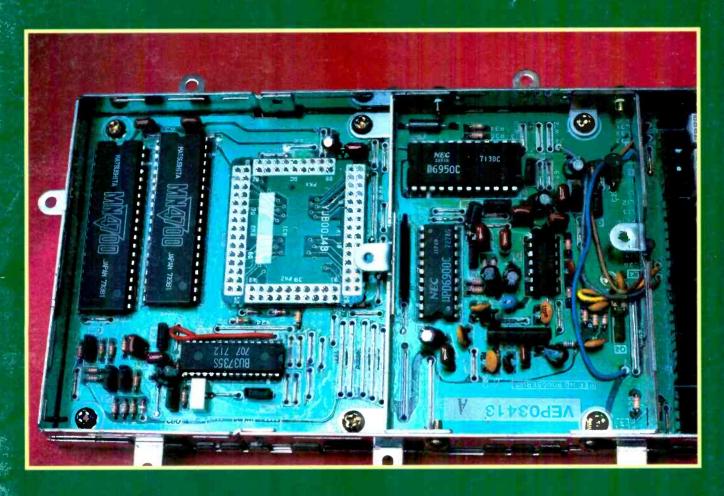
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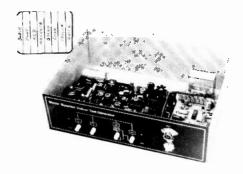
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- Chequerboard.

DEC. 1982

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- ★ Additional video output for CCTV & VCR.
- ★ Facilities for sound output.
- Easy to build kit, standard parts. Only 2 adjustments. No special test equipment required.
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- ★ All kits fully guaranteed with back-up service.

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- ★ 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.

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

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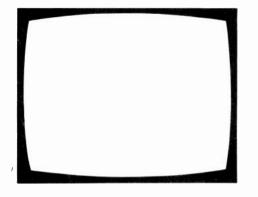
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June 1988 Vol. 38, No. 8 Issue 452

Nick Beer

Roger Bunney

Mike Phelan

Eugene Trundle

On sale May 18th

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INDEXES

Indexes to Vols. 35 and 36 are available at 80p each from the Editorial Office (address above).

OUERIES

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 above given (see "correspondence").

