of doing things — ways you'll never remember. Follow the KISS principle — keep it simple, stupid.
- (4) Use meaningful names for variables — names that show what the variable represents.

A certain amount of compromise is involved when using an interpreter. Remarks and comments take up memory space and have to be read by the interpreter at run time, so they can slow things down. In addition it's sometimes necessary to resort to obscure code either to keep things short or to gain maximum speed. Long variable names usually slow things down, though this depends on how many of the name's digits are significant. With some Basic interpreters this figure is four, which

means that if we call variables Fred, Freda and Frederick the interpreter cannot distinguish between them — a recipe for disaster!

With a compiler however the remarks and comments are only in the source code and are ignored by the compiler, and there's no definite relationship between the amount of object code and the source code needed to produce it with different approaches to a problem. So we can use straightforward and readable, though long-winded, code.

To summarise this:

For speed and efficient memory use: no remarks; short names for variables; use integers wherever possible; multiple statements on one line (Basic).

For readability: profuse remarks; explanatory names for variables; one statement per line.

The comments above are general guidelines only, and should be read with the language to be used taken into consideration. For example, with many languages multiple statements per line cannot be used. Language C allows any number of statements per line — the exact layout of the source code is totally free-form, as C treats spaces, carriage returns, blank lines and tabs equally — it ignores them!

## Choice of Language

If the resident language is a Basic interpreter, this is probably the first choice. It is after all a general-purpose language. There are a few excellent C and Pascal compilers available at budget prices of around £50, and these are worth considering. There are reasons why Basic may not be a good choice.

This isn't intended to be a "knock Basic" session, but it's worthwhile pointing out the disadvantages of Basic. It's possible to write very good structured programs in Basic, but as there's a lack of built-in discipline in the language you can equally write some bad ones. We'll look at the disadvantages. As there's no standard Basic, it's possible that your version overcomes some of these.

First, there's a lack of multiline IF construction. This means that IF a condition is TRUE, only a small number of statements can be executed — those that can be fitted on one line. The solution is the following construction:

```
10 IF NOT (condition) THEN 60
20 statement
30 statement
40 statement
50 statement
60 REM endif
```

Secondly there's a lack of multiline functions and functions with multiple argument types. A function is a portion of a program to which one or more variables (arguments) are passed and which returns something. The function acts as a variable. In Basic, functions are represented by the DEF FN statement, which defines a function in terms of its arguments. This may sound totally confusing. To give an example, say we need to calculate continually the monthly rental income of our business. The equation might be average rental base times unit rental. We may need to perform this calculation several times for different months, types of equipment, etc., the only variables being the rental base at the start and end of the month and the unit rental. It would be nice if we could

avoid the calculation and refer to the income, something like income (start, end, unit rental) and write one function only. DEF FN allows us to do this if we can get it all on one line, which in this case we can —

```
DEF FNinc(b1,b2ur) = ((b1-b2)/2+b1)*ur
```

The three arguments can be called anything, as they are purely place holders. Executing PRINT FNinc(1100,1000,12.5) will print the income from these figures, of which some or all can be variable names. This is a function that returns a number, and all the arguments have to be of the same type, i.e. number. Other languages, e.g. C, allow mixed arguments and multiline functions.

Thirdly there's a lack of private variables. In Basic once a variable is declared it can be "seen" by all parts of the program. This seems like a great idea. It's not — in a long program unpredictable things can happen because part of the program changes the value of a variable in use elsewhere.

Fourthly there's a memory restriction: no matter how much memory the machine has, Basic has access to only 64K of it.

Finally Basic identifies a subroutine by its line number rather than a name, which could be more meaningful.

Despite all this, Basic can be very useful. Don't ignore the fact that a great deal of software is generally available, at no more than the cost of the disk. This includes compilers, utilities and applications. Look at the advertisements in computer magazines and user groups.

## Structured Programs

A great deal has been said about structured programming, but misconceptions abound. The most common one is about the use of the GOTO statement. In earlier versions of Basic the only iterative loop available was FOR/NEXT. Say we wanted to read an array until an element with a particular value was found. GOTO is about the only way:

```
10 INPUT "Enter name:",n$
20 j = 0
30   j = j+1
40   IF name$(j)<> n$ THEN 30
50 REM end of loop
```

There is nothing messy about this piece of code, which simulates a REPEAT/UNTIL LOOP but uses GOTO (implied with THEN in line 40). The problems arise when GOTOs are used all over the place and paths cross. Most languages may have, but don't need, GOTOs.

Each subroutine, function or procedure must have one exit point only and carry out one process. This makes the code more readable. The actual number of program files depends on the language and programming style: Basic uses one file but can load overlays or transfer control to other programs with CHAIN; C tends to use one maybe huge file; dBase can use multiple files but opening a file takes a finite time and there's a limit, set by the operating system, on the number of files that can be open at any one time.

## Debugging

All that now remains is for you to write your program. Next month we'll tell you how to debug it.

# Servicing the Decca 120/130 Chassis

Nick Beer

These sets were introduced at about the time that Decca Radio and Television was taken over by Tatung. They were sold in large numbers under both the Tatung and Deccacolour brand names. The basic circuitry is contained on a flat tray-style chassis with the RGB output stages on the tube base panel and the remote and tuning control circuits on the side of the cabinet behind the customer controls. The 120 chassis is used in 14-22in. models with 90° preconverged tubes and no EW circuitry. The 130 series is substantially the same but is modified to drive the 110° 30AX tube in 22 and 26in. sizes. There were standard, remote control and teletext versions of the sets, the basic chassis being well designed with a view to adding such options — provision for a SECAM decoder was also included. The purpose of this article is to summarise the stock faults, and a few not-so-common ones, we've encountered over the past seven years or so. A series on the design of these chassis appeared in the November 1981 to January 1982 issues of *Television*.

## Power Supply Faults

The switch-mode power supply is based on the now familiar TDA4600 control chip. Fig. 1 shows the circuit. Disregarding any remote control circuitry, if you have a dead set you'll almost always find the power supply d.c. fuse F802 (1AT) open-circuit and the chopper transistor Q801 (BU426A) short-circuit. This transistor is clipped to the heatsink between the chopper transformer and the main electrolytic reservoir capacitor C804 on the left-hand side of the chassis. When replacing it, check the clip to ensure that it still fits with a nice tight "click" — as you do with the Ferguson TX100 chassis.

One thing that will catch the inexperienced engineer is that if you switch on immediately after replacing F802 and Q801 you'll almost certainly find that they blow again. To avoid this, check R808 and R810. They are usually both 150k $\Omega$  but in some sets R808 is 47k $\Omega$ , 100k $\Omega$  or 120k $\Omega$ . The likelihood is that they will both be open-circuit.

An alternative dead set situation is failure of the mains fuse F801 (2AT) due to one or more of the BY127 diodes in the bridge rectifier D801-4 being short-circuit or trouble with the degaussing circuit thermistor R901. The latter can develop an intermittent internal short.

The two most common causes of failure to start are R802 (10k $\Omega$ ) and the chopper control chip I801 (TDA4600). The resistor can be quickly checked but the TDA4600 is a SIL device whose heatsink will call for a hefty iron for unsoldering should this be necessary (sometimes the bolt is so tight that it's not possible to undo it in situ).

Once the set is running, check the h.t. carefully at TP43. R813 sets the voltage which should be 117V with the 120 chassis and 148V with the 130 chassis. If you cannot adjust the h.t. correctly, or if it has dropped suddenly, check R812 (22k $\Omega$ ) and C814 (1 $\mu$ F).

With the 120 series chassis the power consumption is 60W while with the 130 it's 93W.

If the set incorporates remote control it will remain in standby instead of blowing fuse F802 — this is standard practice with modern sets.

If the 12V supply that feeds the low-power parts of the

set is absent, i.e. there's no sound or raster, the usual culprit is the LM340T-12 12V regulator. It tends to go short-circuit, taking the fusible resistor R817 (0.33 $\Omega$ ) with it.

## The Line Timebase

When there's a fault in the line output stage you'll usually find that the fusible-link resistor R430 (15 $\Omega$ ) is open-circuit. This is in the h.t. feed to the line output stage. The most obvious cause is a collector-emitter short-circuit in the BU500 (an uprated BU208A) line output transistor Q402. This may well be the case, and is easy enough to check, but experience has shown that a faulty tripler is far more often the cause. Again this is easy to check, simply by disconnecting the input lead. This could mean that the line output transformer is weak but all will usually be well when the tripler has been replaced. Depending on where you get it your replacement will either be an exact one — the tall, thin white type — or you may get a modification kit consisting of a more traditionally shaped tripler, green in colour, with a metal bracket, fixing bolts and cable ties. The bracket fixes to the existing metal chassis frame and the tripler is fitted to the bracket. Remember to refit the plastic covers over the leads to the focus control.

Another indication that the tripler is faulty is when R432 and R433, both 330k $\Omega$ , 1W, go high in value or open-circuit. This is usually indicated by charred rings around the centres of their bodies. These resistors can fail in this way of their own accord, and it's always worth taking a look at them when you've got the back off. They are situated between and slightly to the right of the tripler and the line output transformer.

The other main cause of R430 going open-circuit is shorted turns in the line output transformer. You will often find burn marks on the core — or, when you resolder the fusible link, a ring of fire will show around the core! Remember not to apply any new GP solder when resoldering the fusible link otherwise you'll defeat its purpose. If you have to replace it, note that it's rated at 2.8W and is a critical safety component!

Other faults in this area have included noisy tracks in the combined focus and first anode control unit, necessitating replacement — don't try to clean it! No raster is often due to the c.r.t.'s heaters being out because R902 is open-circuit. This resistor is on the c.r.t. base panel. While on the subject of this panel note that the focus spark gap, which is integral with the c.r.t. socket, can close over, giving rise to intermittent problems such as a change of channel when it fires across.

Line frequency drift is not common but on a couple of occasions we've traced the cause to C406 (22 $\mu$ F, 16V) being leaky. I've only once had I401 (TDA2576A) fail. This occurred when the line output transformer had been burning for a while — after replacing the transformer there was no sync (shades of the 80/100 series!).

## Field Faults

The field timebase in the 120 series chassis is based on a TDA1170 chip (I301) which accounts for most of the

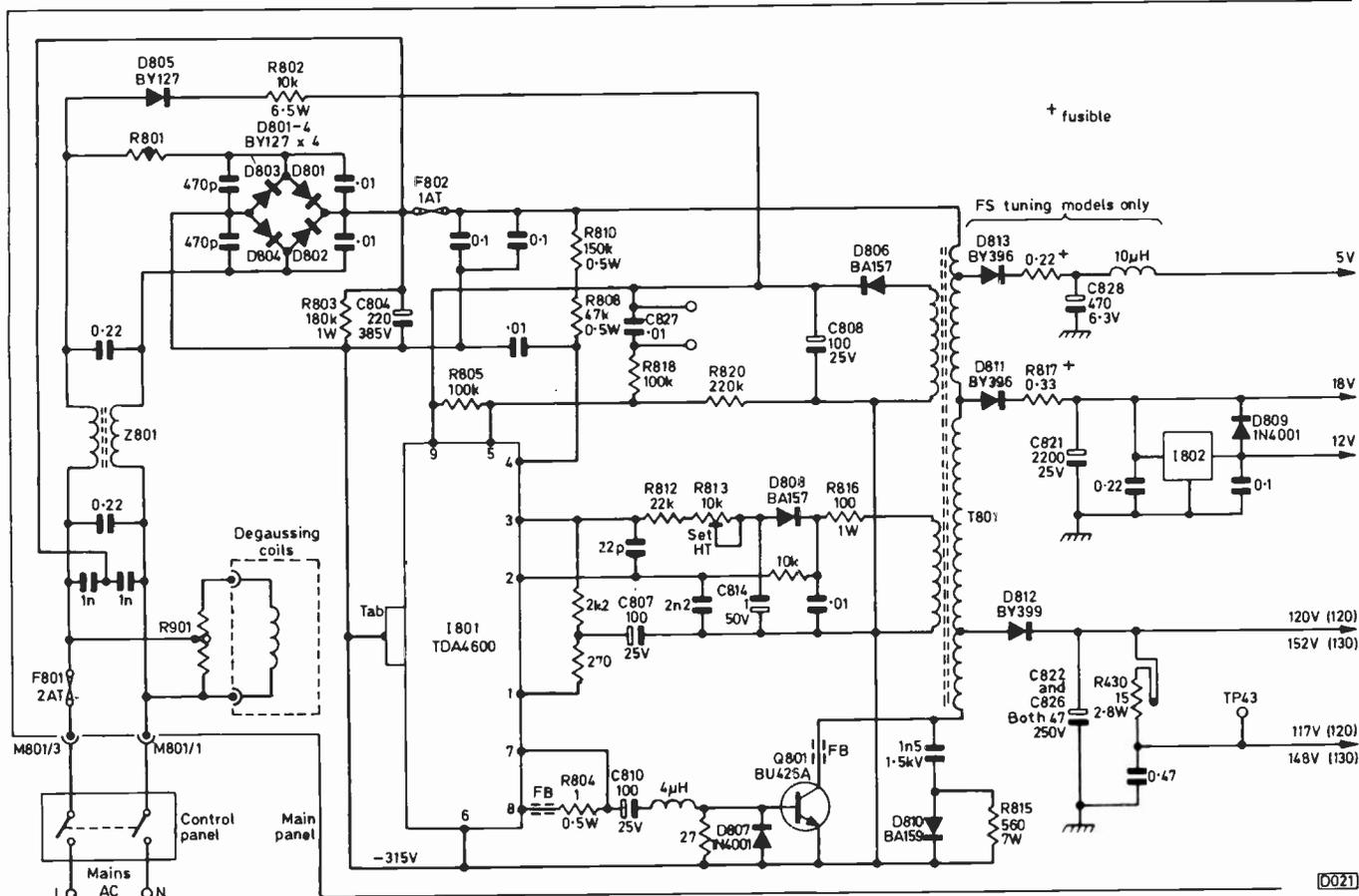


Fig. 1: Power supply circuit used in the Decca/Tatung 120/130 series chassis. In FST models R805 is omitted and R818/R820/C827 are added.

problems in this area. Field collapse will often mean that this i.c. is shorted internally. As a result R434 (10Ω, fusible) will be open-circuit and you may sometimes find that the associated 23V supply rectifier diode D404 (BA159) is open-circuit. Check at pin 2 of the i.c. where you should find 23V. If you don't the suspects are as indicated. The chip can also be responsible for field distortion, but it's worth checking R311 (470kΩ), R307 (220kΩ) and C305 (10µF, 40V) first. The 130 series chassis uses the higher-rated TDA1670 chip.

### Tuner and IF Circuits

We've had little trouble with the tuner and i.f. circuits. By far the most common complaint is of a snowy picture or just snow. In both cases the tuner is suspect but ensure that the tuning voltage system is working, i.e. that you are actually on tune or looking. For a snowy picture, once correct tuning has been confirmed a solder around the tuner's input stages should pay dividends. If not, try a replacement. In the odd stubborn cases I've had the SAWF Z101 and the BF959 i.f. preamplifier transistor Q101 cause this trouble. In the event of a purely snowy screen with no sign of a picture or any accompanying hiss from the speaker the tuner should be replaced as a first step though more often than not a tuning voltage fault will be the cause. The tuner is a solder-in U321 as opposed to the plug-in ones used in the 70/90/110 series chassis.

As the tuner's pins aren't numbered, monitor the tuning voltage at R005 (47kΩ). The tuning voltage supply is derived from the h.t. rail and is stabilised by the TAA550 33V regulator I001. The feed to the tuning presets is via R001 (560Ω) and to the tuner itself is via R005. As always the 33V regulator is the favourite when

things go wrong but the resistors can also fail. The chassis has provision for fitting a v.h.f. as well as a u.h.f. tuner.

### Colour Faults

After the tuner/i.f. section the colour decoder and RGB output stages are probably the most reliable parts of the receiver. When faults do occur they can usually be quickly located. A loss or lack of one colour is generally caused by the appropriate feedback resistor in the RGB output stages. These are R226 (red), R244 (green) and R251 (blue). Their value is 100kΩ, 2 per cent, and to prevent future problems all three should be replaced at the same time. Don't forget that 22in. models may well be fitted with the ill-fated Mullard A56-540X tube which should not escape suspicion. We've had to retube several of these sets for this and poor focus faults as I'm sure many of you have — and not just in these models!

When teletext is incorporated an RGB interface panel is added between the teletext decoder panel and the colour decoder. This is a common cause of loss or predominance of one colour. The fault is usually intermittent due to the cause being dry-joints on the edge-mounted plug/socket MR058.

No colour is not exactly a common fault but we have had it. In our experience the cause has been either the 4.433MHz crystal X502 or the µPC1365C chip I501 — on an approximately 50:50 basis. The chip has also on a very few occasions been the cause of the previously mentioned RGB faults, but can be eliminated with almost complete certainty by checking the RGB outputs at pins 26, 28 and 27 respectively. The voltage at these pins should be 2.2V.

Another possibility for RGB faults is the transistors in the output stages, but we find that this is rarely the case.

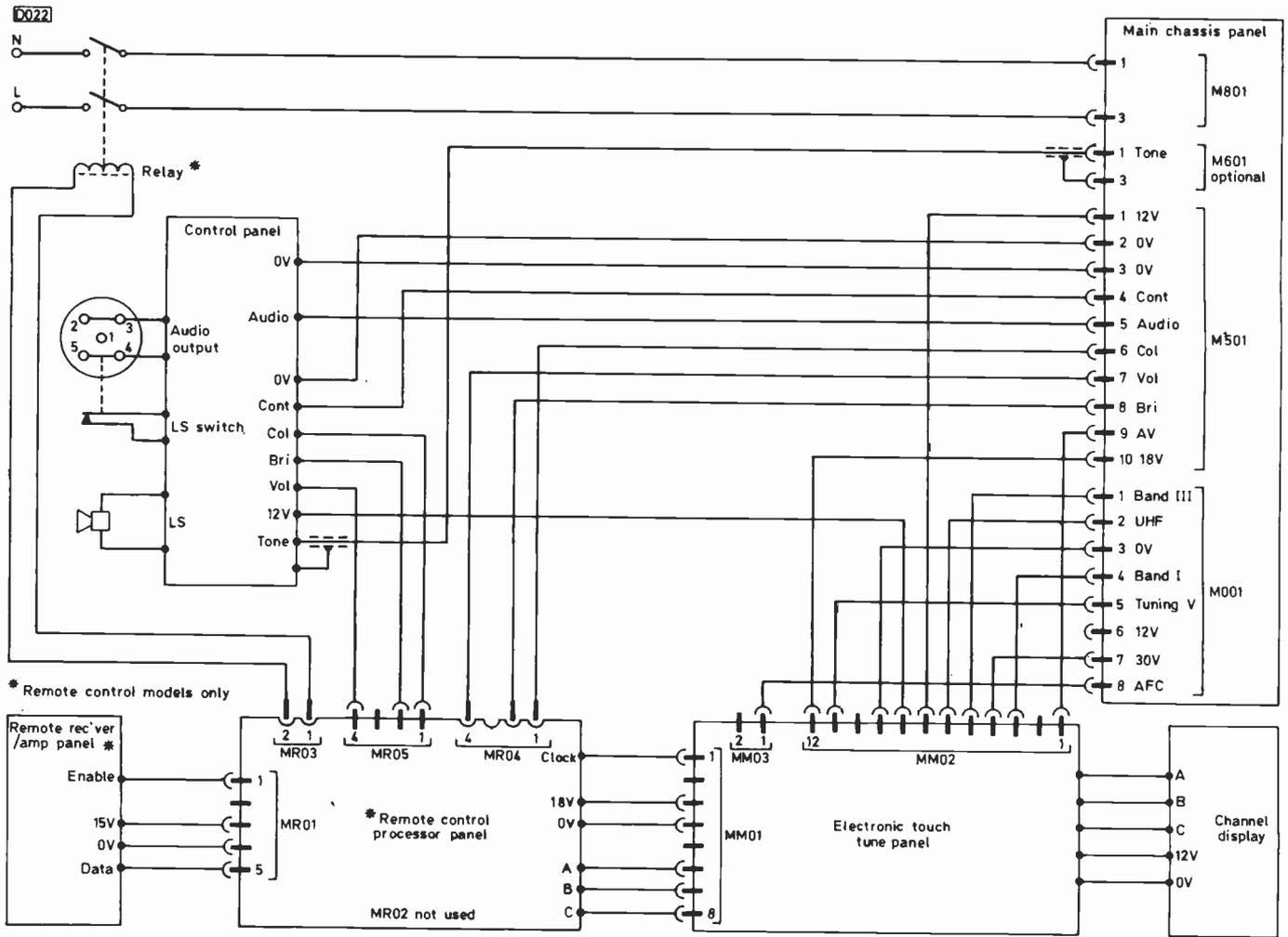


Fig. 2: Basic control options with the Decca/Tatung 120/130 series chassis, showing panel interconnections.

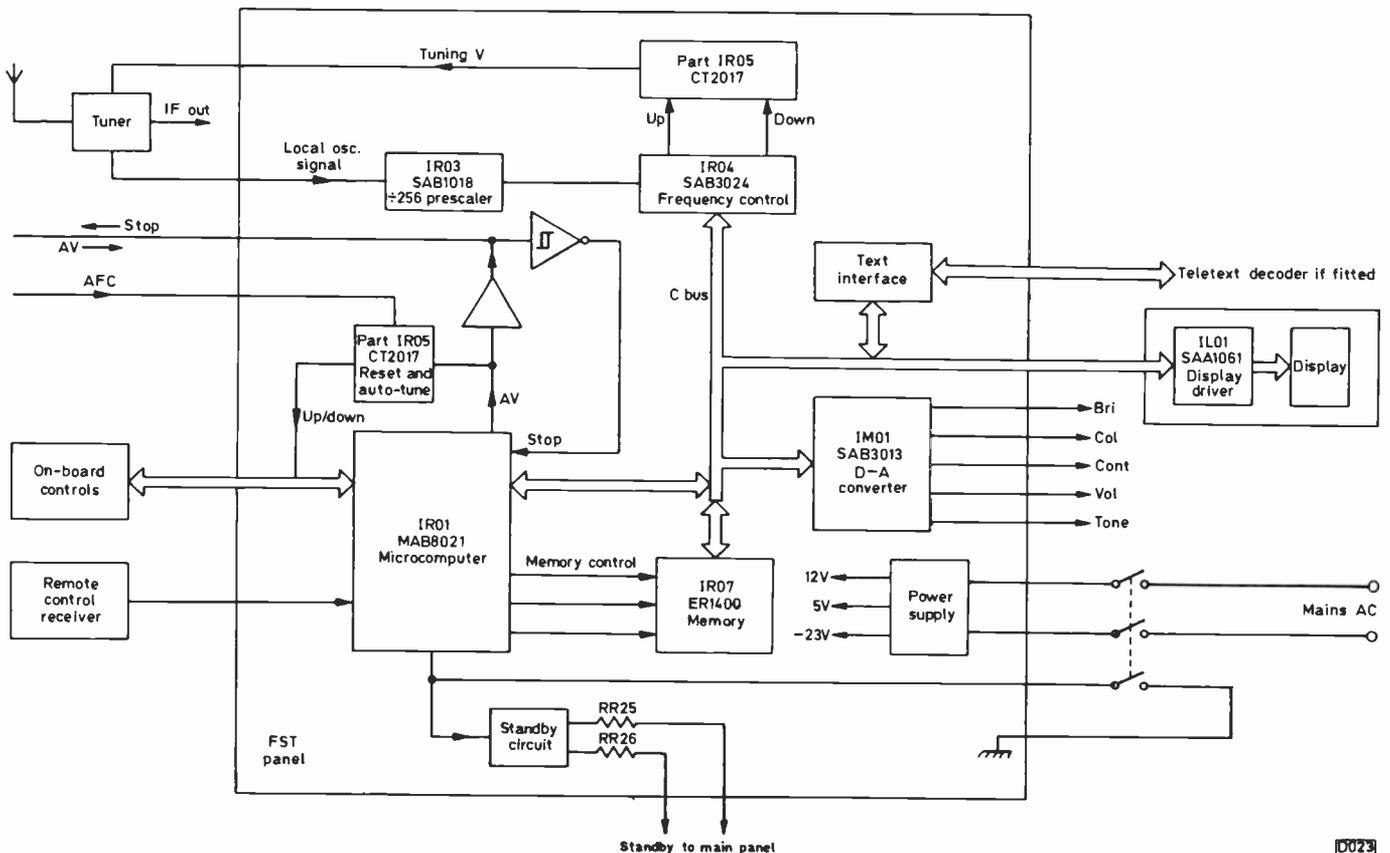


Fig. 3: Block diagram of the RC30 frequency synthesis tuning system. R001 is 82Ω with FST sets.

The following voltages should serve as a quick guide:

Q203/8/11 7.6V emitter, 8.2V base, 136V collector.  
Q204/10/12 1.4V emitter, 2.1V base, 7.6V collector.

The c.r.t. in the 120 series chassis should have 10V at its grids (pin 5), 600V at its first anodes (pin 7) and 136V at its cathodes (pin 6 green, pin 8 red, pin 11 blue). The heater voltage at pins 9/10 should be around 3.7V when measured on the 10V a.c. range of a typical multimeter (6.1V true r.m.s.).

If the c.r.t. is cut off (cathode voltages high) it's worth checking the 6.8V zener diode D201 and the BC547 transistor Q206. These items are included to provide a low emitter impedance in the RGB output stages and stabilise the background levels as the temperature rises. Q206 going short-circuit has been the cause of an overbright raster on more than one occasion.

Any other colour faults have been one-off events.

### The Sound Circuit

A TDA3190 chip (1601) provides the intercarrier sound and audio amplifier functions. There is nothing complicated here. The audio output at pin 11 is fed via C616 (220 $\mu$ F, 25V) to an 8 $\Omega$  loudspeaker and, via an isolating transformer, to a 5-pin domino output socket which breaks the feed to the internal speaker when the plug is fitted and is difficult to obtain — except from Tatung of course. C616 can be responsible for intermittent or grumbling sound.

### Basic Options

The basic options for these chassis (RC20 system) are shown in Fig. 2. The control panel takes care of the user controls — colour, contrast etc. On remote control sets presets for these levels are usually on a small panel with access through holes in the back cover — at the top, left-hand corner viewed from the rear. Depending on model, there may or may not be a tone control.

Various touch-tune panel assemblies are used when the tuning is preset using potentiometers. These incorporate the channel selection switching and the presets. With these units RM17 (560k $\Omega$ ) has been known to go open-circuit and give the no tuning symptom. Odd channel change faults, e.g. won't come off one station, is virtually always due to the SN76705AN chip IM01. One fault that's been unusually common is defective LEDs, causing non-illumination of certain segments of the channel display.

Note that for compatibility a VCR should be used on ch.8.

The only stock fault we've had with the remote control handsets has been failure of the crystal. This gives the no remote control symptom of course. On several occasions one or other of this device's legs has rotted away. Otherwise the handsets are on the whole reliable, though they do tend to look tatty and worn out before their time. Don't forget that the remote control handset may be hidden in its little slot on the front of the set before you curse someone for not collecting it!

### Sweep Tuning

With sweep tuning models you'll find the tune and store buttons behind the flap. The system uses frequency synthesis tuning (RC30 system) which is a bit more involved (see Fig. 3). If the power supply goes off and the

# next month in

# TELEVISION

#### ● SERVICING THE PANASONIC NV333/366

These VCRs sold in large numbers during the 1982-3 period. Both are top loaders, the NV333 being the basic model while the NV366, with its four-head drum, features perfect freeze frame, still advance and a four-event timer. Sound and picture quality are very good and thousands of these machines continue to give sterling service. Nick Beer covers the mechanical and electrical sides of these machines.

#### ● TVs WITH LC DISPLAYS

Personal TV sets using liquid-crystal displays are becoming increasingly popular. Most such sets have a picture size of around three inches diagonal, but the race is on to develop larger screens. The principles used are totally different from conventional TV, both in the display and the way in which it's driven. A look at this interesting new technology.

#### ● PULSE STRETCHER CIRCUIT

Many older sets suffer from teletext interference at the top of the screen, especially since additions have been made to the service. One solution is to generate a longer flyback blanking pulse. This stretcher circuit was designed for use with the Rank A823 chassis but the principle could be used with other sets.

#### ● SERVO FAULT FINDING

Part 2 of Joe Cieszyński's article on VCR servo systems tells you how to identify servo faults and then how to go about tracing the source of the trouble.

#### ● THE AMSTRAD CTV2200/2210

These sets have come in for comment recently in our letters pages. Dave Mackrill provides servicing guidance based on considerable experience of them.

#### ● PRACTICAL 405 — HOT TO RUN YOUR VINTAGE TVs

Despite the absence of transmissions, there are ways of keeping your 405-line equipment going. Jeffrey Borin describes the various ways of providing signals, including guidance on video recording and on optical standards conversion.

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fault is not on the main chassis suspect either RR25 or RR26 (both 1k $\Omega$ ) on the FST panel — they are in the standby switching circuit. A clue is provided by the fact that the standby symbol won't be illuminated. For no tuning memory suspect IR07 which is an ER1400 as in the Salora G chassis. If the on-board channel selectors intermittently lock on one channel try freezing IR01

(MAB8021), the main microcomputer chip. It often goes faulty when warm.

In this article we've been concerned mainly with day-to-day servicing of the basic chassis. It should help you to do a few more repairs in the field, and help those with little experience of these sets to tackle them with a degree of confidence.

## Test Report: Hameg HM205 Oscilloscope

Alfred Damp

In the modern workshop it's necessary to be able to display on an oscilloscope both high-frequency and very low-frequency signals. The Hameg HM605, which was reviewed by Eugene Trundle in the January 1987 issue of *Television* along with the HM204, is very good at the high-frequency end. It has a 60MHz bandwidth and a delay timebase, but unfortunately doesn't have a storage system for timebase speeds of 50msec or longer.

The Hameg HM205 has the necessary storage system to enable it to display a constant trace at up to the maximum timebase setting of 5sec/cm. Anyone with experience of JVC compact disc players will know that some waveforms require a timebase setting of 0.5sec/cm — when observing the focus drive. With such a low timebase setting, on an ordinary oscilloscope as the waveform appears in one square the trace in the previous square will be extinguished so that all you really see is the spot moving across the screen. The Hameg 205 employs a digital storage facility to overcome this problem, enabling waveforms at these slower speeds to be displayed continuously.

### Evaluation

When we received the scope for evaluation we used it first as a conventional analogue display device with various TV sets and VCRs, displaying composite video waveforms, f.m. envelopes and, with correct triggering, the equalising pulses, field sync pulses and the teletext and test signal lines. The scope was next hooked up to a compact disc player: a well-defined "eye waveform" — the signal from the laser pickup assembly — was obtained. The results in the analogue mode were very good, the sort of results we've come to expect from Hameg after purchasing an HM203 several years ago.

The scope was next tried in the storage mode. As luck would have it an elderly Ferguson 3V22 VCR was on the bench, so the scope was connected to TP11 on the servo board. This is the capstan trapezoid waveform test point. The displayed trace was most impressive: it's the first time that I've seen this waveform as shown in the manual (see Fig. 1) — a timebase speed of 50msec/cm or slower is required.

Various other VCRs were then checked. One was a Ferguson 3V65 with an intermittent "sometimes stops" fault. Connecting the scope to display the take-up reel pulse fed into the mechacon control chip revealed that its amplitude varied. The cause turned out to be a loose earthing screw. This condition could not have been detected using a conventional analogue scope because of the slow timebase setting required.

By selecting other storage system modes, which I'll explain later, we were able to display switch-on reset pulses and mechanical timing signals to the mechacon

chips. This was done with a Ferguson 3V44 and we found that the waveforms obtained corresponded exactly with the timing charts in the manual.

Compact disc players were next tried. With such excellent waveforms in the JVC manuals we hijacked an XL-V22 from the shop for the afternoon. The first waveform to be checked was the drive waveform during focus search, see Fig. 2. We found that the scope's display matched the oscillogram in the manual exactly. The next waveform (Fig. 3), the focus search voltage, was also as shown in the manual. The last waveform checked, "waveform until TOC is read" (Fig. 4), did not produce a display exactly as shown in the manual. The waveform started at the point marked "spindle motor starts to rotate" — this could have been due to incorrect triggering as a result of our inexperience in using the scope.

### Digital Storage

To the right of the c.r.t. there's an arrangement of six pushbuttons and two LEDs, see Fig. 5. The green on-LED lights when the scope is switched to the storage mode. The storage system has two modes of operation, single or refresh. In the refresh mode the "single" button is released and the spot scans the screen in the usual manner — except that for even very slow timebase speeds the waveform continues to be displayed and doesn't go out. With the single button depressed the spot scans the screen once and the waveform is then displayed continuously, i.e. it's not up-dated as in the refresh mode. At this point the "ready" LED is out. If another sweep is required, push the reset button and the sweep will start as soon as the scope is triggered by the waveform being checked. This mode is ideal for examining i.c. reset pulses.

If you want to hold a waveform in order to compare it with another one you depress the hold-1 or hold-2 buttons depending on the Y channel in use. Waveforms can be held in this way even when the scope is switched off.

The final button in this array is "dot join". This enables the sample dots that make up the waveform to be joined.

### Table 1: Brief specification.

**Analogue mode:** Two channels with d.c. to 20MHz bandwidth. Y amplitude attenuator is variable in twelve steps from 5mV to 20V per division. Timebase speeds 0.2sec to 0.5 $\mu$ sec. Triggering at d.c. to 40MHz.

**Digital mode:** Maximum sampling rate 2  $\times$  5MHz. Memory 2  $\times$  1,024  $\times$  8 bits. Timebase speeds 5sec to 20 $\mu$ sec. Dot joiner.

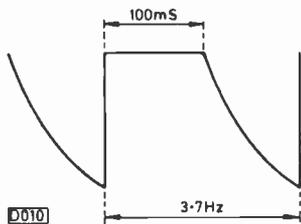


Fig. 1: Capstan trapezoid waveform at TP11 on the servo board in the Ferguson 3V22 VCR.

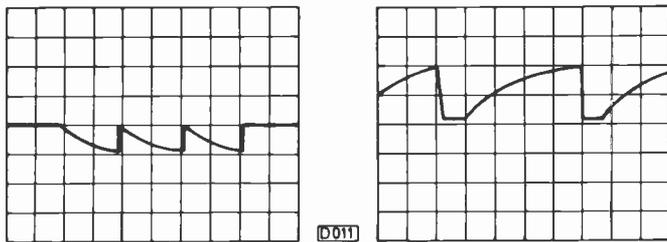


Fig. 2 (left): Drive waveform during focus search in the JVC XL-V22 compact disc player, at 1sec/division and 1V/division.

Fig. 3 (right): Focus search voltage waveform in the JVC XL-V22 CD player, at 0.5sec/division and 2V/division.

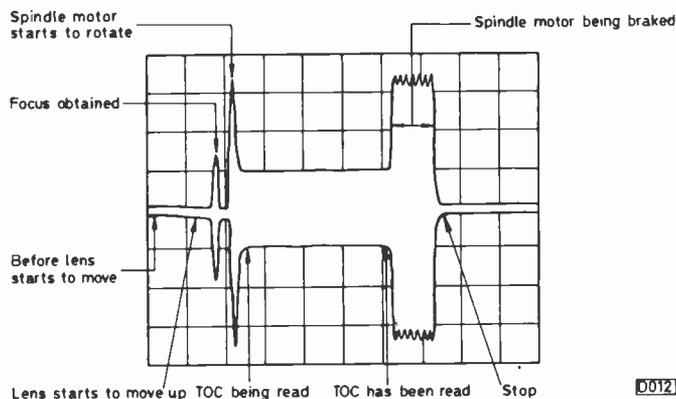


Fig. 4: Waveform "until TOC is read" in the JVC XL-V22 CD player, at 0.5sec/division and 2V/division.

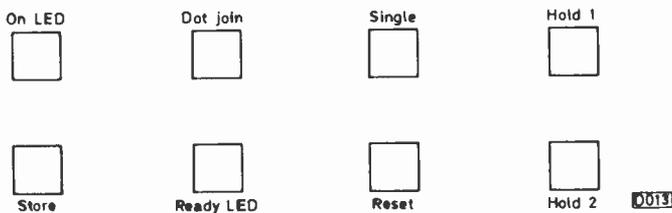


Fig. 5: Arrangement of pushbuttons and LEDs to the right of the c.r.t.

Unfortunately this can cause slight distortion of the display – usually squarewaves become rounded off.

### The Y Amplifiers

When the oscilloscope is used in the analogue mode the two channels can be displayed simultaneously or alone, with either an alternate or a chop-mode sweep. Either channel can be inverted, and the two channels can be displayed as sum or difference signals – this depends on the setting of the invert switches. This facility is also available in the digital store mode.

An output from the Y amplifiers is provided at a BNC socket at the rear of the scope. By connecting a frequency counter to this socket you can check the frequency of the signal being monitored. Thus the size, shape and frequency of the signal can be checked simultaneously. We

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FERGUSON 3V48 JVC HRD565	£44.99
<b>SONY REPLACEMENT HEADS</b>	
SONY UNIVERSAL 1 PIN C5/C6/C7 AND 2 PIN/SL8080 ETC	£18.50
SONY SLF-1/C20/C30/F30/C40/SLT20ME SLT30ME	£24.50
SONY SLC-8/C9/60/80/SLT50/SLF60/SL200	£40.00

### PANASONIC UNIVERSAL 3HSSN £17.00

PANASONIC NV370/NV380/NV100-PHILIPS VR6460	£24.00
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PANASONIC NV230/NV250/NV260/NV270/NV-G9/10/11	£34.50
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PANASONIC NV366 4 HEAD	£40.00
PANASONIC NV730 4 HEAD	£42.00
PANASONIC NV180 PORTABLE 4 HEAD	£44.00
HITACHI VT6500, VT7000, VT8000, VT8500, VT8700	£21.00
HITACHI VT11, VT14, VT33, VT34, VT330, VT340	£21.00
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SANYO VHR1500 3 HEAD	£49.00
TOSHIBA V9600	£25.00
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FISHER UNIVERSAL FVHD720, 520, 530 ETC	£24.00

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have found this to be very useful when dealing with chroma faults in VCRs.

### The X Timebase

The X timebase is adjustable from 5sec/cm to 0.5µsec/cm. At speeds slower than 0.2sec/cm an audible bleep reminds you to switch from the analogue to the digital storage mode. If, when using the digital storage mode, you increase the timebase speed beyond 20µsec/cm the bleep warns that you're outside the range of the storage mode and should revert to the analogue mode. Times ten X magnification is available in either mode.

### Component Tester

The scope has a built-in component tester for cold checks on semiconductor devices, capacitors and inductors. There are full instructions on its use in the manual, along with a page of photographs that show what to expect for various components – whether out of circuit, in series or in parallel.

### In Conclusion

The scope comes with two probes that are switchable to ×1 or ×10 and a comprehensive instruction manual that covers all aspects of operation and includes test instructions, service instructions, calibration procedures and circuit diagrams.

We found that the scope is very versatile. It's now in daily use in our workshop. The HM205 is available from advertisers such as BK Electronics and trade sources such as SEME Ltd. A brief specification is shown in Table 1.