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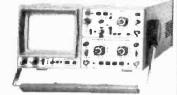
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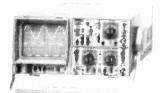
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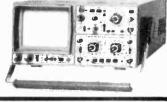
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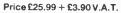
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ITT CVC45 PHILIPS G8 (550)	7.90 SL4	80 2.8 90 2.9		3.25 UPC118	o∠ri 85H	1.70 Ferguso 2.50 Ferguso	on (Universal) on TX9/10 (Re	1.00 em) , 1.95	BF469 BF470		.50 U321	8.75
PHILIPS KT3	7.95 SL1	4301.90	5 TDA1510	3.80 UPC123	30H	4.35 Ferguso	on TX90 (Rem)	· 1.75	BF757		70 U341	7.95
RBM T20/T22A	7.35 SL1	4311.9	5 TDA1512	3.50 UPC136	63C	3.95 Fidelity A	AVS1600/2000	0 1.45	BF871		80 U343 coaxskt)	14.95
THORN 8500/8800 THORN 9000	800 SNI	432				4.20 Fidelity (CTV140 CTV14S/140R	1.45 2.75	BR103		75 U344C	9.95
UNIVERSAL	.5.70 SIA	471C6.9	5 TDA1770	A3.70 UPC138	82	4.35 Fidelity (CTV14R	2.75	BR303 BT116		.30 U411	11.95
	STK	.077	5 TDA1870	6.95 UPC139	94C	2.95 Grundia	g CUC731 G8 (Metal)	3.75	BT151/800	1.	.15	28.95
FUSES		433 5.9	5 TDA1908	A	ru	Philips C	G8 (Metai) G11	1.35	BU126	1	.50	
20mm A/S: (Pkts of 10)	STK	4332 5.9	5 TDA2002	1.50		Philips G	G11 (Rem)	1.85	BU205 BU208A		AF.	
250MA, 315MA, 400MA, 500MA, 630MA, 800MA,	STK	435	5 TDA2003	1.55	C SO	CKETS Philips K	KT3 (Rem)	1.95	BU208D	1.	95 IVELECTRUL	YTICS.
1A, 1.25A, 1.6A, 2A, 2.5A	J STK	(437		2.90 16 Pin I	υπ-υπ Dil-Quil	35 Pve G11	CTX (Rem) 1 (Rem)	1.85	BU326A		45 FIDELITY ZX(220/385)	2.95
3.15A, 4A, 5A, 6.3A,8A	.1.20 STK	4598.5	5 TDA2006	1.95 18 Pin [Dil-Dil	18 RBM T2	20A (3K3)	2.45	BU407D	1	ACO DIGHT ID C COLCON MONE	2.95
20mm 0/B: (Pkts of 10) 500MA, 630MA, 800MA,		(461 9.9) (463 9.9)		3.20 24 Pin [Dil-Dil	25 Sony KV	V1612 V2022 (Rem)	4.95	BU426A	1	35 RBM T20A(220/400)	2.50
1.6A, 2A, 2.5A, 3.15A					Dil-Dil		VZUZZ (Hem) Jniværsal	1.00	BU500 BU508A	1	33 THORN 1000 (4700/20))1.35
												}2. 90
PERMITTED AND THE STREET											11101111 3000(100/100)	
FERGUSON TV SP	ARES	GEC/HITACHI S		PUSH BUTTONS		SERVICE MANU		sc	ONY SPARES		V.C.R. PILOT B	ULBS
TX9/10		HM6232	5.95	AMSTRAD CTV1401	5.95	TELEVISION	UALS		NY SPARES		V.C.R. PILOT B	ULBS
TX9/10	2.85	HM6232 HM6251	5.95 4.70	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY	5.95 8.50	TELEVISION Ferguson TX9	UALS	CS/C7 Ace Head	Assembly		V.C.R. PILOT B Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug)	ULBS 1.9 5
TX9/10 Dual PTC Focus Unit TX10 Line O/P Trans TX9	2.85 8.50 23.50	HM6232 HM6251 HM9032 STR6020 (Kit)	5.95 4.70 5.95 5.75	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10	5.95 8.50 16.95 16.95	TELEVISION	UALS 27.95 38.95	C5/C7 Ace Head Capstan M	Assembly	27.95	V.C.R. PILOT B Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V29 (Plug)	ULBS 1.9 5
TX9/10 Dual PTC Focus Unit TX10 Line O/P Trans TX9 Line O/P Trans TX10	2.85 8.50 23.50 29.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI	5.95 4.70 5.95 5.75	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90	5.95 8.50 16.95 16.95 12.95	TELEVISION Ferguson TX9 Ferguson TX10 Ferguson TX90 Ferguson TX100	UALS 27.95 38.95 11.95	C5/C7 Ace Head Capstan W Pinch Rolle Rewind Kit	Assembly flotorer	27.95 1.95 4.65	V.C.R. PILOT B Amstrad 7000 Ferguson 3V00/22 Ferguson 3V29 (Plug) Ferguson 3V29 (Plug) Hitachi VT8000	ULBS 1.9 5
TX9/10 Dual PTC	2.85 8.50 23.50 29.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI	5.95 4.70 5.95 5.75 RES	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY	5.95 8.50 16.95 16.95 12.95 11.75	TELEVISION Ferguson TX9 Ferguson TX10 Ferguson TX90 Ferguson TX100 Ferguson 1790/1	UALS 27.95 38.95 11.95 15.95 1.95	C5/C7 Ace Head Capstan M Pinch Rolli Rewind Kit Timer Lid	Assembly flotorer	27.95 1.95 4.65 1.50	V.C.R. PILOT B Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V29 (Plug) Hitachi VT8000 Nat Pan. NV2000	ULBS 1.9 5 8 8 8 8
TX9/10 Dual PTC Focus Unit TX10 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote). Push Button TX9	2.85 8.50 23.50 29.95 1.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head	5.95 4.70 5.95 5.75 RES	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9. FERGUSON TX10 FERGUSON TX90 ITT CVC5 7 WAY ITT CVC8/9	5.95 8.50 16.95 16.95 12.95 11.75 12.80	TELEVISION Ferguson TX9Ferguson TX10Ferguson TX90Ferguson TX100Ferguson TX100Ferguson 1790/1	27.95 	C5/C7 Ace Head Capstan M Pinch Rolli Rewind Kit Timer Lid	Assembly flotorer	27.95 1.95 4.65 1.50	V.C.R. PILOT B Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V29 (Plug) Hitachi VT8000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000	8ULBS 1.9 5 8 8 8 9 7
TX9/10 Dual PTC Focus Unit TX10 Line 0/P Trans TX9 Line 0/P Trans TX10 On/0f Switch (Remote) Push Button TX9 Push Button TX10 RFI Choke TX9	2.85 8.50 23.50 29.95 1.95 16.95 16.95 2.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head Capstan Motor	5.95 4.70 5.95 5.75 RES 18.95 31.90	AMSTRAD CTV1401 AMSTRAD/IT16 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20730 ITT CVC20750	5.95 8.50 16.95 12.95 12.95 12.80 8.50 19.95	TELEVISION Ferguson TX9 Ferguson TX10 Ferguson TX90 Ferguson TX90 Ferguson TX100 Ferguson 1790/1 Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R	27.95 38.95 11.95 15.95 2.50 2.50 2.50	CS/C7 Ace Head Capstan M Pinch Rolli Rewind Kit Timer Lid . Video Hea	Assemblydotorer	27.95 1.95 4.65 1.50 23.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V29 (Plug) Hitachi VT8000 Hitachi VT8000 Nat. Pan. NV2000 Nat. Pan. NV2000 Sharp VC8300	8ULBS 1.9 5 8 8 8 9 7 7
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX10. On/0ff Switch (Remote) Push Button TX9. Push Button TX10. RFI Choke TX9. Tuner.	2.85 8.50 23.50 29.95 1.95 16.95 16.95 2.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head Capstan Motor FF/Rew Idler	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65	AMSTRAD CTV1401 AMSTRAD/IT16 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC5 7 WAY ITT CVC8/9 ITT CVC90/30 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550)	5.95 8.50 16.95 12.95 12.80 8.50 19.95 16.50	TELEVISION Ferguson TX9 Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX100 Ferguson TY3901 Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV14R	27.95 38.95 11.95 15.95 1.95 2.50 2.50 2.50	C5/C7 Ace Head Capstan M Pinch Rollie Rewind Kil Timer Lid Video Hea C6 Capstan M	Assembly		V.C.R. PILOT B Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V29 (Plug) Hitachi VT8000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000	8ULBS
TX9/10 Dual PTC Focus Unit TX10 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote) Push Button TX9. Push Button TX10 RFI Choke TX9. Tuner TX90/100	2.85 	HM6232 HM6251 HM9032 STR6020 (Kit) V1DEO SPAI V4000H/VT8000 Audio Head. Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65 85	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC5 7 WAY ITT CVC89 ITT CVC20/20 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH	5.95 8.50 16.95 12.95 11.75 12.80 8.50 19.95 16.50 29.95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX90. Ferguson TX100 Ferguson T790/1 Fidelity AVS1800 Fidelity AVS2000 Fidelity CTV20R Fidelity CTV20R	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50	C5/C7 Ace Head Capstan M Pinch Rollie Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass	Assembly		V.C.R. PILOT B Amstrad 7000. Ferguson 3V00/22. Ferguson 3V23 (Plug). Ferguson 3V29 (Plug). Hitachi VT8000. Hitachi VT9300/9500. Nat. Pan. NV7000. Nat. Pan. NV7000. Sharp VC8300.	8ULBS
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote) Push Button TX9. Push Button TX10. RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14°.	2.85 	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Pulley Pinch Roller Play Idler	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65 85 3.395	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/20 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G[1 T] E SWITCH RBM T20A 6 WAY		TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100 Ferguson TX100 Fidelity AVS1800 Fidelity AVS2000 Fidelity AVS2000 Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC CT403H	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50	C5/C7 Ace Head Capstan M Pinch Rolle Rewind Kit Timer Lid Video Hea C6 Capstan M Pulley Ass Pinch Rolle Reel Moto	Assembly	27.95 1.95 4.65 1.50 23.50 23.95 1.25 1.95	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V29 (Plug) Hitachi V18000 Nat Pan NV2000 Nat Pan NV2000 Sharp VC8300 Sharp VC8300 Universal	8ULBS
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX10. On/Off Switch (Remote) Push Button TX9. Push Button TX10. RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 24"	2.85 8.50 23.50 29.95 1.95 16.95 2.95 14.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head. Capstan Motor FF/Rew Idler. FF/Rew Pulley. Pinch Roller Play Idler. Video Head.	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65 85 3.395	AMSTRAD CTV1401 AMSTRAD/IT16 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC879 ITT CVC879 ITT CVC879 ITT CVC875 PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL	5.95 8.50 16.95 12.95 12.75 12.80 8.50 19.95 16.50 29.95 11.95	TELEVISION Ferguson TX9 Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TY100 Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV14R Fidelity CTV20T GEC C1403H GEC C1403H	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.75 2.75 2.95	C5/C7 Ace Head Capstan M Pinch Rolle Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rolle Reel Moto Reel Moto	Assembly	27.95 1.95 4.65 1.50 23.50 23.95 1.25 1.95 1.95 1.95	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V28 (Plug) Hitachi VT8000 Nat Pan. NV2000 Nat Pan. NV2000 Nat Pan. NV7000 Sharp VC8300 Sharp VC8300 Universal.	8ULBS 1.9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX9. Push Button TX10. RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20". Line 0/P Trans TX90 20".	2.85 8.50 23.50 29.95 1.95 16.95 2.95 14.95 19.75 19.75	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head Capstan Motor FF/Rev Idler FF/Rev Pulley Pinch Roller Play Idler Video Head V4100H/V4002H	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65 85 3.395	AMSTRAD CTV1401 AMSTRAD/IT16 WAY FERGUSON TX9 FERGUSON TX90 FERGUSON TX90 ITT CVC879 ITT CVC879 ITT CVC879 ITT CVC20730 ITT CVC5 FVGRT PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text	5.95 8.50 16.95 12.95 11.75 12.80 8.50 19.95 16.50 29.95 11.95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100 Ferguson TX100 Fidelity AVS1800 Fidelity AVS2000 Fidelity AVS2000 Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC CT403H	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rolli Rewind Kii Timer Lid Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Reel Moto Rewind Kii	Assembly	.27.95 	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V02/22 Ferguson 3V02/22 Ferguson 3V23 (Plug) Hitachi V78000 Hitachi V78000 Nat. Pan. NV7000 Nat. Pan. NV7000 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500 9000 Amstrad VCR4500	8ULBS 1.9 5 8 8 8 9 7 7 7 7 7 5 5 5 5 5 5 5 5 5 5 5 5 5 5
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX10. On/Off Switch (Remote) Push Button TX10. RFI Choke TX9. Tuner. TX99/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 110. On/Off Switch (Remote)	2.85 8.50 23.50 29.95 16.95 16.95 2.95 14.95 19.75 19.75 29.55 20.95	HM6232 HM6251 HM9032 STR6020 (Kit). VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Pulley. Pinch Roller Pinch Roller Video Head. V4100H/V4002H 9300E/9500E	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65 85 3.95 4.50 27.50	AMSTRAD CTV1401 AMSTRAD/IT1 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC45 (PORT.) PHILIPS G8 (S/L550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 U/S Basic	5.95 8.50 16.95 12.95 17.75 12.80 8.50 19.95 16.50 29.95 11.95 LS 14.95 17.75	TELEVISION Ferguson TX9 Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX100 Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV14R Fidelity CTV20T GEC C1403H GEC C1403H GEC C1407H Philips CTX-E Philips CTX-S	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan N Pinch Rolli Rewind Kii Timer Lid . Video Hea C6 Capstan N Pulley Ass Pinch Rolli Reel Moto Reel Moto Rewind Kii Video Hea	Assembly	.27.95 	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi VT8000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV2000 Sharp VC3300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V00/22/23/39	8ULBS 1.9 1.9 5.8 8.8 9.9 7.7 7.7 1.9 5.5 DS 228.9 221.9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX10. RFI Choke TX9. Tuner. TY990/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX10 90.	2.85 8.50 23.50 29.95 11.95 16.95 2.95 14.95 19.75 19.75 19.95 20.95 11.75	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Pulley. Pinch Roller Play Idler. Video Head. V100 Head. V100 Head. V100 Head. V100 Head. V100 Head. V100 Head. V100 Head.	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65 85 3.95 4.50 27.50	AMSTRAD CTV1401 AMSTRAD/IT16 WAY FERGUSON TX9 FERGUSON TX90 FERGUSON TX90 ITT CVC879 ITT CVC879 ITT CVC879 ITT CVC20730 ITT CVC5 FVGRT PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text	5.95 8.50 16.95 12.95 12.95 12.80 8.50 8.50 19.95 16.50 29.95 11.95 LS 14.95 14.50	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX100 Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-S.	27.95 38.95 11.95 1.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Roll Rewind Kii Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Roll Reel Moto Rewind Ki Video Hea C9	Assembly	27.95 1.95 4.65 1.50 23.50 23.50 23.95 1.25 1.95 14.95 19.90 3.45 23.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi VT8000 Nat. Pan. NV7000 Nat. Pan. NV7000 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/2/29/39 Ferguson 3V32/44/44/5/47/ Ferguson 3V32	SULBS 1.9 5 8 8 8 9 7 7 1.9 5 5 DS 228.9 21.9 28.7 750 37.5 5
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX9. Push Button TX10. RFI Choke TX9. Tuner. TYS9/100 Line 0/P Trans TX90 14" Line 0/P Trans TX100 90. Line 0/P Trans TX100 110. On/Off Switch (Remote). Push Button TX90.	2.85 8.50 23.50 29.95 11.95 16.95 2.95 14.95 19.75 19.75 19.95 20.95 11.75	HM6232 HM6251 HM9032 STR6020 (Kit). VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Pulley. Pinch Roller Pinch Roller Pinch Roller Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler. FF/Rew Idler	5.95 4.70 5.95 5.75 5.75 RES 18.95 2.65 2.65 4.50 27.50	AMSTRAD CTV1401 AMSTRAD/IT1 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC207	5.95 8.50 16.95 12.95 12.95 12.80 8.50 19.95 16.50 29.95 11.95 LS 14.95 14.95 14.95 14.95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TY100 Fidelity AVS1600 Fidelity AVS2000 Fidelity TY14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips GTX-E Philips GTX-S	27.95 38.95 11.95 11.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Princh Rolli Rewind Kil Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Reel Moto Rewind Kil Video Hea C9 DC-DC Cor	Assembly		V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/02/21 Ferguson 3/02/21 Ferguson 3/02/21 Hitachi V78000 Nat Pan. N/0200 Nat Pan. N/0200 Nat Pan. N/0200 Sharp VC8300 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR7000 Amstrad VCR7000 Ferguson 3/02/21/29/39 Ferguson 3/02/21/9/39 Ferguson 3/02/21/9/39 Ferguson 3/02/21/9/39 Ferguson 3/02/21/9/39 Ferguson 3/02/21/9/39	SULBS 1.9 5.8 8.8 8.9 7.7 7.7 1.9 5.5 DS 27.9 21.9 21.9 37.5 77.0 37.5 77.0 37.5
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Unit Off Switch (Remote). Push Button TX10. BFI Choke TX9. Tuner. TY90/100 Line 0/P Trans TX90 14". Line 0/P Trans TX90 20". Line 0/P Trans TX10 90. Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Line 0/P Trans TX100 10. On/Off Switch (Remote). Push Button TX90. Tuner. FERGUSON	2.85 8.50 23.50 29.95 1.95 16.95 2.95 14.95 19.75 19.75 19.95 20.95 14.35	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Pulley. Pinch Roller Play Idler. Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler. FF/Rew Veller.	5.95 4.70 5.95 5.95 5.75 RES 18.95 31.90 27.50 27.50 31.95 31.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95	AMSTRAD CTV1401 AMSTRAD/IT16 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879	5.95 8.50 16.95 12.95 11.75 12.80 8.50 19.95 16.50 29.95 11.95 LS 14.95 14.50 14.95 14.50	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX100 Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-S.	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rollic Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Reel Moto Reel Moto Rewind Kit Video Hea C9 DC-DC Col Ooor Asse Front Door Front	Assembly	.27.95 1.95 4.65 1.50 23.50 23.50 23.50 1.25 1.25 1.95 1.95 1.95 23.50 3.45 23.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V02/22 Ferguson 3V23 (Plug) Hitachi V78000 Hitachi V78000 Nat. Pan. NV7000 Nat. Pan. NV7000 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/22/29/39 Ferguson 3V42/44/45/47 Fisher FVH-D520/F615/D	1.9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX9. Push Button TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX90 20" Line 0/P Trans TX10 010. On/Off Switch (Remote). Push Button TX90. Tuner. FERGUSON VIDEO SPARE	2.85 8.50 23.50 29.95 1.95 16.95 2.95 14.95 19.75 19.75 19.95 2.05 11.75 12.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Pulley. Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pier Holler FF/Rew Pulley. Pier Holler FF/Rew Pulley. Play Idler FF/Rew Pulley. Play Idler FF/Rew Pulley. Play Idler FF/Rew Pulley. Play Idler FF/Rew Pulley.	5.95 4.70 5.95 5.75 RES 18.95 2.65 85 31.90 2.77.50 31.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC89 ITT CVC20/20 ITT CVC20/20 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G1 TI IT SWITCH RBM T20A 6 WAY REMOTE CONTRO Amstrad CTV2210 Text Ferguson TX9 U/S Basic Ferguson TX9 U/S Basic Ferguson TX9 U/S Dasic Ferguson TX9 U/S Text Ferguson TX9 U/S Dasic	5.95 8.50 16.95 12.95 11.75 12.80 8.50 19.95 16.50 29.95 11.95 14.95 14.95 14.50 14.50 14.50 14.55 17.55 15.95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100 Ferguson TX100 Fidelity AVS1600 Fidelity AVS2000 Fidelity AVS2000 Fidelity CTV20R Fidelity CTV20T GEC C1407H Fidelity CTV20T GEC C1407H Filips CTX-E Philips CTX-E Philips G11 Philips K73 Philips K30. Philips K35. Philips K35.	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan N Pinch Rollin Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Reel Moto Reel Moto Rewind Kit Video Hea C9 DC-DC Col Ooor Asse Front Door Gear Kit	Assembly Motor Mot	.27.95 .1.95 .4.65 .4.65 .23.50 .23.50 .23.50 .23.95 .1.25 .1.25 .1.95 .3.45 .23.50 .23.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V02/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V78000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV2000 Sharp VC8300 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V00/22/29/39 Ferguson 3V42/44/5/47 Fisher FVH-D520/P615/D Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000	ULBS 1.9 5 8 8 8 9 9 7 7 7 7 7 1.9 5 5 5 5 5 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX9. Push Button TX10. RFI Choke TX9. Tuner. TYS9/100 Line 0/P Trans TX90 14" Line 0/P Trans TX100 90. Tuner. FERGUSON VIDEO SPARE: 3/900/16/22	2.85 8.50 23.50 29.95 16.95 16.95 2.95 14.95 19.75 19.75 19.95 2.95 14.95	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Pulley. Pinch Roller Play Idler. Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler. FF/Rew Veller.	5.95 4.70 5.95 5.75 RES 18.95 2.65 85 31.90 2.77.50 31.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3	AMSTRAD CTV1401 AMSTRAD/IT16 WAY FERGUSON TX9 FERGUSON TX9 FERGUSON TX90 ITT CVC57 WAY ITT CVC89 ITT CVC20'30 ITT CVC59 PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV22'10 Text Ferguson TX9 U/S Basic Ferguson TX9/10 Text	5.958.5016.9516.9512.9511.7512.808.5019.9511.95 LS14.9514.5014.5014.9514.5014.9517.5515.9517.95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX90. Ferguson TX100 Ferguson TY90/1 Fidelity AVS1800 Fidelity AVS1800 Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1405H Filips CTX-E Philips CTX-E Philips CTX-S Philips KT3 Philips K30. Philips K30. Philips K30. Philips K30.	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50	C5/C7 Ace Head Capstan M Pinch Rollic Rewind Kit Timer Lid Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Reel Moto Reel Moto Reel Moto Reel Moto C9 DC-DC Col Oor Asse Front Door Gear Kit Guide Pin I Pinch Rolli	Assembly	.27.95 .1.95 .4.65 .1.50 .23.95 .1.25 .1.25 .1.25 .1.4.95 .19.90 .3.45 .23.50 .22.95 .4.95 .4.95 .6.70 .5.95 .8.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/00/22 Ferguson 3/02/21 (Plug) Ferguson 3/03 (Plug) Ferguson 3/03 (Plug) Hitachi VT8000 Nat Pan. N/2000 Nat Pan. N/7000 Sharp VC8300 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3/02/22/39 Ferguson 3/32 Ferguson 3/32 Ferguson 3/32 Ferguson 3/32 Ferguson 3/32 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT1300 VC HR3300/HBD 225	SULBS 1.9 8.8 8.8 9.9 7.7 1.9 5.5 DS 27.9 28.9 27.9 27.9 27.9 28.9 27.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9
TX9/10 Dual PTC Focus Unit TX10 Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote) Push Button TX10 RFI Choke TX9 Luner TY90/100 Line 0/P Trans TX90 14° Line 0/P Trans TX90 20° Line 0/P Trans TX100 90 Line 0/P Trans TX100 90 Line 0/P Trans TX100 90 Line 0/P Trans TX100 T00 On/Off Switch (Remote) Push Button TX90 Tuner FERGUSON VIDEO SPARE 3V00/16/22 Capstan Motor	2.85 8.50 23.50 29.95 16.95 16.95 14.95 14.95 19.75 19.75 20.95 14.35	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Pulley. Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Play Idler Play Idler Video Head V4100H/V4002H Video Head. V410H/V711E Audio Head	5.95 4.70 5.95 5.75 RES 18.95 31.90 2.65 85 3.95 4.50 27.50 31.95 1.95 1.95 27.50	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 IU/S Basic Ferguson TX9/IU/Text Ferguson TX9/IU/Text Ferguson TX9/IU/Text Ferguson TX9/IU/Text Ferguson TX5 Stereo Text Ferguson TX5 Stereo Text Ferguson TX5 Stereo Text Ferguson 3V31 Video		TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Fidelity AVS1800. Fidelity AVS2000. Fidelity CTV14R. Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1405H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K30. Philips K30. Philips K35. Philips K3440. VIDEO RECORDERS	27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rollic Rewind Kit Timer Lid Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Reel Moto Reel Moto Reel Moto Reel Moto C9 DC-DC Col Oor Asse Front Door Gear Kit Guide Pin I Pinch Rolli	Assembly fotor er	.27.95 .1.95 .4.65 .1.50 .23.95 .1.25 .1.25 .1.25 .1.4.95 .19.90 .3.45 .23.50 .22.95 .4.95 .4.95 .6.70 .5.95 .8.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi VT8000 Hitachi VT9000 Nat. Pan. NV7000 Nat. Pan. NV7000 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V00/22/29/39 Ferguson 3V00/20/29/39 Fergu	SULBS 1.9 5 8 8 8 8 7 7 7 1.9 5 5 DS 28.9 28.9 28.9 27.5 5 77.5 27.5 28.9 27.5 28.9 27.5 28.9 37.7 27.9 37.7 37.7 38.7 37.7 38.7
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX9. Push Button TX9. TX90/100 TX90/TTANS TX90 20' Line 0/P Trans TX90 10' Line 0/P Trans TX100 110. On/Off Switch (Remote). Push Button TX90 Tuner. FERGUSON VIDEO SPARE: 3V00/16/22 Capstan Motor Drum Motor.	2.85 8.50 23.50 29.95 16.95 16.95 12.95 14.95 19.75 19.75 19.75 19.95 20.95 11.75 12.95 14.35	HM5232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler FF/Rew Idle	5.95 4.70 5.95 5.95 5.95 5.95 5.75 RES 18.95 31.90 2.26 5.95 8.5 2.75 31.95 3	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC37 ITT CVC37 ITT CVC39 ITT CVC	5,95 8,50 16,95 12,95 11,75 12,95 11,75 12,96 11,95 18,95 18,95 11,95 14,95 14,95 14,95 14,95 14,95 14,95 14,95 14,95 14,95 14,95 17,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TY90/1 Fidelity AVS1800 Fidelity AVS1800 Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1403H GEC C1405H GEC	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Reel Moto Reel Moto Reel Moto C9 DC-DC Col Ooor Asse Front Door Gear Kit Guide Pinl Pinch Rolli Video Hea	Assembly dotor er	.27.95 1.95 4.65 1.50 23.50 23.50 23.95 1.25 1.95 14.95 19.90 3.45 23.50 23.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/02/21 Ferguson 3/02/21 Ferguson 3/02/21 Hitachi V78000 Nat Pan. N/0000 Nat Pan. N/0000 Nat Pan. N/0000 Sharp VC8300 Sharp VC9300 Universal VIDEO HEAI Amstrad VCR7000 Amstrad VCR7000 Ferguson 3/02/2/29/39 Ferguson 3/02/22/29/39 Ferguson 3/02/24/5/3/7 Ferguson 3/02/22/29/39 Ferguson 3/02	SULBS 1.9 5 8.8 8.8 9.9 7 7 7 7 1.9 5 5 5 5 5 6 8 7 7 7 7 7 28 9 21 9 21 9 21 9 21 9 21 9 21 9 21 9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10. On/Off Switch (Remote) Push Button TX10 RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Line 0/P Trans TX100 100. On/Off Switch (Remote) Push Button TX90 Tuner. FERGUSON VIDEO SPARE 3V00/16/22 Capstan Motor Drum Motor Princh Roller Take-Up Clutch (Small)	2.85 8.50 23.50 23.55 1.95 16.95 16.95 12.95 14.95 19.75 19.75 20.95 1.75 12.95 1.75 12.95 1.75 12.95 1.75 12.95 14.35	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler. FF/Rew Pulley. Pinch Roller Play Idler. Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pinch Roller FF/Rew Pulley. Pinch Roller FF/Rew Pulley. Pinch Roller Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pinch Roller Video Head Capstan Motor Capstan Motor Capstan Motor Capstan Motor Clutch Assy.		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC89 ITT CVC20/200 ITT CVC20/200 ITT CVC45 (PORT) PHILIPS G8 (S/L 550) PYE G1 ITI IT SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 U/S Basic Ferguson TX9 U/S Basic Ferguson TX9 U/S Basic Ferguson TX9 IVS Express Ferguson TY9 IV	5,95 8,50 16,95 12,95 12,95 12,95 12,80 12,80 19,95 16,50 19,95 11,95 14,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Fidelity AVS1800. Fidelity AVS2000. Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1405H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K30. Philips K30. Philips K30. Philips K35. Philips K35. Philips K14/40 VIDEO RECORDERS Ferguson 3V29. Ferguson 3V35/36 Ferguson 3V35/36 Ferguson 3V35/36 Ferguson 3V35/36 Ferguson 3V35/36	27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan Pinch Roll Rewind Kin Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Roll Reel Moto Reel Moto Rewind Kin Video Hea C9 DC-DC Cor Ooor Asse Front Door Gear Kit Guide Pin I Pinch Roll Video Hea	Assembly	.27.95 .1.95 .4.65 .1.50 .23.50 .23.50 .23.55 .1.25 .1.1.95 .1.1.95 .1.1.95 .3.45 .23.50 .23.50 .23.50 .3.45 .23.50 .23.50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V02/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V78000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV2000 Sharp VC8300 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V00/22/29/39 Ferguson 3V00/22/29/39 Ferguson 3V42/44/45/47 Fisher FVH-D520/P615/D Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Nat. Pan. NV333 Nat. Pan. NV333 Nat. Pan. NV336	SULBS 1.9 8.8 8.8 9.9 7.7 1.9 22.9 22.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX10. RFI Choke TX9. Tuner. TYS9/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 91. Inie 0/P Trans TX100 91. Inie 0/P Trans TX100 91. Push Button TX90 Tuner. FERGUSON VIDEO SPARE: 3/00/16/22 Capstan Motor Pinch Roller Take-Up Clutch (Small). Take-Up Clutch (Small).	2.85 	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Pulley Pinch Roller Play Idler Video Head V4100H/V4002H V300E/9500E Capstan Motor FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler W100H/V4002H V100H/V4002H V100H/V4002H V100H/V4002H V100H/V4002H V100H/V4002H V100H/V4004 V100H/V4004 V100H/V4004 Capstan Motor Clutch Assy	5.95 4.70 5.95 5.95 5.75 RES 18.95 2.65 85 2.75 4.50 27.50 31.95 3.95 3.95 27.50 19.95 22.95 23.95 23.95 23.95 23.95	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC20730 ITT CVC20730 ITT CVC20730 ITT CVC20730 ITT CVC20730 ITT CVC20730 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 10 VIS Basic Ferguson TX9 10 VIS Basic Ferguson TX9 10 Text Ferguson TX9 10	5,958,508,5016,9512,9512,9512,9511,7516,5029,9511,9514,9514,9514,9514,9517,9514,9517,9514,9517,9514,9517,9514,9514,9514,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TY90/1 Fidelity AVS1800 Fidelity AVS1800 Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K30. Ferguson 3V29. Ferguson 3V29. Ferguson 3V3536 Ferguson 3V4445 GEC V4005H	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan M Pinch Roll Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Roll Reel Moto Reel Moto Reel Moto Revind Kit Video Hea C9 DC-DC Coo Ooor Asse Front Door Gear Kit Guide Pin I Pinch Roll Video Hea VID Amstrad V	Assembly Motor Mot	.27,95 1,95 4,65 1,50 23,50 1,25 23,50	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V78000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V00/22/29/39 Ferguson 3V00/22/29/39 Ferguson 3V42/44/54/3/ Fisher FVH-D520/P615/D Hitachi VT8000 Hitachi VT8000 JVC HR7655 JVC HR7655 JVC HR7655 JVC HR7655 JVC HR7850 JVC HR7655 JVC HR7800 Nat. Pan NV333 Nat. Pan NV336	ULBS 1.9 5 8 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9
TX9/10 Dual PTC Focus Unit TX10. Line (J/P Trans TX9 Line (J/P Trans TX9 Line (J/P Trans TX) On/Off Switch (Remote). Push Button TX10 RFI Choke TX9. Tuner. TX90/100 Line (J/P Trans TX90 14" Line (J/P Trans TX90 20" Line (J/P Trans TX100 91) Line (J/P Trans TX100 91) Line (J/P Trans TX100 91) Push Button TX90 Tuner. FERGUSON VIDEO SPARE: 3/100/16/22 Capstan Motor Drum Motor Pinch Roller Take-Up Clutch (Small). Take-Up Clutch (Large). Video Head	2.85 	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler. FF/Rew Pulley. Pinch Roller Play Idler. Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pinch Roller FF/Rew Pulley. Pinch Roller FF/Rew Pulley. Pinch Roller Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pinch Roller Video Head Capstan Motor Capstan Motor Capstan Motor Capstan Motor Clutch Assy.		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 IU/S Basic Ferguson TX9 IU/S Basic Ferguson TX9 IV/S Basic Ferguson TX9 IV/S Basic Ferguson TX9/10 Text Ferguson TX5 Video Ferguson 3V35 Video Ferguson 3V35 Video Fidelity CTV14S Fidelity Teletext Grundig TP400 Text ITT Digivision	5,958,508,5016,9516,9512,9511,7512,808,5019,9511,9514,5014,5014,5014,5014,5014,5014,5014,5014,5014,5014,5014,5014,5014,5014,5014,5014,9514,9514,9514,9514,9514,9514,9514,9514,9514,9514,9514,9514,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX100 Ferguson TX100 Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips KT3 Philips K30. Philips K40. Philips 640.00005	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rollic Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rollic Reel Moto Reel Moto Rewind Kit Video Hea C9 DC-DC Cor Oper Assessing the C9 DC-DC Cor C9 Cear Kit Goulde Pin IP Pinch Rollic Video Hea WID Assessing Coulde Pin Linch Rollic Video Hea	Assembly fotor fotor for fotor	.27.95 .1.95 .4.65 .1.50 .23.50 .23.50 .23.50 .1.25 .1.95 .1.95 .19.90 .3.45 .23.50 .22.95 .4.95	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V02/22 Ferguson 3V23 (Plug) Hitachi V78000 Hitachi V78000 Nat. Pan. NV7000 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR4500/9000 Ferguson 3V02/22/29/39 Ferguson 3V02/24/4/5/47 Fisher FVH-D520/F615/D Hitachi V718/000 Hitachi V718/000 Hitachi V718/000 Ntt Pan NV300 Nat. Pan NV333 Nat. Pan NV336 Nat. Pan NV370	SULBS 1.9 8 8 8 8 9 7 7 7 1.9 5 5 6 8 8 8 8 8 8 8 8 8 8 8 8
TX9/10 Dual PTC Focus Unit TX10 Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote) Push Button TX10 RFI Choke TX9 Tuner TY90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90 Line 0/P Trans TX100 90 Line 0/P Trans TX100 10 On/Off Switch (Remote) Push Button TX90 Tuner FERGUSON VIDEO SPARE 3V00/16/22 Capstan Motor Drum Motor Pinch Roller Take-Up Clutch (Small) Take-Up Clutch (Small) Take-Up Clutch (Large) Video Head	2.85 8.50 23.50 23.55 1.95 16.95 1.95 14.95 19.75 19.75 20.95 1.75 20.95 1.75 12.95 14.35	HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head Capstan Motor FF/Rew Pulley Pinch Roller Play Idler Video Head V4100H/V4002H V300E/V500E Capstan Motor FF/Rew Pulley Pinch Roller Pinch Roller Video Head V4100H/V410E Hay Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Idler	5.95 4.70 5.95 5.95 5.75 RES 18.95 3.19.95 2.65 8.5 2.75 3.95 3.19.5 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC207	5,958,5016,9516,9512,9512,9512,9511,7512,808,5016,5029,9516,5029,9517,7514,9514,9517,7514,9514,9514,9514,9514,9514,9514,9514,9514,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Fidelity AVS1800. Fidelity AVS2000. Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1403H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips KT3. Philips KT3. Philips KT3. Philips KT4/40 VIDEO RECORDERS Ferguson 3V44/45 Ferguson 3V44/45 GEC V4005H Philips 6460/00/05 Philips 6462/00/05 Philips 6462/00/05	27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto	Assembly	.27.95 .1.95 .4.65 .1.50 .23.50 .23.50 .23.50 .1.25 .1.25 .1.4.95 .1.3.45 .23.50 .22.95 .4.95 .5	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V00/23 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V18000 Nat Pan NV2000 Nat Pan NV7000 Sharp VC8300 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/22/933 Ferguson 3V02/22/933 Ferguson 3V02/22/933 Ferguson 3V02/44/5/47/ Fisher FVH-DS20/P615/D Hitachi V18000 Hitachi V18000 Hitachi V19300/9500 Hitachi V19300/9500 Hitachi V19300/9500 Nat Pan NV306 Nat Pan NV333 Nat Pan NV330	BULBS 1.9 8.8 8.8 9.7 7.7 1.9 22.9 22.9 27.5
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX9. Push Button TX10 BFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Tuner. FERGUSON VIDEO SPARE 3V00/16/22 Capstan Motor Push Button TX90 Tuner. FERGUSON VIDEO SPARE 3V00/16/22 Capstan Motor Drum Motor Pinch Roller Take-Up Clutch (Small) Take-Up Clutch (Large). Video Head 3V29/30 Booster	2.85 .8.50 .23.95 .1.95 .1.95 .2.95 .2.95 .1.95 .2.95 .1.95 .2.95 .1.75 .1.95 .2.95 .1.75 .1.75 .1.75 .1.295 .1.4.35	HM5232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler FF/Rew Idler FF/Rew Idler Capstan Motor FF/Rew Idler Finch Roller Video Head V4100H/VT11E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Finch Roller Video Head	5.95 4.70 5.95 5.95 5.95 5.95 5.95 5.95 31.90 31.90 31.90 27.50 31.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC89 ITT CVC20/30. ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 10 N/Text. Ferguson TX9/10 Text Fidelity Teletext Grundig TP200 Grundig TP200 Grundig TP200 Grundig TP200 Forundig TP400 Text ITT Digivision Philips G11 U/S Text	5,958,5016,9516,9511,7512,808,5029,9511,9514,9517,7514,5014,9517,9517,9517,9517,9517,9517,9517,9517,9517,9517,9517,9517,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Fidelity AVS1800 Fidelity AVS1800 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K13 Philips K30. Philips K440 VIDEO RECORDERS Ferguson 3V29 Ferguson 3V445 GEC V4005H Philips 64000005 Philips 64000005 Philips 64000005 Philips 652000.	27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan M Pinch Rolli Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pulley Ass Pulley Ass Pulley Ass Pulley Ass Pulley Capstan M Pulley Ass Port Note Pinch Rolli Video Hea VID Amstrad V Ferguson	Assembly Motor Mot	. 27.95 1.95 1.95 1.50 . 23.50 . 23.50 . 23.95 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.2	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V78000 Nat Pan NV7000 Nat Pan NV2000 Nat Pan NV2000 Nat Pan NV300 Nat Pan NV300 Mat Pan NV300 Nat Pan NV300	BULBS 1.9 8.8 8.8 8.9 7 7 7 1.9 5.5 21.9 22.9 46.7 37.5 21.9 44.9 22.9 36.7
TX910 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote) Push Button TX10 RFI Choke TX9. Tuner. TY990100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90 Line 0/P Trans TX100 110 On/Off Switch (Remote) Push Button TX90 Tuner. FERGUSON VIDEO SPARE: 3V00/16/22 Capstan Motor Drum Motor Pinch Roller Take-Up Clutch (Small) Take-Up Clutch (Large) Video Head 3V23/30 Booster Capstan Motor	2.85 .8.50 .23.50 .23.50 .1.95 .16.95 .1.95 .2.95 .14.95 .2.95 .1.75 .19.75 .20.95 .1.75 .12.95 .14.35 .24.95 .25.95 .25.	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Pulley. Pinch Roller Play Idler. Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pinch Roller Pinch Roller Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Play Idler. Pinch Roller Video Head. V4100H/V411E Audio Head. Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head. V4004H/V4733E Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head. V4004H/V4733E Capstan Motor FF/Rew Idler	5.95 4.70 4.70 5.95 5.95 5.75 RES 18.95 31.90 2.66 85 4.50 27.50 31.95 85 3.95 27.50 27.50 29.50 20.5	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20-20 ITT CVC20 ITT CVC20-20 ITT CVC20-2	5,958,5016,9516,9512,9512,9512,808,5012,9514,9514,9514,9514,5015,9515,9514,7014,50	TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Fidelity AVS1600. Fidelity AVS1600. Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1403H GEC C1407H Philips CTX-E Philips GTX-E Philips CTX-S Philips K30. Philips K30. Philips K30. Philips K35. Philips K35. Philips K35. Philips K35. Philips K35. Philips K46000005 Ferguson 3V44/45 GEC Figuson 3V44/45 Ferguson 3V44/45 Ferguson S46000005 Philips B46200005 Philips B46200005 Sony C5. Sony C6. Sony C6. Sony C6.	27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rolli Reel Moto Rewind Kit Video Hea C9 DC-DC Cor Oor Asse Front Door Gear Kit Guide Pin I Pinch Rolli Video Hea VID Amstrad V Ferguson : Fergus	Assembly Motor Mot	.27.95 .4.65 .1.50 .23.50 .23.55 .1.25 .1.25 .1.35 .1.	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V78000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC8300 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V00/22/29/39 Ferguson 3V00/22/29/39 Ferguson 3V42/44/45/47 Fisher FVH-De520/P615/D Hitachi VT8000 Hitachi VT11/33E (genuit JVC HR7855 JVC HR7855 JVC HR0140/160 Nat. Pan NV330 Nat. Pan NV300 Nat. Pan NV300 Nat. Pan NV777 Nat. Pan NV777 Nat. Pan NV7000	ULBS 1.9 5 8 8 8 8 8 7 7 7 7 1.9 5 5 DS 28.9 28.9 21.9 21.9 21.9 21.9 21.9 21.9 21.9 21
TX910 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX10. RFI Choke TX9. Tuner. TYS90100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Tuner. FERGUSON VIDEO SPARE: 3V0016/22 Capstan Motor Pinch Roller Take-Up Clutch (Small). Take-Up Clutch (Large). Video Head 3V29/30 Booster Capstan Motor Loading Motor. Pinch Roller Capstan Motor Pinch Roller Capstan Motor Pinch Roller Capstan Motor Pinch Roller Loading Motor. Pinch Roller	2.85 	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler FF/Rew Pulley. Pinch Roller Play Idler Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Play Idler Pinch Roller Video Head. V410H/V411E Audio Head. Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head. V400H/V711E Audio Head. Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head. V400H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head. V400H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head. V400H/V733E Capstan Motor FF/Rew Idler FF/Rew Idler FF/Rew Idler FF/Rew Idler	5.95 4.70 4.70 5.95 5.95 5.75 RES 18.95 31.90 2.66 85 4.50 27.50 31.95 85 3.95 27.50 27.50 29.50 20.5	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC89 ITT CVC20/30. ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 10 N/Text. Ferguson TX9/10 Text Fidelity Teletext Grundig TP200 Grundig TP200 Grundig TP200 Grundig TP200 Forundig TP400 Text ITT Digivision Philips G11 U/S Text	5,958,5016,9516,9511,7512,8019,9516,5011,9511,9514,9514,50	TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Fidelity AVS1600 Fidelity AVS1600 Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K13 Philips K30. Ferguson 3V35/36 Ferguson 3V48/45 GEC V4005H Philips B600005 Philips B52000.05 Sony C5. Sony C6. Sony C6. Sony C6 MkII.	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid. Video Hea C6 Capstan N Pulley Ass Pinch Rollin Reel Moto	Assembly	.27.95 1.95 1.95 1.05 1.23.50 .23.50 .23.55 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/02/21 Ferguson 3/02/21 Ferguson 3/02/21 Ferguson 3/03/21 (Plug) Hitachi VT8000 Nat. Pan. N/2000 Nat. Pan. N/2000 Nat. Pan. N/7000 Sharp VC8300 Universal Amstrad VCR4500/9000 Amstrad VCR4500/9000 Ferguson 3/02/22/33 Ferguson 3/02/22/33 Ferguson 3/02/22/33 Ferguson 3/02/22/33 Ferguson 3/02/22/33 Ferguson 3/02/22/33 Ferguson 3/02/24/45/47 Fisher FVH-D520/F615/D Hitachi VT8000 Hitachi VT8000/HBD25 JVC HR3655 JVC HR7655 JVC HR7655 JVC HR7655 JVC HR7655 JVC HR7655 JVC HR7656 Nat. Pan NV330 Nat. Pan NV377 Nat. Pan NV7300 Nat. Pan NV7300 Nat. Pan NV7300 Nat. Pan NV7300 Nat. Pan NV7000 Philips VCR6462/6520	SULBS 1.9 5 8 8 8 8 9 7 7 7 1.9 5 5 28.9 28.9 27.9 28.9 27.9 28.9 27.9 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX10. RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14". Line 0/P Trans TX90 20". Line 0/P Trans TX100 90. Line 0/P Trans TX100 910. Line 0/P Line 0/P Trans TX100 910. Line 0/P Line 0/P Trans TX100 910. Line 0/P	2.85 8.50 23.50 23.55 1.95 16.95 16.95 16.95 12.95 14.95 20.95 14.35 24.95 24.95 24.95 3.95 5.65 5.95 21.95 24.95 3.95 3.95 3.95 3.95 3.95 3.95 3.95 3	HM5232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Pinch Roller Video Head V400H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head V400H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/30 ITT CVC20/30 ITT CVC20/30 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 IU N Basic Ferguson TX9 IU N Basic Ferguson TX9 IU N Ext Ferguson TX9 IU Fix Fergus	5,958,508,5016,9511,7512,8019,9519,9519,9511,9511,7,7514,5014,5014,5014,5014,9517,9514,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX90. Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R. Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips GTX-S Philips GTX-S Philips GTX-S Philips K130. Philips K30. Philips K30. Philips K30. Philips K30. Philips K30. Philips K30. Philips K35. Philips K36000005 Philips 6460/0005 Philips 6460/0005 Philips 6460/0005 Philips 6460/0005 Philips 6500/0005 Sony C6. Sony C6. Sony C6. Sony C6. Sony C7.	27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	CS/C7 Ace Head Capstan M Pinch Roll Rewind Kit Timer Lid Video Hea C6 Capstan M Pulley Ass Pinch Roll Reel Moto Reel Moto Reel Moto Reel Moto Rewind Kit Video Hea C9 DC-DC Cot Ooor Asse Front Door Gear Kit Gouide Pin I Pinch Roll Video Hea VID Amstrad V Ferguson 3 Ferguson 5 Ferguson 5 Ferguson 5 Ferguson 5 Ferguson 6 Ferguson 6 Ferguson 6 Ferguson 6 Ferguson 6 Ferguson 6 Ferguson 7 Ferg	Assembly	.27.55 1.95 1.95 1.95 1.22.50 .22.55 1.25 1.45 1.45 1.45 1.45 1.45 1.45 1.45 1.4	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V13000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC3300 Universal WIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/22/933 Ferguson 3V02/22/933 Ferguson 3V02/22/933 Ferguson 3V02/44/5/47/Fisher FVH-DS20/P615/0 Hitachi V18000 Hitachi V18000 Hitachi V1300/9500 Hitachi V1300/9500 Hitachi V11/32E (genuir JVC HR7855 JVC HR7855 JVC HR0140/160 Nat. Pan NV333 Nat. Pan NV330 Nat. Pan NV330 Nat. Pan NV330 Nat. Pan NV300 Nat. Pan NV300 Nat. Pan NV300 Nat. Pan NV770 Nat. Pan NV7700 Nat. Pan NV7700 Nat. Pan NV7000 Nat. Pan NV7000 Philips VCR64650 Philips VCR64650 Rayo (TC5000) (genuirs VCR665500 Rayo (TC5000) (genuirs VCR666500 Rayo (TC5000) (genuirs VCR666500	BULBS 1.9 5 8 8 8 8 8 9 7 7 7 7 1.9 5 5 DS 22.9 28.9 27.5 21.5 21.5 21.5 21.5 21.5 21.5 21.5 21
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX9. Push Button TX10 RFI Choke TX9. Tuner. TYS90/100 Line 0/P Trans TX90 20°. Line 0/P Trans TX90 20°. Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Tuner On/Off Switch (Remote). Push Button TX90 Tuner. FERGUSON VIDEO SPARE 3V00/16/22 Capstan Motor Pinch Roller Take-Up Clutch (Large). Video Head 3V29/30 Booster Capstan Motor Capstan Motor Loading Motor. Pinch Roller Loading Motor. Pinch Roller Loading Motor. Pinch Roller	2.85 .8.50 .23.95 .1.95 .1.95 .2.95 .1.95 .2.95 .14.95 .19.75 .19.75 .19.75 .12.95 .14.35 .24.95 .3.95 .5.65 .5.65 .5.95 .21.95	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler Pinch Roller Play Idler Video Head V4100H/V4002H 9300E-9500E Capstan Motor FF/Rew Pulley. Pinch Roller Pinch Roller Video Head V410H/V4002H STREW Pulley STREW Pulley Pinch Roller Video Head Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head V4004H/V7T33E Capstan Motor FF/Rew Idler Finch Roller Video Head V4004H/VT33E Capstan Motor FF/Rew Idler FF/Rew Idler Finch Roller Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Video Head	5.95 4.70 4.70 5.95 5.75 RES 18.95 31.90 2.66 85 4.50 27.50 31.95 85 3.95 27.50 19.95 22.95 22.95 23.95 27.95 27.95	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9. FERGUSON TX90. ITT CVC37 WAY ITT CVC37 ITT CV	5,958,5016,9516,9511,9512,8019,9511,9511,9514,9514,9517,7514,50	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TY90/1 Fidelity AVS1800 Fidelity AVS1800 Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K30. Ferguson 3V29. Ferguson 3V29. Ferguson 3V4445 GEC V4005H Ferguson 3V4445 GEC V4005H SeC V6005 Fory C5. Sony C6. Sony C6. Sony C6. Sony C6. Sony C7. Sony C9. Sony C9.	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pulnch Roll Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Roll Rewind Kit Video Hea C9 DC-DC Coo Ooor Asse Front Door Gear Kit Pinch Roll Video Hea VID Amstrad V Ferguson	Assembly	.27.55 .1.95 .1.95 .1.95 .1.23.50 .22.55 .1.25	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/00/22 Ferguson 3/02/21 Hitachi V78000 Nat Pan NV2000 Nat Pan NV2000 Nat Pan NV7000 Sharp VC8300 Sharp VC9300 Universal WIDEO HEAI Amstrad VCR7000 Amstrad VCR7000 Amstrad VCR7000 Amstrad VCR7000 Amstrad VCR7000 Hitachi VT8000 Amstrad VCR7000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Hitachi VT8000 Nat Pan NV300 Nat Pan NV303 Nat Pan NV303 Nat Pan NV300 Nat Pan NV770 Nat Pan NV7000 Philips VCR6462 Philips VCR6462 Sanyo VTCS000 (genuins Sanyo VHR11001000 Sanyo VHR11001000 Sanyo VHR11001000	SULBS 1.9 8.8 8.8 8.8 9.7 7.7 1.9 28.9 28.9 29.9 21.9 48.7 77.7 20.2 21.9 48.7 21.9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote). Push Button TX10 RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 910 Push Button TX90 Tuner. FERGUSON VIDEO SPARE: 3/Y00/16/22 Capstan Motor Drum Motor Pinch Roller Take-Up Clutch (Large). Video Head 3/Y29/30 Booster Capstan Motor Loading Motor Pinch Roller	2.85	HM5232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Pinch Roller Video Head V400H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head V400H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head	5.95 4.70 4.70 5.95 5.55 5.75 RES 18.95 3.19.95 2.265 8.5 2.265 8.5 2.7.50 31.95 3.95 2.7.50 19.95 2.3.95 2.7.95 2.95 2.7.95 2.95 2.7.95	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/20 IT	5,958,508,5016,9511,7512,8019,9511,9511,9514,9614,9614,9614,9614,9614,9614,9614,9614,9614,9614,9614,9614,9614,9614,9614,9614,96	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX90. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX100 Ferguson TX100 Ferguson TX90. Fidelity AVS1600 Fidelity AVS1600 Fidelity CTV14R Fidelity CTV20T GEC C1403H GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-E Philips K130. Philips K30. Philips K40. Philip	27.95 38.95 11.95 15.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rolli Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Rolli Rewind Kit Video Hea C7 C9 DC-DC Cot Door Asse Front Door Gear Kit C9	Assembly	27.55 1.95 1.95 1.95 1.95 1.95 1.95 1.95 1	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V00/23 Ferguson 3V23 (Plug) Hitachi V73000 Hitachi V73000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV2000 Sharp VC8300 Universal VIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V00/22/29/39 Ferguson 3V00/22/29/39 Ferguson 3V00/22/29/39 Ferguson 3V42/44/45/a/7 Fisher FVH-De50/P615/D Hitachi V18000 Hitachi V18000 Hitachi V17300/9500 Hitachi V17300/9500 Hitachi V17301 NUC HR7655 JVC HR7655 JVC HR0140/160 Nat. Pan NV300 Nat. Pan NV7000 Nat. Pan NV7000 Nat. Pan NV7000 Nat. Pan NV7000 Sanyo V1CS000 (genuine Sanyo VHR1100/1300 Sanyo VHR1100/1300 Sanyo VHR1100/1300 Sanyo VHR1100/1300 Sharp VC8300/9700/381/4	ULBS 1.9 8.8 8.8 8.9 9.7 7.7 7.7 7.5 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10. On/Off Switch (Remote) Push Button TX10 RFI Choke TX9. Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Line 0/P Trans TX100 91. Line 0/P Line 0/P Trans TX100 91. Line 0/P Line TX100 90. Line 0/P Line TX100 91. Line 0/P Line 0/P Line TX100 91. Line 0/P Line 0/P Line TX100 91. Line 0/P Line 0	2.85 8.50 23.50 23.55 1.95 16.95 16.95 16.95 1.95 2.95 14.95 20.95 14.35 24.95 24.95 24.95 24.95 25.95 27.95 27.95 27.95 28.70 4.50 28.70 4.50 28.70 4.50 28.70	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head Capstan Motor FF/Rew Pulley Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley Pinch Roller Pinch Roller Video Head V4100H/V401E Audio Head Capstan Motor FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Idler Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Video Head V4004H/V733E Capstan Motor FF/Rew Idler Video Head V4004H/V733E Capstan Motor FF/Rew Idler Video Head V4004H/V733E Capstan Motor FF/Rew Idler Video Head V4005H/V763E Capstan Motor End Sensor Video Head	5.95 4.70 4.70 5.95 5.95 5.75 RES 18.95 3.19.95 2.265 8.5 2.265 8.5 2.7.50 31.95 3.95 27.50 19.95 23.95 27.95 29.95 27.95 29.95 27.95 49.95	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC207	5,958,5016,9511,7512,8019,9511,9514,9514,5014,5014,5017,95	TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX100 Ferguson TX100 Ferguson TX90. Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips KT3. Philips KT3. Philips KT3. Philips KT3. Philips K30. Philips K30. Philips K30. Philips K35. Philips K35. Philips K36000005 Philips 646000005 Philips 646000005 Philips 646000005 Philips 656000005 Philips 65000005 Sony C5. Sony C6. Sony C6. Sony C6. Sony C7. Sony C7. Sony C9. Sony C9. Sony C9. Sony C20. Sony C20. Sony C20. Sony C20. Sony C30. Sony C40.	27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid. Video Hea C6 Capstan N Pulley Ass Pinch Rollin Reel Moto	Assembly	27.55 1.55 1.55 1.55 1.55 1.55 1.55 1.45 1.55 1.55 1.50 2.25 1.55	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/00/22 Ferguson 3/02/21 Ferguson 3/03/21 (Plug) Hitachi V18000 Nat Pan NV2000 Nat Pan NV7000 Sharp VC8300 Sharp VC9300 Universal VIDEO HEAI Amstrad VCR7000 Amstrad VCR7000 Amstrad VCR7000 Ferguson 3/02/2/29/39 Ferguson 3/02/2/29/39/39/39/39/39/39/39/39/39/39/39/39/39	ULBS 1.9 8.8 8.8 9.7 7.7 1.9 28.9 28.9 28.9 29.9 48.7 77.7 20.2 21.9 48.7 27.9 21.9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote). Push Button TX9. Push Button TX10 RFI Choke TX9. Tuner. TYS90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Tuner On/Off Switch (Remote). Push Button TX90 Tuner. FERGUSON VIDEO SPARE 3700/16/22 Capstan Motor Pinch Roller Take-Up Clutch (Large). Video Head 3729/30 Booster Capstan Motor Loading Motor. Pinch Roller Loading Motor. Pinch Roller Loading Motor. Pinch Roller Take-Up Clutch (Large). Take-Up Clutch (Take).	2.85 8.50 23.50 23.55 1.95 16.95 16.95 16.95 1.95 2.95 14.95 20.95 14.35 24.95 24.95 24.95 24.95 25.95 27.95 27.95 27.95 28.70 4.50 28.70 4.50 28.70 4.50 28.70	HM5232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Pinch Roller Video Head V400H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head V400H/V733E Capstan Motor FF/Rew Idler FF/Rew	5.95 4.70 4.70 5.95 5.95 5.95 5.95 5.95 31.90 31.90 2.26 5.95 8.5 8.5 27.50 31.95 3.95 27.50 31.95 22.95	AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/20 IT	5,9511,7512,9611,7512,9611,7512,9611,7512,9611,7514,9611,7514,96	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX100. Ferguson TX90. Fidelity AVS1600. Fidelity AVS1600. Fidelity CTV14R. Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1407H Philips CTX-E Philips GTX-S Philips GTX-S Philips K13. Philips K13. Philips K30. Philips K30. Philips K35. Philips K14/40. VIDEO RECORDERS Ferguson 3V35/36 Ferguson 3V35/36 Ferguson 3V4445 GEC V4005H Philips 6460/0005 Philips 6460/0005 Philips 6460/0005 Philips 6460/0005 Philips 650/0005 Sony C6. Sony C6. Sony C6. Sony C6. Sony C7. Sony C9. Sony C9. Sony C9. Sony C9. Sony C9. Sony C30. SHARP VIDEO SI	UALS 27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	CS/C7 Ace Head Capstan M Pinch Roll Rewind Kit Timer Lid . Video Hea C6 Capstan N Pulley Ass Pinch Roll Rewind Kit Wideo Hea C9 DC-DC Cot Ooor Asse Front Door Gear Kit Guide Pinl Pinch Roll Video Hea WID Amstrad V Ferguson 3 VID WC HR77Z JVC HR7ZZ JVC HR7ZZ JVC HR78Z JVC HR78Z	Assembly	27.55 1.55 1.55 1.55 1.55 1.22.50 22.55 1.45 1.45 1.45 1.45 1.45 1.55 1	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/02/21 Ferguson 3/02/29 Ferguson 3/02/29 Ferguson 3/03/29 Hitachi VT8000 Nat. Pan. N/2000 Nat. Pan. N/7000 Nat. Pan. N/7000 Sharp VC8300 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Ferguson 3/02/29/39 Ferguson 3/02/29/39/39/39/39/39/39/39/39/39/39/39/39/39	BULBS 1.9 5.8 8.8 8.9 7.7 7.7 1.9 5.5 28.9 27.9 28.9 27.9 28.9 27.5 2
TX910 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote) Push Button TX10. RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 910. Line 0/P Trans TX100 110. On/Off Switch (Remote) Push Button TX90. Tuner. FERGUSON VIDEO SPARE 3700/16/22 Capstan Motor Drum Motor Pinch Roller Take-Up Clutch (Large) Video Head 3729/30 Booster Capstan Motor Loading Motor Pinch Roller Pilot Lamp Reel Idler Take-Up Clutch	2.85 8.50 23.50 23.55 1.95 16.95 16.95 16.95 1.95 2.95 14.95 20.95 11.75 19.75 20.95 11.75 20.95	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley Play Idler Pinch Roller Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Pinch Roller Video Head V4004H/V713E Capstan Motor FF/Rew Idler FF/Rew Idler Pinch Roller Video Head V4004H/V713E Capstan Motor FF/Rew Idler Video Head V4005H/V763E Capstan Motor FF/Rew Idler Video Head V4005H/V763E Capstan Motor End Sensor Video Head		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC20/200 ITT DIgvision ITT Digvision Philips G11 I/S Full Rem Philips G11 I/S Text Philips G11 I/S Text Philips K13/30 Text Philips K13/30 IText Philips RC5 (Equivalent0. Sony RM604-RM606 Sony RM604-RM606 Sony RM605-SON RM605	5,9511,7512,9611,7512,9611,7512,9611,7512,9611,7514,9611,7514,96	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TY90/1 Fidelity AVS1800 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1405H GEC C1405H GEC C1405H Filips CTX-E Philips CTX-E Philips CTX-E Philips K13 Philips K30. Philips G5000.05 Sony C6. Sony C6. Sony C6. Sony C7. Sony C9. Sony C9. Sony C30. Sony C40. SHARP VIDEO SI S000/381	UALS 27.95 38.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan M Pulnch Rolling Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Rolling Rewind Kit Video Hea C9 DC-DC Coo Ooor Asse Front Door Gear Kit Mideo Hea VID Amstrad W Ferguson Funch Rolling Finch Rolling VID Amstrad V	Assembly	.27.55 1.95 1.466 1.150 .22.50 .22.55 1.25 1.25 1.25 1.25 1.25 1.25 1.	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V13000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/24/45/47 Fisher FVH-DS20/P615/0 Hitachi V18000 Hitachi V18000 Hitachi V19300/9500 Hitachi V11/32E (genuitachi V1800) Nat. Pan. NV301 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV304 Nat. Pan. NV305 Nat. Pan. NV307 Nat. Pan.	ULBS 1.9 8.8 8.8 8.8 9.7 7.7 1.9 28.9 28.9 27.9 21.9 48.7 77.70 28.9 27.5 28.8
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX10 RFI Choke TX9. Tuner. TYS9/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Line 0/P Trans TX100 90. Cine 0/P Trans TX100 90. Tuner. FERGUSON VIDEO SPARE 3700/16/22 Capstan Motor Drum Motor Pinch Roller Take-Up Clutch (Small). Take-Up Clutch (Small). Take-Up Clutch (Small). Take-Up Clutch (Large). Video Head 3729/30 Booster Capstan Motor Pinch Roller Finch Roller Take-Up Clutch (Large). Video Head 3735/36 Capstan Motor Cassette Housing.	2.85	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler. FF/Rew Pulley. Pinch Roller Play Idler. Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pinch Roller Pinch Roller Video Head. V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley. Pinch Roller Video Head. V400H/V4002H AT100H/V411E Audio Head. Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head. V4004H/V713E Capstan Motor FF/Rew Idler Video Head. V4004H/V734E Capstan Motor FF/Rew Idler Video Head. V4004H/V735E Capstan Motor FF/Rew Idler Video Head. V4006H/V763E		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20-20 ITT CVC20 ITT CVC20-20 ITT CVC20-20 ITT CVC20 ITT CVC20-20 ITT CVC20-20 ITT CVC20 ITT CV	5,958,508,5016,9511,7512,8019,9511,9511,9514,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TY90. Ferguson TY90. Ferguson TY90. Fidelity AVS1800 Fidelity AVS1800 Fidelity CTV20R Fidelity C	UALS 27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pulnch Rolling Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Rolli Rewind Kit Video Hea C9 DC-DC Coo Ooor Asse Front Door Gear Kit Video Hea VID Amstrad V Ferguson Fergu	Assembly	27.55 1.95 1.95 1.95 1.95 1.95 1.95 1.95 1	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/00/23 Ferguson 3/02/21 (Plug) Ferguson 3/03/21 (Plug) Ferguson 3/03/22/21/23/23 Ferguson 3/03/24/45/45/47 Fisher FVH-D520/P615/D Hitachi VT13/03/03/500 Hitachi VT3/03/03/F01/25/23 Ferguson 3/03/24/45/45/45/47 Fisher FVH-D520/P615/D Hitachi VT3/03/03/F01/500/15/03/1	ULBS 1.9 8.8 8.8 8.8 9.9 7.7 7.7 1.9 5.5 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9
TX910 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote) Push Button TX10 RFI Choke TX9. Tuner. TY990100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 20" Line 0/P Trans TX100 20" Line 0/P Trans TX100 110 On/Off Switch (Remote) Push Button TX90 Tuner. FERGUSON VIDEO SPARE: 3V00/16/22 Capstan Motor Drum Motor Princh Roller Pilot Lamp Reel Idler Pilot Lamp Reel Idler Pilot Lamp Reel Idler Take-Up Clutch Take-Up Clutch Take-Up Clutch Take-Up Clutch Take-Up Clutch Capstan Motor Loading Motor Pinch Roller Pilot Lamp Reel Idler Take-Up Clutch Take-Up Clutch Take-Up Clutch Capstan Motor Cassette Housing Reel Idler Take-Up Clutch Take-Up Idler Tyleo Head	2.85 8.50 23.50 23.55 1.95 16.95 1.95 2.95 14.95 20.95 14.95 20.95 14.35 24.95 24.95 24.95 37.95 8.70 4.50 22.95 37.95 8.70 4.50 21.95	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler FF/Rew Pulley. Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler FF/Rew Idler Play Idler Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler FF/Rew Pulley. Play Idler Pinch Roller Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Pinch Roller Video Head V4004H/V733E Capstan Motor FF/Rew Idler Pinch Roller Video Head V4005H/V763E Capstan Motor FF/Rew Idler Video Head V4005H/V763E Capstan Motor End Sensor Video Head N4033 Reel Idler NV333 Pinch Roller		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY FERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC20/200 ITT DIgvision ITT Digvision Philips G11 I/S Full Rem Philips G11 I/S Text Philips G11 I/S Text Philips K13/30 Text Philips K13/30 IText Philips RC5 (Equivalent0. Sony RM604-RM606 Sony RM604-RM606 Sony RM605-SON RM605	5,958,508,5016,9511,9512,8019,9511,9514,9514,5014,5014,5017,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TY90/1 Fidelity AVS1600 Fidelity CTV14R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips G11 Philips K30. Serguson 3V29. Ferguson 3V29. Ferguson 3V4845 GEC V4005H Philips B52000.05. Sony C5. Sony C6. Sony C6. Sony C6. Sony C6. Sony C6. Sony C7. Sony C9. Sony C9. Sony C30. Sony C30. Sony C30. Sony C40. SHARP VIDEO SI S000.381 Capstan Motor Cassette Lamp. Pinch Roller	UALS 27.95 38.95 11.95 15.95 25.90 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	CS/C7 Ace Head Capstan M Pinch Rollie Rewind Kit Timer Lid. Video Hea C8 Capstan M Pulley Ass Pinch Rollie Reel Moto	Assembly	27.55 1.95	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V13000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/24/45/47 Fisher FVH-DS20/P615/0 Hitachi V18000 Hitachi V18000 Hitachi V19300/9500 Hitachi V11/32E (genuitachi V1800) Nat. Pan. NV301 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV304 Nat. Pan. NV305 Nat. Pan. NV307 Nat. Pan.	ULBS 1.9 8.8 8.8 8.8 9.9 7.7 7.7 1.9 5.5 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX90 Line 0/P Trans TX90 14" Line 0/P Trans TX90 14" Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 10 Line 0/P Trans TX100 90 Line 0/P Trans TX100 10 Line 0/P Line 0/P Trans LX100 10 Line 0/P Li	2.85 8.50 23.50 23.55 16.95 16.95 16.95 14.95 2.95 14.95 20.95 14.35 24.95 24.95 24.95 25.95 27.	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head Capstan Motor FF/Rew Pulley, Pinch Roller Piole Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley Pinch Roller Pinch Roller Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley Pinch Roller Video Head V4100H/V111E Audio Head Capstan Motor Clutch Assy, FF/Rew Idler Pinch Roller Video Head V400H/V713E Capstan Motor FF/Rew Idler Pinch Roller Video Head V400H/V7138 Capstan Motor FF/Rew Idler Pinch Roller Video Head V4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head V4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head V4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head V4005H/VT63E Capstan Motor FF/Rew Idler N333 Pinch Roller NV333 Pinch Roller NV333 Pinch Roller NV333 Pinch Roller NV333 Pinch Roller		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX90 ITT CVC37 ITT CVC37 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 10 N/Text Ferguson TX9 10 N/Text Ferguson TX9 10 Text Ferguson TX9 Text Ferguson T	5.9511.7512.8012.9512.9512.9512.9512.9513.9513.9514.95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX90. Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K130. Philips K30. Philips K35. Philips K30. Sony C80. Sony C80. Sony C8. Sony C8. Sony C9. Sony C9. Sony C9. Sony C30. Sony C40. SHARP VIDEO SI S000381 Capstan Motor Cassette Lamp Pinch Roller Reel Idler.	UALS 27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 3.50 1.00 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3	C5/C7 Ace Head Capstan M Pinch Rolli Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Rolli Rewind Kit Video Hea C7 C8 C9	Assembly	27.55 1.95	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/00/22 Ferguson 3/02/21 Fierguson 3/03/21 (Plug) Hitachi V78000 Nat Pan NV2000 Nat Pan NV2000 Nat Pan NV7000 Sharp VC8300 Sharp VC8300 Liniversal VIDEO HEAI Amstrad VCR7000 Amstrad VCR7000 Amstrad VCR7000 Ferguson 3/02/22/29/39 Ferguson 3/02/20/29/39/39 Ferguson 3/02/20/29/39/39/39/29/39/39/39/39/39/39/39/39/39/39/39/39/39	ULBS 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9 Line 0/P Trans TX10 On/Off Switch (Remote). Push Button TX10 RFI Choke TX9. Tuner. TX90/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 90. Tuner. FERGUSON VIDEO SPARE: 3V00/16/22 Capstan Motor Princh Roller Take-Up Clutch (Large). Video Head 3V29/30 Booster Capstan Motor Loading Motor. Pinch Roller Take-Up Clutch (Large). Video Head 3V29/30 Booster Capstan Motor Capstan Motor Loading Motor. Pinch Roller Take-Up Clutch (Large). Video Head 3V35/36 Capstan Motor Cassette Housing. Reel idler. Take-Up Clutch Take-Up Idler Take-Up Clutch	2.85 	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler Pinch Roller Play Idler Video Head V4100H/V4002H 9300E-9500E Capstan Motor FF/Rew Pulley. Pinch Roller Play Idler Video Head V4100H/V4002H 9300E-9500E Capstan Motor FF/Rew Pulley. Play Idler FF/Rew Pulley. Play Idler Video Head Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head V400H/V713E Capstan Motor Clutch Assy. FF/Rew Idler Pinch Roller Video Head V400H/V733E Capstan Motor FF/Rew Idler Video Head V400H/V763E Capstan Motor End Sensor Video Head V400H/V763E Capstan Motor End Sensor Video Head N400H/V763E Capstan Motor End Sensor Video Head		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/20 IT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 ITT CVC20/20 IT CVC20/20	5,958,508,5016,9511,7512,9511,7512,9511,9513,9514,95	TELEVISION Ferguson TX9 Ferguson TX10. Ferguson TX10. Ferguson TX90 Ferguson TX90 Ferguson TY90/1 Ferguson TY90/1 Fidelity AVS1800 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-E Philips K13 Philips K30. Ferguson 3V29 Ferguson 3V29 Ferguson 3V29 Ferguson 3V44/45 GEC V4005H Philips E620/00.05 Sony C5. Sony C6. Sony C6. Sony C6. Sony C6. Sony C7. Sony C9. Sony C9. Sony C9. Sony C9. Sony C9. Sony C30. Sony C40. SHARP VIDEO SI S900/381 Capstan Motor Cassette Lamp Pinch Roller Reel Idler Reel Idler Reel Idler	UALS 27.95 38.95 11.95 11.95 15.95 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	CS/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid . Video Hea C6 Capstan M Pulley Ass Pinch Rolli Rewind Kit Video Hea C9 DC-DC Col Oor Asse Front Door Gear Kit Golde Pinl Pinch Rolli Video Hea WID Amstrad V Ferguson . Serguson . Ferguson . Ferguson . Ferguson . Serguson . Ferguson	Assembly	27.55 1.55 1.55 1.55 1.55 1.46 1.55 1.45 1.45 1.45 1.45 1.45 1.45 1.55	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V13000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/24/45/47 Fisher FVH-D520/F615/0 Hitachi V13000/9500 Hitachi V13000/9500 Hitachi V11/33E (genuit Aliachi V13000/9500 Hitachi V11/33E (genuit Nut. Pan. NV301 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV300 Nat. Pan. NV300 Nat. Pan. NV4000 Nat. Pan. NV7000 Sanyo VT6R6462/6520 Sanyo VT6C86462 Sanyo VT6C86463 Sanyo VT6C87UB Sony SLC5/6/7UB Sony SL	ULBS 1.9 8.8 8.8 9.9 7.7 7.7 7.7 7.5 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 27.9 28.9 29.9 29.9 20
TX910 Dual PTC Dual PTC Dual PTC Dual PTC Dine O/P Trans TX9 Dine O/P Trans TX9 Dine O/P Trans TX10 On/Off Switch (Remote) Push Button TX10 RFI Choke TX9 Tuner TY990100 Dine O/P Trans TX90 14" Line O/P Trans TX90 20" Line O/P Trans TX100 90 Line O/P Trans TX100 110 On/Off Switch (Remote) Push Button TX90 Tuner FERGUSON VIDEO SPARE 3V00/16/22 Capstan Motor Drum Motor Pinch Roller Pilot Lamp Reel Idler Pilot Lamp Reel Idler Pilot Lamp Reel Idler Take-Up Clutch Take-Up Clutch Take-Up Clutch Capstan Motor Cassette Housing Reel Idler Take-Up Clutch	2.85 	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/VT8000 Audio Head Capstan Motor FF/Rew Pulley, Pinch Roller Piole Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley Pinch Roller Pinch Roller Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Pulley Pinch Roller Video Head V4100H/V111E Audio Head Capstan Motor Clutch Assy, FF/Rew Idler Pinch Roller Video Head V400H/V713E Capstan Motor FF/Rew Idler Pinch Roller Video Head V400H/V7138 Capstan Motor FF/Rew Idler Pinch Roller Video Head V4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head V4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head V4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head V4005H/VT63E Capstan Motor FF/Rew Idler N333 Pinch Roller NV333 Pinch Roller NV333 Pinch Roller NV333 Pinch Roller NV333 Pinch Roller		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX10 FERGUSON TX10 FERGUSON TX90 ITT CVC57 WAY ITT CVC20/200 ITT CVC57 WAY ITT CVC20/200 ITT CVC20/200 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 U/S Basic Ferguson TX9 U/S Basic Ferguson TX9 U/S Basic Ferguson TX9 IVS	5,958,508,5016,9511,7512,9511,7512,9511,9513,9514,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TX90. Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20R Fidelity CTV20T GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K130. Philips K30. Philips K35. Philips K30. Sony C80. Sony C80. Sony C8. Sony C8. Sony C9. Sony C9. Sony C9. Sony C30. Sony C40. SHARP VIDEO SI S000381 Capstan Motor Cassette Lamp Pinch Roller Reel Idler.	UALS 27.95 38.95 11.95 11.95 12.90 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rollin Rewind Kir Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Rolli Redel Moto Reel Moto	Assembly	27.55 1.55 1.55 1.55 1.55 1.55 1.45 1.55	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/02/19 [lug] Hitachi VT8000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Longital Control of the Control of t	SULBS 1.9 8.8 8.8 8.8 9.9 7.7 7.7 1.9 5.5 27.9 28.9 27.9
TX910 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9. Line 0/P Trans TX9. Line 0/P Trans TX10. On/Off Switch (Remote). Push Button TX10 RFI Choke TX9. Tuner. TYS90100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 920" Line 0/P Trans TX100 920" Line 0/P Trans TX100 930 Line 0/P Trans TX100 930 Tuner. FERGUSON VIDEO SPARE: 3V00/16/22 Capstan Motor Pinch Roller Take-Up Clutch (Large). Video Head 3V23/30 Booster Capstan Motor Loading Motor. Pinch Roller Take-Up Clutch (Large). Video Head 3V35/36 Capstan Motor Cassette Housing Reel Idler Take-Up Clutch Take-Up Idler Video Head 3V35/36 Capstan Motor Cassette Housing Reel Idler Take-Up Clutch Take-Up Clut	2.85	HM6232 HM6231 HM6232 HM6251 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head. Capstan Motor FF/Rew Idler Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler FF/Rew Idler Pinch Roller Play Idler Video Head V4100H/V4002H 9300E/9500E Capstan Motor FF/Rew Idler FF/Rew Pulley Play Idler Pinch Roller Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy, FF/Rew Idler Pinch Roller Video Head V4004H/V733E Capstan Motor End Sensor Video Head V4005H/V7638 Capstan Motor End Sensor Video Head V4005H/V7638 Capstan Motor End Sensor Video Head V4005H/V7638 August Augus		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20/200 ITT CVC20/200 ITT CVC45 (PORT) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 U/S Basic Ferguson TX9 U/S Basic Ferguson TX9 U/S Basic Ferguson TX9 ID/Text Ferguson TX30 VI/Text Philips G11 I/S Full IRem Philips K13/30 IVFext Philips RC5 Sany RM603 Sony RM604 Sony RM605 Sony RM	5,958,508,5016,9511,7512,9611,7512,9611,7512,9611,9511,9511,9514,95	TELEVISION Ferguson TX9. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX10. Ferguson TX100 Ferguson TX100 Ferguson TY20/ Fidelity AVS1600 Fidelity AVS1600 Fidelity CTV14R Fidelity CTV20T GEC C1403H GEC C1403H GEC C1405H GEC C1407H Philips CTX-E Philips CTX-E Philips CTX-S Philips K13 Philips K30. Philips S52000.05 Sony C50. Sony C6. Sony C6. Sony C6. Sony C7. Sony C9. Sony C30. Sony C40. SHARP VIDEO SI 9300.381 Capstan Motor Cassette Lamp. Pinch Roller Reel Motor Unlock Assembly	UALS 27.95 38.95 11.95 11.95 12.90 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	CS/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid. Video Hea C8 Capstan M Pulley Ass Pinch Rollin Red Moto Reel Moto	Assembly	27.55 1.55 1.55 1.55 1.55 1.55 1.55 1.45 1.55	V.C.R. PILOT BI Amstrad 7000 Ferguson 3V00/22 Ferguson 3V00/22 Ferguson 3V23 (Plug) Ferguson 3V23 (Plug) Hitachi V13000 Nat. Pan. NV2000 Nat. Pan. NV2000 Nat. Pan. NV7000 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Amstrad VCR7000 Ferguson 3V02/24/45/47 Fisher FVH-D520/F615/0 Hitachi V13000/9500 Hitachi V13000/9500 Hitachi V11/33E (genuit Aliachi V13000/9500 Hitachi V11/33E (genuit Nut. Pan. NV301 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV303 Nat. Pan. NV300 Nat. Pan. NV300 Nat. Pan. NV4000 Nat. Pan. NV7000 Sanyo VT6R6462/6520 Sanyo VT6C86462 Sanyo VT6C86463 Sanyo VT6C87UB Sony SLC5/6/7UB Sony SL	SULBS 1.9 1.9 5.8 8.8 8.8 9.9 7.7 7.7 1.9 5.5 DS 27.9 28.9 27.9 28.9 27.9 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5
TX9/10 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9. Line 0/P Trans TX10. On/0ff Switch (Remote). Push Button TX10. RFI Choke TX9. Tuner. TYS0/100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 20" Line 0/P Trans TX100 110. On/0ff Switch (Remote). Push Button TX90. Tuner. FERGUSON VIDEO SPARE: 3V00/16/22 Capstan Motor Drum Motor Princh Roller. Take-Up Clutch (Small). Take-Up Clutch (Large). Video Head. 3V29/30 Booster Capstan Motor Loading Motor. Princh Roller. Pilot Lamp Reel Idler. Take-Up Idler. Video Head. 373/35/36 Capstan Motor Cassette Housing Reel Idler. Take-Up Clutch. Take-Up Idler. Video Head. 373/35/36 Capstan Motor Cassette Housing Reel Idler. Take-Up Idler. Video Head. 3744/45 Capstan Motor Cassette Housing Reel Idler. Take-Up Idler. Video Head. 3744/45 Capstan Motor Cassette Housing Cassette Housing Sassette Housing Cassette Housing Cassette Housing Cassette Housing Cassette Housing	2.85 8.50 23.50 23.55 1.95 16.95 1.95 1.95 2.95 14.95 20.95 14.35 24.95 24.95 24.95 37.95 8.70 4.50 22.95 37.95 8.70 4.50 21.95 24.95 22.95 37.95 37.95 24.95 24.95 37.95 37.95 24.95 24.95 22.95 37.95 37.95 37.95 37.95 37.95 37.95	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller Video Head V4100H/V4002H V300E/9500E Capstan Motor FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Idler FF/Rew Idler FF/Rew Idler FF/Rew Idler FF/Rew Idler Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Pinch Roller Video Head V4004H/VT33E Capstan Motor FF/Rew Idler FF/Rew Idler Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Nideo Head N4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head N4005H/VT63E Capstan Motor FF/Rew Idler N4006H/VT33D Capstan Motor FF/Rew Idler N4006H/VT63E Capsta		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20730 ITT CVC20730 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 IVS Basic Ferguson TX9 IVS Full Text Ferguson TX9 IVS Full Text Ferguson TX9 IVS Full Fext Fidelity CTV14S Fidelity Teletext Grundig TP400 Forundig TP400 Forundig TP400 Text ITT Digivision Philips G11 IVS Full Rem. Philips R173/30 Text Philips R173/30 Text Philips K173/30 NText Philips K173/30 NText Philips K173/30 Text Philips K174/30 Text Philips K174/30 Text	5,958,508,5016,9511,7512,8019,9511,9511,9514,9514,9514,9517,9514,9517,9514,9517,9514,9517,9514,9514,9514,9515,9514,9514,9514,9514,9514,9514,9516,9514,9516,9514,9516,9514,9516,9514,9516,9514,9516,9514,9516,9514,9516,9514,9516,9514,9516,9514,9516,9517,70 RES	TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX10. Ferguson TX90. Ferguson TX100 Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R. Fidelity CTV20T GEC C1403H GEC C1403H GEC C1407H Philips CTX-E. Philips CTX-E. Philips CTX-S. Philips K130. Philips K30. P	UALS 27.95 38.95 11.95 15.95 25.90 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Rollin Rewind Kit Timer Lid. Video Hea C6 Capstan N Pilley Ass Pinch Rollin Rewind Kit Video Hea C9 DC-DC Cor Oor Asse Front Door Gear Kit Cit Cit Cit Cit Cit Cit Cit Cit Cit C	Assembly	27.55 1.55 1.55 1.55 1.55 1.55 1.55 1.55	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/02/29 Ferguson 3/02/29 Ferguson 3/03/29 [Plug) Hitachi V18000. Nat. Pan. N/2000 Nat. Pan. N/2000 Nat. Pan. N/7000 Sharp VC8300 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Ferguson 3/02/29/39 Ferguson 3/02/29/39/39 Ferguson 3/02/29/39/39 Ferguson 3/02/29/39/39/39/39/39/39/39/39/39/39/39/39/39	SULBS 1.9 5.8 8.8 8.8 9.7 7.7 7.9 1.9 5.5 DS 27.9 28.9 27.9 28.9 27.9 27.5 27.5 27.5 27.5 27.5 27.5 27.5 27.5
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TX910 Dual PTC Focus Unit TX10. Line 0/P Trans TX9 Line 0/P Trans TX9. Line 0/P Trans TX9. Une 0/P Trans TX10. On/Off Switch (Remote) Push Button TX10. RFI Choke TX9. Tuner TX90100 Line 0/P Trans TX90 14" Line 0/P Trans TX90 20" Line 0/P Trans TX100 20" Line 0/P Trans TX100 100. Line 0/P Trans TX100 110. On/Off Switch (Remote) Push Button TX90. Tuner FERGUSON VIDEO SPARE: 3V00/16/22 Capstan Motor Drum Motor Princh Roller Take-Up Clutch (Small) Take-Up Clutch (Large) Video Head 3V29/30 Booster Capstan Motor Loading Motor Princh Roller Pilot Lamp Reel Idler Take-Up Clutch Take-Up Idler Video Head 3V3/35/26 Capstan Motor Cassette Housing Reel Idler Take-Up Clutch Take-Up Clutch Take-Up Clutch Take-Up Idler Video Head 3V3/35/26 Capstan Motor Cassette Housing Reel Idler Take-Up Clutch Take-Up Idler Video Head 3V34/45 Capstan Motor Cassette Housing Reel Idler Take-Up Idler Video Head	2.85	HM6232 HM6231 HM9032 STR6020 (Kit) VIDEO SPAI V4000H/V78000 Audio Head Capstan Motor FF/Rew Idler FF/Rew Pulley Pinch Roller Video Head V4100H/V4002H V300E/9500E Capstan Motor FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Pulley Play Idler FF/Rew Idler FF/Rew Idler FF/Rew Idler FF/Rew Idler FF/Rew Idler Video Head V4100H/V711E Audio Head Capstan Motor Clutch Assy FF/Rew Idler Pinch Roller Video Head V4004H/VT33E Capstan Motor FF/Rew Idler FF/Rew Idler Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Video Head V4004H/VT33E Capstan Motor FF/Rew Idler Nideo Head N4005H/VT63E Capstan Motor FF/Rew Idler Nideo Head N4005H/VT63E Capstan Motor FF/Rew Idler N4006H/VT33D Capstan Motor FF/Rew Idler N4006H/VT63E Capsta		AMSTRAD CTV1401 AMSTRAD/ITT 6 WAY PERGUSON TX9 FERGUSON TX9 FERGUSON TX90 FERGUSON TX90 ITT CVC57 WAY ITT CVC879 ITT CVC20730 ITT CVC20730 ITT CVC45 (PORT.) PHILIPS G8 (S/L 550) PYE G11 TIP SWITCH RBM T20A 6 WAY REMOTE CONTROL Amstrad CTV2210 Text Ferguson TX9 IVS Basic Ferguson TX9 IVS Full Text Ferguson TX9 IVS Full Text Ferguson TX9 IVS Full Fext Fidelity CTV14S Fidelity Teletext Grundig TP400 Forundig TP400 Forundig TP400 Text ITT Digivision Philips G11 IVS Full Rem. Philips R173/30 Text Philips R173/30 Text Philips K173/30 NText Philips K173/30 NText Philips K173/30 Text Philips K174/30 Text Philips K174/30 Text	5,958,508,5016,9511,7512,8019,9511,9514,9514,9514,9514,9517,9514,95	TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX10. Ferguson TX90. Ferguson TX100 Ferguson TX90. Ferguson TX90. Ferguson TX90. Ferguson TX90. Fidelity AVS1600 Fidelity AVS2000 Fidelity CTV14R. Fidelity CTV20T GEC C1403H GEC C1403H GEC C1407H Philips CTX-E. Philips CTX-E. Philips CTX-S. Philips K130. Philips K30. P	27.95 38.95 11.95 15.95 25.90 2.50 2.50 2.50 2.50 2.50 2.50 2.50 2.5	C5/C7 Ace Head Capstan M Pinch Roll Rewind Kit Timer Lid. Video Hea C6 Capstan M Pulley Ass Pinch Roll Rewind Kit Video Hea C9 DC-DC Coo Ooor Asse Front Door Gear Kit Cit Cit Cit Cit Cit Cit Cit Cit Cit C	Assembly	27.55 1.55	V.C.R. PILOT BI Amstrad 7000 Ferguson 3/00/22 Ferguson 3/02/29 Ferguson 3/02/29 Ferguson 3/03/29 [Plug) Hitachi V18000. Nat. Pan. N/2000 Nat. Pan. N/2000 Nat. Pan. N/7000 Sharp VC8300 Sharp VC8300 Universal WIDEO HEAI Amstrad VCR4500/9000 Ferguson 3/02/29/39 Ferguson 3/02/29/39/39 Ferguson 3/02/29/39/39 Ferguson 3/02/29/39/39/39/39/39/39/39/39/39/39/39/39/39	ULBS 1.99 5.88 8.89 9.70 7.70 7.70 7.70 7.70 7.70 7.70 7.7