## Hitachi VT33

This machine wouldn't play or record when hot. It would thread up, but the head speed would then begin to vary, making the micro think that the head had stalled. If you went into play-pause first the machine would sometimes play all right, but not always.

A look round the head servo revealed that the 9.5V supply started to oscillate when threading was complete. Replacing the many electrolytics associated with this supply had no effect. A new STK5421 finally cured the problem. **P.B.**

## Philips VR2023

The fault with this machine was no deck functions: when a function was selected the brake solenoid rattled but nothing else happened. The cause of the trouble was absence of the +12V supply due to a dry-joint on bridge rectifier 6005. **P.B.**

## Grundig VS180

This machine would play but didn't unthread fully every time. The switch on the threading ring FA1 worked correctly but the FB switch was dirty.

Another of these machines produced noise bars on the picture every thirty seconds during playback. A lot of time was wasted checking the tape tension etc. before the scope came out. We then found that the control track pulses were missing because the control head was open-circuit. **P.B.**

## Grundig 2 × 4 Super

For no or poor braking, check the +12VR line at pin 18 of the power supply. In the machine we had the supply was intermittent because the relay contact was poor. **P.B.**

## Hitachi VT17

A problem that's becoming common is no clock display due to absence of the 10V supply on the timer panel. The cause is that Q1795 on the back-up board goes open-circuit. It's not very easy to change. **M.D.**

## Saisho VR1000

In this machine the capstan was permanently in operation. We had to obtain a manual from Mastercare – £25 for a poor quality photostat copy. It turned out that C2039 (0.022µF) was leaky. This took us a long time to find, not helped by the fact that the circuit is incorrect – C2039 goes from pin 3 of CD2003 to the base of Q2017, not its collector. **M.D.**

## ITT VR3907

This was a good one. The machine would wind and rewind perfectly but in play or record it would lace up, run for three seconds then shut down. The counter is electronic and counted during those three seconds. We thought this indicated that the take-up reel pulses were o.k., but we were wrong. They were there but of low amplitude because Q0610 had gone low gain. The pulses were adequate for the counter but of insufficient am-

plitude to tell the microcomputer chip that the take-up was working. It took rather a long time for the ITT supplier Hoopwell to provide the spare part – we were told that this particular machine is a Samsung clone. **M.D.**

## Pye 64VR60/Philips VR6460

This machine was in permanent rewind. The cause was that R117 (2.7Ω) was open-circuit. The first one took us a while to track down but we've since had several more of these machines with the same problem. **M.D.**

## Sharp VC8381

It was impossible to tune this machine to stations. We found that the tuning voltage was missing because the aux-tuner switch had poor contacts. **M.D.**

## Sharp VC9300

There was no output from the modulator. We took it apart carefully and found that L2 in the 12V supply was open-circuit. **M.D.**

## Samsung VI910

This machine came in dead. We replaced the blown fuses and switched on. The capstan started to run straight away but the operate switch did nothing. Then the fuse blew again. The cause of the trouble was the mica insulator under Q1 (2SC1983) in the power supply – it was leaky. **M.D.**

## Panasonic NV-D80

When this machine was connected to a mono audio source the audio record level VU meters didn't agree. The left level was lower. We adjusted this as laid down in the manual, with VR4004, to obtain correct balance, but then found that the left meter displayed too high a level at the lower end and too low a level at the upper end. Correct conditions were obtained when the LED level meter unit (VEK3183) was replaced. **I.B.**

## Panasonic NV-G11

The reported fault was that the machine broke a tape. A dummy cassette was inserted and play pressed. After loading a knocking noise came from the DD capstan motor. We also found that if the motor stopped at a certain position it wouldn't restart. Further investigation revealed that the cause of this was incorrect drive to one of the three pairs of coils, due to a faulty Hall effect chip mounted with the coils on the stator. **I.B.**

## Samsung VI626

In the E-E mode there was no sound and the channel couldn't be shifted from no. 1. The sound was being muted by an output (pin 13) from the µPC1363 channel selection chip IC800 on the front panel. This chip has two inputs, channel up and down, one of which pulses low momentarily to shift the channel. We found that the

channel up input (pin 16) was permanently low, because the 15k $\Omega$  pull-up resistor R0916 on the "joint PCB" (mounted upright on the inside of the VCR's plastic frame) was open-circuit. I.B.

### Ferguson 3V58

This machine was completely dead, with no display or mechanical functions. We found that the supplies from the three regulator circuits were missing. The main one is the switched 12V supply which should always be present when the machine is connected to the mains. The bias for this circuit is taken from the 45V supply on the mains transformer board. It was missing because the 10 $\Omega$  safety resistor in series with the rectifier diode was open-circuit. This in turn was due to the fact that the associated reservoir capacitor C5 (47 $\mu$ F, 63V) was short-circuit. When the resistor, capacitor and diode had been replaced the machine worked fine. I.B.

### Sanyo VHR1500

This machine chewed tapes intermittently. An accusing finger was pointed at the reel motor and the reel idler, although the torque was correct. When the machine chewed a tape a loop about two feet long was left hanging outside the cassette. Why hadn't the take-up reel sensor stopped the machine earlier?

The machine was set to play without a tape and the take-up reel was held. After about five seconds the machine entered the stop mode, which is correct. So why was so much tape left hanging from the cassette? The machine was left on one side and as expected worked perfectly for the rest of the day. Next day luck was on my side as I saw the fault occur. It wasn't the reel motor stopping. Instead the capstan motor suddenly ran at full speed. As the take-up reel was still running at the normal play speed it couldn't keep up with the amount of tape the pinch roller was pulling through. Checks around the capstan servo were about to be made when the fault cleared.

The capstan servo reference is taken from a ROM within the servo chip, the various references being controlled by data lines from the main microcomputer i.e. First thoughts were of noise on the data lines – it could have been instructing the ROM to give the wrong output. As this was going to be difficult to prove, attention was turned to the comparison signal. If this went missing or low, would the motor run fast? A series of magnets around the circumference of the motor provide the comparison signal, and with such an intermittent fault a dry-joint was a distinct possibility. It was found whilst probing around on the capstan motor board. The legs of the magnetic sensor that produces the comparison signal had not been pushed through the board when it was soldered. A.D.

### Ferguson 3V65, FV11R etc

We've had this fault on Models 3V65 and FV11R but it could occur on any of this range of machines. The fault report stated that the "VCR stops playing or recording



Fig. 1: Correct (left) and the incorrect waveform (right) found at pin 36 of IC106 in the Ferguson 3V65.

intermittently then goes to stop". When the first machine came along we found that the take-up reel FG input waveform at pin 36 of IC106 was distorted – ideally you need a digital storage scope to be able to see this waveform correctly. Fig. 1 shows the correct and distorted waveforms.

Our first move was to replace the take-up reel photo-interrupter. To do this the tape deck has to be removed from the VCR. This necessitates removal of the head pre/rec board and disconnecting the plugs from the full erase head, the audio/control head and various earth leads. The deck terminal board then has to be removed. This involves removal of the capstan motor, disconnecting the ribbon connector and unsoldering the cassette LED. After this the deck terminal board can be removed by releasing two securing screws. We noticed that these screws had not been screwed down tightly, and both appeared to be print earthing points. As we'd got this far we went on to fit a new photo-interrupter, which apparently provided a cure.

Inspection of the print leading to one of the deck terminal board securing screws revealed that it's the only earth return for the photo-interrupter. So when the second machine came along we checked with the oscilloscope as before then carefully flexed the board near this screw to see whether the signal improved or got worse. The take-up signal was lost when the screw was given a slight anticlockwise twist, so we tightened the screw and left the machine on soak test. When the third machine appeared we simply tightened the screw. Since this episode we've had several more of these machines with a loose screw. A.D.

### Ferguson 3V59

The fluorescent display was out but the mechanical functions worked correctly. Oscilloscope checks revealed that there was no output from the display driver chip IC1. All the supplies were correct, as was the oscillator, but there was no input data from the UPD75208CW timer chip IC101. Replacing this cured the fault. A.D.

### Mitsubishi HS304/Salora SV8500

There was no chroma in the playback mode and on removing the top cover I could see a lovely break in the print, bang in the middle of the main panel. Repairing this restored the colour. It's a very long stretch of print that eventually connects the anode of D2A1 to C6D1. N.B.

### Panasonic NV-G25

On checking this machine we found that there was no video information in the E-E or playback modes, though the card just said "faulty" . . . The fault showed up when the machine was unboxed. Before removing any covers I connected a scope to the video output socket and tuned the machine in, using the sound output from the monitor. Video was thus present up to this point so the trouble had to be in or around the r.f. converter. In this machine the video is fed from the convertor via a buffer on the input selector then back to the converter. We found that the video went in at pin 12 but nothing came out at pin 14. The 5V supply was present at pin 11. Once this was established it was not difficult to trace the trouble to Q3501 (2SC2206 but a 2SD636 will do) which was open-circuit all ways round and D3502 (MA27W) which was open-circuit. To gain access to this panel it must be unsoldered from the mother board. N.B.

# Letters

## VIDEO TAPE CHARACTERISTICS

As a Technical Service Engineer in 3M's Video Technical Centre I'd like to comment on George Cole's informative article "Video Tape Types and Characteristics" in the August issue. In particular I feel that the information given in Table 2 (VHS tape specifications) is not wholly correct. VHS specifications are quoted as relative to a JVC reference tape. There's now a new improved reference tape that supersedes the reference tape used since 1976. This improvement has upgraded the basic specification by several dBs, which means that some publications have become out of date. Corrected VHS tape performance figures may now look worse, compared to the figures quoted prior to April 1988, though the tapes may be exactly the same (as was pointed out in the article, on page 739).

Referring to the new JVC reference tape, typical VHS tape performance may be quantified as shown in the accompanying table (Table 1 below). These figures have been obtained from tape performance tests on a cross-section of VHS tape brands. The table shows that the new JVC reference tape is much better than the old one – the new reference tape has the equivalent performance of a Pro-grade tape. Because of this upgrading of the minimum VHS specification some video cassette brands (especially the cheaper Far Eastern ones) don't comply with these minimum requirements.

The following points are worth making in connection with your Table 2.

(1) Current VHS tapes tend to have higher coercivities than the VHS minimum specification of 600 Oersteds, typically 700-770 Oersteds (but not 1,450 Oersteds – a tape with this high coercivity wouldn't work with a VHS machine!).

(2) Chromium dioxide tapes tend to have a similar performance to standard grade ferric oxide tapes. The figure of 4dB f.m. output, i.e. better than for Pro-grade tape, is unlikely to be correct.

Apart from these two points the figures in Table 2 compare well with our tape performance test results.

I would also like to make some comments on your sections on chromium dioxide tape and metal tape. You say that "BASF claims that its chromium dioxide tape actually increases head life". The head wear characteristics of chromium dioxide tapes have improved since they were first introduced, but independent head wear tests carried out for 3M have shown that they do no better than ferric oxide tapes and would not therefore increase head life.

You say that "most ferric oxide tapes have a life of 100-300 passes", implying that chromium dioxide tapes have a

longer life. 3M supports its Scotch Lifetime Guarantee by multiple pass testing to in excess of 1,000 times: along with some other major brands, tapes have been played successfully for 2,000 passes. Thus the tape life of all ferric oxide tape should be well in excess of 300 passes. The life of all major brand tapes is more likely to be limited by the condition of the VCR rather than the tape formulation or grade of cassette.

Finally VHS recorders use analogue recording techniques, so your comment on the development of "digital VHS recorders" is terminologically incorrect. Digital home VCRs would require a new format – an interesting development.

*T.A. Exell, Technical Service Engineer,  
3M United Kingdom PLC, Swansea.*

## INTERNATIONAL TV STANDARDS

Here are some corrections to the international TV standards list published last month:

Country	System	Colour
Albania	B, G	PAL
Cameroon	B	PAL
Columbia	M	NTSC
Greece	B, G	SECAM
Greenland	B	PAL
(US Forces)	M	NTSC
Haiti	M	NTSC
Paraguay	N	PAL
Rumania	D, K	PAL
Tibet	D	PAL

Some additional points: Hong Kong uses u.h.f. only, and the sound spacing at Macao is 6MHz; Belgium uses system H at u.h.f., not system G; Albania uses the Italian channel C and chs. E6-12; although Indonesia uses the E channels they are numbered 1 to 3 and 4 to 11.

I understand that Afghanistan uses PAL B in Kabul, set up by the Russians, and SECAM D elsewhere.

When Laos started test transmissions in early 1984 PAL M was used. Later in the year both PAL and SECAM were used. Recent rather vague information suggests that SECAM D is being used with a Russian supplied transmitter. PAL B sets are in use to receive Thailand TV. I have been unable to check on the position in neighbouring Kampuchea. Haiti had used System M SECAM at an earlier stage.

*Gareth Foster,  
Whitton, Middlesex.*

## TRANSISTOR WARNING

In the August issue TV Fault Finding it was suggested that a BU208A would work all right as a replacement for the 2SC3156 chopper transistor in the Amstrad Model CTV2200. I tried this but the h.t. rose to 245V. For-

**Table 1: VHS tape specifications.**

Characteristic	Basic specification	Typical standard grade tape	Typical Pro-grade tape	Chromium dioxide tape
F.M. output	-3dB	-1dB	0dB	-1dB
Chroma output	-2dB	-1.5dB	-1dB	-1.5dB
Video s/n ratio	-2dB	-0.5dB	+0.5dB	-0.5dB
Chroma s/n ratio	-2dB	-0.5dB	0dB	-1dB
Audio frequency response	±3dB	+1dB	+2dB	+1.5dB
Coercivity	600 Oe	730 Oe	740 Oe	720 Oe

tunately the line output stage feed resistor was disconnected. The set worked all right when a 2SC3156 was fitted. Incidentally the line output transistor is type 2SD1398, not 2SD139B.

The Sony KV2704 is another set that doesn't like the BU208A. The replacement has to be the original type.

*J.S. Ruwala,  
Pinner, Middx.*

## THE ORACLE PUZZLE

After reading Chris Plaice's letter (August) I dashed for my remote control unit and pressed 777. After some patience I managed to get page 101 by pressing "time" then pressing 3333. This is the only page I can get by using this method, but if you cancel "time" and wait, pages will scroll down the screen. If you are quick you can display a page by pressing the "stop" button. Also try page 799 (ITV). Information is displayed in a similar way to Televox, but it's harder to "catch" a page.

*D. Hindley,  
Bradford, W. Yorks.*

After reading Chris Plaice's letter (August) I had a look at page 777 on TVS. Certainly there are flashing text pages. On some I could just read Televox. Between times there was a blank screen, apart from the 777 called page number and the clock. After some experimenting I discovered that it's possible to hold the display by pressing any keypad digit quickly, so clearing the 777, as the page flashes up. This got me off page 777 before the memory wipe could occur. It took a bit of practice, but after a while I found that the best approach is to hit digit 7 quickly and, if I was too slow, just put in the next two sevens to get back to 777 again before the next try.

The Televox introductory page appears as shown below:

```
P777 TELEVOX 000101 **ab11151507:08
                                         TP ↑↑↑↑
```

TELEVOX

Hello . . . this is TELEVOX

- Televox is controlled by your spoken commands – but you must first let Televox hear how you say the words Star and Next
- You will be given your Televox page number. Key this into your TV (in place of the 3333)
- Only when this is done say STAR NEXT (say \*#) to continue

Ring 0898 444 777 or 0898 444 747

25p min cheap rate/38p other times

For a FREE preview: 0800 515 333

This explains what's supposed to happen. I believe that the TP in the top right-hand corner stands for "Televox page". My display showed flashing arrows, but it appears from the page of text that 3333 will normally appear. Then, when you've been given your own unique number (for the duration of your phone call presumably), you key it in, using your current teletext TV receiver. I can't do this with my VM6101 decoder. After this is done you control what goes on by saying Star, Next or the numbers One, Two, Three and Four which the Televox computer has learnt to recognise, using the screen as a prompt. Pages I've found at random include advertisements for property and cars, information on the chance of getting

stand-by flights, puzzles and games. The "Myrzad" that Chris mentions is actually an advertisement for Myriad Computer Services.

So it looks as if Televox is a form of Pay Teletext, operating in conjunction with the telephone. I rang 0800 515 333 and was greeted by a recorded announcement asking me to say Star and Next.

I must admit that I quite enjoyed the fun of trying to beat the system, displaying pages by chance instead of via the phone. A brief mention of the Televox system appeared in the August Teletopics (page 742).

*Keith Cummins  
Holbury, Hants.*

## BRYAN TUCKFIELD REPLIES

Wow! You did all sit up and take notice, didn't you? Yes, it's Friar Tuck again from Willow! Regretfully most of you (letters, August) seem to have missed my point. So, just before I close my suitcase to emigrate, let's look at the comments made.

Jon from Wells, Somerset. If you have to do a "clear up" job there must surely be a profit in it for you? Yes of course £3 worth of belts would incur a handling charge – on their own. But not if tacked on to your order for fuses and normal workshop stock items. Would you deliver a PP9 or a 13A plug for the nett cost of the item? And give at least one month's credit? I don't think Joe Public would expect a spares by return of post service if it was explained that you couldn't order individual items on their own. Also, Jon, what surcharges and postage amounts to more than £5? Our highest rate is £2.80, and that's only if the value of the order is under a fiver. Come on, be fair!

Now let's see what Adrian from E17 has to say. Why does he need to assess the "punter?" If the customer wants a belt, why not sell him one? If he doesn't fit it properly it's no skin off your nose and it could get you a "clear up" job like Jon's. Why ring up to order the part? Again if you explain to the customer that you'll tack his request on to your next order, unless he wants to pay for the call, surely he'll understand. No we don't feel piqued at producing a costly catalogue, unless it's not used! No one likes waste do they?

Now on to our North Devon Sharp dealer. Hi! No name, but no we don't mind supplying the public as in most cases they are exasperated after trying all other avenues. So by the time we get 'em they're seething anyway. In fact it's part of our contract with Sharp that we do supply the public. Surely if a member of the public has purchased a product he or she is entitled to be able to buy parts for it? Subject to any safety aspects of course. I feel that dealers should support manufacturers' merchandise. After all sales, it seems, is where you make your main living. O.K. the public can be a problem, but where would you be without them? If you have no wish to supply a part or get involved, at least be helpful and point them in the right direction, even if it means us. If it's Sharp or Philips we'll support the manufacturers on your behalf. That way you'll have been of service to your customer and as a result your establishment will have earned a reputation for always being helpful. Even in this day and age good will still has a high value. So, as for supplying the public, yes we do. Someone has to! Mind you they pay the retail price plus post and packing. No, we had no proof other than the customer's word that he'd tried locally, and who wants to see a diploma? We are talking about only one belt and one pinch wheel.

So to L.J. of Buckfastleigh. I agree that it's hard to get

a Willow Vale catalogue, mainly because we are all so busy sourcing, buying and stocking that we don't have time to list it all. But we are working away at it, without Caxton's help. Mind you we do produce eight catalogues in total. Aimed at different manufacturers' spares and products. I can't really see that L.J. (I wonder if it's S034) has none of them. What's his 1986 price list I wonder? If it's for Sharp, the latest one was February 1st 1988. And there are plenty of current Price Matrix available for pricing Sharp.

Phew, this is hard work! Now who's next. Oh yes, C. Deus of King's Lynn. Why so formal? Again, leaping to the phone. I've covered that one above. As for getting stuck with the parts, why not take the cash with the order? Then if your customer doesn't return you've got your bits and some bread. One point I will take you up on though. We don't make a handling charge of £2.50 for an order of a belt and £100 worth of spares. All normal spares orders in excess of £25 are carriage free, unless Data Post or Securicor "A" service is requested. As for not repairing certain brands, yes I quite agree. But in the case I reported, of a Sharp RG955, there was no spares problem and it's good equipment. Field research? Yes, I've done my share and yes it does pay off. That's why we stock so many lines. I go out and ask the trade what's needed. Mind you a lot of the answers I get would be against the law to stock anyway . . .