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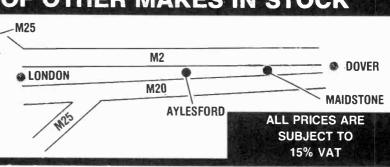
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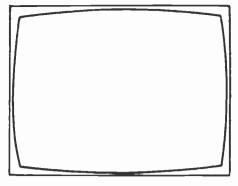
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John A. Reddihough

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COVER PHOTO

This month's cover photograph shows the memory module used in the Panasonic Model NV-D80 VCR. The two 1Mbit memory chips can be seen on the left: the memory control gatearray chip is to the left of centre. An account of the digital video signal processing made possible by the use of these chips will be featured in Part 2 of our new series "Storing TV Pictures in Chips" next month. Part 1 starts on page 584.

TELEWISIOM

Over to You What's this? - a questionnaire (see pages 599-601). Your first reaction might be to suspect that the magazine is a bit uncertain about what it's up to. Not so, really: our main concerns are and will as always be to keep readers abreast of technical developments in the TV/video field and to pass on hints and tips of help in servicing and making use of domestic TV/video equipment. But we need help to ensure that we are doing this in the most effective way that serves readers best. Hence this month's questionnaire, which gives you a chance to tell us what you think about the magazine

and will thus help us to formulate policy in the immediate future.

We have included reader questionnaires before. The last time was in September 1981. Some readers at the time may not have been aware of it, since the questionnaire was included as a loose item in only some one in six copies. This time we thought it best to enable all readers to record their views. We hope you will do so: the more replies we receive, the more accurate our picture of readers and their requirements will be. The questionnaire has been designed to provide us with information that will serve as a guide to policy in general, not just editorial policy. So if you are wondering why on earth we should, for example, be interested in the daily newspaper you read, well the aim in this case is to obtain information that will suggest suitable places in which to advertise the magazine.

Last time we had a gratifyingly large response – it was also reassuring to us that most readers indicated satisfaction with the magazine as it was at the time. But nearly seven years is a long time in electronics and much has changed. The magazine has certainly had to change, in particular to cater for the growing importance of video equipment. Perhaps we have not changed in the ways you would prefer. If so, you now have an

opportunity to tell us.

There are several "open" questions that have been included to enable you to pinpoint your particular likes and dislikes. These are going to be difficult for us to handle, because the answers we receive will be statistically analysed by a computer, and computers like everything to be cut and dried. So we must ask you to be concise with such comments you may wish to make. If you want to go into detail you can always drop a line to the editor. Letters and the information and views they provide are always

There is one fatal flaw for us in this sort of exercise. Most of those who reply will be committed readers. We'd also like to hear from those who might be interested but don't get to see the magazine. There is of course nothing we can do about this. It's also a fact that any publication has to be a compromise to some extent. We'd like the magazine to be twice the size with wider coverage, to appear say fortnightly instead of monthly, printed on glossy paper and so on. But to remain viable we have to accept that there are constraints on what we can do. This does not imply that you should feel there is any limitation on the views and opinions you may wish to offer: we mention the point only to explain why it may not be feasible to follow up some suggestions, however sensible and

well meaning they may be.

We already receive letters from readers offering their views. One point that has been made on several occasions is that we don't at present publish many articles on servicing particular TV sets/chassis. This is not however a result of deliberate editorial policy but reflects the vastly increased reliability of the TV receivers produced in recent years. We have at various times dealt with all the better known older chassis and their quirks. If you handle a variety of makes and models it's hard, with recent products, to build up a history of recurrent faults. We suspect that with modern sets it would be necessary to handle really large numbers to be able to write about general fault diagnosis rather than particular faults. It's also a fact that many sets use similar circuitry and tend to suffer from just one or two types of failure – all those models with TDA4600-based power supplies for example. Be that as it may, there is probably a lot of experience readers could pass on to others. So if any of you can fill in the gaps, please don't hesitate to do so. All articles included in the magazine are paid for shortly after publication. We've had little to say about many ranges, such as Mitsubishi, Toshiba, Sanyo and so on. We know that these are reliable products, but if anyone wishes to contribute any know-how they

would be more than welcome to do so. Typing is not essential, and rough sketches or references to manuals are acceptable by way of illustrations.

One thing that has become clear from the recent correspondence on servicing in our letters pages is the wide diversity of approaches and requirements today. No one wants to encourage the bodger, that's for sure, but there is a wide range of servicing activities that extends from specialist handling of the latest and more sophisticated equipment at one extreme to getting the most out of older sets at the the other. This brings into focus the fact that what's economic to repair in one context differs considerably from what's feasible in another. If you've invested in a lot of specialised equipment and employ highly trained staff you probably won't welcome a stream of hybrid colour sets with worn tubes. Nevertheless some people like to and others have to keep the older sets going. There is thus a place for a wide range of activities in the servicing field.

The job of an editor is to be responsive to the needs of his readers. You can help by sending in completed questionnaires. Strict confidentiality is assured: nearly all the work of assessing the replies will be done by computer. So it's over to you.

Servicing the Decca 80 and 100 Chassis

Nick Beer

While these sets are now getting on a bit, many are still in service. Most continue to give excellent results, particularly 20in. 80 series sets in which the displays produced by a lot of the c.r.t.s have remained as crisp and sharp as when new.

Sets fitted with the 80 series chassis have 18 or 20in. tubes of the Toshiba SSI type. The 88 variant has a 20in. PIL tube. By far the most common sets you come across these days are the 20in. ones. The 100 series chassis was designed for use with the 20AX tube, mainly 22 and 26in. types. These are the general rules but you may, for example, come across a 100 series chassis with a 20in. tube.

The chassis themselves differ in the number of panels – the 100 chassis has an extra panel which contains mainly convergence circuitry. The power supply, decoder and i.f. panels are interchangeable between chassis. Fig. 1 shows the basic layout of the 80 and 100 chassis. These views are with the chassis in the fixed position: raising the chassis will reveal the line output panel (with the 100 series the field output transistors are also mounted on this side of the chassis).

Power Supply Faults

The power supply panel is responsible for the most tricky faults, but even these are usually quickly sorted out once you get to know these sets.

In the event of a dead set the mains fuse will almost certainly be open-circuit (but see also the timebase chassis with the 80/88 chassis). If this is the case, check the bridge rectifier diodes D600-603. They usually go short-circuit in pairs and are ordinary BY127s. Note however that some of the diodes nowadays supplied as BY127s do not last in these positions and are considerably smaller than the originals. My rule is to ensure that the replacement device is as big as the original.

If these are in order and the mains filter capacitor C8 on the mains input/tuner panel is o.k., proceed as follows. Open link TP600-601 on the power supply panel, wire a 100W bulb across it, disconnect the e.h.t. tripler's input lead, replace the fuse and switch on. If the lamp lights up the fault is still present and attention should be turned to the line output panel (see later). If the lamp doesn't light, replacing the tripler should cure the fault – but leave the lamp connected until the point has been proved. When the repairs have been completed, restore the link – it's the enabling link for the crowbar trip.

The power supply panel usually contains the answer to intermittent fuse blowing – the time intervals can be anything from several minutes to several months. The first thing to do is to check whether a $12k\Omega$, 1W resistor is fitted in series with D617. This usually ends the story, but if the problem persists check the following points.

- (1) The h.t. setting. The correct voltage depends on the c.r.t. size, and is critical. With the 80/88 chassis the reading across C801 should be 165V. With the 100 chassis it should be 168V
- (2) Check that the covering of the degaussing coils has not been pierced and that the coils are well clear of the e.h.t. cap at the top of the c.r.t. Clean the cap as a matter of course.