I think I've answered you all but if I've missed a particular point you can always contact me at the office by letter or ring through to 0734 860 158 ext. 11 (I'll regret that). Really, you are all lovely people trying to earn a crust - so are we. In closing, may I say once more that my purpose was not to knock the service trade but to make it more aware. Not to lay down the law but to help with information.

*Bryan Tuckfield, Sales Manager,  
Willow Vale Electronics, 11 Arkwright Road,  
Reading, Berks RG2 0LU.*

### SPARES FROM CHS

Following recent correspondence about spares, may I point out that Charles Hyde and Son Ltd. is also an approved Sharp distributor, as well as being an authorised spares distributor for Ferguson, Philips and GEC. CHS, as we are generally known, also carry some spares for Sanyo, Hitachi, Decca, ITT, Sentra, Hinari, Seleo, Sony and many other brands.

We have two catalogues. One deals exclusively with our Sharp range, the other covering the rest of our product range, including rebuilt picture tubes from our own factory. We would be delighted to send copies to any bona fide retail service department that would care to contact us - by phone on 0759 303 068, facsimile on 0759 303 620 or by sending a note to the address below.

*Freddie Whipp, Sales Manager,  
Charles Hyde and Son Ltd., Prospect House,  
Barmby Road, Pocklington, York YO4 2DP.*

### TRADE TRANSMISSION MUSIC

Accompanying the ITV Trade Transmissions during the years 1957/8/9 there were six-monthly schedules of gramophone music. Each schedule consisted of fourteen LP records, played in two-weekly instalments of seven LP records that alternated weekly. The first schedule commenced on Monday June 17th, 1957 with the Frank Chacksfield "Music of George Gershwin" (Decca label)

and a record commencing with "The Blue Danube". The IBA hasn't kept copies of the relevant play lists and I'm wondering whether any reader has the lists issued at the time by ITV. There would be about five lists covering 17/6/57 to the end of 1959. I'd be happy to pay for photocopies of such lists. I'd also be interested in similar lists for the music played during the BBC Television Trade Transmissions in late 1957 and throughout 1958/9.

*G.J. Mayer, 151 Thorndon Gardens,  
Stoneleigh, Epsom, Surrey KT19 0QE.  
Telephone 01-393 4615.*

### AKAI MODEL VS2

In the July Service Bureau a complaint about "new recording - previous sound for about ten seconds" with the Akai model VS2 was mentioned. These VCRs don't have an audio erase head, so a portion of the tape between the full erase and the record/playback heads is left with the previous audio, i.e. there's no fault with the machine. I hope this may help anyone else confused by this characteristic.

*J. Kent,  
Bromsgrove, Worcs.*

### THANKS

Following my letter in the May issue on the difficulty of obtaining test equipment, as I am disabled, I have received a signal generator and scope and offers of the loan of other equipment. The veterans of our industry responded handsomely, and my trust in human nature has been well rewarded. Thank you all.

*C. T. Marden,  
Ecton, Northants.*

### HELP WANTED

Can anyone help with a circuit diagram/manual for the Auritone model 80T1 - it's a 5in. monochrome TV set. I'd be happy to pay for any information - buy or loan.

*Leon Electronics, 11 Woodend Close,  
Three Bridges, Crawley, West Sussex.  
0293 20536.*

Due to an unfortunate accident in the workshop I'm trying to find a lid and hinges for a National Panasonic SG5090 music centre. The lid is no longer available from the manufacturer. If anyone out there has these items, please ring us on 0943 466860.

*Graham S. Brooke, 65A Walkergate,  
Otley, Yorks LS21 1HD.*

Can anyone supply a circuit diagram for a Vendomatic 26in. colour TV set, type 41682? The set was made in West Germany.

*Alan Wilson, 19 North Road,  
Stoughton, Guildford GU2 6PU.  
Telephone 0483 571 908.*

I'm an electronics graduate who is extremely interested in learning about TV/video servicing. Would anyone in this area be willing to provide training in return for voluntary labour on my part, possibly on a Saturday? I'm quite adept at wielding a soldering iron. The aim is not to obtain qualifications but to learn the necessary skills.

*A.J. Dudley, 37 Ainsdale Drive,  
Whitworth, Nr. Rochdale, Lancs OL12 8QB.  
Telephone 0706 344 431.*

# The Philips NC3 Chassis

Harold Peters

As long as you are willing to forget the model numbers it's a fact that Philips' small-screen portable colour sets have been following a logical, progressive shrinkage that's culminated in this year's latest version, the NC3. This has a chassis that looks smaller than last year's mono portables. Fig. 1 shows the basic chassis layout.

The logical development can be seen in the circuitry. The timebases, chroma and sound sections and the RGB output stages still owe a lot to the KT3, in theory if not in practice, though to look at the chassis you wouldn't think so. The vast majority of the circuitry is now included in two chips, a TDA3565 colour decoder and a TDA4505 that incorporates the i.f. strip, with a.g.c. and a.f.c. outputs, the sync department and the timebase generators.

There are one or two novelties. The power supply is a variation on the now well-known Philips SOPS (self-oscillating power supply) but, because there's no call for a dead-chassis configuration (no Euroconnector), the optocoupled feedback loop used in larger screen chassis to provide isolation between the primary and secondary sides of the circuit is replaced with a resistive network. As a result the entire chassis is at half mains potential.

The station selector is a rotary switch. Thus the space-consuming and often noisy push-button bank assembly is dispensed with. Channel tuning is assisted by an on-screen vertical green tuning bar that moves from left to right as a tuning potentiometer is adjusted from ch. 21 to ch. 68. The arrival of a signal of watchable strength produces an a.g.c. bias which mutes the green line.

This a.g.c. bias is also applied to the time-constant pin of the line oscillator part of the TDA4505 chip in such a way that the time-constant is shortened as the signal strength rises. Since the average VCR delivers about 10mV it automatically counts as a strong signal so that the required short time-constant is obtained regardless of which switch position is tuned to the video channel.

Discrete circuitry is used for the above operations – the chassis would look balder than ever if integrated circuitry was used for the purpose.

The automatic band switching in the Continental version is worth a mention. The tuning potentiometers that select channels 21-68 in the UK version tune through 0-4.3V for Band I, 4.3-12V for Band III and 12-33V for

Bands IV/V in the Continental version. Amplifiers with gains of  $\times 7$ ,  $\times 4$  and  $\times 2$  respectively convert the reduced voltage change to a full 0-33V swing for the tuner's varicap diodes, and operational amplifiers decide which tuner pin should get the 12V band-switching supply.

Under certain conditions early sets could suffer from a poor start up. To overcome this problem R422 was reduced from 820 $\Omega$  to 560 $\Omega$  in later versions. This resistor is in the SOPS feedback loop and is worth changing if you find that the earlier value is fitted.

The UK version has the U411 tuner, a proven type that came in with the System 4 chassis. At the risk of being repetitive we'll mention once more that it can be responsible for instability or patterning in the region of ch. 59 after some use. The reason for this is oxidation of the earthing contacts between the copper side of the tuner's PCB and the cover. As a result the small spring strips are turned into a lecher bar at Band V frequencies. The slightest disturbance will cure the trouble for a number of weeks. The writer's cure is to lean the cover out from the tuner so that none of the three earthing points makes contact.

Don't forget that the tuner needs an aerial isolator. Some sets with "dead" chassis and U411s have what looks like an isolator but is in fact a straight-through connector. If in doubt check for continuity (or lack of it).

The mains lead is brought in and anchored bare on two solder points at the back of the panel, from where it's connected by jumper wires to the on-off switch. These two points are live, even with the set switched off, and because they are just where you need to pull on the chassis to draw it out it's worthwhile unplugging the set from the wall before you start.

The initial models fitted with this chassis are the Philips 14CN3001/05B (black) and 14CN3001/05L (red) and the Pye 37KN3030/05C (silver black) and 37KN3030/05W (white).

## The NC3CR Version

This version of the NC3 chassis has just been released. It reverts to the practice of using an optocoupler in the SOPS power supply so that if needs be the chassis can be "dead", though the models so far announced do not include video connections. There are "basic" and simple remote (volume and channel change only) models, and in order to maintain common circuit operation both versions use an electronic tuning memory in place of the rotary switch and the green-line tuning circuitry employed in the NC3. The CR version's control panel is detached from the main chassis, though the control chip is on the main panel where the green-line components are in the NC3. The mains input anchor points are much closer to the on-off switch than they are in the NC3, reducing the safety hazard for engineers who could accidentally grab the live part of the chassis.

Models fitted with the NC3CR chassis are as follows: basic versions Philips 14CN2001/05B (black) and 14CN2001/05L (red), Pye 37KN2010/05C (silver black) and 37KN2010/05W (white); remote control models Philips 14CN2201/05B (black) and 14CN2201/05W (white), Pye 37KN2012/05R (anthracite) and 37KN2012/05W (white).

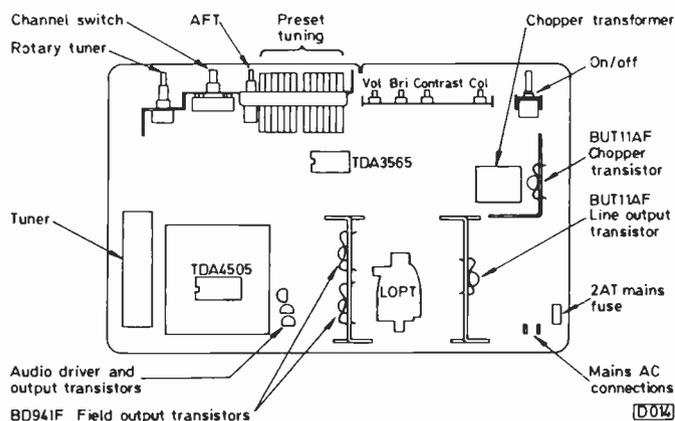


Fig. 1: Layout of the Philips NC3 chassis, showing the main components.

# TV Fault Finding

*Reports from Denis Parsons, Dave Dulton, P.J. Roberts, Alfred Damp, Laurence W. Heslop, J.G. Grieve, J.R. Armagh, Hugh MacMullen, M.K. Hayter, Ian Bowden and Nick Beer*

## Ferguson TX90 Chassis

We've had a couple of interesting faults recently on these sets. The first had expanded teletext lines with flyback lines above, going down the centre of the picture. R194 (243k $\Omega$ , 1 per cent) in the field feedback circuit had gone high in value – to over twice its correct value in this case.

With the second set the sound was weak and distorted at the centre of the range: when the volume was turned up the sound disappeared. Adjustment of the sound discriminator coil L114 had no effect. The sound discriminator circuit is coupled to pin 13 of the TDA4500 chip IC102 by C114 (0.01 $\mu$ F) which was the cause of the trouble. **D.P.**

## Amstrad TVR1

This set came in with the fault that it took a long time to come on. It certainly did – anything from a quarter to half an hour. This is one of the Amstrad TV/VCR combinations and it was the TV section that wasn't working correctly. Voltage checks around the STK7348 power supply chip IC1501 showed that the start-up feed voltage at pin 7 was low – only 0.7V. A resistance check on the start-up feed resistors R1503/4, both 270k $\Omega$ , showed that they were of the correct value, leaving only the 0.22 $\mu$ F electrolytic capacitor C1507. This didn't read leaky but fitting a replacement restored normal operation. **D.D.**

## ITT CVC32 Chassis

This set tripped when switched on with the aerial plugged in, even when operated with an isolating transformer. Replacing the aerial isolator unit put matters right. **P.J.R.**

## Toshiba C2636 etc

The field linearity was stretched and there was foldover at the top of the picture. C313 (4.7 $\mu$ F, 160V) in the field output stage was found to be open-circuit. This basic field output stage circuit, using a complementary-symmetry pair of transistors and including C313, is used in a number of Toshiba models. **A.D.**

## Network NW1286

This set came in with a picture, but it soon faded off to a condition of little or no brightness. When the voltage at the tube's grid was checked the brightness was restored. Tracing back we found that R508 (560k $\Omega$ ) was open-circuit. **A.D.**

## ITT 80-90° Chassis (CVC823 Power Panel)

The problem was no results except for a chirp from the power supply when the set was switched off. The first step should be to remove the scan plug as this has a link that connects the h.t. to the line output stage. A short-circuit TDA1170S field timebase chip will also stop these sets working. With the scan plug removed the h.t. still didn't rise, so attention was turned up the switch-mode power supply.

The voltage at the emitter of the chopper driver transistor T615 was 20V, thus exonerating the high-value base bias resistor R643 and the two 20V zener diodes D614 and D619. Other high-value resistors in the circuit

were checked and proved to be in order, and the oscillator T611/2 was running. But there was no output from the pulse-width modulator stage T613/4. This was a similar state to a trip condition – the trip acts on the pulse-width modulator. In-circuit checks on various semiconductor devices in this area were inconclusive, but when the two trip transistors T616/7 were checked out of circuit we found that T616 (BC238B) had a slight leak. **A.D.**

## Salora 22K30

The problem with this 22in. colour set was slow start-up – it took up to ten minutes to produce sound and a picture. We eventually traced the cause to CB604 in the switch-mode power supply circuit. This 1,000 $\mu$ F, 16V electrolytic is the 8.5V supply reservoir capacitor. I understand that sets using the K chassis are prone to this problem. **L.W.H.**

## Salora 15L30

This 15in. FST portable suffered from loss of red drive to the c.r.t. We found that there was no red output at pin 20 of the TDA3301B colour decoder chip. As this chip is responsible for most of the video processing we suspected an internal fault, but fitting a replacement made no difference. The cause of the trouble turned out to be the red clamp capacitor CF29 connected between the 12V rail and pin 21 of the TDA3301B. As this chip is a 40-pin device it would be worth checking the clamp capacitors CF29 (red), CF30 (green) and CF31 (blue) if you get this type of fault. **L.W.H.**

## Some Quickies

**Sharp C1871:** Intermittent partial field collapse was traced to R525.

**Sharp C2002:** This set refused to start up. Replacing the STR4090 power supply chip cured the problem.

**Philips/Pye CTX-E chassis:** This set was tripping. We found that the BYV95A 26V rectifier D6590 in the line output stage was short-circuit.

**Decca 70/90/110 chassis:** One of these sets came in with the power supply fuse and the chopper transistor Tr605 blown. We found that D608 and D610 which are in series with Tr605 had also failed, and as a precaution we also replaced C627 (10 $\mu$ F, 16V) which is in parallel with them. **J.G.G.**

## Hitachi CPT2218 (NP81CQ Chassis)

This one broke our hearts. The customer complained that after about half an hour a teletext display would suddenly invade the screen of her set, obliterating the picture. This would happen on any channel, and after a moment or two the set would go into standby. If left for say a quarter of an hour everything became normal. The problem was said to occur only at night.

Repeated tests in the workshop, even using the hairdryer on the text and interface panels, showed nothing amiss. So we resorted to drastic measures. We put the set in a large plastic bag with a thermometer visible and blew air from the hairdryer in at the bottom. At 90°F the fault really did happen. Spraying IC2101 (SAA1272) with freezer cured the trouble, and reheating it confirmed that

it was the culprit. So we changed it and returned the set.

Next day the customer reported that the set was no better. Repeating the bag and hairdryer treatment again showed that she was right. This time IC2101 was blameless and it was the SAA1251 that caused the trouble.

Soon after another of these sets arrived and my heart sank into my shoes. This time the teletext thing crept slowly over the picture from the right, pushing the picture away. After our previous experience we decided to replace the SAA1251 without further ado. It did the trick. I don't trust this device!  
**J.R.A.**

### Philips G8 Chassis

This set suffered from Hanover blinds that couldn't be cured by adjusting any of the controls in the decoder section. After a lot of soul searching and scoping I discovered that whoever had fitted a new line output transformer had made a wonderful dry-joint at pin three, as a result of which no line pulses were being fed back to the chroma circuitry. Resoldering put matters right.  
**H.MacM.**

### Philips G11 Chassis

The problem was occasional field collapse. Almost everything in the field timebase circuit had been replaced except for the panel itself. We eventually found that there was a tiny haircrack in the track of the field hold potentiometer.  
**H.MacM.**

### Saisho CT141X

The sound was so low that it was almost inaudible – just a very quiet hum. I'd no manual so I checked around in the sound i.f. section with a signal generator and found that C303 (100pF) read in the region of 5k $\Omega$ . It damped the i.f. coil so much that the sound was killed.  
**H.MacM.**

### Saisho CT1400

Very weak sound on this set turned out to be due to R356 (10k $\Omega$ ) being open-circuit.  
**H.MacM.**

### NordMende F11 Chassis

This set had no EW correction. The control chip was changed but this made no difference. We eventually found that coil LG02 had shorted turns. Instead of being wound on a bead, later versions consist of a proper coil on a former.  
**H.MacM.**

### Rank T20 Chassis

Field collapse the man said, so I switched the set on to make sure and field collapse it was. Off with the back then and lower the scan drive panel. I noticed that 4R9 had burnt out and that 4R4 was slightly burnt. An Avo check revealed that 4R4 (1k $\Omega$ ) had gone very high in value – 500k $\Omega$  in fact. Now these two resistors are in the driver/output stage section of the field timebase, so I concluded (wrongly) that the working conditions had been upset and that one or more of the four transistors involved had suffered. Each transistor was checked in turn but they were all o.k. So I replaced the two resistors and switched on. After about ten seconds 4R9 began to cook. Switch off quickly.

Up with panel. Any dry-joints? None could be found, so I engaged neutral and went off for a cuppa. Then I remembered something. The two output transistors are

connected by three-pin sockets to their leads from the panel. Could these sockets be loose on the transistor pins? Yes, some pins were not making contact. Only one thing for it. I snipped off both sockets, sleeved each lead individually and soldered them direct to the relevant pins, pushing the sleeving over each soldered joint. Finally I clamped each bundle of three leads together with a cable tie to prevent the sleeving from moving. When the set was switched on again everything was back to normal and after a soak test it was returned to its owner.  
**M.K.H.**

### Salora 22J20

The fault was no raster. After checking that the field blanking section of the sandcastle pulse was present we moved to the c.r.t. base panel where the 1kV supply was found to be missing. RB503 (2.2k $\Omega$  non-flammable) was open-circuit but we could find no reason for this. A replacement was fitted and the set was put on soak test. Several hours later a plume of smoke appeared and RB503 had gone again. As there were no shorts on the c.r.t. base side of this resistor diodes DB503 and DB506 (both BA159) which provide the 1kV supply were checked. They were both leaky in the reverse direction.  
**I.B.**

### National Panasonic TC202G

This set is second only to the similarly aged TC275G (see letter, July) in terms of picture quality over a long period of time. It's also one of the most reliable sets ever made. This one came in with the complaint that there was no picture. The field engineer mentioned that there had been a very low-level, defocused picture.

On checking I found that the supply from the diode-split line output transformer to the combined A1/focus control unit was low, which would explain what was wrong. The voltage is tapped from a winding and fed via a series resistor within the transformer. At the input to the A1/focus unit there was only about 700V, and there was almost nothing at the A1 output. The h.t. was correct, and all the other line output transformer derived supplies were normal. So it seemed that the transformer was faulty, though they hardly ever fail in Panasonic sets, especially these older ones. The e.h.t. was correct so, suspecting the internal resistance, a new transformer was fitted. We then had a truly superb picture, though I first had to replace the AN320 green line chip (fit an AN322 kit) to correct a misbehaving a.f.c. circuit.  
**N.B.**

### Rediffusion Mk 3 Chassis

This was the first time we've had one of these sets in the workshop. The complaint was "dead" and the 20mm fuse on the power supply panel was open-circuit – but not blackened. On replacing this the set tripped and stayed off though the fuse remained intact. I disconnected the input to the tripler as this seemed as good a place as any to start, and when I switched on again the set burst into life – minus a raster of course.

A universal tripler was fitted, with the diode lead left disconnected to try it out. As the set then produced a picture the lead was cut off and insulated. But the picture was very weak: the raster was over bright and the contrast control had no noticeable effect. We checked around in the area of the tripler and decided that the trouble was probably in the beam limiter circuit. It didn't take us long to discover that 5R24 had risen substantially from its correct value of 220 $\Omega$ . When this had been replaced there

was a normal picture apart from teletext lines over the top four inches of the picture – the field linearity was o.k. I suspected that a capacitor in the field timebase circuit was leaky or open-circuit but eventually found that 8R26 had

risen in value from 270Ω to over 750Ω. After replacing this the set produced a perfect picture. All this was done without a manual or the need for any special spares. Why isn't life always as rewarding?!

N.B.

## Panasonic Video Maintenance Kits

Ian Bowden

A series of eight video maintenance kits has been introduced by Panasonic, covering a range of machines from the NV2000 to the NV730. Each kit contains the most common spares, apart from heads of course, that will be required for a full service or reconditioning of a machine. Panasonic suggest that to prolong the life of a VCR the parts specified should be replaced after every 1,000 hours' use.

As an example of what the kits contain, that for Models NV230/430/810 provides a capstan belt (VDV0149), a loading belt (VDV0152), a front loading belt (VDV0153), a pinch roller assembly (VXL1209), an impedance roller (VDP0908), a play and fast-wind drive idler (VXP0521), a back-tension brake band (VXZ0165), a pinch roller washer and circlip and a slot washer for the drive idler.

The other kits have similar contents, though some of course will contain more parts, particularly in the case of older machines. This will be reflected in the price. I must admit that prices came as a nice surprise to us. Typically the trade price of a kit is approximately the same as that of just the pinch roller and one or two idlers. In fact in the case of the kit whose contents are listed above the price is less than that of the pinch roller and drive idler when these are ordered separately.

Inclusion of the circlips and slot washers is a sensible idea. How many times have you had a slot washer drop on to the floor never to be seen again? And as they tend to spread when removed they don't grip on the shaft as

they should when reused, something that could lead to trouble later.

Perhaps the idea behind the introduction of these kits was that if you have all the parts to hand you'll use them, whereas if one item that should be replaced isn't in stock you might be tempted to clean up and/or make do with the old one. This could lead to further trouble shortly after, reflecting poorly on both the dealer and the manufacturer. Providing maintenance at a reasonable price with no comebacks can only help a dealer's reputation and build up a manufacturer's reputation for reliable products.

Though eight kits have been introduced so far, at the time of writing they were all out of stock! Possibly this reflects their usefulness to the trade. Anyway, let's hope that Panasonic continue with the idea, covering later machines and perhaps prompting other manufacturers to do something similar. Here's the complete list of kits to date:

Part no.	For Models
VUD4086KIT	NV7000
VUD4087KIT	NV2000, NV2010
VUD4088KIT	NV7200
VUD4089KIT	NV333, NV366
VUD4090KIT	NV777
VUD4091KIT	NV730
VUD4092KIT	NV370, NV850
VUD4093KIT	NV230, NV430, NV810

## ECA Semiconductor Reference Books

Nick Beer

It's almost impossible to have available data on all the semiconductor devices you're likely to encounter while servicing brown goods. Over the years many manufacturers have produced many devices, and quite a number of different type number conventions have been used. Various books that list characteristics and equivalents have been produced, some by manufacturers and others by independent publishers. They are all useful in their own ways, but probably the most successful and most widely used have been the ECA series – the ones with the yellow covers and the owls on the front. These books are updated annually and are available from major component suppliers. In the past the series has consisted of two books covering transistors, two for diodes, and single books for linear i.c.s, CMOS devices and thyristors. The cost of each book is in the region of £7, but they are worth their weight in gold. Now the company has introduced two new books that combine all the information from the previous ones plus more new information. Some bits that are not really required for this trade have been cut out – the previous books have aimed at design as well as service engineers.

The result is a pair of books that are superbly laid out and contain stacks of useful information. Looking anything up is simplicity itself – everything is in alphabetical (Book 1) or numerical (Book 2) order, regardless of whether it's a diode, an i.c. or whatever. The information provided for each device consists of a brief description with characteristics, the pinning and comparison types – in the case of i.c.s the application is given. The improvements make for an uncluttered, clear layout, and since the books are the same size as the old diode ones (twice the size of the transistor books) they don't keep falling shut when you put them on the bench. This also enables the information to be laid out down the page instead of across it as before. Another particularly good idea that's been implemented is to include Japanese equivalents for Japanese devices – previously all equivalents were of the BC/BD/BF/BU classification, but now we get the 2SC etc. series as well. Yet another improvement relates to the pin configuration diagrams: a note is included to tell you from exactly which angle the diagram is shown. This was mostly pretty obvious anyway, but there was room for confusion with some devices.

On checking through the books and looking up devices as I encountered them I came across a couple of absentees, but these were specific manufacturers' types that don't have equivalents. I was pleasantly surprised by some of the things there are included, in particular a large number of numerical only types and the various prefixes used for zener diodes – ZPY and RD for example. Some devices used in Salora equipment caught my eye – RGP10, RGP15 and S2000a are all there. This is bound to help those who have to tackle all types of repair for their living. For example, if one of the multitude of cheap portables comes in with a duff regulator that takes you just ten minutes to diagnose you may then take forever trying to find a replacement that you can guarantee. Or

say you have an i.f. fault and it must be in one of two chips but you don't know which one houses the audio detector and you've never come across either device before.

When these books are updated no device is ever left out, no matter how old it is. So you can buy these two new books and give your pile of existing ones to a field engineer or your apprentice. In my opinion they quite obviously represent phenomenal value. In the short time we've had them they've saved us a great deal of time. They are available as a pair for a mere £17.85 trade (no VAT with publications!) from Willow Vale Electronics (head office 11 Arkwright Road, Reading, Berks. RG2 0LU) under order code 21-004B.

## *The Temptation of Tiny Tim*

*Les Lawry-Johns*

Tiny Tim was having a rest after doing nothing for the best part of the morning. The door opened and in walked delicious Dora. What a face, what a figure. And what a cheek . . . her lips parted as though to give Tim a kiss.

"Would you be kind enough to bring my set in for me? It's a bit heavy for me to carry."

Tim popped out to her car and picked up the Thorn 8800. He carried it into the shop and put it on the counter.

"Can I watch you do it?" asked Dora.

As Tim's wife was out, gassing to everyone up the farm (King's Farm, about a mile up the road), he didn't mind at all. He whipped the back off and plugged the set in, switched on and nothing happened. Next he checked the plug and mains lead, read it through to the on/off switch, then realised he'd fallen for it again. The cut-out button at the back. He pressed it and the set started up. The sound was o.k. and after a short period the picture appeared. It was blurred, so he tried to adjust the focus knob. It was at maximum and turning it back only made things worse.

Tim remembered the time when he'd changed the e.h.t. unit and the focus control several times without improving things and Keith and Alex had popped in on their way back to Portsmouth. Keith had offered to do the job for him there and then. He'd removed the earth lead from the bottom of the focus unit and switched on. There had been an almighty crack from the tube, with flashes everywhere. Keith had then switched off and reconnected the earth lead. On the next attempt the picture appeared in full focus and Keith and Alex had then made their way back to Pompey, having taught Tim another lesson.

Tim thought of trying this again, just to frighten Dora out of her life, but decided against it. He slid the chassis out – with the set switched off – and loosened the e.h.t. unit. After shorting the e.h.t. lead to chassis he disconnected the leads. He walked round, brushing Dora's behind on the way, and selected a new unit from the shelf.

"This will cost you twenty quid" he told her.

"We can talk about that later" Dora said.

So Tim fitted the new unit and switched on. He could now turn the focus control quite a way back and the picture looked good.

"Aren't you clever!" said Dora.

"At most things" Tim said modestly.

He wrapped the set up and carried it out to Dora's car, then went back for his twenty quid.

Dora was leaning against the counter in a suggestive way. "Open to negotiation?" she asked.

Now Tim fancied Dora but, well, maybe it was the weather . . . He's an odd bloke but there are plenty like him. Dora looked annoyed. She opened her purse just as Tinker Bell returned, having cut short her shopping (jawing). Tim took Dora's notes and, as she left the shop, put them in the till.

### *An Awkward K30*

Tim had a Philips K30 that was driving him mad. He'd sold the set some years back to a lady whose husband had been a friend of his and had died two years ago. When she'd phoned to tell him about the set he'd promised to call round that afternoon. He'd gone without a care in the world, taking with him all (he thought) the things he might need.

When he tried the set there was sound but no raster. He replaced the two upper left-hand boards. No difference. He turned up the first anode controls and obtained a blank raster that was locked solid until the aerial was disconnected. So he took the set back to the shop and spent hours trying to find out why the first three transistors on the RGB output board were not turning on. All the supplies to the board were present.

After suffering for a long time he thought he'd let someone else suffer. He took the set along to Moon Lane and handed it to Geoff and Eddy. They laughed when he asked for their help. Two days later he called in to find out whether they'd solved the mystery. They hadn't and the set sat there on the bench, looking at them with the same blank raster. Tim said he was sorry to have given them such a trial. They didn't laugh this time and carried the set down the stairs for Tim and put it in his car. Said they were glad to see the back of it.

Tim settled down to find the source of the trouble but became more and more baffled. The cause of the problem seemed to be lack of bias for the first three transistors on the RGB panel. They are pnp emitter-followers with their collectors returned to chassis and their emitters supplied from the 13V LT3 rail. After a lengthy search Tim found an invisible break in an earth circuit, roughly midway across the main panel near the focus control. Three electrolytics (including the LT3 reservoir) and a resistor are returned to earth at this point. Tim was left very puzzled as the other open-circuit electrolytics and the resistor, which is in the first anode network, should have had other effects. Maybe the break was "made" as far as some of them were concerned.

# ECONOMIC DEVICES PO BOX 15, WOLVERHAMPTON, WV2 4AZ

150R04	3.30	ZSC1826	0.67	AN206	2.98	BC207	0.14	BDX54B	2.16	BU205	1.15	HA1196	7.43	MC1351P	2.96	SAS567	4.70	SB440	4.70	TB4940	1.87	TD4431	2.27
150R51	3.30	ZSC1829	2.22	AN208	3.55	BC212B	0.26	BDX62A	2.15	BU206	1.27	HA1301	1.73	MC1352P	2.50	SAS570	4.52	SB445	4.52	TB4950	1.94	TD4440	2.26
17052	5.61	ZSC1875	4.50	AN210	2.28	BC213L	0.10	BDX63A	1.96	BU207	1.65	HA1306	2.26	MC1353	2.61	SAS575	4.81	SB450	4.81	TB4970	3.56	TD4442	4.15
17063	5.61	ZSC1883	3.02	AN211	3.25	BC214	0.10	BDY20	1.21	BU208	1.20	HA13402	7.87	MC1358P	1.35	SAS580	2.25	SB454	4.95	TB4990	1.98	TD4500	4.75
17074	9.30	ZSC1906	0.98	AN210	4.00	BC225	0.40	BDY81	1.05	BU2080Z	1.97	HA1342	2.65	MC1400	2.40	SAS600	3.13	SB4600	5.25	TB49900	1.68	TD4600	2.10
17089	9.45	ZSC1921	1.37	AN234	5.92	BC228	0.10	BF115	0.40	BU208A	0.40	HA13365	4.02	MC1403	0.61	SAS660	2.97	SB4620	5.73	TC42700	0.96	TD4620	6.88
17126	1.77	ZSC1921	1.37	AN234	5.92	BC228	0.10	BF115	0.40	BU208B	0.40	HA13365	4.02	MC1403	0.61	SAS660	2.97	SB4620	5.73	TC42700	0.96	TD4620	6.88
17137	1.58	ZSC1929	2.25	AN240P	1.25	BC238B	0.08	BF117	0.67	BU209	1.10	HA1350	1.52	MC1449P	2.75	SAS670	1.51	SB4630	2.61	TC42800	0.67	TD4630	6.20
1N4001	0.04	ZSC1942	1.65	AN241	1.71	BC239B	0.25	BF121	0.25	BU209	2.45	HA1368R	2.45	MC1449	3.46	SAS670	1.51	SB4630	2.61	TC42800	0.67	TD4630	6.20
1N4002	0.06	ZSC1959	0.26	AN245	4.00	BC251A	0.31	BF123	0.21	BU236	2.00	HA1368	1.76	MC14510B0AL	3.75	SB4750	1.61	TC4604	0.11	TC4290A	2.19	TD45720S	2.25
1N4003	0.06	ZSC1957	1.09	AN253	1.80	BC294	0.50	BF127	0.13	BU326A	2.20	HA1370	3.30	MC14511BCP	1.10	SC4920	19.35	TC4605	1.20	TC4400	2.25	TD48190	2.75
1N4004	0.06	ZSC1953	1.93	AN260	3.05	BC296	0.36	BF137	0.29	BU406	1.49	HA1374	4.80	MC14528BCP	2.15	SC9504P	1.46	TC4609	1.45	TC4530	2.24	TD49403	3.15
1N4005	0.06	ZSC1862	0.95	AN272	0.25	BC201	0.58	BF153	0.58	BU406D	1.75	HA1375	1.95	MC1712	3.08	SDA2006	1.75	TC4620	0.87	TC4640	2.20	TD49603	1.95
1N4006	0.06	ZSC1969	2.04	AN295	5.52	BC302	0.53	BF154	0.26	BU407	0.92	HA1377	1.75	MC1712	1.95	SC21122	12.85	TC4636	1.98	TC4660	2.25	TD49613	3.15
1N4007	0.07	ZSC1983	2.21	AN301	2.00	BC303	1.04	BF157	0.33	BU412	0.52	HA1389	2.05	MC1724CP	4.95	SC264A	6.95	TC4669	2.27	TC4660B	2.60	TD4970	2.58
1N4148	0.03	ZSC2085	1.56	AN302	1.93	BC307A	0.08	BF158	0.18	BU425A	1.13	HA1389	2.38	MC1781C	2.18	SG613	0.75	TC4673	1.25	TC4730	3.21	TD4981	7.05
1N4448	0.05	ZSC2009	0.34	AN305	3.20	BC388A	0.11	BF159	0.18	BU500	1.45	HA1392	2.17	MC1810	0.56	SG629	8.27	TC4750	2.25	TC4810	2.85	TD4981	7.05
1N4540	0.14	ZSC2229	2.33	AN315	1.29	BC309	0.17	BF160	0.31	BU508A	1.25	HA1394	1.95	MC1820	2.28	SG633	11.96	TC4910	1.40	TC4800Q	6.95	TD4981	7.05
1N4540	0.15	ZSC2228	2.11	AN316	1.58	BC313A	0.58	BF161	0.33	BU536	1.05	HA1395	2.17	MC1821	0.28	SL125H	0.28	TC4910	1.40	TC4800Q	6.95	TD4981	7.05
1N4540	0.16	ZSC2063	0.99	AN318	4.41	BC237	0.15	BF173	0.34	BU538	1.00	HA1398	2.28	MC1822	0.28	SL125H	0.28	TC4910	1.40	TC4800Q	6.95	TD4981	7.05
1N4540	0.15	ZSC2078	2.11	AN320	5.47	BC238	0.10	BF177	0.35	BU705	2.95	HA1406	1.30	ME6102	0.28	SL1630D	20.50	TC4910	1.40	TC4800Q	6.95	TD4981	7.05
1N4548	0.35	ZSC2073	3.25	AN321	2.25	BC337	0.09	BF178	0.40	BU806	1.79	HA1452	0.85	ME8001	0.34	SK2F104	1.38	TC4910W	1.98	TC4910	2.24	TC4800Q	6.95
1N4548	0.35	ZSC2073	3.25	AN321	2.25	BC337	0.09	BF178	0.40	BU806	1.79	HA1452	0.85	ME8001	0.34	SK2F104	1.38	TC4910W	1.98	TC4910	2.24	TC4800Q	6.95
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1N4548	0.35	ZSC2073	3.																				

# ★ HIGH QUALITY VIDEO SPARES ★

## (FAST EX-STOCK)

**AKAI**  
Machine Nos.: VP77 VP88 VP7100 VP7200 VS1 VS2 VS3 VS5  
VS10 VS9300 VS9500 VS9700 VS-P1 VS-P5

**AMSTRAD**  
Machine Nos.: VCR4500 VCR5200  
Machine Nos.: VCR7000  
VCR4600 VCR9000

**FERGUSON/JVC**  
Machine Nos.: 3292 8903 3V00 3V01 3V06 3V16 3V22 3V23 3V24  
3V29 3V30 3V31 3V35 3V36 3V38 3V39 3V49

**FISHER**  
Machine Nos.: FVH — D520 D530 D620 D720 P420 P510 P520  
P530 P615 P620 P622 P710 P720 P721 P722

**GEC**  
Head Part Nos.: 5458161 5458165  
Machine Nos.: 4000H 4001H 4002H  
Head Part Nos.: 5458282 5458413 5458415 5458992  
Machine Nos.: 4001H 4004H

**HITACHI**  
Machine Nos.: VT3000  
Head Part Nos.: 5458104  
Machine Nos.: VT4000 VT4200 VT5000 VT5500  
Head Part Nos.: 5458161 5458165  
Machine Nos.: VT6500 VT7000 VT8000 VT8040 VT8100 VT8500  
VT8700 VT9000 VT9300 VT9500 VT9700 VT9900

Head Part Nos.: 5458282 5458413 5458415 5458992  
Machine Nos.: VT11 V14 VT33 VT34 VT330 VT340 VT5030 VTP10 VTP30

**ITT**  
Machine Nos.: VR3605 VR3033 VR3905 VR3913 VR3914 VR3935  
VR3943 VR3963 VR3993 VR3975 VR3985 VR3986 VR3983

**JVC (see also Ferguson)**  
Machine Nos.: HP4000 HR2200 HR3300 HR3320 HR3330 HR3350  
HR3360 HR3660 HR3750 HR3860 HR4100 HR7200 HR7600  
HR7610 HRD110 HRD111 HRD120 HRD121 HRD140 HRD150  
HRD220 HRD225

**MITSUBISHI**  
Machine No.: HS200  
HS7008

**NATIONAL PANASONIC**  
Head Part Nos.: VEH0099 0103 0115 0121 0131  
Machine Nos.: NV300 NV322 NV332 NV333 NV340 NV390 NV2000  
NV3000 NV7000 NV7200 NV7500 NV7800 NV7850 NV8170  
NV8200 NV8400 NV8600 NV8610 NV8620

Head Part Nos.: VEH0171 VEH0218  
Machine No.: NV370 NV3708  
Head Part Nos.: VEH0171  
Machine No.: NV330 NV777

Head Part Nos.: VEH0286  
Machine No.: NV430  
Head Part Nos.: VEH0174  
Machine No.: NV366

**SHARP**  
Head Part Nos.: DDRMU 0002 HE17/21/27  
Machine No.: VC581/2/3 651 681/2/3/5 659 699  
Head Part Nos.: DDRMU 0001 HE00 C002 HE02 04 05 06  
Machine No.: 2C9 VC110 VC200 VC220 VC300 VC381 VC384  
VC386 VC387 VC388 VC477 VC481 VC482 VC930 VC970 VC3300  
VC9100 VC9300 VC9400 VC9500 VC9600 VC9700

Head Part Nos.: DDRMU 0001 HE09  
Machine No.: VC7300 VC7700 VC775C  
Head Part Nos.: DDRMU 0001 HE10  
Machine No.: VC6300

Head Part Nos.: DDRMU 0001 HE12  
Machine No.: VC8300  
Head Part Nos.: DDRMU 0001 HE14  
Machine No.: VC2300

**SANYO**  
Head Part Nos.: 1430242 T01700 1430242 T22300  
Machine No.: VTC5000 VTC5150 VTC5300 VTC5400

Head Part Nos.: 1430242 T02200  
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# VCR Servo Systems

## Part 1

Joe Cieszynski

Despite the fact that VCRs have been with us for a number of years now many engineers still have difficulty in grasping the details of servo operation. There are several possible reasons for this. First, engineers are usually kept busy enough dealing with the day-to-day workload, which leaves them with little time to study the technical details of servo systems. Secondly, those who attend short training courses often find that they retain only a very basic knowledge of how a servo works, usually because of the amount of information that has to be crammed into the course. Because this basic knowledge is sufficient to be able to cope with most servo faults the average hard-pressed engineer will concentrate his technical studies on the latest innovations in domestic electronics rather than the finer points of servo operation. Yet a more thorough grasp of servo operation can in many cases simplify fault diagnosis and greatly reduce the time spent on fault finding. In this article we'll break the servo system down into the various loops, describe their operation and give practical advice on rapid location of the source of faults.