(3) If the fault persists, replace the following items on spec: D617 (186V zener diode), TY600 (DEC1), TY601 (DEC2) and the 6.8Ω section of the dropper resistor (R801).

All this assumes that you've isolated the fault to this panel – see also the timebase panels for further information on these symptoms.

On rare occasions a blown mains fuse is caused by TY600/TY601 going short-circuit – sometimes one goes, sometimes both. They are special Decca types (DEC1 and DEC2).

The only other point worth making about this panel is to resolder the legs of R601 whenever one of these sets comes in. This is the large wirewound resistor in the middle of the panel, on stand-off pillars. Dry-joints are becoming a problem here.

The IF Panel

The i.f. panel is the second interchangeable one and is relatively reliable. Intermittent sound, intermittent vision and uncontrollable volume are all caused by its main failing – dry-joints on the two multi-pin plugs and sockets. A solder around these is always worthwhile, whatever the fault.

Distorted sound is not uncommon. Half the time the cause is the 16Ω , 7×4 in. loudspeaker. The other main cause is the TBA800 audio output chip IC104 which is under the silver fin type heatsink. Occasionally the BD533 37V shunt regulator transistor Tr801, which is bolted to the chassis under the tripler, will give similar symptoms. I've found that the speaker is becoming somewhat difficult to obtain from general suppliers, but is no problem from Decca (D and S Electronics).

A.G.C. faults have always been similar and have been caused by IC102 (TCA270S). Replacing this i.c. has also cured the very few cases of a negative picture I've encountered.

The Decoder Panel

The decoder panel is the last interchangeable one and is probably the most trouble free. The vision signal from the i.f. panel enters at P200 – the single red and white lead goes to the bottom right-hand corner of the panel. Pulling this provides a convenient way of getting a raster with which to set the grey scale in the field.

Assuming that the tube is all right, if one primary colour is missing the cause is usually the relevant BF458 R/G/B output transistor Tr204/6/2. For some reason, this is becoming a less common fault these days. By far the most common fault with this panel is no luminance due to dry-joints on the luminance delay line DL200 – I've also had the odd one go open-circuit.

Intermittent black lines on the picture are usually caused by dry-joints on the single socket on this panel. The same trouble can cause intermittent colour. Careful resoldering will very often save call-backs. No colour at all is generally due to the 4.43MHz crystal Z200, but this fault is not common. The i.c.s on this panel seem to be very reliable.

An over-bright raster with flyback lines probably means that the 7.5V zener diode D207 is faulty. If the set is left on in this condition the mains fuse will blow. D207 can also be

responsible for no picture (RGB output transistors cut off) or varying brightness. The 6-8V zener diode D200 can also be the cause of excessive brightness while D202 (25V) can give the no raster symptom (check whether R246 has sprung open).

Timebase Panel - 80 Series

There are four plugs and sockets on the 80 series timebase panel and the most common trouble is, you guessed it, dry-joints! This is the other cause of intermittent fuse blowing.

It's not uncommon to find no sync after replacing the tripler. In this event the most likely cause is that IC300 (TBA920) has been dealt a deathly blow by the offending tripler. It plugs in, so replacement is very straightforward.

There are two slightly different versions of this panel. The 80 chassis panel for use with SSI tubes has three separate R/G/B first anode controls. With the PIL tube 88 chassis the panel has a single A1 potentiometer which is referred to as the preset brightness control. These potentiometers are all $2 \cdot 2 \text{M}\Omega$ types and all suffer form noisy tracks. The result is varying brightness or grey-scale as relevant. I always replace rather than clean them as experience has proved that this saves call-backs.

If the set is dead and the mains fuse is intact the $5.1k\Omega$, 5W start-up resistor R324 is probably open-circuit.

For field distortion you won't go far wrong by replacing IC301 (TDA1170). If there's no field scan at all R342 (repairable fusible) will probably have gone open-circuit, indicating a fault in IC301.

Line Output Panel - 80 Series

Access to the line output panel in 80 series sets is obtained by raising the chassis and removing the single screw that holds the screening can. Removing the two small bolts on the side of the chassis will then allow the panel to be lifted out. To remove the panel completely, the two plugs, the tripler's input lead, the leads to the line output transistor and the c.r.t.'s heater leads all have to be disconnected, making this the least serviceable panel.

This panel may well hold the key to a blown mains fuse. If you find that a bulb fitted to the power supply (see earlier) still lights after replacing the tripler, the line output transformer could well have gone down as well. If the tripler proves to be blameless, the transformer is the next most likely cause – a clue is provided by the fact that the windings will get warm rapidly if the set is left on with the bulb connected. I always leave the bulb connected to ensure that the tripler isn't also faulty. One piece of information gained over the years is that the bright blue Siemens triplers rarely fail.

A fairly common trouble spot is D400 (BYX55-600) which goes open-circuit, removing the 37V rail. As a result there's no supply to the timebase panel or the signals panels.

If dry-joints develop on the plugs and are not repaired quickly they will flare up, the result being a melted plastic plug and shrivelled print.

Convergence Panel – 100 Series

The convergence panel in the 100 chassis always looks as if most of the components are missing! A lot of the same rules apply as for the 80 series panels – dry-joints etc. The line scan correction capacitor C508 (910nF) is a regular fuse blower and most times you won't need to be a Sherlock

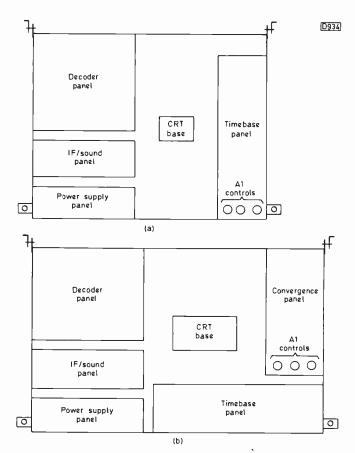


Fig. 1: Basic chassis arrangements, (a) 80 chassis, (b) 100 chassis. The 88 chassis is as shown at (a) but with a single preset brightness control replacing the A1 controls.

Holmes to find this out as it has a habit of melting all over the panel. It's of the same type as in the Philips G11 and the Bang and Olufsen 35XX chassis.

The $2 \cdot 2M\Omega$ first anode potentiometers are the same as in the 80 chassis and suffer from the same ailments – but I have seen some fitted with a gun switch arrangement as in the G11.

Timebase Panel - 100 Series

The main cause for concern in the timebase section of the 100 chassis is the BD278A field output transistors, which are mounted on the black heatsink behind the panel. They cause all manner of faults depending on whether or not they both go short-circuit. Complete field collapse will very often blow the mains fuse as the fusible link (R510) in the supply to the field timebase won't open in time.

The TBA920 chip provides the sync and line generator functions as in the 80 series and can again suffer when the tripler fails. For VCR compatibility, earth pin 10 of this chip.

A common fault in the past has been failure of R371 $(2\cdot2k\Omega)$ which was originally underrated. By now most sets will have had a 1W replacement fitted.

Line Output Panel - 100 Series

The line output panel in the 100 chassis is somewhat easier to remove since the line output transistor is mounted on the panel rather than the chassis, but this means reduced reliability – the BU205 line output transistor in the 80 series chassis hardly ever fails, but the BU208A in the 100 chassis goes as often as you would expect it to. As with the 80 series, tripler and line output transformer failures are not

uncommon. There are one or two other trouble spots in the 100 chassis however. The main problems concern the two diodes in the EW modulator circuit, D401 (BY223) and D402 (BYX71-600), and the 37V supply reservoir capacitor C407 (680 μ F, 40V). You may well find that the capacitor has leaked physically. It should be uprated to 63V. The two diodes either go short-circuit, blowing the fuse, or opencircuit, with the result of bowed picture edges.

The extra plug (no heater connections on top of the line output transformer) represents another chance for dry-joints to develop. All sockets should be checked each time.

General Points

A few final points. When replacing the chassis, make sure that the R/G/B leads don't rest on the dropper resistor or they will melt. The 470Ω log. slider volume control used in the 80 series tends to become very noisy – 7mm plastic nuts hold the front panel on which it's mounted. Tuning drift is normally caused by a noisy button unit. Replacement is straightforward: after removing the previously mentioned front panel there are only three leads to solder. The ELC1043/05 tuner can cause snowy pictures. A repair is usually possible by resoldering the connections around the input. Decca even provide slots in the PCB to push the leads away when desoldering, in case you forget your braid and sucker!

The base panels for the various tube types differ but

suffer from the same very minute faults – mainly clogged spark gaps that arc (SG700 etc.). In the 100 chassis the fusible resistor (R709) in the heater supply tends to become dry-jointed. The result is fading or no picture.

The Mullard A56-500X and A66-500X 20AX tubes by now tend to be low in emission. Reactivation works well most times. The Toshiba 510JKB22 tube has two weaknesses. The heater can go open-circuit, giving the no picture symptom, and intermittent shorts between electrodes can produce a bright red, green or blue raster.

For no tuning, suspect the tuning voltage supply resistors R4 and R5, one $12k\Omega$ and the other $15k\Omega$. One or other will usually be found open-circuit.

A rattling mains transformer is not uncommon: plastic seal left to set will provide a lasting cure. Always check the main reservoir/smoothing electrolytics C800/801. This combined unit is bolted to the chassis and tends to bubble out causing, eventually, a hum bar.

As you can see, there are varied faults with these chassis. None cause real problems apart from the odd case of intermittent fuse blowing. These receivers make excellent rental sets, having a convenient panel arrangement and being very easy to repair. For a more detailed treatment of faults etc., refer to the November and December 1980 issues of *Television*. The official Decca spares source is now D and S Electronics, Building 15, Unit 4, Stanmore Industrial Estate, Bridgnorth, Salop WV15 5HR, telephone 0746 766 641 (Tatung no longer hold spares for sets of this age).

Long-distance Television

Roger Bunney

March is often said to come in like a lion and depart like a lamb. Unfortunately from the DX viewpoint conditions remained akin to the latter animal throughout, and very little to excite us was seen. The weather gave scant encouragement, with winds and rain, though a settled period over the 8-9th produced a slight tropospheric lift, with reception in Band III and at u.h.f. from Holland, Belgium, Luxembourg, and West Germany just making it. Several enthusiasts welcomed sightings of the new Dutch NOS-3 transmitters on chs. E30, 34, 35 and 42, though it must be said that our Benelux counterparts are far less impressed since it leaves them with fewer channels for DXing.

There was minimal Sporadic E reception, though short-duration signals lasting for several minutes were noted. The log, such as it is, follows:

3/3/88 TVE (Spain) ch. E2; SR (Sweden) E3; RUV (Iceland) E4, TSS (USSR) R1.

4/3/88 CST (Czechoslovakia) R1; NRK (Norway) E2.

6/3/88 TVE E2, 3, 4.

7/3/88 CST R1; TVP (Poland) R1.

8/3/88 TVE E2, 3.

9/3/88 SR E2, 3.

16/3/88 NRK E4.

17/3/88 TVE E3; TVP R2; CST R2.

18/3/88 RAI (Italy) IA; TVE E3.

20/3/88 TVE E2; SR E2.

21/3/88 CST R1.

23/3/88 TVE E2.

24/3/88 TVP R2. 25/3/88 TVE E2, 3, 4; SR E2, 3, 4.

28/3/88 CST R2; NRK E3.

29/3/88 TVP R2; CST R2; NRK E4.

30/3/88 SRG (Switzerland – German language service) E3; TVP R2; CST R2; NRK E4.

My thanks to Simon Hamer (Powys), Bill Cotterill (Tipton), Roger Fussell (Torpoint) and David Oliver (Birmingham) for sending in details of their loggings.

Hugh Cocks writes from the Algarve, Portugal with brighter news. He reports that TE (trans-Equatorial skip) propagation was active during March. On several afternoons he received signals, at times strong, from ZTV (Zimbabwe) on ch. E2, with the familiar Z caption. There were no signs of ch. E2 signals from NTV (Nigeria) or GBC (Ghana) however. On March 26/27th Hugh logged Brazilian TV on ch. A2, with Portuguese sound. The signal was fluttery, becoming a viewable picture at times, and was present from around 2200 to about 0100. Weak sync pulses were present during this period in ch. A3. Apparently weak sync pulses in ch. A2 are quite common and can be heard at "scanner" level. On the same night Hugh received tropospheric signals from the Canary Islands in ch. E3. Since Brazil is in the same direction he wonders whether the signals from that country received tropospheric enhancement at the end of their

Robert Copeman at Mount Waverley near Melbourne, Australia reports increased activity towards the end of the SpE season there. He logged Malaysia ch. E2 via multiple-hop SpE – this signal was seen simultaneously by Todd Emslie in Sydney. Another first for Robert was full colour from SAS-7 Adelaide while the local HSV-7 station was off-air. SAS-7 previously used the identification ADS-

7. A pirate frequently operates on ch. 11 in the Melbourne area, with programming (mainly films) for the

Greek population.

More news about the aurora, which seemed to be particularly intense during its afternoon phase, on February 22nd. The RSGB v.h.f./u.h.f. newletter reports that UK amateurs had contacts with Norway, Sweden, Denmark, Finland, Austria, Switzerland, Italy, Czechoslovakia, Yugoslavia, Poland, Estonia, France, Belgium, Holland, Eire, Northern Ireland, Scotland, Wales and Jersey in both the 50 and 144MHz bands. In addition the 50MHz Greenland beacon was heard at very high levels. The aurora was preceded by a short-wave fade out and flare on the 20th. On the following day a solar storm occurred. This developed into a magnetic storm during the late morning of the 22nd, the aurora following from that.

I've at last got a working satellite TV receiver in operation. Signal information (TV or telecom traffic) has been noted from the satellites at 34·5, 27·5, 24·5, 18·5 and 1°W and 7, 10 and 13°E. Gorizont at 14°W was also logged, though with an 11GHz carrier only. New Italian cable TV channels were noted intermittently at 18·5°W, at times on test pattern. Ian Waller in Lincoln recently logged various UK outside broadcast links at 34·5°W. The various downlinks at 7°E are mainly used for news distribution but offer many test cards prior to news items. RTM (Morocco), RAI and ORF (Austria) are often seen: more unusual was the USSR 0167 pattern on April 4th. Satellite TV reception has proved to be more rewarding than I'd expected – it's amazing what can be seen, even with a budget set-up employing a 90cm dish.

News Items

New Zealand: Television New Zealand is to adopt a dual-sound system to provide stereo sound, alternative commentary information or the addition of Maori language sound. The extra subcarrier will not involve extensive modification to the existing main transmitters and relays.

The new TV3 service has produced channel allocation problems. BCNZ occupies most of the available v.h.f. spectrum space and has suggested that TV3 uses u.h.f. – though most receivers in NZ are capable of v.h.f. reception only.

Poland: Following two years of experimental transmissions over TVP-1, full-time teletext transmissions are to start this summer, with about 100 pages.

Gibraltar: The Spanish Cadena SER network has put forward proposals for supplying programming to the financially strapped GBC-TV, which has just signed an agreement with ITN to take the 2200 UK news live via satellite.

Sunspot cycle: The sunspot count in the present cycle (22) is rising rapidly, more so than predicted, following the minimum reached in September 1986. The latest forecast from Melbourne is that a high maximum of around 160 mean should be reached in late 1989 or during 1990.

Satellite News: The US FCC is seeking to establish a "high power" Ku band slot between 87-93°W, with only 1.5° orbital spacing. Satellites with 60W TWT amplifiers would give reception over wide areas using small dishes of 1m or less. To cope with the close spacing the satellites would employ cross-polarisation with respect to their neighbours.

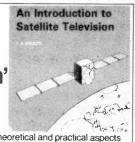
The PAN-AM satellite is due to be launched via Ariane in May, with services starting a month after. For the European (Ku band) coverage of this US satellite, see

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page 522 last month.

Canal 10, the Spanish-language cable service available at 27.5°W, has started to use sat-save scrambling (similar to that used by the BBC/Premiere).

After nearly eleven years in operation the Indonesian Palapa A-2 satellite has been retired to make way for Palapa B-2R.

SpE Reception from the Middle East

As the season of SpE propagation starts, thoughts amongst DXers often turn to "what can be received other than TVE and RAI every night?". For many of us, reception of Arabic stations in the Middle East adds an element of romance. In Europe, the closure of Band I transmitters continues while 50MHz amateurs and other non-TV users have come to occupy parts of the spectrum, but in the Middle East Band I is firmly established for TV use and the good news is that an increasing number of transmitters are coming into operation. Information on these stations tends to be unreliable – in several instances specific details are not known. So the following must be taken as a general guide rather than a definitive listing! All the transmitters listed could be received in the UK via single- or double-hop SpE. The transmitter power doesn't have to be great for SpE reception: in the early seventies I recall receiving an RUV (Iceland) 10W relay station in Southampton, on ch. E4.

Turkey (TRT): Bagisli ch. E3, 5kW e.r.p. horizontal (one source suggests 2.5kW). Istanbul University (campus transmitter – may be closed) ch. E4, 0.5kW horizontal. There have been no UK reception reports of these transmitters.

Syria (STC): Abou-Kmal 200kW and Nabi-Saleh 100kW,

both ch. E3. Hassakeh 200kW and Salkhad 0-64kW, both ch. E4. Signals on both channels have been received at good strengths in the UK and Low Countries.

Jordan (JTV): Suweileh ch. E3, 104kW e.r.p. This station is commonly received via SpE.

Lebanon (TL): Fih 1·1kW, Beit Mery 1kW and Jounieh 1kW, all ch. E2. Masser el Chouf 60kW ch. E4. The situation in this country is of course rather confused. The ch. E4 transmitter has been received in the UK, with confirmation from TL. French language programming heard in ch. E2 may come from this country.

Egypt (ERTU): Dumyat chs. E2 and 4, both 0-9kW. Port Said ch. E3. The ch. E2/4 transmitters are known to be on-air but Port Said may be closed, though it's been seen in the UK in earlier years. A "mystery" ch. E3 FUBK test pattern sometimes seen during SpE openings may come from either Egypt or Libya.

Saudi Arabia: Dahran ch. E3, 12kW e.r.p. – the Aramco outlet. This station has been received in the UK and the Low Countries on several occasions, with both English and Arabic programming, opening with the Koran. All Middle Eastern stations, including English-language services, open with the Koran. English-language services often have sub-titles.

Iran (**IRIB**): Shiraz 20kW, Boushehr, both ch. E3. Hamedan 108kW, Ilam and Shah Nakhjer (possibly 200kW e.r.p.), all ch. E4. Iranian stations have been received in the UK several times.

UAE: Dubai 240kW e.r.p., ch. E2. Abu Dhabi 1kW ch. E3. Dubai has been received in the UK.

Bahrein (BT): Isa Town 120kW, ch. E4. Thought to have been received in the UK and the Low Countries.

Yemen (YTV): Al-Ainah ch. E4, 0-4kW e.r.p. No reports of this one ever having been seen!

Arabic stations closer to home include Ramada, Tunisia (RTT) ch. E4 and Laayoune, Morocco (RTM) ch. E4. The 40kW Ramada transmitter is often received, using the FUBK pattern; Laayoune uses the PM5544 pattern and is less often received.

For those who go in for satellite TV reception, Iran can be seen via an 11GHz downlink at 63°E. It's just receivable over the horizon in east/SE UK.

Information in the above listings was obtained from the *World Radio/TV Handbook*, the European Broadcasting Union's *List of VHF/UHF Television Stations* and the Benelux DX Club. Additional information would be welcome.

Book Review

Books on satellite TV have in the past always seemed to be rather pricey. Bernard Babani (Publishing) Ltd. however has just published *An Introduction to Satellite Television* by F.A. Wilson at a very reasonable £5.95 (order code BP195, from Babani Publishing at The Grampians, Shepherds Bush Road, London W6 7NF). The book is in A4 format with 104 pages and a blue hard cover. It's easy to read, though the author does in places use a lot of mathematical formulae to prove specific points or characteristics.

The book assumes no knowledge of the subject. It starts with the basics, working its way through signal characteristics, how satellites are put into orbit and work, downlink characteristics and footprints and, very important, information on home TVRO installations. A series of appendices provide detailed calculations. Much of the information is presented in an informal manner, which makes it easy to follow – for example the section entitled

"The Uninvited Guest" gives information on unwanted noise and other interference arriving from space. Good also to see a vast gain chart for dishes of various efficiencies at different frequencies. Did you know for example that the gain of a 70cm dish with an efficiency of 65 per cent is 37·2dBi at 12·3GHz? The book deals mainly with K/Ku band operation, with only bare mention of C band.

There are numerous illustrations, charts and graphs throughout, though I would have liked to see a few photographs of reception, showing noise degradation at various levels etc. Commercial equipment is not featured, which means that the book will not date. I feel that it's very good value at the price and should serve as a useful reference work.

From our Correspondents . . .

Steve Giess has written drawing attention to the cheap (\$4.95) "TV modulator with antenna switch" marketed in the USA by Radio Shack, order no. 277-1015. It's compact, metal cased and takes a video input at 1V, 75 Ω with audio at 1V, 39k Ω , the output being on either ch. A3 or 4 at 300 Ω . It can be easily retuned from system M to system I sound spacing. The modulator is made by Texas Instruments, with Astec components. Steve also comments on computer interference: his Atari 520STFM has minimal emission in Band I and just a little more in Band III – but vastly below the levels from BBC, Electron and Sinclair models.

Brian Renforth, an active DXer for many years, seeks contact with others in his area. Write direct to him at 174 Helmsley Road, Sandyford, Newcastle upon Tyne, Tyne and Wear NE2 1RD.

Jean-Louis Dubler writes from Montreux that the high powers being used by Swiss TV are causing severe adjacent channel interference to several Italian outlets in the Milan area, while the French CNCL (equivalent to the UK DTI) has closed down three illegal French f.m. transmitters that were being used to broadcast to Switzerland across Lake Geneva. The Swiss government has forced the TV channel Telecine to end its agreement with Canal Plus since the latter doesn't adhere to guidelines for subscription TV issued in Switzerland. Telecine's finances now look decidedly dodgy.

Book Review

Principles of Domestic Video Recording and Playback Systems by K. Shipman, LCG, Eng. Tech. Published by Dickson Price Publishers Ltd., Hawthorn House, Bowdell Lane, Brookland, Kent TN29 9RW at £15.95.

We are told that this book "is primarily intended to provide those interested in video cassette recorders with a basic appreciation of their fundamental operating principles, the depth of coverage also being appropriate for students studying for the City and Guilds Part III Video Recording and Playback certificate". There are nearly 300 large pages, and the book tackles the subject matter very thoroughly. We found it easy to follow and were impressed by the wealth of excellent technical diagrams – the electronic, mechanical and computer control aspects of VCR operation are all comprehensively illustrated. The book covers the VHS, Beta and V2000 systems, though the latter is now obsolete. It does not cover the 8mm system. We feel that the book is very good value at the published price.