### Basic Objectives

A VCR servo system has to carry out the following objectives:

- (1) Maintain a precise *drum speed*. In most formats this is 1,500 r.p.m. – with the VHS-C format it's 2,250 r.p.m.
- (2) Maintain a constant longitudinal *tape speed* with minimal wobble and flutter.
- (3) Maintain an exact tape-to-head phase relationship during record and playback.
- (4) Compensate for mechanical tolerances when playing both the machine's own recordings and prerecorded tapes.

In order to meet these requirements most VCRs employ separate drum and capstan motors, with two servo loops for each motor. In each case the main loop provides speed control. This loop is responsible for running the motor up to full speed and then maintaining this speed.

### Speed Control

The principle involved is shown in Fig. 1. This simple servo could be used in an audio cassette recorder. The motor has a built-in frequency generator (FG). Its speed is preset by RV1, which results in a certain frequency being generated. Should the motor attempt to speed up, the frequency of the FG signal will increase and the base bias applied to Tr1 will decrease. The current flowing through the motor via the motor-drive amplifier transistor Tr2 will thus be reduced, correcting the motor speed.

This simple circuit is not suitable for VCR use because the rectifier action of D1/C1 is not sufficiently consistent to guarantee precise speed control. D1 and C1 can be replaced by a sample-and-hold (S/H) arrangement as shown in Fig. 2. This has two inputs, a sampling pulse and a trapezoid, both of which are derived from the FG signal. C1 charges via R1 to produce a d.c. bias for the motor-drive amplifier. When the sampling pulse arrives Tr1 switches on, discharging C1. Tr1's conduction, and thus the discharge of C1, depends on the amplitude of the trapezoid at Tr1's emitter at the time when the sampling pulse arrives.

The FG signal from the motor is generally at a frequency of 600-1,500Hz, depending on the design of the VCR. This sinusoidal waveform is squared before being fed to a complex timing network using gates and monostable multivibrators (MMVs).

Fig. 3 shows the servo under consideration in block diagram form. The key to the operation of the circuit lies in the trapezoid generator. The lengths of the trapezoid ramps depend on the timing of the incoming squarewave, i.e. on the FG signal's frequency. The slower the motor, the longer the ramp. In addition, the timing of the pulse generated by the short time-constant circuit will alter with variation of the FG signal's frequency.

The outputs from the timing networks are such that when the motor speed is correct the sampling pulse will occur near the centre of the ramp. The charge on C1 (Fig. 2) maintains the correct motor speed. If the speed fluctuates, the FG signal likewise varies and the relative timing of the ramp and the sample pulse changes, resulting in an increase or decrease of the charge held by C1. Fig. 4 illustrates these basic conditions.

The arrangement shown in Fig. 3 is in most service manuals shown as a block labelled frequency-to-voltage

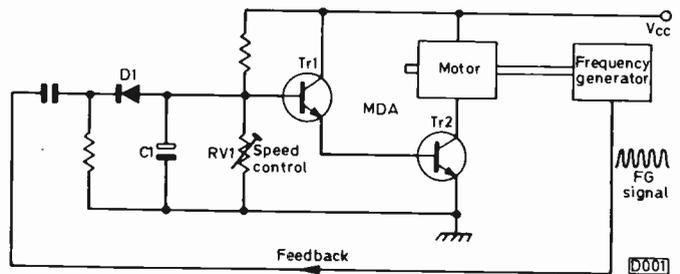


Fig. 1: A simple speed control system.

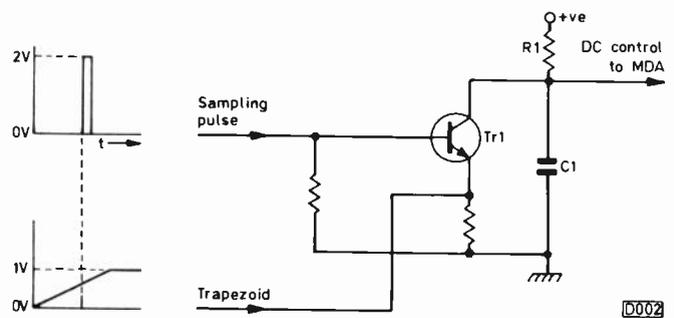


Fig. 2: A sample-and-hold circuit provides better results.

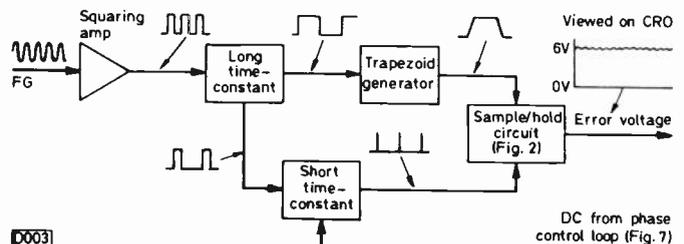


Fig. 3: Block diagram of a servo system providing speed control with provision to add phase control.

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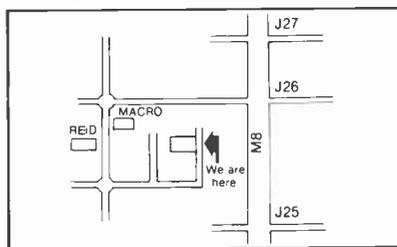
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(F-V) converter and is contained within an i.c. A typical example is the VC1029 chip used in many older JVC and Sharp machines.

### Phase Control (Tracking)

With most VCRs the track width is approximately  $49\mu\text{m}$ . It's vital that the tracks are laid down correctly and that, during playback, the heads travel along the centres of the tracks (tracking). It's the job of the phase control section of each servo to maintain correct tape-to-head phasing. This is done by comparing the relative phase of pick-up pulses obtained from various sources with stable reference signals, again using sample-and-hold comparators.

In the event of a phase error the head scanning the tape will pass over both the A and B tracks - see Fig. 5. The result will be a loss of f.m. output, because of the  $12^\circ$  head azimuth offset. The effect on the picture is a bar of poor signal-to-noise ratio information across the screen, more commonly referred to as a noise bar.

Phase control is often regarded as a fine speed control. It's much more than this however. In the record mode the phase control system must ensure that as the head drum rotates the A head begins to scan the tape just as the odd field flyback starts while the B head begins its scan as the even field flyback starts. In the playback mode the phase control system must ensure that the A and B heads are aligned with their own tracks and are not  $180^\circ$  out of phase. Fig. 6 illustrates this.

The phase control sample-and-hold system shown in Fig. 7 operates in the same manner as the circuit shown in Fig. 2. The 25Hz reference signal can be derived from a number of sources depending on the design. These are

usually the field sync pulses divided by two or the output from an h.f. crystal oscillator divided down to 25Hz. The sample pulse will be derived from a pickup sensor of some sort on the deck. This sensor will be so positioned that the pulse indicates not only the speed of the relevant motor

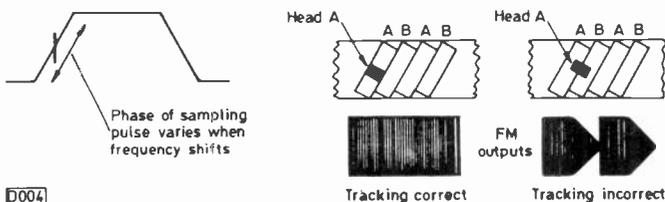


Fig. 4 (left): The position of the sampling pulse on the ramp waveform, i.e. its phase, varies as the frequency shifts.

Fig. 5 (right): Correct and incorrect head/tape tracking conditions, showing the reduced f.m. output when the tracking is incorrect.

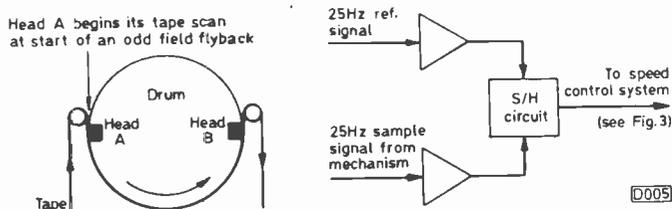


Fig. 6 (left): In the record mode the phase control system must ensure that head A starts its scan across the tape at the beginning of an odd field flyback.

Fig. 7 (right): Phase control principle. This time the sample-and-hold circuit compares the feedback signal with a fixed reference signal.

but also the tape-to-head position. If the latter is incorrect the sample pulse will move in relation to the ramp and the speed of one of the motors (drum or capstan) will alter momentarily to provide the required correction, shifting the tape/head position to maintain correct head phase and tracking.

The phase control loop has to provide only the slightest variation in the motor speed. This is achieved by adding the error voltage output from the phase loop sample/hold circuit to that in the speed control loop – reference to Fig. 3 will show how this can be achieved. The short time-constant consists of a monostable multivibrator: altering the bias applied to one of the transistors in this circuit has the same effect as changing the value of the RC time-constant network. When the phase loop S/H produces an error output the d.c. change is fed to the speed F-V converter. The phase of the sampling pulse then changes in relation to the ramp and the d.c. output from the speed loop S/H shifts slightly.

### **Design Approaches**

A mistake made by many engineers is to assume that VCR manufacturers have a set of specific rules for the design of servo circuits. For example, many I've spoken to think that the tracking control must always operate on the capstan servo, or that the control pulses must always be fed to the capstan loop. This is not the case. A look at a cross-section of manuals reveals that in fifty per cent of machines tracking control is applied to the capstan servo while in the other fifty per cent it's applied to the drum servo.

In Figs. 8-11 some basic VCR servo systems are shown in block diagram form. The aim in describing these will also be to point out some of the design variations encountered.

### **Drum Servo: Record Mode**

Fig. 8 shows a drum servo system in the record mode. The drum pickup coil is mounted under the drum assembly. Two rotating magnets (N and S) mounted 180° apart generate a 25Hz (1,500 r.p.m.) signal which is fed to a flip-flop circuit. The output from this indicates head position and is used for servo phase control, also for head switching, channel identification in the chroma circuitry and drum rotation detection by the mechanism control microcomputer.

Head switching and channel identification (i.e. identifying which head is scanning the tape) are controlled by the state of the flip-flop's output. As the A head begins its sweep the flip-flop output will go low: at the start of head B's scan the PG pulse will make the flip-flop's output go high. From this information the drum phase servo can recognise the position of the head drum and apply any correction necessary.

The flip-flop's output is shown being converted by the trapezoid generator to provide the ramp input to the S/H circuit. This need not be the case. The system works equally well if the flip-flop's output is converted to provide the sample pulse input to the S/H circuit, the reference signal (off-air field sync pulses) being used to generate the ramp input.

The field sync pulses that provide the 25Hz reference signal are divided by two, shaped and fed to the S/H circuit. They are also fed to the control head which records them on the control (CTL) track.

In this arrangement the tracking control affects the

drum phase. It's imperative that the control is overridden to prevent the user altering the tracking in the record mode. This is done by applying the switched 12V Rec supply to the pulse shaper (the 12V Rec supply is present only in the record mode).

The output from the phase S/H circuit alters the delay introduced by a monostable circuit in the speed control timing network, producing a momentary speed variation.

The frequency generator in the speed control loop can be one of a number of devices. For example, in many JVC machines a large number of magnets (60) mounted in the drum motor rotate above a PCB coil. Early Panasonic machines that employed Hall-effect motors required an h.f. oscillator to drive the motor: as a result a 600Hz sine wave that can be extracted as the FG signal is present in the windings. The early JVC HR3330 (Ferguson 3V00) produced an FG signal by feeding the ripple from the commutator to a high-gain operational amplifier: the output was large enough to run the drum servo.

The motor-drive amplifier (MDA) is designed to run the motor up to full speed from switch on. Once the motor begins to rotate the FG signal acts to slow the motor down. This mode of operation removes the need for a start-up circuit.

The drum discriminator (drum lock) control is used to set the speed control loop to produce a drum speed of 1,500 r.p.m. This adjustment is critical and must be done properly before any other servo adjustments are carried out.

### **Drum Servo: Playback Mode**

Fig. 9 shows a playback drum servo system. In this case the phase S/H compares the PG pulse derived trapezoid with the counted-down output from a 32kHz crystal oscillator. This is not the same arrangement as shown in Fig. 8 because the tracking control has been omitted. With this particular arrangement the tracking control would, if included in the drum servo, have to operate on the flip-flop: but this is something that's never done as it would present problems in maintaining the correct head to field sync pulse phasing.

Cl is the storage capacitor for the S/H circuit. Its value is generally of the order of 0.01μF. It has to be of value such that the discharge time-constant is longer than 40msec (the phase loop sampling speed).

It cannot be guaranteed that in mass production the magnets and the PG coil will always be located precisely. Differences in these positions will result in the head switching being different with different machines. For this reason head switching adjustment is provided. These controls set the phase of the drum flip-flop by altering the delay provided by the two monostables that drive it.

### **Capstan Servo System**

Fig. 10 shows a record/playback capstan servo system. In both modes the capstan phase is locked to a crystal oscillator. The other input to the phase S/H circuit is derived from the off-tape control pulses in the playback mode and from field sync pulses divided by two in the record mode.

The speed control circuit is similar to the arrangement used in the drum servo. Some older machines omit the FG generator: instead, a common brush type d.c. motor is used and the small ripple from the commutator is fed to a high-gain operational amplifier whose output controls the MDA – any variation in the motor speed will vary the

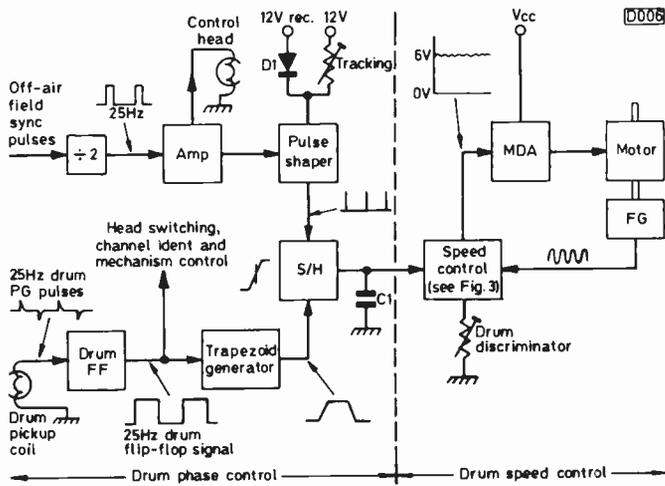


Fig. 8: Block diagram of a drum servo in the record mode.

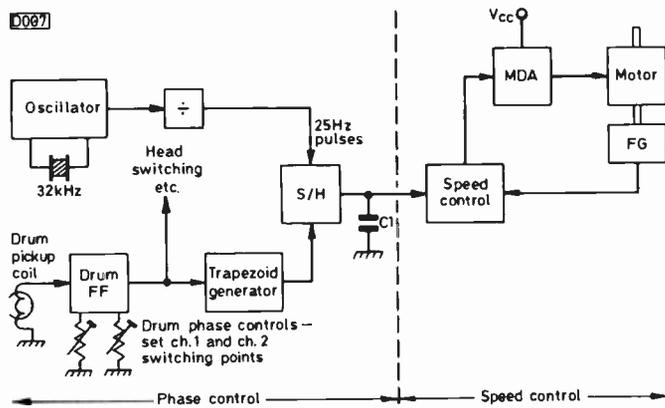


Fig. 9: Block diagram of a drum servo in the playback mode.

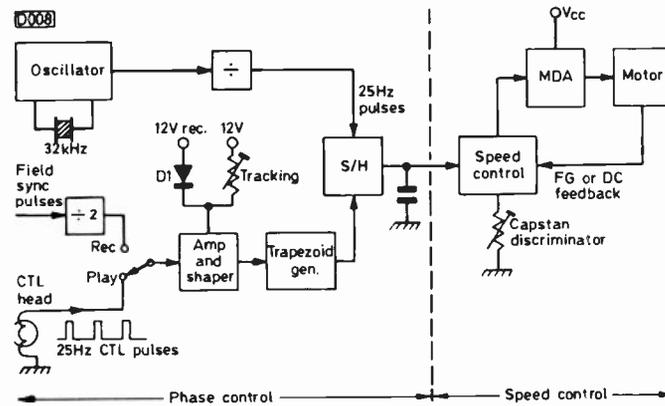


Fig. 10: Block diagram of a capstan record/playback servo system.

ripple frequency, giving a d.c. shift at the output from the operational amplifier.

The tracking control varies the d.c. applied to a monostable multivibrator, advancing or retarding the CTL pulse with respect to the trapezoid. D1 overrides the tracking control in the record mode.

### Later System

The systems we've looked at so far, in Figs. 8-10, demonstrate the principles of servo control. As we've said however there's no set format. Another common arrangement is shown in Fig. 11. You'll see that many of the techniques previously described are used here. There are some points worth noting however.

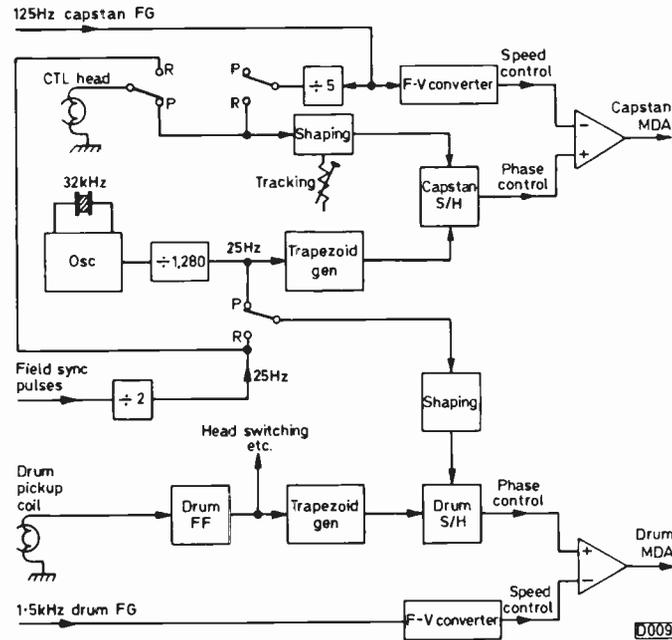


Fig. 11: Block diagram of a more recent VCR servo system for speed and phase control of the capstan and drum.

First, a digital frequency-to-voltage converter is used in both the capstan and the drum speed control loops. A typical example is the VC1029 chip mentioned previously.

A second important point is the way in which the speed and phase error signals are combined: both are fed to operational amplifiers whose d.c. outputs are used to control the appropriate MDAs.

Another common approach is to use the capstan FG signal to control the phase as well as the speed of the capstan motor. In Fig. 11 this is done in the record mode, the CTL pulse being used for capstan phase control in the playback mode. A major change in speed will result in the F-V converter reacting in the usual way. A minor speed error will not be detected by the speed loop, but by feeding the divided down ( $\div 5$ ) FG pulses to the capstan phase S/H circuit the shift in the FG signal phase will be detected and a correction voltage produced.

From what we've discussed so far it will be noted that the speed loops remain the same in both the record and playback modes. The phase loops however often have a different reference or sample pulse source in the two modes. In the example shown in Fig. 11 the phase control loops can be summarised as follows:

- (1) Capstan record: the capstan FG signal is compared with the output from a crystal oscillator.
- (2) Capstan playback: the off-tape CTL signal is compared with the output from a crystal oscillator.
- (3) Drum record: the flip-flop output is compared with the divided down field sync pulses.
- (4) Drum playback: the flip-flop output is compared with the output from a crystal oscillator.

I would once more emphasise that things are done differently in different machines and that there is no basic list of rules that have to be followed. The general idea is that the servo compares the phase of the controlled motor with a known reference source and applies whatever correction is necessary. When servicing, if you are confronted with a difficult servo fault it's first necessary to identify the reference and sample signal sources for each loop. This will be discussed in more detail next month when we will be looking at fault identification and location.

# Service Bureau

*Requests for advice in dealing with servicing problems must be accompanied by a £1.50 cheque or postal order (made out to IPC Magazines Ltd.), the query coupon and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.*

## **PYE 5487**

There's an intermittent purity fault with this 22in. teletext set – it's been noticeable from new and may occur only every other day but is quite distinct. The impure colour appears in an exact rectangular shape at the bottom left-hand side of the screen and may fade out when channels are changed or the set is tapped. Despite replacing the c.r.t. and checking the degaussing circuit for poor connections and dry-joints the fault persists.

You've tried the obvious cures so here are a couple of odd ones. Make sure that the scan coils are fully forward, and that there's nothing preventing them from going fully home. Then try externally degaussing the set while it's running. If the patch persists after this it's due to the shadowmask buckling as a result of excess local heat produced by prolonged viewing of a stationary light-coloured or white object. This can be simulated by watching the test card with excessive brightness: white blocks will discolour but revert to normal on a blank raster. This, regrettably, is a feature of the 30AX system.

## **HITACHI VT64**

There's an intermittent fault with this machine. The symptom is a line tear that travels down the screen, with the vision strength falling gradually until it momentarily disappears with the sound and sync. The drive belts appear to be in good condition and the capstan has been lubricated. E-E operation is perfect.

The effect described sounds very much like intermittent loss of head drum servo lock. If it occurs only in the record mode, i.e. the effect is at the same point during each playback, it's likely that the field sync input from the receiver section is impaired. Possibilities here are C832, C810 and R809 on the i.f. PCB. Before changing them, examine the field sync pulse at pin 2 of TG751 closely, using a d.c.-coupled scope. If the effect is present only in playback, clean the control track head then check the progress of the head PG pulses, from pin 3 of PG602 onwards, with the scope.

## **TANDBERG CTV2-2 CHASSIS**

C759 was found to be open-circuit and the line shift control R772 was burnt out. After replacing these items the set worked well though the line shift control had no effect. As the picture was central we left this. Now the fault seems to be excessive e.h.t. The picture size is reduced, with a one to one and a half inch gap all round, and the e.h.t. arcs across from the final anode to the Aquadag coating. Also the shift control has burnt out again. There's no dampness or condensation.

The two faults you have were common in these sets in

their heyday. The shift control burns because of shorted turns in the shift choke L752 – remove both items if the picture remains reasonably centred. The excessive e.h.t. is due to partial failure of the line output stage tuning capacitor C754. Be sure to replace it with a similar type, i.e. one designed to work at 16kHz with high voltage and ripple current ratings.

## **PYE 715 CHASSIS**

There are two problems with this set. First flyback lines that start from various points across the screen. Secondly severe bowing of the horizontals at the top and bottom of the raster.

These problems could both be due to a well worn tube, especially if it's the original one. Alternatively for the flyback lines you could check whether the blanking waveform is arriving at pin 2 of socket SK479 on the decoder panel. Pincushion distortion has always been a problem with these sets. Increasing the height usually puts it out of the picture.

## **SONY C6 Mk II**

There appear to be two ways in which the threading belt can be removed, either from below after removing the change lever or from above the chassis after removing the complete gearing unit (the clearance of the final gear would have to be reset). Could you advise on the best way to go about this and on any problems with replacing the phosphor-bronze bearing?

Remove the bearing with a small cross-headed screwdriver and a small hammer. Tap the new one into place. We find it easiest to replace the loading belt from the top of the deck – remove the gear assembly and disengage the hook at the bottom of the lever assembly gear (No. 503). We then degrease the hook and pin before jiggling the belt through the gap and re-engaging the pin and hook.

## **ITT COMPACT 80R SERIES**

The standby light remains on but the set is dead. Fuse F651 had failed and a replacement didn't blow. D723 and D721 were found to be open-circuit and have been replaced.

The power supply problem could be caused by R716 having gone high in value. If necessary, check C703, D733 and D732.

## **SHARP VC8300**

Fuse F902 blows every few weeks. It's not a violent failure and cold checks have not revealed any faults.

There are several possibilities for this fault. Most likely is Q905, but bridge rectifier D901 could be responsible as could any of the secondary rectifiers D909/10/11. Before replacing these, check carefully for dry-joints on the chopper transformer T902.

## **FERGUSON TX10 WITH TELETEXT**

There is no teletext display apart from the beginnings of a few characters on the extreme left-hand side of the screen. So far I've replaced the focus control and the SAA5012 remote control chip to cure a tripping fault and the absence of odd channels, also D117 on the PC1515 remote control panel. The picture display is now very good.

We've often encountered this set of symptoms, which is invariably brought about by flashover in the focus control

unit. The teletext decoder chip that usually fails is the SAA5030, IC1033. This CMOS device must be replaced with care.

# TEST CASE

## 310

*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.*

Now that VCRs have been with us for over ten years we find that the awaiting repair rack contains an amazing variety of machine types and vintages – stock machines so small they're mistaken for CD players, big old seventies bangers cheek-by-jowl with diddy £1,200 camcorders, and V8 deck machines of mind-boggling complexity sitting on vintage top-loaders whose days are probably done. There's plenty of variety for the video man in 1988 . . .

The decision whether to scrap a very old machine that requires extensive repairs is not a difficult one. "Middle-aged" machines are more of a problem: what do you do with a JVC HR7200 whose heads are worn out while the machine is otherwise in good order? The decision has to be taken by the customer of course, who is going to have to foot the bill.

In this particular case the owner pondered for a day or two before phoning to give us the go-ahead. Fitting a replacement head to one of these VHS machines is not a difficult task, but it's important to check all the relevant setting-up adjustments, both mechanical and electrical, before returning the machine to the customer. If this isn't done the machine will work, producing pictures, but reliability will not be good and there will probably be incompatibility with tapes recorded on other machines.

Much of the setting up required is done by inspecting the f.m. envelope waveform produced by an alignment tape or a credible substitute. It was here that our troubles began. The playback carrier signal from each head on the newly-fitted drum was fine. Manipulation of the control track head or the tracking control would maximise the amplitude of the output from head A or B at will – but not at the same time! As the output from one head increased, so that from the other would decrease.

Because the head assembly was brand new there was plenty of playback carrier signal, and a control track head position that gave equal carrier levels from both video heads could be found. This level was sufficient to provide an acceptable playback picture, free from dropouts and noise so long as the tracking control was carefully adjusted. Move it far from the click position however and flickering spots would mar the picture as the output from one or other of the heads dropped below the f.m. clip level. No such trouble had been present with the original head, which was simply worn to the point where the

playback carrier from both heads was too low.

Careful adjustment of the entry and exit tape guides straightened the tops and filled the shoulders of each head's output envelope waveform, but each head still peaked at a different tracking control setting. Suspicion fell on the replacement drum. Was it a rebuild perhaps? No, this one had come from JVC. Were there any adjustments relevant to this particular effect? Again no. Neither the electrical nor the mechanical adjustments should have a differential effect on the outputs from the two heads.

Sage's opinion on the matter was sought. He looked at the scope trace and twiddled the tracking control. He then switched the machine off and slowly turned the head by hand while moving the bench lamp this way and that, squinting all the while at the drum. This procedure was not positively conclusive, because at the end of it he had two alternative diagnoses. What were they, and which one was the most likely? See next month's issue.

### ANSWER TO TEST CASE 309

– page 848 last month –

Last month's test case should not have been difficult to solve! The set in trouble was fitted with the ITT CVC20 chassis, the symptom being reduced width which was not affected by adjustment of the width control or even complete removal of the EW modulator control board CMH10. The EW modulator circuit itself is on the main board, and the usual cause of the symptoms described is a short-circuit EW modulator driver transistor, T17. This has the effect of grounding the junction of the two EW modulator diodes, thus minimising the width.

If the technician had carried out an in-circuit check on T17 he would have got an almost dead short reading across its collector and emitter – the reading would in fact have been 6-8Ω, the value of R101 which is in series with T17 – because the modulator diode connected to chassis, D24, was completely short-circuit. The scan rectification action to produce the 24V line etc. was unimpaired because the other diode, D23, can do this part of the job as effectively as the two diodes!

This low-level pincushion-correction system was superseded by the high-level circuit in which the modulator diodes are connected directly across the line output transistor. Later the diode modulator became redundant with the introduction of "pin-free" tube/scan coil assemblies. Such is the march of progress!

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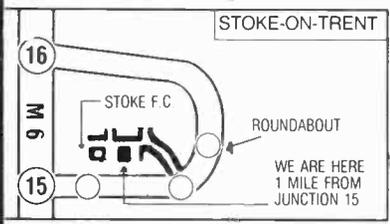
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TELEVISION OCTOBER 1988

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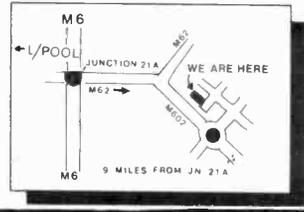


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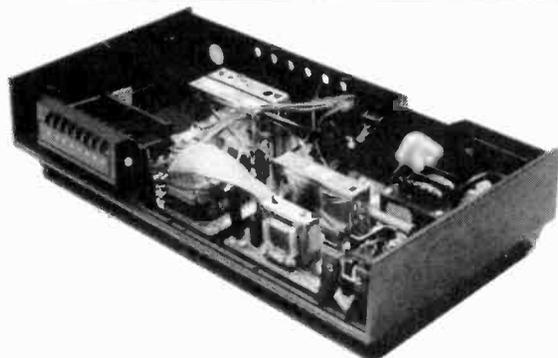
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AA119	9p	BD179	32p	BF493	18p	MJ2955	55p	2N 1613	24p	BY278R RANGE	AN-318	450p	HA-1137V	150p	LA-7031	400p	NE-544	115p	TA-7140	130p	TDA-2540	120p
AA137	40p	BD182	60p	BF496	16p	MJ3000	115p	2N 1711	24p	2V7 to 39V 6p	AN-331	250p	HA-1156	110p	LA-7033	400p	NE-556	40p	TA-7145	220p	TDA-2550	120p
AC107	25p	BD186	60p	BF505	25p	MJ3011	115p	2N 1893	30p	1 3W	AN-360	100p	HA-1197	150p	LA-7040	280p	NE-564	380p	TA-7146	400p	TDA-2581	180p
AC126	25p	BD187	60p	BF518	30p	MJ3012	115p	2N 2102	30p	VOLTAGE	AN-362	140p	HA-1199	145p	LA-7042	280p	NE-565	110p	TA-7148	350p	TDA-2590	200p
AC127	21p	BD201	33p	BF520	38p	MJ3013	115p	2N 2104	30p	2V7 to 39V 12p	AN-610	160p	HA-1219	240p	LA-7045	300p	NE-567	115p	TA-7152	300p	TDA-2634	180p
AC128	21p	BD202	38p	BF597	16p	MJ3014	115p	2N 2218A	24p	REGULATORS	AN-612	160p	HA-1319	240p	LA-7046	300p	NE-568	110p	TA-7159	420p	TDA-2651	120p
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AC141K	30p	BD204	42p	BF617	30p	MJ3016	115p	2N 2321	25p	7806	AN-540	280p	HA-1359	350p	LA-7051	300p	NE-572	290p	TA-7182	300p	TDA-2670	150p
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AC188K	28p	BD265	31p	BF790	40p	MP8145	45p	2N 2935	18p	7944	AN-605	350p	HA-1407	320p	LA-7089	300p	NE-553AP	110p	TA-7235	180p	TDA-3591	290p
AC188K	28p	BD266	31p	BF791	40p	MP8146	45p	2N 2936	18p	7945	AN-606	350p	HA-1408	320p	LA-7090	300p	NE-553AP	110p	TA-7236	180p	TDA-3592	290p
AC188K	28p	BD267	31p	BF792	40p	MP8147	45p	2N 2937	18p	7946	AN-607	350p	HA-1409	320p	LA-7091	300p	NE-553AP	110p	TA-7237	180p	TDA-3593	290p
AC188K	28p	BD268	31p	BF793	40p	MP8148	45p	2N 2938	18p	7947	AN-608	350p	HA-1410	320p	LA-7092	300p	NE-553AP	110p	TA-7238	180p	TDA-3594	290p
AC188K	28p	BD269	31p	BF794	40p	MP8149	45p	2N 2939	18p	7948	AN-609	350p	HA-1411	320p	LA-7093	300p	NE-553AP	110p	TA-7239	180p	TDA-3595	290p
AC188K	28p	BD270	31p	BF795	40p	MP8150	45p	2N 2940	18p	7949	AN-610	350p	HA-1412	320p	LA-7094	300p	NE-553AP	110p	TA-7240	180p	TDA-3596	290p
AC188K	28p	BD271	31p	BF796	40p	MP8151	45p	2N 2941	18p	7950	AN-611	350p	HA-1413	320p	LA-7095	300p	NE-553AP	110p	TA-7241	180p	TDA-3597	290p
AC188K	28p	BD272	31p	BF797	40p	MP8152	45p	2N 2942	18p	7951	AN-612	350p	HA-1414	320p	LA-7096	300p	NE-553AP	110p	TA-7242	180p	TDA-3598	290p
AC188K	28p	BD273	31p	BF798	40p	MP8153	45p	2N 2943	18p	7952	AN-613	350p	HA-1415	320p	LA-7097	300p	NE-553AP	110p	TA-7243	180p	TDA-3599	290p
AC188K	28p	BD274	31p	BF799	40p	MP8154	45p	2N 2944	18p	7953	AN-614	350p	HA-1416	320p	LA-7098	300p	NE-553AP	110p	TA-7244	180p	TDA-3600	290p
AC188K	28p	BD275	31p	BF800	40p	MP8155	45p	2N 2945	18p	7954	AN-615	350p	HA-1417	320p	LA-7099	300p	NE-553AP	110p	TA-7245	180p	TDA-3601	290p
AC188K	28p	BD276	31p	BF801	40p	MP8156	45p	2N 2946	18p	7955	AN-616	350p	HA-1418	320p								



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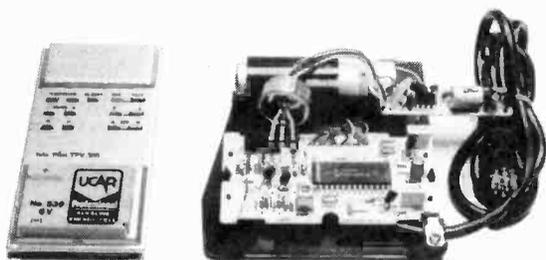
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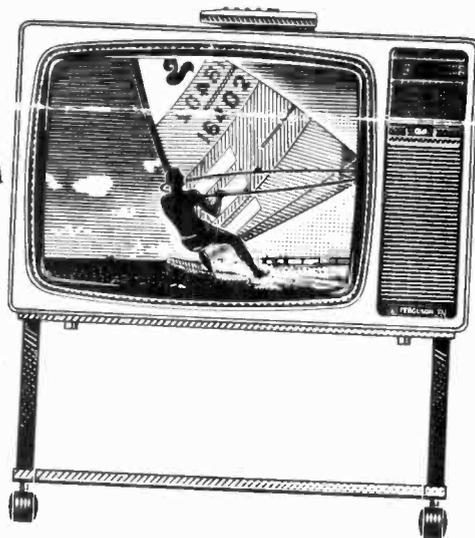
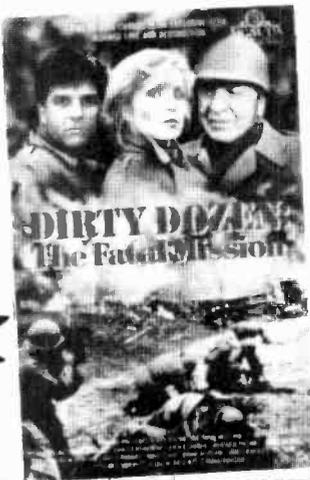
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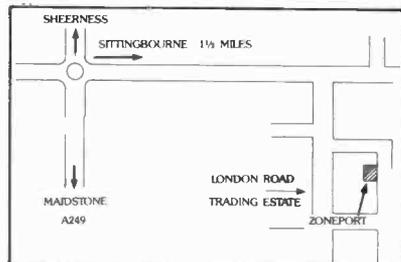
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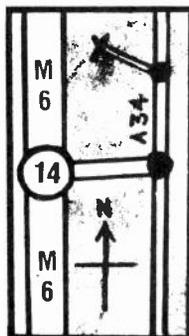
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PS3BT - Toshiba V9600/31/33	£23.75
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<b>Reel Motors</b>	
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Panasonic NV333/366	£13.20
Ferguson 3V29/30 JVC HR200/7300	£22.70

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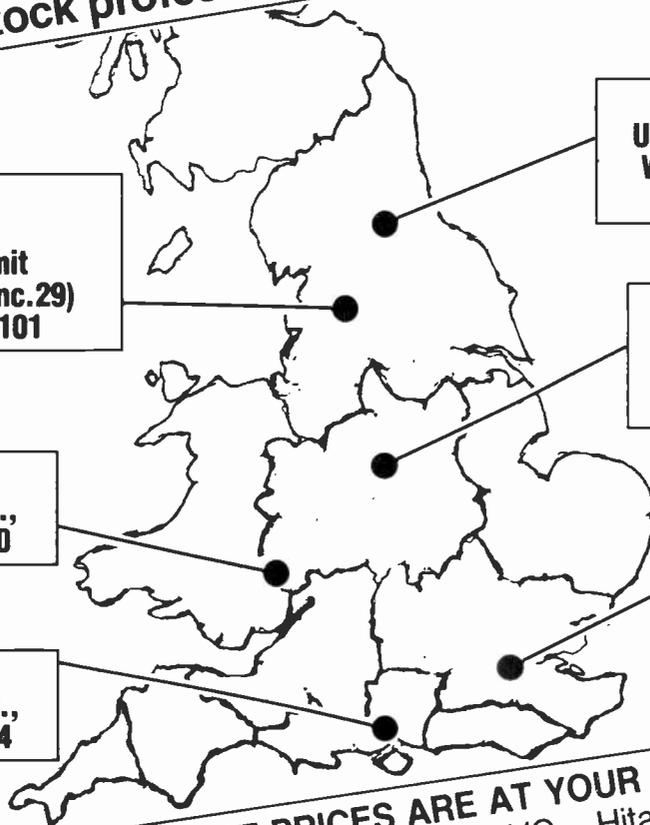
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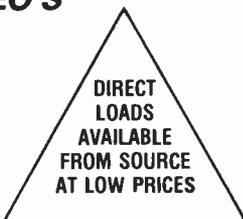
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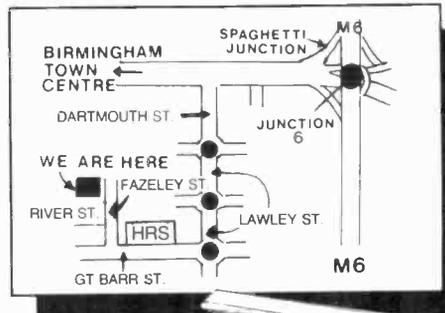
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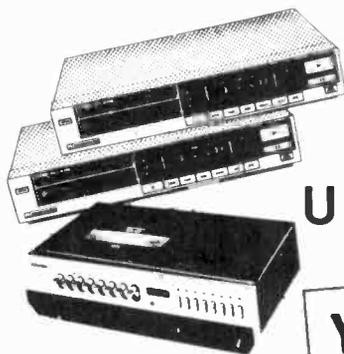
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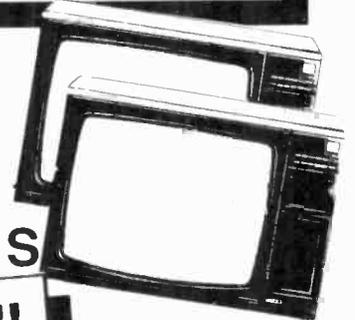
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 VCRs FROM £25**