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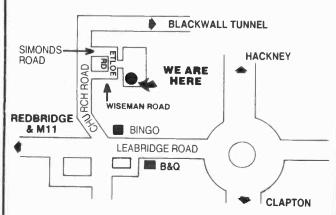
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RECEIVER K3 Tex Front Panels with LCs (SAA3027P/SAE G8 100K Pots on Panel & Lead for 6 Push Button Unit	5.5(15/11C/446326) £5.00		_		
	00.13	GEC 20AX	POWER SUPPLY Mark 2		£10.00
K30 Mains Switch remote K35 Mains Switch remote	75p	THORN ON	00 4.7m 400V		40p
K35 Aerial Socket and Plug in Lead to Tuner	£1.50				
KT3-K30 Slider Pots 4.7ku	20p each	12 VOLT B	ATERY PACK Nicad A.A		£5.00
		1 G8 TUNER	V/CAP on Panel		£3,50
LARGE Foacs Pots. Fits Pye, GEC, ITI, Decca	75p				
G8 Power Supply Panel	£4.00	G8 SPEAK	LK .		
EX DECCA 80-100 Decoder	£5.00	9,000 SPEA	KER		00.12
EX DECCA 80-100 Frame	£5.00	THOUSAN DOG		-	
THORN 8000-8500-8800 Decoder	£6.90	THURN 900	00 Sound OP Panel		£30p
GLASS BEADS Diodes 200v/1.2A	25 for £1.00	ONE LC K	35 Decoder		£7.00
<u> </u>		T	1F		£2.00
GII IF Panel	00.83				
G11 Decoder Panel	83.00		pt 8500-8800		£4.00
JVC HEADS 3H55	£20		N Tuncr Panel with ICS Po	ds.	£3.00
G11 Condenser 470/250V ITT	£2,00 £3.50				
G9 Power Panel G8 Line Panel	£12,00		IASSIS 1600-1700 Series M	ono	10.00
G8 Transductor	£1.25		10 Rec- & Anode Cap		50p
G8 Push Button Unit	£2.00				
G8 Con/Panel New Back Type	£4.00	KT3-K30 St	ider Pots 4.7k		£1.00 for 10
		K 35, 20 Turn	n Pots		6p each
KT4-KT3-K30 Handset Replacement	£12.00 £15.90		k GEC 20k Pots		20 for £1.00
HT520 METER 20,000 Fuse Diode Protector Logic Test Fact HT420	£13.90 £12.00				
H1420		- KI3 K30 3	peaker		
9000 SERIES Decoder 01 929 014 080 Thorn	£5.00	K 30 Push P	utton Switch 6 Way		00.13
LATEST VIDEO			_		
For Latest Philips, GEC. Pye and Hitachi, Front panel wi	ith memory chin and nush hutton and nots and	K35 Sound	O/P Panel Plug in		£3.00
LED's.	£6.00 NEW	K35 12 way	Push Button Unit		£1.50
		+			
20AX GEC LOPT Panel with Split Diode	£4.00		T. Split Diode		26.00
RANK T20 Fouces Pot	75p £1.00		Front Panel		£6.00
RANK 718 Foucs Pot 26" LOPT Split Diode 2432301	£8.00	G8 6 Buttor	n Unit, New Type		£2.00
16" LOPT Split Diode 2432801	26.00	-			
Ex Panel Split Diodes 2432871/2432981	£5		DISPLAYS, Mixed		£1.00
Split Diode 2433752	£6		TESTER, Infra Red		68.80
T703A LOPT Transformer Rank with Focus Pots and Diode	£3.00				
		AERIAL SE	PLITTER with filter		
MET A CHAIL Manner Court I		Lang paper	TIONAL Dynamic Microp	L	£1.00
HITACHI Mains Switch		CAL DINE		none	£1.00
HITACHI Mains Switch HITACHI AE Socket	30p	CAL DINE		none	£2.00
HITACHI AE Socket		20 TURN P	OTS with Band Switch		£2,00 10p
HITACHI AE Socket -I CONDENSER Axail Leads 450 A/C 1200 D/C	15p	20 TURN P			£2.00
HITACHI AE Socket	15p £1.00	20 TURN P PUSH BUT PYE 731 Li	OTS with Band Switch TON Mains Switch with Sci		£2,00 10p
HITACHL AE Socket -(1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/20v/8s	15p £1.00	20 TURN P PUSH BUT PYE 731 Li	OTS with Band Switch TON Mains Switch with Sci ine Trans		£2.00 10p 4 for £1 £3.50
HITACHI AE Socket -1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/2b//8v GREEN FLAT, NEC, LED's	15p £1.00 3p each 100 for £2	20 TURN P PUSH BUT PYE 731 Li PYE 731 No	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply	ew Holes Fixing	£2.00 10p 4 for £1 £3.50 £4.00
HITACHI AE Socket I CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/20v/8v GREEN FLAT, NEC, LED'S 15V0/5V 1 Amp Print Type	15p £1.00 3p each 100 for £2	20 TURN P PUSH BUT PYE 731 Li PYE 731 No	OTS with Band Switch TON Mains Switch with Sci ine Trans	ew Holes Fixing	£2.00 10p 4 for £1 £3.50
HITACHL AE Socket -I CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/2bv/8s GREEN FLAT, NEC, LED's 15V01SV 1 Amp Print Type 12+12V 2.8VA Print 1"x1"	15p £1.00 3p each 100 for £2 £1 75p	20 TURN P PUSH BUT PYE 731 Li PYE 731 No	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads	ew Holes Fixing	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00
HITACHL AE Socket -I CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/20v/8s GREEN FLAT. NEC, LED's 15V015V 1 Amp Print 1"x1" 8+8V 1 Amp Print	15p £1.00 3p each 100 for £2 £1 75p 75p	20 TURN P PUSH BUT PYE 731 Li PYE 731 No 800v DIODI KT3 Line C	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer	ew Holes Fixing	£2,00 10p 4 (or £1 £3,50 £4,00 6p each, 20 for £1.00 £5,00
HITACHL AE Socket 1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/28/86 GREEN FLAT, NEC, LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1"×1" 8+8V 1 Amp Print ET596 UHF V/CAP Tuner, small	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50	20 TURN P PUSH BUT PYE 731 Li PYE 731 No 860v DIODI KT3 Line C	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads	ew Holes Fixing	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00
HITACHL AE Socket -1 CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/2bv/8s GREEN FLAT. NEC. LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'x1" 8+8V 1 Amp Print ET596 UHF V/CAP Tuner. small FIDELITY Panels with 1.C	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50	20 TURN P PUSH BUT PYE 731 Li PYE 731 No 860v DIODI KT3 Line C	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer IN Front Panel with POTs &	ew Holes Fixing	£2,00 10p 4 (or £1 £3,50 £4,00 6p each, 20 for £1.00 £5,00
HITACHL AE Socket 1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240/ in/28/86 GREEN FLAT, NEC, LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1"x1" 8+8V 1 Amp Print ET596 UHF V/CAP Tuner, small FIDELITY Panels with 1.C FIDELITY LOPT Spill Diode AT2076/80	15p £1.00 3p each 1(0) for £2 £1 75p 75p £2.50 £1.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 No 800v DIODI KT3 Line C 9000 THORN 850	OTS with Band Switch TON Mains Switch with Sci ne Trans. ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer N Front Panel with POTs & 00 Time Base	ew Holes Fixing	£2.00 10p 4 (or £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00
HITACHL AE Socket 1 CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/26v/8s GREEN FLAT. NEC. LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'×1' 8+8V 1 Amp Print ET596 UHF V/CAP Tuner. small FIDELITY Panels with 1.C FIDELITY LOPT Split Diode AT2076/80 AT 2076/80	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50	20 TURN P PUSH BUT PYE 731 Li PYE 731 No 800v DIODI KT3 Line C 9000 THORN 850	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer IN Front Panel with POTs &	ew Holes Fixing	£2.00 10p 4 (or £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00
HITACHL AE Socket -1 CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/2bv/8s GREEN FLAT. NEC. LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'x1" 8+8V 1 Amp Print ET596 UHF V/CAP Tuner. small FIDELITY LOPT Split Diode AT2076/80 AT 2076/80 ITT CVC20 to 45 PANELS Send for list	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50 £1.00 £3.00 £5.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 No 8000 DIODI KT3 Line (9000 THORN 85 7 SEG DISI SPLIT DIO	OTS with Band Switch TON Mains Switch with Sci ne Trans. ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer N Front Panel with POTs & 00 Time Base	ew Holes Fixing	£2.00 10p 4 (or £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00
HITACHL AE Socket -I CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/2bv/8s GREEN FLAT. NEC. LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'×1' 8+8V 1 Amp Print ET596 UHF V/CAP Tuner. small FIDELITY Panels with 1.C FIDELITY LOPT Split Diode AT207680 AT 207680	15p £1.00 3p each 100 for £2 £1 75p 75p £2.59 £1.00 £3.00 £5.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THORN 85 7 SEG DISI SPLIT DIO PUH IPS E	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer N Front Panel with POTS & 00 Time Base PLAYS 4 Bank Displays Z. DE FBS1245AR	ew Holes Fixing	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 £3.00
HITACHL AE Socket -1 CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/26v/8s GREEN FLAT. NEC. LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'x1' 8+8V 1 Amp Print ET596 UHF V/CAP Tuner. small FIDELITY Panels with 1.C FIDELITY LOPT Split Diode AT2076/80 AT 207680 ITT CVC20 to 45 PANELS Send for list	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50 £1.00 £3.00 £5.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 Li 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Output Transformer N Front Panel with POTs & 00 Time Base PLAYS 4 Bank Duplays Z DE FBS1245AR T3 4R7 W.W. Resistor	ew Holes Fixing R Push Buttons	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00
HITACHL AE Socket 1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240/ in/2b//8 GREEN FLAT, NEC, LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'×1' 8+8V 1 Amp Print 1'×1' 8+8V 1 Amp Print ET596 UFF V/CAP Tuner, small FIDELITY Panels with 1.C FIDELITY LOPT Spit Diode AT2076/80 AT 2076/80 ITT CVC 20 to 45 PANELS Send for list MULLARD TEL-TEX DECODER Type VM6103 LINE TRANSFORMER Philips TX 12' and 14" Portable	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50 £1.00 £3.00 £5.00 £7.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer N Front Panel with POTS & 00 Time Base PLAYS 4 Bank Displays Z. DE FBS1245AR	ew Holes Fixing R Push Buttons	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 £3.00
HITACHL AE Socket 1 CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/26v/8s GREEN FLAT, NEC, LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'×1' 8+8V 1 Amp Print ET596 UHF V/CAP Tuner, small FIDELITY Panels with 1.C FIDELITY LOPT Split Diode AT2076/80 AT 2076/80 ITT CVC20 to 45 PANELS Send for list MULLARD TEL-TEX DECODER Type VM6103 LINE TRANSFORMER Philips TX 12' and 14' Portable WANDER PHONES Key Pad and Hand Set. No Case.	15p £1.00 3p each 100 for £2 £1 75p 75p £2.55 £1.00 £5.00 £5.00 £1.00 £1.00 £1.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K PHILIPS F	OTS with Band Switch TON Mains Switch with Sci ne Trans ew Power Supply ES at 3 amps. Glass Beads Output Transformer IN Front Panel with POTS & 00 Time Base PLAYS 4 Bank Displays Z. IDE FBS1245AR TJ 4R7 W.W. Resistor OR PICK UP HEAD GP42	ew Holes Fixing R Push Buttons	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00
HITACHL AE Socket -1 CONDENSER Axaal Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/26v/8s GREEN FLAT. NEC. LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'×1' 8+8V 1 Amp Print ETS96 UHF V/CAP Tuner. small FIDELITY Panels with 1.C FIDELITY LOPT Split Diode AT2076/80 AT 207680 ITT CVC20 to 45 PANELS Send for list MULLARD TEL-TEX DECODER Type VM6103 LINDER TRANSFORMER Philips TX 12' and 14' Portable WANDER PHONES Key Pad and Hand Set. No Case. TV AERIAL AMPS 1 way £9.00; 2 way	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50 £1.00 £3.00 £5.00 £7.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K PHILIPS F	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Output Transformer N Front Panel with POTs & 00 Time Base PLAYS 4 Bank Duplays Z DE FBS1245AR T3 4R7 W.W. Resistor	ew Holes Fixing R Push Buttons	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00
HITACHL AE Socket 1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240x in/28/8 GREEN FLAT, NEC, LED'S 15VIJSV 1 Amp Print Type 12+12V 2.8VA Print 1"x1" 8+8V 1 Amp Print ET596 014F V/CAP Tuner, small FIDELITY Panels with 1.C FIDELITY LOPT Split Diode AT2076/80 AT 2076/80 ITT CVC20 to 45 PANELS Send for list MULLARD TEL-TEX DECODER Type VM6103 LINE TRANSFORMER Philips TX 12" and 14" Portable WANDER PHONES Key Pad and Hand Set. No Case. TV AERIAL AMPS 1 way £9.00; 2 way 2432211	15p £1.00 3p each 100 for £2 £1 75p 75p £2.55 £1.00 £5.00 £5.00 £1.00 £1.00 £1.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K PHILIPS F	OTS with Band Switch TON Mains Switch with Sci ne Trans ew Power Supply ES at 3 amps. Glass Beads Output Transformer IN Front Panel with POTS & 00 Time Base PLAYS 4 Bank Displays Z. IDE FBS1245AR TJ 4R7 W.W. Resistor OR PICK UP HEAD GP42	ew Holes Fixing k Push Buttons kMAZT 2/GP2211	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00
HITACHL AE Socket 1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/20v/8s GREEN FLAT. NEC. LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'×1' 8+8V 1 Amp Print ET596 01FF V/CAP Tuner. small FIDELITY Panels with LC FIDELITY LOPT Split Diode AT207680 AT 207680 ITT CVC20 to 45 PANELS Send for list MULLARD TEL-TEX DECODER Type V/M6103 LINE TRANSFORMER Philips TX 12' and 14' Portable WANDER PHONES Key Pad and Hand Set. No Case. TV AERIAL AMPS 1 way £9,00; 2 way 2432211 2432301	15p £1.00 3p each 100 for £2 £1 75p 75p £2.50 £1.00 £3.00 £3.00 £5.00 £7.00 £1.00; 3 way £15.00; 4 way £40.00; 6 way £50.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K PHILIPS F GEC TEXT	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer N Front Panel with POTS 8 00 Time Base PLAYS 4 Bank Displays Z DE FBS1245AR T3 4R7 W.W. Resistor OR PICK UP HEAD GP42 PANEL PC895A7	ew Holes Fixing k Push Buttons 6042T 2/GP2211 AT2036000 AT2076/55	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00 £5.00 £5.00
HITACHI AE Socket -I CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240/ in/20//8/ GREEN FLAT, NEC, LED'S ISVIISV I Amp Print Type 12+12V 2.8VA Print I*X1* 8+8V I Amp Print ET596 UHF V/CAP Tuner, small FIDELITY Panels with LC FIDELITY LOPT Split Diode AT2076/80 AT 2076/80 ITT CVC20 to 45 PANELS Send for list MULLARD TEL-TEX DECODER Type VM6103 LINE TRANSFORMER Philips TX 12* and 14* Portable WANDER PHONES Key Pad and Hand Set. No Case. TV AERIAL AMPS 1 way £9.00; 2 way 2432211 2432301 2432301	15p £1.00 3p each 100 for £2 £1 75p 75p 81.00 £2.50 £3.00 £5.00 £11.00; 3 way £15.00; 4 way £40.00; 6 way £50.00 33651	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K PHILIPS K GEC TEXT	OTS with Band Switch TON Mains Switch with Sci ine Trans ew Power Supply ES at 3 amps. Glass Beads Dutput Transformer N Front Panel with POTS 8 00 Time Base PLAYS 4 Bank Displays Z DE FBS1245AR T3 4R7 W.W. Resistor OR PICK UP HEAD GP42 PANEL PC895A7	E Push Buttons 6042T AT203600 AT2076/55 AT2048/11 AT205/71T	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00 £5.00 £5.00
HITACHL AE Socket 1 CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240v in/20v/8v GREEN FLAT, NEC, LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1'X1' 8+8V 1 Amp Print 1YE 8+8V 1 A	15p £1.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800v DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K PHILIPS K GEC TEXT	OTS with Band Switch TON Mains Switch with Sci ne Trans ew Power Supply ES at 3 amps. Glass Beads Output Transformer IN Front Panel with POTS & 00 Time Base PLAYS 4 Bank Displays Z. IDE FBS1245AR TJ 4R7 W.W. Resistor OR PICK UP HEAD GP42	AT2036/01 AT2076/55 AT2048/11 AT2076/71T AT2055 AT288/15	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00 £5.00 £5.00 £5.00 £5.00
HITACHI AE Socket -I CONDENSER Axail Leads 450 A/C 1200 D/C MAINS TRANSFORMER 240/ in/20//8/ GREEN FLAT, NEC, LED'S 15V015V 1 Amp Print Type 12+12V 2.8VA Print 1"x1" 8+8V 1 Amp Print ET596 UHF V/CAP Tuner, small FIDELITY LOPT Split Diode AT2076/80 AT 2076/80 ITT CVC20 to 45 PANELS Send for list MULLARD TEL-TEX DECODER Type VM6103 LINE TRANSFORMER Philips TX 12" and 14" Portable WANDER PHONES Key Pad and Hand Set. No Case. TV AERIAL AMPS 1 way £9.00; 2 way 2432211 2432301 2432401 2432491 343241 SPLIT-DIODE	15p £1.00 3p each 100 for £2 £1 75p 75p 75p £1.00 £2.50 £1.00 £3.00 £5.00 £1.00 £11.00; 3 way £15.00; 4 way £40.00; 6 way £50.00 £11.00; 3 way £15.00; 4 way £40.00; 6 way £50.00 £11.00; 3 way £15.00; 4 way £40.00; 6 way £50.00	20 TURN P PUSH BUT PYE 731 Li PYE 731 N 800V DIODI KT3 Line C 9000 THOR THORN 85 7 SEG DISI SPLIT DIO PHILIPS K PHILIPS F GEC TEXT	OTS with Band Switch TON Mains Switch with Sci ne Trans. ew Power Supply ES at 3 amps. Glass Beads Jupput Transformer IN Front Panel with POTS & 00 Time Base PLAYS 4 Bank Dusplays Z. Due FBS1245AR T3 4R7 W.W. Resistor OR PICK UP HEAD GP42 PANEL PCN95A7 RANSFORMERS	E Push Buttons 6042T AT2036/00 AT2076/55 AT2080/11 AT2076/71T AT205 AT2080/15 AT2080/15 AT2070/35 RCO ST CT3325	£2.00 10p 4 for £1 £3.50 £4.00 6p each, 20 for £1.00 £5.00 £4.00 £3.00 50p £5.00 £5.00 £5.00 £5.00 £5.00
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What's up Doc?

Les Lawry-Johns

You may remember the articles "What's up Doc?" parts one and two that I wrote some while back. They related to an examination (painful) I had to have and a prostate operation to help remove a swelling on my right-hand side. I still have the swelling, but at least I know that it's nothing to worry about. What has been worrying me is this heart trouble I've mentioned from time to time recently. My doctor made an appointment for me to see a heart specialist about my muzzy head, which doesn't allow me to think straight – or to write straight either.

It took some time for the date of my appointment to come round. I went along to the hospital on March 30th and after a while I was weighed and measured. Then I went in to see the specialist. He asked me what the trouble was and I told him I couldn't think straight because my doctor thought my heart wouldn't pump enough blood up to my brain.

"How long has this been going on?" he asked.

"Since last October" I replied. "I seem to be muzzy most of the time."

So he asked me some questions to see whether my brain was working.

"Who's after Neil Kinnock's job?"

"Tony Benn."

"Who's helping him?"

"Some left-winger. I forget the name."

"How many children has the Queen got?"

"Four, I think."

"Name them."

"There's Charles and Ann and the one in the Fleet Air Arm, my old mob, that's Andrew. And one who wants to be on the stage, er, I forget his name."

"Edward."

That's all he asked. I think. Then he gave me a brief check over and some chits of paper to go and have tests. As I made my way down the corridor I kept seeing people I knew I should have known, but I couldn't think of their names. One of them told me to pop into the X-ray room first and give them my name and one of the chits, then to go to the blood test department to get that over with, after which I'd be first in line for the X-rays. It nearly worked out like that.

I told them in the blood department that they'd find it was largely whisky, and that raised a laugh. But I think I'll get a ticking off from the specialist when I see him again. It's just that I don't like the idea of swallowing a lot of rat poison to keep my blood thin. Well, that's my story anyway.

The girl in the X-ray room told me to undress, upper part only. After the X-rays I dressed and was then called back and told to get undressed again as the machine hadn't seen enough.

The tablets I was given to take are very small white ones. It says on the bottle take half a tablet twice a day. The job is cutting each one in two. Oh well, all in the cause of science I suppose. Back to work.

This Skantic set had a Luxor chassis inside and I spent quite a long time trying to find out why it wouldn't start. Eventually I gave up. When its owner came back I explained that I wasn't thinking too clearly and couldn't do

it. I put it on the bench to show him. Switched it on and a beautiful picture appeared, with good sound. I told him to take it away as I wasn't feeling up to it all.

But if there's one set that doesn't worry me it's a G11. Until this one came along. I'd resoldered all the joints, fitted a new line output transistor, and had the set on test. After a while the picture faded. The sound faded too. Attention to the video panel restored a good picture, but the sound remained low. As it was a remote control version I first tested the audio section on the lower left side – this responded well to tests – then turned my attention to the extreme left side remote control panel. After a lot of seeking I replaced the resistor that feeds the volume control. This restored normal sound, and the set was collected shortly afterwards. It came back next day with the complaint "no sound". I switched it on and received full sound. Oh well . . .

Philips KT3 Drill

Some of our usual stock faults are changing slightly, though they still come in often enough. Take the Philips KT3 chassis. It was common for the tripler to cause audible tripping. We now more often get complete shut down. If the h.t. is present at both ends of the 4.7Ω surge limiting resistor in the power supply, don't waste time – disconnect the line output transistor (remove the connecting screws to its collector). If this restores some signs of life, disconnect the tripler's input lead and replace the line output transistor. If the line output stage now works, bring the tripler's disconnected lead back near to it (beware of the high voltage). If the result is tripping, replace the tripler and write out the bill.

Remember the drill. If the set is tripping, disconnect the tripler. If this was the cause of the fault the tripping will stop and the tube's heaters will light up. If the set is dead, check the 4.7Ω resistor on the power board then, if necessary, disconnect the line output transistor (I didn't say the BU208A, because alternatives are sometimes fitted). It's also wise to disconnect the tripler to prevent the new transistor going up the creek. It may not do so, but it's sensible to protect it in this way.

Is This a Record?

Something that I might claim to put in the book of records has just happened. A car drew up outside and the driver left its engine running as he carried in an old Decca Bradford. He left the door open as well.

"I'd like you to look at this and tell me how much it would cost to repair it."

"If you'd like to leave it, I'll look it over and tell you this afternoon."

"Could you look at it now?"

So I looked, having removed the rear cover. I switched it on and the tube's heaters glowed but the valves didn't light up. I thought I'd start at the beginning, so I switched off and removed the PY500 boost diode, whose heater comes first in the heater chain. The top cap came off and there was a hole in the glass. A check on the heater confirmed that it was open-circuit.

I fitted a new PY500 and switched on again, keeping my eyes on the heaters, ready to switch off in a hurry. The heaters all glowed but there was no sign of life at the PY500's top cap. So I turned the set on its side and carefully slid the chassis out. The 500mA fuse in the supply to the PY500 was open-circuit. I fitted another and turned the set upright. When the set had been switched on again and the valves had warmed up, life returned to the line

output stage. Connecting an aerial produced a picture. The tube was in good order and the sound was clear.

"How much?" he asked.

"Twelve quid" I replied.

"O.k., I'll have it done."

"It is done."

"Make out the bill then."

So I made him out a bill. He paid up and carted the set out – after I'd replaced the rear cover. He put it back in the car, closed the door (at last), jumped in the driver's side and drove off

I ask you. Draw up, leave the engine running, leave the door open and have the set repaired before closing the door again. Can I claim a record – for being a fool?

Practical Computer Programming

Part 5 Mike Phelan

It's time we considered the steps involved in designing, producing and testing a typical computer application. As an example we've selected a repair history database covering customers' equipment. We want to be able to store data on the types of faults dealt with, actual repairs carried out, parts fitted, charges made and so on.

Before deciding to go ahead it's worth considering whether the use of a computer to do the job is appropriate. If the use of a computer entails extra cost, time spent or any other debit aspect, it may be better to do the job manually. If, on the other hand, a computer is available, the volume of work is such that keeping paper records is not really feasible, or you wish to be able to extract much more information than could readily be done with a manual paper system, then the use of a computer is worth consideration. A direct comparison is usually difficult, because the computer system will end up giving you more than the manual one it might replace. Another point, though an obvious one, is that the amount of detail required in any output, whether on a screen or a printout, must at some stage be keyed in.

This raises the question the amount of data to be held. A database system reads the information from tape or disk and holds some or all of it in memory. Is there enough room for this? Maybe we shall have to sacrifice some of the data – or not store it for ten years! Generally it's not necessary to keep data for too long, but in the present example it would be nice to record the history of a set during its lifetime – whatever that may be.

System Specification

Assuming we've decided that a computer system is appropriate, we can go ahead with its design. You may be surprised that we've not so far mentioned anything about the choice between an off-the-shelf package or dedicated software, and in the latter case which computer language to use. We will not be going into this for some time yet. At this stage, the truth is that it doesn't matter. These questions will be taken up at the end of the design stage.

In this context, design is what is called a "system specification" as opposed to a program specification. The system specification covers things like which items of data are to be stored, how the system must appear to the user and what comes out of it in what format. After doing this we can decide on which package or language to use, taking into account the budget, expertise available and the possible limitations of a particular language.

Now down to it. We start at the back end. What do we want out of the system? Fairly typical things on the list would be: (1) a complete service history of any set; (2) turnover in a given period; (3) the progress of a particular job (in a large or medium business); (4) parts used; (5) call rates per annum for a given make/model. Items (1)

and (3) could be available on-screen only, items (2) and (5) printed, while (4) might need to be interfaced with some form of stock control should the system be expanded. In our example, we'll leave out (4).