**VIDEO 2000 FROM £15**  
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 ALL TYPES. BLOCKS OF 10 SETS  
 FROM £40 PER BLOCK**

**G11 20" 22" & 26" FROM UNDER £20**

**KT3 FROM £30**

**TELETEXT FROM £30 EACH  
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 Beta VCRs Remotes etc.**

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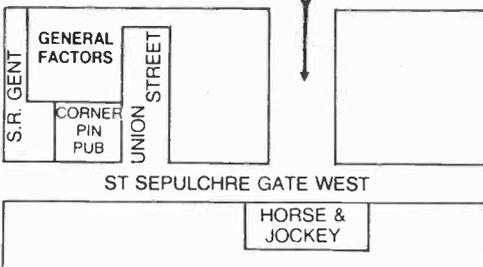
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THORN TX10 Text .....	£70.00
THORN TX Stereo Text .....	From £90.00
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PYE G11 .....	£20.00
PHILIPS G11 Text .....	£45.00
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I.T.T. CVC Models .....	£15.00
I.T.T. Trimline Basic .....	£35.00
I.T.T. Trimline R/C .....	£50.00
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Decca 80/100 .....	£15.00
Bush T-20 .....	£15.00
RED-FUSIN Mk.III 26" .....	£10.00
RED-FUSIN Mk.III 22" & 26" .....	£15.00
RED-FUSIN Mk.IV Basic .....	£25.00
RED-FUSIN Mk.IV Text .....	£60.00
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G.E.C. Starline Basic .....	£20.00
G.E.C. Starline R/C .....	£25.00
G.E.C. Hitachi Chass .....	£30.00
G.E.C. Hitachi Text .....	£60.00
GRUNDIG Basic .....	£40.00
GRUNDIG R/C .....	£55.00
GRUNDIG Text .....	£60.00
FIDELITY Basic .....	£35.00
FIDELITY Text .....	£50.00
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TOSHIBA Various Models .....	£45.00
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SONY Various Models .....	£45.00
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FINLANDIA Remote .....	£25.00

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3V29 .....	£75.00
3V30 .....	£75.00
3V31 .....	£95.00
3V32 L/P .....	£100.00
3V35, 36, Etc. ....	£95.00
<b>PANASONIC</b>	
NV333 .....	£75.00
NV366 .....	£75.00
NV2000 .....	£75.00
NV2010 .....	£75.00
<b>SHARP</b>	
VC7300 .....	£65.00
VC8300 .....	£75.00
VC9300 .....	£85.00
VC9700 .....	£100.00
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VT8300 .....	£75.00
VT8500 .....	£75.00
VT9500 .....	£85.00
VT11 .....	£85.00
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**ARE**  
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At BOB's we carry a large range of all the most popular makes of Televisions and video recorders including Ferguson, Phillips, National Panasonic, Hitachi, Sharp etc. This equipment is available in "Off the Pile" to fully refurbished and ready to install, also available are Phillips B grade sets.

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**IN MANCHESTER** ( UNIT 3, MERSEY ROAD INDUSTRIAL ESTATE FAILSWORTH )

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Pye G11 .....	£25
Pye KT3 .....	£35
Pye K30 .....	£40
Ferguson TX 9/10 .....	£30
Grundig .....	£20
Hitachi .....	£20
Thorn 9000 .....	£20

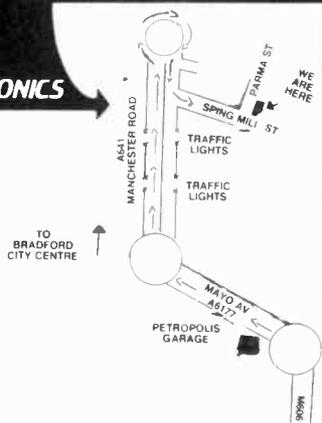
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Sharp Electronic 7300 ...	£65
Ferguson 3V29 .....	£75
Sharps 8300 .....	£80
National Panasonic .....	£75
Ferguson 3V30 .....	£90
Sharp 9300 .....	£95

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IF	Con- verger	De- coder	Line scan	Power	Frame
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718 7.50	5	14	20	3	14.00
Philips					
G11	14.50	5	12	20	20 11.50

All prices include Postage & Packing.  
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LARGE QUANTITY OF READY TO  
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100's PX  
**HOOVER JUNIOR  
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All models in stock

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Pye G11 .....	£15
Pye KT3 .....	£30
Pye K30 .....	£35
Ferguson TX9 .....	£15
Grundig .....	£10
Hitachi .....	£10
Thorn 9000 .....	£10

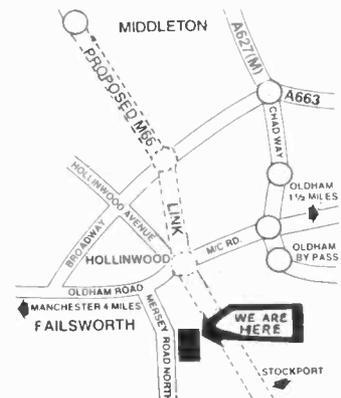
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Ferguson 3V29 .....	£50
Sharp 8300 .....	£50
National Panasonic .....	£40
Ferguson 3V30 .....	£55
Sharp 9300 .....	£55
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Thorn 9600 .....		<b>£25.00</b>	<b>£18.00</b>
Thorn TX9-TX10 .....		<b>£50.00</b>	<b>£40.00</b>
Decca 80 & 100 .....		<b>£20.00</b>	<b>£15.00</b>
G.E.C. ....		<b>£20.00</b>	<b>£10.00</b>
I.T.T. R/C .....		<b>£30.00</b>	<b>£20.00</b>
Philips G11 & Pye G11 .....		<b>£28.00</b>	<b>£18.00</b>
Philips G11 & Pye G11 Text with Handset .....		<b>£55.00</b>	<b>£45.00</b>
KT3 .....		<b>£50.00</b>	<b>£40.00</b>
KT3 Text with Handset .....		<b>£70.00</b>	<b>£45.00</b>
KT35 .....		<b>£55.00</b>	<b>£45.00</b>
KT35 Text with Handset .....		<b>£90.00</b>	<b>£65.00</b>
TX9 & TX10 Text with Handset .....		<b>£70.00</b>	<b>£60.00</b>
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Grundig Text with Handset .....		<b>£90.00</b>	<b>£65.00</b>
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G11 Basic	£12.00	£20.00
KT3 Text	£50.00	£68.00
KT30 Text	£55.00	£75.00

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8800	£6.00	£14.00
9000 R/C	£12.00	£18.00
9600 R/C	£14.00	£20.00
TX9-TX10 Basic	£30.00	£45.00
TX9-TX10 Text	£55.00	£70.00
TX9-TX10 R/C	£35.00	£50.00

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Ferguson	Non Working	Working
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3V23	£55.00	£80.00
3V30	£55.00	£80.00
R/C 3V31	£60.00	£85.00

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9,000  
9,600  
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ITT-Various Models.

GEC-Various Models.

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3V29  
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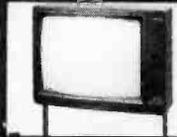
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6 1/2" dia	3 ohm	£1.50	
2 3/4" dia	8 ohm	75p	
3" dia	8 ohm	75p	
4 1/2" sq.	15 ohm	75p	
KT3 speaker	K30	75p	
3" dia	15 ohm	60p	
1600 5x3	12 ohm	£1	
K45 Phono	15 ohm	75p	
K30 15 watt	£1		
<b>KT3-K30</b>			
OF-425			
OF-550	10p		
OF-513	10p		
OF-557	50p		
<b>DIODES</b>			
BY 126	10p		
BY 127	10p		
BY 133	10p		
BY 134	10p		
BY 179	25p		
BY 184	25p		
BY 187	10p		
BY 190	40p		
BY 196	30p		
BY 204A	8p		
BY 206 - BY 47 Eqp	8p		
BY 208/800	8p		
BY 210/400	5p		
BY 210/800	10p		
BY 223	60p		
BY 224/600 - 4.5A/600V bridge	50p		
BY 226	15p		
BY 227	15p		
BY 228 1500h	20p		
Flat BY 229 black	25p		
BY 299 Red	20p		
BY 229/400	20p		
BY 299/600 Tag	20p		
BY 237	30p		
BY 254	10p		
BY 255	10p		
BY 288	10p		
BY 299	10p		
BY 406	8p		
BY 527	20p		
BY 407A	10p		
BY 527	10p		
F 402	10p		
F 247	10p		
GP20G	5p		
GRP98G (TX10)	60p		
XK 3102	50p		
BYV 282/0	20p		
Bridge TX10 800/3 amps	30p		
KBP35-42 Bridge	£1.50		
Bridge Rec D35B10	40p		
International Rectifier EHT Diodes G770/1V34 6kV	3 for 8p		
6A/600V Stud Diodes	20p		
6A/100V Stud Diodes	20p		
6A/473 PNP C/P	10p		

Rank T20 Z136 Panel	£6.00		
NEW GEC 20AX Power Supply Switch Mode	£12.00		
Field + Jungle panel for GEC 3133/3135	£1.50		
GEC 2110 line panel with transformer	£7.00		
GEC 2110 tuner unit + IF Panel	£12.00		
Pyc/Chelsea Line up panel	£3.99		
Pyc 205 Tuner	£7.00		
Pyc 713 IF panel and tuner	£10.00		
Pyc 713 Chroma	£5.00		
Pyc/Chelsea Timebase panel with LOPTI	£10.00		
Pyc 731 Frame Panel	£5.00		
Pyc 731 Convergence Panel	£10.00		
Pyc 731 IF panel + tuner	£10.00		
GEC portable chassis + LOPTI 2114 New	£4.00		
G9 Power Panel	£10.00		
Mono Rank Chassis 127A NEW	£4.00		
NEW G9 Frame Panel	£10.00		
NEW G11 IF Panel	£4.00		
G8 Tuner Unit + Panel	£4.00		
G8 IF & Chroma	£6.00		
G8 Chroma	£3.00		
G11 IF Detector	£3.00		
G11 Selector gain module	£3		
Complete CVC 825 Chassis (both panels)	£40.00		
AEC V/Cap Resistor Unit UHF with IC	£10.00		
SAS660 SAS670	£3.00		
Z714 RANK IF Panels 6MHz 1 L.C.	£10.00		
SL437F	£3.00		
Z909B RANK IF Panels	£12.00		
Export 5.5MHz 2 L.C.'s	£2.50		
TBA1205B TCA2705C	£6.00		
K35 IF	£6.00		
Z743 RANK IF Panel	£12.00		
GEC Line O/P PC 650B3	£6.00		
IBA750+SC95HP+	£1.50		
SC9503P	£1.50		
Pyc G11 Front panel with transducer, pots, tuner pots, 6 pb switch + lead	£5.00		
GEC 6 button switch portable	£1.00		
Pyc V/Cap 70h/100V tuner and IF + sound O/P PC 70h/100V (Export)	£12.00		
GEC Line O/P PC 650B3	£6.00		
2110 GEC Power Panel	£8.00		
CVC 20 Front panel with sliders + mains input panel	£4		
CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots	£9.00		
8 button unit	50p		
CVC9 slider pots panel	£9.00		
Universal Focus, Fits Pyc, Thorn and Decca Units	£1.00		
T147 Rank tube base on panel	£1.00		
Z718 Focus Unit	£1.00		
I20 Focus Unit	£2.375		
Large Type	75p		
Decca Small	60p		
K30 Focus Unit	75p		
K30 Focus Pot	75p		
K30 Tube base on panel	£1.00		
TX10 Focus Units	£8.50		
CVC 32 Focus Unit	75p		
Fidelity Focus Unit 14R-14S	30p		
300 Thorn Focus Unit	£1.00		
IIT Small for use with Split	£2.00		
Z718 Bush Focus	£2.00		
Decca Small	50p		
Rank IV12SP	50p		
1600 Thorn EHT Rec and Lead	50p		
IV14	50p		
TV20	£1.00		
TV45	£1.00		
Thorn 14/1500 rec stick	5p		
TX10 8 Button Unit	£10.00		
TX10/TX100 16 Button	£10.00		
G11 drawer ASS 3 pots Mains switch and lead	£2.00		
K30 Drawer Ass with pots cable	£1.00		
TX10 Drawer with 8 way pots, ass. £2.50	£2.50		
TX10 Ex. port with band switch (d/w/er)	£2.50		
Line O/P panel GEC 2217/2218/2213/2214/2226/2227/2228	£10		
<b>PHILIPS BATTERIES (Small Types) HAND SETS</b>			
SR41	25p		
SR43	25p		
SR44	25p		
SR54	25p		
LR43	25p		
LR44	25p		
LR54	25p		
CR2032	25p		
10 500PF 2KV	20p		
22/1000	20p		
1/250AC	20p		
1/100	5p		
IMFD-250AC	25p		
TAA7750	£1.00		
HA41485	£1.00		
UPC1373	50p		
M50143	£1.00		
M491BB1	£1.00		
M58657F	25p		
M50441/50	3p		
M58658P	£1.00		
Delay Line TDK Small	10p		
CVC 20-25-30 Mains Switches	60p		
Infra Red and Ultrasonic G11 Teletext Decoder Panel	£30		
RANK & IIT Mains Remote On-Off Switch (720R)	£1.50		
RANK & IIT Remote Switch 2800 ohm	£1.50		
G11 Mains Switch	50p		
4 lamp Mains Switch	25p		
GEC 8 pins Switch 4 amp	£1.00		
KT3 Mains Switch	£1.00		
G8 Mains Switch	£1.00		
G11 Preh Red LED P/Button for C.H. Change	£1.20		
RANK TOSHIBA Transducers TPC-3011	£1.00		
Mains switch IIT Long Type Print	£1.00		
Mains switch Philp Long Type TAG	£1.00		
Mains switch GEC Long Type TAG	£1.00		
2000 Chassis Fidelity Mains Switch (4 TAG)	£1.00		
250V/A White Lofin Mains Switch	£1.00		
KT3-K30-K35 Full Remote Mains Swi ch (6 TAG)	£1		
Teletext Adaptor Kit Ty-500 Panasonic	£12		

220 MFD Sprague 385V	50p		
350V 300M + 300M	£1.00		
400V 400M	60p		
350V 400M	60p		
Thorn 3500	£1.00		
175/100/100/35k	£1.00		
KT3/200/25/25/385v	£1.00		
KT3-K30 220+400-40	75p		
200+200+75+25+325V	£1.00		
300+300+150+100+50MFD	£1.00		
350V	£2.00		
G11 CAP 470/250	£2.50		
47/20/350	60p		
150/150/100/100/320v	£2.00		
2500/2500/63v	£0.50		
150/200/200/300v	70p		
300/100/100/275v	£1.50		
100/200/325v	£6.00		
150/150/100/375v	£1.50		
200/200/75/25M 375V	£1.00		
Thorn TX9 Caps 500+500M 175V	£1.00		
300/300/100/32/32/300v	2.00		
1500/2000/30v	50p		
150/150/100/100/320v	£2.00		
100/350 + 30V/200/100/16/275v	£2.00		
225+25/300	70p		
200/100/100/350v	£1.50		
500/500/25v	50p		
150/150/100/300v	75p		
200/150/150/300v	1.00		
IIT 8 and 6 Push Button	£1.00		
Pyc 725 EOPTS	£6.00		
Pyc 731 LOPTs	£6.00		
Thorn 8500-8800 LOPTs	£5.00		
CMC 301 front panel	£5.00		
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Way	£3
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V/Cap Rank UHF Z773T/Unit	£6
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NEW G8 Tuner V/Cap	£3.50
T204 Push Button Unit	£7
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GEC 2110 V/Cap	£5
FE6180	£20.00
ELC1042 NI.W	£6.00
ELC1043 (Ex Panel)	£3.75
ELC2000	NEW £4.00
ELC2004	NEW £8.00
ELC2003	NEW £4.00
ELC2006	NEW £4.00
GEC Tuner V/Cap Hitachi Alter	£8.00
1979 ETS48, ETS47, ETS41B	£6.00
ETS46	£6.00
ET614 UHF Tuner	£2.50
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U344C	£10.00
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U.V. 418	£7.00
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SW157	50p	BD1401	20p
SW158	50p	BD1402	20p
SW159	50p	BD1403	20p
SW160	50p	BD1404	20p
SW161	50p	BD1405	20p
SW162	50p	BD1406	20p
SW163	50p	BD1407	20p
SW164	50p	BD1408	20p
SW165	50p	BD1409	20p
SW166	50p	BD1410	20p
SW167	50p	BD1411	20p
SW168	50p	BD1412	20p
SW169	50p	BD1413	20p
SW170	50p	BD1414	20p
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SW200	50p	BD1444	20p
SW201	50p	BD1445	20p
SW202	50p	BD1446	20p
SW203	50p	BD1447	20p
SW204	50p	BD1448	20p
SW205	50p	BD1449	20p
SW206	50p	BD1450	20p
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SW213	50p	BD1457	20p
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SW215	50p	BD1459	20p
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SW217	50p	BD1461	20p
SW218	50p	BD1462	20p
SW219	50p	BD1463	20p
SW220	50p	BD1464	20p
SW221	50p	BD1465	20p
SW222	50p	BD1466	20p
SW223	50p	BD1467	20p
SW224	50p	BD1468	20p
SW225	50p	BD1469	20p
SW226	50p	BD1470	20p
SW227	50p	BD1471	20p
SW228	50p	BD1472	20p
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SW230	50p	BD1474	20p
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SW249	50p	BD1493	20p
SW250	50p	BD1494	20p
SW251	50p	BD1495	20p
SW252	50p	BD1496	20p
SW253	50p	BD1497	20p
SW254	50p	BD1498	20p
SW255	50p	BD1499	20p
SW256	50p	BD1500	20p
SW257	50p	BD1501	20p
SW258	50p	BD1502	20p
SW259	50p	BD1503	20p
SW260	50p	BD1504	20p
SW261	50p	BD1505	20p
SW262	50p	BD1506	20p
SW263	50p	BD1507	20p
SW264	50p	BD1508	20p
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SW322	50p	BD1566	20p
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SW324	50p	BD1568	20p
SW325	50p	BD1569	20p
SW326	50p	BD1570	20p
SW327	50p	BD1571	20p
SW328	50p	BD1572	20p
SW329	50p	BD1573	20p
SW330	50p	BD1574	20p
SW331	50p	BD1575	20p
SW332	50p	BD1576	20p
SW333	50p	BD1577	20p
SW334	50p	BD1	