Design Procedure

The next stage is to design on paper the five types of report required, detailing each item of data and whether it is to be entered directly or calculated from other data. Following this we list all the data items that need to be stored on disk, excluding those that can be calculated on the spot (call rate percentages and so on). We also need to specify the type of data (numerical or character) and its width, i.e. how many digits per item.

A first attempt might look like this:

1	Name	16
2	Address line 1	24
3	Address line 2	24
4	Address line 3	24
5	Address line 4	24
6	Postcode	9
7	Telephone number	12
8	Make	10
9	Model	10
10	Repair description	50
11	Net cost	10
12	Price charged	10

which amounts to a space requirement of 223 digits (bytes) per record. We now have a database consisting of one record per repair job, which is the level of detail we need. The record has twelve "fields".

Suppose that we have 200 customers, each with a rather troublesome video, TV set and radio receiver, and that each of these items generates five service calls a year. Over a complete year we would have $200 \times 3 \times 5$ records of 223 bytes each, which would take up 653K bytes of disk space! As this is beyond the limits of most disk systems in our range, we must clearly cut down somewhere.

It will help if we can reduce the size of some of the fields in each record. Each item needs only sufficient information to make it unique. This is an important point. For example, we don't actually need 9 digits for the postcode since it's not necessary to store the space between the two parts, so 8 will do. Likewise a phone number requires only 10 digits, or we might decide to omit this item – there's an excellent database called the telephone directory. We will normally need to phone the customer only while a repair is in progress. The job will have some sort of ticket attached to it, and we can write the phone number on this when given. Other savings can be made on things like the make and model – using the

first three or four letters of the maker's name should be enough for identification purposes.

Fifty bytes for a repair description is extravagant: a series of codes, each one representing a particular type of repair, could be used. More than one repair may be carried out on a piece of equipment at a particular time, so we need room for more than one code. Up to five simultaneous faults per item should be sufficient. We need to know what the codes mean, but more on this later.

We don't need to use ASCII code to represent each individual digit in a number. After all, a byte in itself can represent any number up to 255. If we need decimal places, each type of computer has its own way of storing such numbers. Typically, "real" numbers (those with decimal places) are stored as four bytes. We could of course store monetary values as integers (pence).

After applying this logic, the database may look like

24 24
24
8
3
8
5
4
4

which has reduced the total space per record to 116 bytes. By assuming the same total number of repairs per year as before, i.e. 3,000, we arrive at a storage requirement of 339K bytes (remember that 1K = 1,024). This is better, but could we save any more without losing anything? The answer is yes.

So far the customer and equipment details have been repeated for each repair. Thus much of the data is redundant. What we need is a way of identifying the customer without repeating his name and address etc. We can't use any of the existing fields to do this, because the name for example is not unique. Neither are any of the address lines. Hold it, I hear you say – why not use the first address line? The possibility of having two of these in the same area is remote to say the least, but it's possible. We could maybe use the name and one address line, but this would not save much space.

Use of Linked Files

The answer is to use a customer identification field. We still need to store the other details – name and address – but these can be in a separate file, as long as both files contain the customer identification field. The identification could be numeric, but as most computers store numbers as four bytes it would be better to use a character field of two bytes. By using only the upper case letters of the alphabet we could store 26×26 (676) customers. If we need to store more, use of lower case and numerals gives us a maximum of 12,996 (114 × 114). If you need to store more than this you can probably afford a larger computer! So our customer file has only one record per customer now, and things are arranged as follows:

Customer file

1	Name	12
2	Address line 1	24

3	Address line 2	24
4	Address line 3	24
5	Postcode	8
6	Customer identification	2

which is 94 bytes per record, giving a storage requirement of 18-35K for 200 customers, plus

Repair file

1	Customer identification	2
2	Make	3
3	Model	8
4	Repair description	5
5	Net cost	4
6	Price charged	4

which, at 26 bytes per record multiplied by 3,000 repairs, is a storage requirement of 76·17K.

It's obvious then that by rearranging the data in two files we've effected a considerable saving in space – now only some 94.5K bytes in total are required. This technique of using more than one file, linked in some way, is known as a *relational database*. The customer file has one record per customer and all the fields that are unique to a customer are in this file. Each customer record "owns" one or more records in the repairs file, which contains only the fields relevant to each repair plus the important linking field.

Use of Alphabetical Code

As previously mentioned, to save space repair descriptions can be replaced by alphabetical codes. We could possibly record the fault descriptions supplied by the customer in a similar way, as the two often don't relate! One way to do this would be to keep a printed list of the codes and descriptions by the keyboard. We would need to refer to this on data entry and also when looking at the computer's output.

We could get the computer to do the work of supplying a fault description when given a code but the converse, converting a description to a code, would for several reasons be impractical. The descriptions would have to be consistent, correctly spelt, and would take longer than a code to enter. An effective compromise would be to enter the code, with the key to the codes being displayed on the screen or available upon pressing a particular key. The key could be kept in the form of a file with two fields (description, code) or embedded in the program. If the list is fairly constant, the latter would suffice, but if changes are envisaged files must be kept together with the facility to add, amend or delete a record. This system is known as a look-up table - the data is not directly involved in the processing but instead forms a sort of dictionary. The add/ amend etc. facility is known as a file maintenance routine. This could be a single program for both repair and fault descriptions, as both files have the same structure.

Situation So Far

We have now seen that it's possible to arrange data so as to save space, by having more than one file. The language or package eventually selected might not allow this, a factor that may limit the amount of data stored. Next month we'll take the design process a stage farther, by deciding what sort of screen displays and reports are required. The actual program design, if we adopt the homebrew approach, comes later.

Storing TV Pictures in Chips

Part 1 Eugene Trundle

Basically, TV and video systems are of analogue type. Light values and colour values can be measured, stored and moved around in digital form, but at either end of the signal chain the transducer – the pick-up sensor and display device – must be of analogue form to interface with the world we inhabit, including the human eye which is the final arbiter of all our efforts in TV and video.

In the recent past, developments in TV technology have tacked various digital items on to the basic analogue signal in peripheral roles - examples include engineering control signals, teletext and NICAM stereo sound signals. The same thing is starting to happen with broadcast radio, where radio data signals are now being added to some of the v.h.f. carriers. Digital technology had already taken a firm hold in the control systems used for domestic electronic equipment: remote control, frequency-synthesis tuning and the mechacon systems of video equipment are prime examples. As the microprocessor, originally developed for computer use, sought new applications, so versatile, convenient and sophisticated systems undreamt of a few years ago have become a part of the domestic TV/video field.

The first example of true video signal processing in digital form in a domestic TV set came with the ITT Digivision range of colour TV receivers. While this was an admirable concept, initially the price of memories capable of storing a TV field was too high to make it feasible to incorporate such a device. Thus the many possible advantages of digital video signal processing could not be exploited. Because the basic constraints of the analogue broadcast system and the conventional c.r.t. remained, the Digivision pictures hardly differed in appearance from those produced by a conventional receiver.

Recently however the cost of memory chips has fallen dramatically – as mass-production yields have improved and as markets have expanded. This has been reflected in the vastly increased storage capacity of modern home computers, in the very low premium charged for Fastext

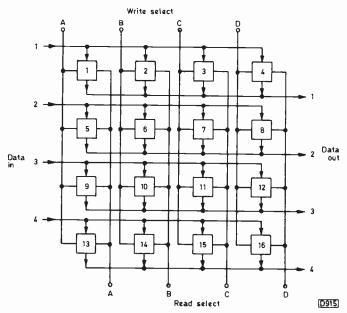


Fig. 1: Basic form of 16-cell memory array.

decoders and now, suddenly, in the availability of TV and video products incorporating digital storage features. The cover of our July 1987 issue showed the PIP display on the screen of a Sanyo TV receiver, and almost overnight several video manufacturers introduced "digital" VCRs with field-store memories. Initially the main use of these was to freeze off-tape or off-air pictures with much better quality than had been possible with previous still-frame systems, in which the tape transport system is stopped and a single tape track is scanned continuously. Apart from this obvious application, a digital storage facility with a versatile control system has the potential for strobe, zoom, mosaic and paint-box effects, "fast shutter" and time-lapse tricks, multiple picture displays and, more usefully, reduced picture flicker and noise cancellation. With sufficient memory capacity it's also possible to achieve a subjective increase in definition: this is done by interpolation between the picture elements in successive frames and fields.

Since the analogue TV transmission system will continue, for both terrestrial and satellite TV transmissions, for the foreseeable future, it does seem that digital picture processing is the way forward for domestic TV and video equipment.

Memories

Before getting involved with techniques we need to know something about how a digital memory works and how it's arranged. A bit (binary digit) is a single piece of data and can have a value of only 0 or 1. To store a bit, a single memory cell is used. A bistable (flip-flop) can be used as the cell, held latched in one of its two states. This would typically be in a volatile bipolar memory, from which the data is lost as soon as the operating voltage is removed (hence the term volatile). An alternative type of cell consists of a field-effect transistor memory, in which the data bit is temporarily held as a charge on the insulated gate of a MOS transistor. Both these types of memories are referred to as RAMs (random access memories), which means that data can be written into or read out of the cells at will. A memory chip's storage capacity depends on the number of storage cells it contains. This is always quoted in bits, e.g. 64K or 512K. It is the convention with memory devices that K = 1,024. Thus a 64K memory has 65,536 cells, i.e. locations, and a 512K memory has 524,288 cells. The reason for this is that with binary numbers we have to think in terms of powers of two, not ten.

For the purpose of reading or writing, a cell must be addressed individually before data transfer can take place. The addressing procedure depends on how the memory banks within the chip are arranged by its manufacturer. Fig. 1 shows an elementary 16-cell memory array arranged in four rows and four columns. To write data to cell 6 a 1 is put on write select line B and the data to be stored is then applied to data input line 2. At this time input lines 1, 3 and 4 are kept open-circuit so that only cell 6 can be written into. Now assume that we want to read from cell 15. A 1 is put on read select line C and the data is read from data output line 4, all the other output lines being held open-circuit.

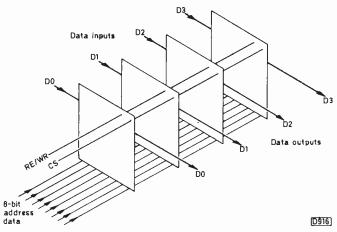


Fig. 2: Parallel addressing and control of a multi-array memory system.

This row/column matrix system is universally used for RAMs of the type we are dealing with. Consider a 1K memory arranged as 32 rows and 32 columns. This would call for 32 data input lines, 32 data output lines, 32 write select lines and 32 read select lines, i.e. a chip with at least 128 pins, which is clearly impractical. It's possible however to define the 1,024 separate locations in terms of a 10-bit binary word, so that with a suitable address decoder within the chip the addressing information can be conveyed on ten lines. Since only one bit at a time can be handled, the data input can be routed via a single pin and then sent to its destination via internal switching. Similarly a single data output pin suffices. The read/write command can be sent as a binary signal to a single i.c. pin. Thus at the expense of some added complexity within the chip the number of pins required is reduced to 10 for addressing, two for data, one for read/write, the supply voltage and earth pins and, usually a chip enable line which we'll come to in a moment. The arrangement of this memory chip is $1K \times 1$ bit.

Let's see how we would store data in this chip. The input data will have to be in serial form as there is only one line for it. As each bit appears on the input data line an appropriate address is sent along the address bus by the memory control chip, which in a computer is the microprocessor CPU and in a TV receiver or VCR effects generator will be a complex gate array. The bit is stored at the designated address in the memory, then a new address designates a new destination for the next bit in the serial data stream and so on. Thus the memory becomes filled with data which is held as long as power is applied. The data can be read out in the same serial sequence only if the addresses follow the same sequence as before.

Note that the write and read operations don't have to be at the same speed, so the data rate can be compressed or expanded as required – so long as the rate doesn't exceed the chip's access time. Bipolar (TTL) memories are fast, about 40nsec compared with some 250nsec for most FET types. The latter are slower because of the time-constant represented by the high gate resistance and storage capacitance. The latest types of FET memories have much faster access times, achieved by reducing the size of the cells and their connections.

Parallel Addressing

It's rare that we would need to handle one bit at a time. Most digital information is in parallel form, typically 4-bit nibbles or 8-bit bytes. So our 1K memory could alternative-

ly be arranged in 256×4 -bit form, as shown in Fig. 2. Here the cells are arranged in four arrays of 16×16 cells, with their address, read/write and chip select lines all connected in parallel. Each of the data input and output lines is connected to one array, so that the four bits of each nibble are separately stored at identical addresses on different "layers" of the chip. We now have to be able to specify only 256 addresses, for which eight address lines are sufficient. If required, the four-bit data nibbles (D0-D3) can enter and leave the chip via the same four pins - by using an I/O (bidirectional) port programmed by the RE/WR (read/write) signal. The 1K memory we are using as an example could also be arranged as a 128 × 8-bit device, with eight data I/O pins and a 7-line address bus, and so on. The same applies of course to the larger capacity memories that are used in practice.

The CS (chip select) line is used by the memory control chip to select one of several memory chips whose data, control and address buses are connected in parallel. For instance, a 1Mbit memory bank can be made up of four 256K memory chips connected in parallel, with only one of them in operation at any one time. Until its CS line is activated, each chip is effectively disconnected from both the data and address buses and has no effect on either.

Digital Video

A colour video signal can be digitised in either component or composite form. With component coding the individual Y/U/V or R/G/B waveforms are digitised separately to produce three streams of data pulses. With composite signal coding the complete CVBS (composite video, blanking and sync) signal is sampled and quantised as a single entity. For good special effects, component coding is essential in studio practice. For productions where high-quality chroma-key work is required wideband RGB coding may be necessary.

So long as complete, real-time pictures are being dealt with composite coding is quite adequate in domestic equipment, where cost is a vital factor and performance can to some extent be traded off for other benefits. This greatly simplifies the electronics and minimises the memory capacity required. Digitising a composite colour CVBS signal calls for a high sampling rate, so that the higher luminance frequencies are adequately defined and the chroma subcarrier frequency is described in sufficient detail, though there is room for compromise in the number of amplitude levels used. For broadcast-quality pictures about 220 levels must be separately defined, and in professional practice 256 levels are used. This calls for an eight-bit word to describe each picture element. If fewer bits are used the number of brightness and colour levels available is reduced and the reproduced picture becomes coarser – the noise figure also rises. A six-bit system will enable an acceptable picture to be reproduced however, with 64 signal levels defined. At present most home-video digital processors are based on a six-bit system. The first to be described is used in the Toshiba DV-80 series of VCRs, but others are similar.

System Overview

An overall block diagram of the digital section of the system is shown in Fig. 3. The composite video input signal is passed into an analogue-to-digital (AD) converter from which it emerges as a stream of parallel six-bit words at intervals of about 75nsec. These enter the memory control chip, which first slows down the data rate by a factor of four

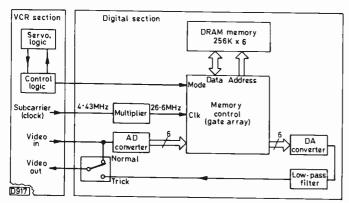


Fig. 3: Outline of the digital video processing section of the Toshiba Model DV-80 VCR.

to suit the access time of the memory bank. Data is passed to the memory in 4×6 -bit parallel form, under the control of address instructions from the memory control chip. The memory consists of six $64K \times 4$ -bit DRAM chips, giving a total capacity of about 1.5Mbits (DRAM = dynamic RAM – the MOS transistor charges have to be "refreshed" periodically, a process that's done automatically).

In the read mode data is taken from the memory in 4×6 -bit parallel form and converted to the original 6-bit words by the memory control chip. The 6-bit data is restored to analogue form by a DA converter, the following low-pass filter being used to remove vestiges of the clock pulses. It now forms the video output signal. The system clock runs at 26.58MHz, which is derived from the 4.43MHz chroma subcarrier by means of a times six multiplier.

Sampling and Quantisation

The first step required is to convert the signal to digital form. Fig. 4 shows a short section of the video waveform, which contains luminance and chrominance information. The section of signal is of about one microsecond duration, and thus represents about 1/52nd of the active duration of a single TV line - say 9mm with a 56cm c.r.t. screen. The signal is sampled by opening a gate at intervals of about 75nsec, under the control of a clock pulse train running at three times fsc (the colour subcarrier frequency). These samples then have to be quantised, i.e. their amplitude is measured against a yardstick having, in this case, 64 divisions. The results are expressed in terms of binary numbers. The first three samples in Fig. 4 are 27, 44 and 57, which in binary terms are 011011, 101100 and 111001. Because the system is a "closed-circuit" there's no risk of damage to or corruption of the bit stream, so there's no need for extra parity or other protection bits - quite unlike teletext, audio CD and Video 8 PCM systems which require heavy protection.

AD Conversion

There are many ways in which AD conversion can be carried out. The choice depends on the speed and accuracy required for the signal being processed. In this application a fast simultaneous converter (sometimes called a "flash" converter) is used. It takes the form of sixty-three separate comparators as shown in Fig. 5. One input of each comparator is connected to a tapping point along a potential-divider chain consisting of 64 separate resistors strung between precision reference voltages of 5V (VRT) and 3-992V (VRB). Thus the voltage applied to the

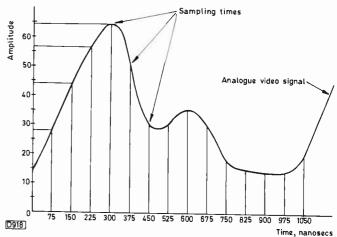


Fig. 4: Sampling an analogue waveform, in this case at a 75nsec interval rate.

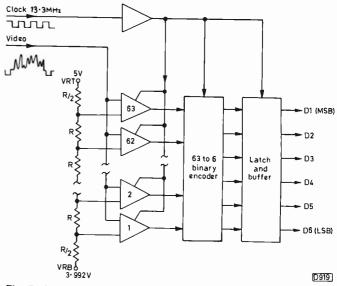


Fig. 5: Analogue to 6-bit digital converter arrangement using comparators.

reference input of each comparator in the group increases in 16mV steps over a range of just over 1V. The sync tip level of the video input waveform, which is of nominally 1V peak-to-peak, is firmly clamped to the AD converter's 3.992V reference voltage and is simultaneously applied to the sampling inputs of all the comparators – these inputs are connected in parallel. As the video input level rises above 3.992V, progressively more of the comparators will conduct.

Samples are taken on each rising edge of a 13·3MHz clock pulse train, so that going into the binary encoder we have a chain of "snapshots" of the amplitude of the video waveform at each sampling instant. The encoder converts these quantised samples into 6-bit words which are then passed to a latched buffer. All the blocks shown in Fig. 5 are incorporated in a 16-pin AD converter chip, type MB40576.

Serial-Parallel Conversion

At the AD converter chip's six output pins we have data emerging at a rate of 13·3Mbits per second. This is too fast for transfer into the memory bank used. The speed is reduced by a factor of four in a serial-to-parallel converter in the memory control chip – see Fig. 6. Each of the six streams of incoming data is fed into a four-stage shift

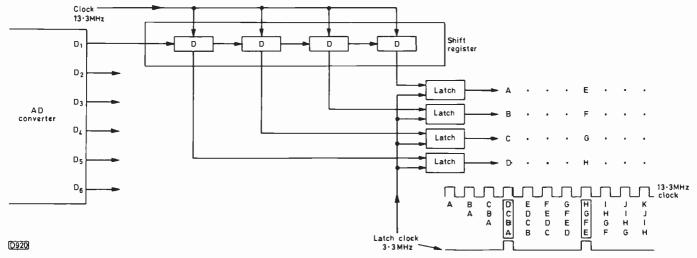


Fig. 6: Serial-to-parallel converter for bit-rate reduction. The time-related chart shows how four bits are accumulated and are simultaneously transferred to the memory at each latch clock pulse.

register which is controlled by the $13\cdot3\text{MHz}$ clock signal. As you will see from the chart in Fig. 6, following every fourth clock pulse the register will be full. At this point the $3\cdot3\text{MHz}$ latch clock freezes the data from a register in four latches. For each of the six input data lines there's a separate series-to-parallel converter of the type shown in Fig. 6. The result of this operation is 24 output lines carrying binary data at $3\cdot3\text{Mbits}$ per second instead of the original rate of $13\cdot3\text{Mb/sec}$. These 24 parallel outputs are passed direct to the memory via the memory control chip's 24 output pins. Thus the data is now being transferred four samples at a time (hence 4×6) at a speed of about 300nsec, which is well within the capability of the memory chips whose access time is about 250nsec.

Memory Store

The memory consists of six type MB81464-12PSZ $64K \times 4$ -bit DRAMs. This type of memory chip was chosen for its low power consumption and high storage density characteristic. It's of the type in which each bit is stored in the form of a charge in the stray capacitance existing at the gate region of a NMOS transistor. This capacitance is tiny, so the charge will soon leak away – this is why the refreshing process previously mentioned is necessary. It takes the form of an automatic internal read/rewrite cycle at intervals of a few msecs.

Each memory chip has four I/O pins and 64K addresses. A 16-bit word would normally be required to define these addresses, but some economy is possible here. In this application we don't need the speed and versatility of true 16-bit addressing, nor could the number of chip pins and bus lines be easily accommodated. Instead, the memory locations are arranged as 256 × 256 squares of rows and columns within each chip. An 8-bit row address word comes along the address bus first. It's latched into the row address store within the chip by an externally applied pulse called the row address strobe (RAS). The 8-bit column address word comes along the address bus next and is latched into the column address store within the chip by a column address strobe (CAS) pulse - these strobe pulses come from the memory control chip of course. The trailing edge of the CAS pulse activates the row and column address decoders, enabling data to be written into or read from the specified addresses. The timing of the RAS and CAS pulse chains is such that the address multiplexing operation occurs outside the critical path timing sequence

for read or write data access. Thus only ten pins are required for addressing – A0-7, /RAS and /CAS. In addition each memory chip has an input pin for read/write (/WE), an output enable pin (/OE) plus supply and earth pins. The four data pins are bidirectional, under the control of the /WE pulses.

Storing a TV Field

The actual capacity of these $64K \times 4$ -bit DRAMs is 262,144 ($64 \times 1,024 \times 4$), so the six chips used provide a total capacity of 1·572864Mbits. We must now relate this to a single field of TV information. The sampling frequency is $3 \times \text{fsc}$, and there are six bits per sample. A total of $3 \times \text{fsc} \times 6 = 79,805,142$ bits per second is thus being generated. The duration of a TV field is 20msecs or 1/50th of a second, so to accommodate this the memory must be capable of holding 79,805,142/50 = 1,596,103 bits. The available capacity of the six DRAMs is about 98.5 per cent of this, implying a shortfall of about four TV lines. This problem is overcome by writing the first 308 lines or so into the memory then discarding the information at the very bottom of the picture.

Thus during readout (see Fig. 7) lines 309-312 are missing. To avoid upsetting the sync and clamping of the display, this "blank" period must contain video information. With a VCR-derived picture the four lines prior to this, approximately 304-308, occur during the head changeover period and thus contain noise and jitter. Rather than repeat these poor quality lines the shortfall is made good by re-reading clean lines from the centre of the field, tacking these on at the bottom of the picture. In a correctly adjusted TV set or monitor they will be outside the viewing area. To prevent interference to the PAL phase sequence during these four lines the chroma information is

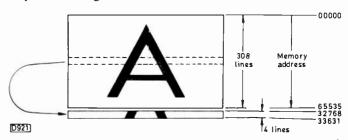


Fig. 7: To make up the four-line shortfall in the capacity of the memory a "slice" from about the centre of the picture is tacked to the bottom of the field.

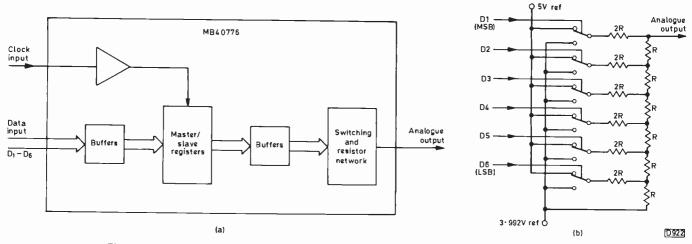


Fig. 8: Block diagram of the DA converter chip (a), and the switching/R-ladder system (b).

removed by a low-pass filter which is brought into operation by a suitably timed 260µsec gating pulse from the memory control chip. It's important with the PAL system to maintain the correct subcarrier phase sequence from field to field: to meet this requirement the number of memorised lines per field is set at an even number – 312 – in the still mode, when the contents of the memory are continuously read out to form a repeated-field still frame.

Read Mode

When the freeze button is operated, the writing process stops and the content of the memory is read out into the memory control chip via the same input/output data pins which are now programmed as inputs. The addresses are generated in the same sequence as before, so the data enters in the same 4×6 -bit parallel form in which it was written. It's reconverted to the original 6-bit word form by a shift register clocked at $13\cdot 3$ MHz and then emerges from the memory control chip's six output pins.

DA Conversion

Now that the digital data is back in the form of 6-bit words it can be converted to the original analogue signal. A block diagram of the MB40776 16-pin DA converter chip is

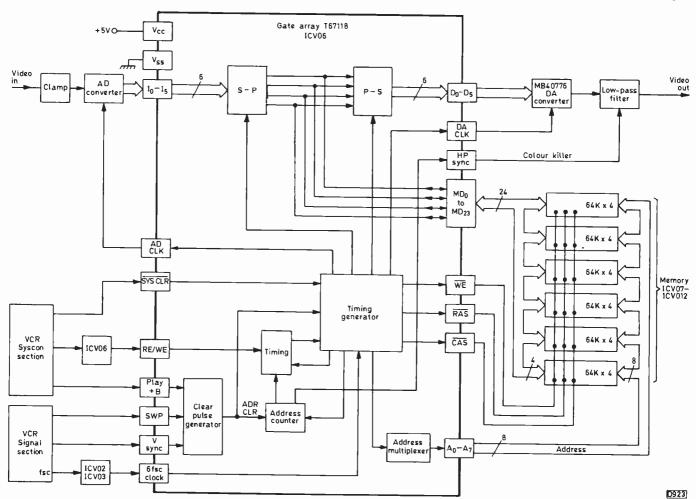


Fig. 9: Block diagram of the Toshiba memory control chip, showing its main connections to the rest of the circuitry.

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shown in Fig. 8. The incoming data is first temporarily stored in slave registers then transferred, when a clock pulse arrives, to six buffer stages whose outputs govern the current flow to and from an R-2R resistor ladder network.

This form of DA converter is very common – such converters all operate using the same principles. In this case there are two reference voltages within the chip, 3·992V and 5V. The influence of each of the six bits in each word depends on the rung of the ladder network to which its output buffer transistor is connected. The bits are "weighted" so that the most significant bit (MSB) D1 can provide 50 per cent of the output voltage with D2 contributing 25 per cent, D3 12·5 per cent and so on down to the least significant bit (LSB) D6 which influences the output by only about 1·56 per cent, corresponding to some 16mV of the full 1V peak-to-peak output signal which ranges from 3·922V to 5V over the binary input range 0000000 to 111111.

Memory Control Chip

The "brainbox" of this system is the memory control chip, a complex gate-array device, type T671118. Fig. 9 shows a block diagram, from which its internal arrangement and its interfacing with the other chips in the system can be seen.

The 6-bit data words from the AD converter enter at input port I, pins 10-15, for serial-to-parallel conversion as described earlier. The 4×6 data is passed to the memory chips via I/O port MD, pins MD0-MD23 – there are four lines to each of the six memory chips. The data destination within the memory is determined by the address multiplexer in the gate-array chip: its 8-bit address bus, in conjunction with the /RAS and /CAS lines, control the

memory chips simultaneously. Thus at any given moment all six memories are storing different 4-bit bytes at identical internal addresses. The memory control bus includes the write enable (/WE) line which is governed by the RE/WE feed from the VCR's syscon section. The latter also provides the Play +B line.

The timing generator within the chip is clocked at 26·6MHz, which is obtained by using ICV02 (TA7347P) to triple a 4·3MHz subcarrier signal from the VCR's signal section then using ICV03 (TA7320P) to double the result. Working from this, counters in the timing generator produce clock pulses for the AD and DA converter chips as well as the internal S-P and P-S shift registers.

The ADR CLR (address clear) input to the timing generator section of the chip comes from the clear pulse generator: the address counter is reset by the falling edge. This ensures that the read/write operation is synchronised to the head-switching flip-flop (SWP) in the playback mode or the V sync pulses in the E-E mode.

The system clear (/SYS CLR) input to the timing generator, from the VCR's syscon section, controls the use of the field memory: when the line goes high the digital mode is brought into operation.

The read/write (RE/WE) input is again from the syscon section and is initiated by the user's freeze key. ICV06 postpones switchover until the start of the next TV field.

Freeze Playback Operation

To freeze an off-air picture while in the E-E mode the digital circuit is activated and the memory system is next switched from write to read. The memory contents are then read out continuously, to be fed to the video output socket

and the VCR's r.f. modulator – the sound continues without interruption.

For freeze frame operation during playback (digital still mode) the output from video head B is fed into the store while the tape transport system is still running normally. This ensures that the best possible off-tape signal is used, since there need be no compromises with tracking. Once the video information has been transferred to the memory the tape transport system is stopped sharply.

The digital freeze-frame system confers several other advantages: the transition from a moving to a still picture is virtually instantaneous, with no shunting or searching; there's no risk of vertical jitter; the system works equally

well in the SP and LP modes; being digitally derived, the frozen picture is almost noise free; and the still picture can in theory be held for ever if required, without the three-minute constraint imposed by the risk of tape and head wear in conventional freeze-frame operation. This last feature is not necessarily incorporated in a VCR: because the usual requirement is to return to the normal playback mode quickly after viewing a still, the tape remains threaded and the head drum continues to rotate – this calls for automatic return to the playback mode after a few minutes.

Next month we'll look at some more systems and applications.

Teletopics

BROADCASTING IN THE NINETIES

The IBA has submitted to the Home Secretary a report detailing its proposals for TV in the nineties, when the next ITV franchises will come into operation. Rather than a franchise auction, as seems to be favoured by the government, the IBA suggests either a tax on advertising revenue together with the existing levy on profits or alternatively a form of tendering that would involve the valuation of each franchise. In addition a new type of franchise is suggested involving regional contractors who would buy in all their programmes, including news, sell their own advertising and operate without owning studios or employing any programme-makers directly.

The report, entitled *Independent Television in the 1990s*, criticises many of the policies that seem to be favoured by the government. It's aim is to initiate public debate on the future structure of the broadcasting industry. The status quo, it says, is not an option in view of the changes that are taking place. It puts forward new suggestions for controlling ITV contractors, including a system of issuing yellow and red warning cards. The IBA favours a fifth TV channel financed by advertising.

How much notice the government will take of these proposals remains to be seen. The government could well decide that the time has come to revise the operation and responsibilities of the IBA itself. During the next eighteen months the IBA intends to review the present regional boundaries and the question of change of ownership of ITV companies during the course of a franchise period.

The use of v.h.f. for additional TV services in the UK has been ruled out, primarily on the grounds of interference to other users. Lord Young, the Trade and Industry Secretary, making the announcement in a written reply in the House of Lords, referred to a technical feasibility study being conducted by the Home Office and the Department of Trade and Industry in conjunction with the BBC and the IBA. The question of using spare capacity in the u.h.f. TV spectrum for an additional TV service is still being considered. The advertising industry maintains that a fifth, advert-financed service would be economically viable and would not damage existing services.

TRADE NEWS

One of the best known names in the UK electronics industry, Mullard, has been dropped. The company name has been changed to Philips Components, to emphasise the fact that it is a part of the world's largest electronic

components business, with annual sales of some £3,000m, and that it has direct access to the latest developments in component technology throughout the Philips group. The original company was founded by Stanley Mullard in 1920 and became a part of Philips in 1927.

CPC Ltd. of 194-200 North Road, Preston, Lancs PR1 1YP (0772 555 034) has been appointed official spares stockist for Hinari products.

As part of the rationalisation of Thomson's UK interests following the company's purchase of Ferguson, Paul Spring Electronics, the UK distributor for Thomson's Telefunken brand equipment, has been merged with Ferguson.

As an extension to its Prestel-based MOVIES (multioption viewdata interactive enquiry system) arrangement Philips Service has introduced PHASES — Philips advisor for service engineering support, an interactive technical advice system designed to help with fault diagnosis in Philips' consumer electronics products. The basic MOV-IES system enables dealers to pass orders, enquiries and messages to the Philips Service computer. PHASES is a user-friendly system that leads the engineer through a series of menus, questions and explanatory text until the general location of a fault has been identified, in order to save time and avoid the frustration of following dead-end trails. The system can also provide details of testing procedures when the repair has been carried out. Initially launched as a pilot scheme, PHASES currently covers self-oscillating power supplies and fifteen types of Pye and Philips compact disc players. The system will, after satisfactory completion of the pilot project, be extended to include other Philips products, especially in the high-tech

Funai branded goods are to be marketed in the UK. They will be distributed by Goodmans.

SATELLITE TV

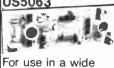
Eutelsat I-F5 is to be launched in July as a replacement for Eutelsat I-F1. It will be positioned at 13°E while Eutelsat I-F1 will be moved to 16°E. All Eutelsat I-F1 services will be transferred to the new satellite which will in turn be replaced by the first Eutelsat II series satellite in 1990.

Some details of the Philips/Plessey MAC decoder chip set, which can handle D-MAC, D2-MAC and C-MAC signals, have been released. The vision and data signals first pass to a microcomputer controlled TDA8734 MACAN (MAC-analogue) chip. This part of the system is completed by a control loop incorporating an MV1720 MAC control chip which also provides outputs to control other parts of the system. The vision output from the MACAN chip passes via an analogue-to-digital converter



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chip to the MV1710 MAC video processing chip, whose YUV outputs then go to a digital-to-analogue converter. The MV1710 also provides outputs to the sound and text processing chips. The system is completed by sound filtering, sound DA converter, memory and access control chips — some of the chips on the sound side were originally developed for use in compact disc players. It's expected that the chip set will be in production in six-ten months' time, hopefully about right for the launch of the

DEVELOPMENTS

Astra satellite.

A prototype six-inch diagonal full-colour liquid-crystal display has been demonstrated at Philips' Redhill Research Laboratories. The display uses an active matrix array of amorphous silicon thin-film transistors arranged in 288 rows by 468 columns to control the light output. The resolution will thus be about half that of a standard PAL picture. The display is intended for use in compact portable TV sets with screen sizes up to ten inches.

Anisotropic liquid-crystal technology developed by the West German company Merck enables displays whose contrast level is independent of viewing angle to be produced. Three European consumer electronics companies are understood to be already using the technology.

Tandy Corporation has demonstrated a prototype record/playback compact disc system. The company maintains that the discs can be erased and re-recorded hundreds of thousands of times over. Development to commercial product stage is expected to take about two years. Several major consumer electronics manufacturers are working on re-recordable optical discs.

Toshiba intends to introduce a 3D camcorder in the USA this summer at a price of under \$3,000. The camcorder will record left- and right-hand images on alternate fields on a VHS-C cassette.

Warner New Media intends to launch compact discs with added graphics in the USA later this year. JVC will be making CD players with the graphics feature. The graphics are displayed as still pictures on a TV screen: with simple graphics a picture change is possible every two seconds, about seven seconds being required for a more complex display. The idea is to reproduce matter relevant to the disc — photographs, lyrics, guitar cord sequences and so on. The basic CD specification includes subcarriers that can be used for the purpose.

Our thanks to the American magazine Radio-Electronics for these last two news items from the USA.

Sony has added a second videodisc player to its range of interactive video equipment. The new player, Model

LDP-1550P, incorporates all the features of the LDP-1500P, adding a jump facility of \pm 200 frames with a "worst case" access time of two seconds. The LDP-1550P has a recommended price of £1,395 plus VAT while the LCP-1500P's suggested price is £1,195 plus VAT. The two players operate in conjunction with Sony's SMC-3000VP video computer and associated software. A complete system, with 14in. monitor, costs £5,795 plus VAT when based on the LDP-1500P player or £5,995 plus VAT with an LDP-1550P player.

EASIWIRE ELECTRONIC CIRCUIT SYSTEM

A wiring kit called Circuigraph Easiwire has been introduced by BICC-VERO Electronics, Flanders Road, Hedge End, Southampton SO3 3LG (0489 288 774). It offers users a simple, versatile and low-cost means of building electronic circuits without the need for solder or chemicals. Connections are made by winding wire fed from a special pen around the pins of each component in the circuit. The technique is easily learnt and can be applied to circuits in TV sets as well as simpler applications. An instruction book is included with the kit.

BOOKS

The third edition of Steve Beeching's Videocassette Recorders — a Servicing Guide has been published by Heinemann Newnes at £20. A great deal of new material, particularly on 8mm video, VHS HQ and S-VHS, has been added. There's a new chapter on the VHS-C format, and the section on fault patterns and component changes has been considerably enlarged. There are over 80 new illustrations.

Heinemann Newnes has also published a second edition of Video Techniques by Gordon White, at £30. This book has been written for engineers and technicians working in the TV and ancilliary industries. It describes TV and video principles and shows how equipment is designed and functions in complete systems, its capability and limitations.

A second edition of Simon Hamer's TV DX for Beginners has been published at £2.95 including postage in the UK or £3.75 air mail world-wide by HS Publications, 7 Epping Close, Derby DE3 4HR. The completely revised and expanded 24-page (A5 format) book is primarily intended as a guide for newcomers to the hobby. It explains why DX signals occur at random and how to resolve them when conditions allow, presenting the subject in a practical way and providing reference material such as channel allocations.

TV Fault Finding

Sony KV21XMU (AE1 Chassis)

On more than one occasion these sets have produced a "jagged picture" effect: the picture is broken into sawteeth, or "wriggles", in a random way, and the fault is generally intermittent. Each time we've found that the cause of the trouble has been the $10k\Omega$ horizontal phase potentiometer RV502. A clean up will usually do, but to be sure of the job it's best to fit a new potentiometer. E.T.

Philips G11 Chassis

This chassis tends to suffer from field timebase faults. Here are some points worth noting.

You sometimes get horizontal black bars when the set warms up. To start with these appear only at the top of the screen, but as time goes on they move downwards, filling more of the screen. The lines are caused by the field flyback circuit turning the beam off because of a fault in the field output stage. If you scope the field output ramp when the fault is present you'll see that there are bursts of h.f. superimposed upon it. This is the reason for the blanking circuit being upset, but where is the h.f. coming from?

You may recall that the TDA2600 field timebase chip works on the class D principle. The output from an h.f. oscillator is mixed with a 50Hz ramp to produce a pulsewidth modulated drive for the output stage. To drive the scan coils, the PWM output is integrated by a filter consisting of a coil and several other components. The fault occurs when one of the capacitors in the filter circuit fails. The usual culprit is C2107 (4·7 μ F): examination may show that it has dried up. Occasionally I've had C2072 (4·7 μ F) cause the same symptom.

Field flyback lines across the screen can be the result of Tr2164 (BC148) becoming leaky. It's one half of the delay multivibrator in the field blanking circuit.

Very occasionally failure of the TDA2600 results in R2066 (1.5k Ω) in its d.c. supply going open-circuit. The result of course if field collapse.

If the problem is persistent failure of the TDA2600 and you reckon you've checked all the stock faults, try putting new heatsink compound on the next TDA2600 you fit – having cleaned off the old, hardened compound. This chip runs very hot and relies heavily on the heatsink to keep it cool: many engineers don't bother to use new heatsink compound when replacing it.

J.C.

Fidelity AV\$1600

The original problem had been a shorted BU508 line output transistor. No cause could be found, and a replacement restored the picture. A couple of days later however we received a report that the TV was flashing over. Removing the back (18 screws) and switching on produced a single crack from the focus unit in the line output transformer, followed by normal operation. Again nothing else could be found, so a new line output transformer was fitted. This time switching on produced a few seconds of fireworks before I could reach the mains switch. A check on the h.t. line revealed that we now had over 130V instead of 119V, so I gave up and reluctantly transported the monster to the workshop. Those familiar with the

Reports from Eugene Trundle, Mick Dutton, Jo Cieszynski, Philip Blundell, Eng. Tech., W.H. Clarke, lan Bowden, Phil. H. Ireland, Hugh MacMullen, Martin Pomeroy and J.L. Howard

AVS cabinet will sympathise deeply.

The culprit was found to be C91 (1μ F, 63V) in the power supply, but the damage had been done. To restore full operation the TDA3562A decoder chip, the TDA8190G audio chip, the TDA2070 field timebase chip and even one of the TDA1908 audio output chips had to be replaced.

P.H.I.

National Panasonic TC85G

The problem with this set was that the picture faded out after half an hour. We found that the cause of the trouble was the AN231 chip IC103, which is no longer available. On asking a friend whether he had a scrap set he told me that an AN331 could be used provided a $680k\Omega$ resistor was fitted between pins 15 and 16. When these components were fitted the set worked perfectly. W.H.C.

Philips KT3 Chassis

We have always been fond of this chassis. Apart from the tube, the 4.7Ω surge limiting resistor and the plug in the socket on the decoder panel we have found that the reliability is good. A set recently came in with the complaint that it would go off of its own accord. On inspection in the house the set tripped soon after it was switched on, and we immediately suspected that damp around the e.h.t. cap was the problem. The area was cleaned and sealed but next day the customer reported that the fault was still present, so we collected the set for a soak test.

The fault proved to be very intermittent. Over a period of time we fitted a substitute power supply panel, tripler, line output transistor and even the main electrolytic capacitor (having had a faulty one a long time ago), but the problem persisted. We suspected the tube of arcing internally, so this was interchanged with one in another set. Still no luck. The customer then called in to ask about progress. During our conversation he mentioned that just after the set was new the tube had had to be purified. The problem had been put down to the proximity of the speaker in a radiogram. This led us to make a check on the degaussing circuit. For good measure we replaced the thermistor, and this cured the problem completely. It would seem that intermittent operation of this device was inducing a pulse in the power supply and that this was the cause of the random tripping. M.D.

Panasonic TC2622

It's quite common knowledge that the high-voltage capacitors used in the power supply circuits in Panasonic sets tend to give trouble. One of these sets would intermittently produce a blank raster and white flashes. The cause of the trouble was C326 (1μ F) which is mounted on the tube base and decouples the 200V rail. M.D.

Toshiba Projection TV

We were recently asked to look at a projection TV set in a hotel. The problem was no colour. It was a multi-standard receiver with automatic switching between PAL and SECAM and a switch to convert to NTSC. The signals section seemed to be very similar to that in Toshiba domestic models. We replaced the decoder chip and the crystal but had no luck, so the unit was uplifted to the workshop.

We were able to measure the chroma output from the decoder chip, then the input to the control i.c. There was nothing at the output from this chip, which does the PAL/SECAM switching. Checking the voltages around it showed that the supply was missing. It comes via a flying lead from the main panel, the lead being pushed on to a metal post. This post had been pushed through but never soldered. Refixing it provided a cure. M.D.

Sanyo CTP7131

This set came in dead. There was h.t. at the collector of the chopper transistor but the power supply wouldn't start. Checking around the power supply failed to reveal anything obvious, so we started to fit substitute semiconductor devices. When D308 was replaced the set came to life, though on soak test we noticed that it was still sometimes sluggish to start. Replacing C312 $(10\mu F)$ cured this problem.

Salora J Chassis

The problem was no colour. A check at pin 4 of the TDA3562A colour decoder chip revealed that the chroma signal was arriving from the filter circuit and was of the correct amplitude (500 mV p-p). After passing through the gated chroma amplifier in the chip however only the burst appeared at pin 28 (the output to the delay line). It seemed reasonable to replace the chip but the results were as before. I then checked the d.c. levels at the relevant pins and discovered that the voltage at the chroma input pin 4 was only 0.7 V instead of 3 V. The cause of the trouble was a leak in CB209 (10 nF) which when checked out of circuit measured around 250Ω .

Bang and Olufsen 37XX Series

The problem with this set was reduced width – only approximately 5cm overall, which couldn't be corrected by adjusting the width potentiometer. C32 (1.5nF, 1.5kV), which is connected from the collector of the line output transistor to chassis, was found to be open-circuit.

Salora 1G Chassis (Ipsalo 1)

This set would start up from cold, but if it was switched off completely after running for a few hours, or was switched to standby via the remote control unit, it would fail to start again. The cause of the trouble was TB15 (BD370B) on the timebase panel going base-emitter open-circuit when hot, as a result of which the 12V start-up supply to the Ipsalo and line oscillator chips was removed.

Philips CP90 Chassis

We have had several cases of no sound or picture with these sets. R3623 (8.2Ω) goes high in value, fuse 1640 stays o.k. but diode D6667 (1N4148) simultaneously goes open-circuit. This gives roughly half of 95V and 163V and the set is in the standby mode – when D6667 is open-

circuit the voltage across winding 1-2 on the SOPS transformer is not rectified. This is why TS7677 (BUT11) doesn't conduct and the set remains in standby. **H.MacM.**

Grundig 7400

The cause of flashing horizontal red bars across the screen for the first five minutes took some time to locate. Eventually C1912, which couples the red output from pin 15 of the TBA530 matrixing chip to the red output transistor, was found to be intermittently open-circuit when cold. The fault was very misleading because the red bars superimposed on the other colours gave the impression of an off-tune reference oscillator. C1912 is the same notorious $4.7\mu F$ capacitor used in the Thorn 3500 chassis.

H.MacM.

Philips 21CE1051

When the sound is o.k. but there's no picture it's common to find that the tube's first anode supply is missing: the weight of the heavy wire to the flimsy c.r.t. socket cracks the print where the wire is connected to the panel.

H.MacM.

Philips TX Chassis

This set wouldn't come on, due to failure of the line oscillator to start up. We found that the voltage at the output from the series regulator was low at 4V, but no fault could be found in the power supply, whose output is smoothed by C113 ($100\mu F$). Unloading the line output stage by disconnecting the scan coils got the set going, with a line down the centre of the screen. When the scan coils were reconnected the set continued to work but couldn't be started again after switching off. It turned out that C113 had dried up, with the result that the average l.t. voltage was too low to energise the line oscillator.

M.P.

Tandberg CTV3-4-172

Don't get caught out by these sets. You bring them out of standby by pressing button N, not the one with the standby symbol (that one puts the set into standby!). If the set is stuck in standby, search in the dust at the bottom of the cabinet for the two 125mA fuses. Both could well have blown. If so, have a good look around the line output and power supply boards for dry-joints.

P.B.

Salora 1F3K

I.B.

The problem with this set was field slip from cold, the symptom taking about ten minutes to clear. When I arrived at the house the set had been on for about an hour, so I changed the field timebase panel on spec. The following day the customer phoned to say that the fault was still present. Being determined to stop the trouble I took along an identical replacement set which, after a few days, produced the same symptoms! On returning to the house I saw that the cause was condensation forming on the top right-hand corner of the mother board – easily corrected by warm air from a hairdryer. We've since had the same trouble with a number of these sets. As you might expect, the heating used in the houses concerned was either a gas fire or a paraffin heater.

Another cold start problem with this chassis occurs when C8 (10μ F) on board STPX27 fails. The result is a twenty minute start-up time. J.L.H.

Conditional Programme Access

Harold Peters

If you've mastered the finer points of satellite TV, to the point where you can explain the differences between D-MAC and D2-MAC, you may well feel that you can simply sit back and wait for it to come, confident that you're ready for it. Not so! MAC is only half of it. Lurking within the packets of digital information are instructions that determine whether or not you will be able to watch the programme of your choice. Conditional Access (CA for short) will sort out who watches what and how much they pay. If the government has its way a similar arrangement might eventually apply to terrestrial TV, to replace the licence. So we might as well get to grips with this added complication. To make conditional access work you first have to scramble the signal.

Scrambling

It's the intention of the D-MAC broadcasters (and probably the D2-MAC camp as well) to scramble all broadcasts from the outset, the currently favoured method being the "double cut" – see Fig. 1. Parts of the picture, both luminance and chrominance, but not necessarily together, are cut out, reversed and reinserted in a pseudo-random manner determined by a key or control word. These keys or control words are included in line 625, together with the field sync pulse word and other codes that control access to countries and selected groups of viewers – see Fig. 2.

Every MAC decoder will have a unique code number implanted within it. This is rather like your credit card, and provision is made for interrogation of the individual code numbers at a rate of about a million subscribers an hour, via the incoming signal. Countries and groups get faster treatment, being up-dated at every programme start.

Panning

Line 625 was originally intended for field synchronisation. With MAC satellite TV transmissions it will, in addition to the field sync word, contain panning information and all the conditional access signals. Panning information? Well, provision is incorporated for future wide-screen (16:9 aspect ratio) transmissions, making it imperative that standard 5:4 receivers can be panned to follow the action, as is done at present when a Cinemascope film is being broadcast. The MAC panning code will indicate whether the transmission is wide-screen or not, and if so where 5:4 viewers' sets will look.

Conditional Access Codes

The conditional access codes are in two groups. The first gives service related messages, the second customer related messages. Service related messages include a descrambling code, programme identification and price details, the latter probably indicating one of four categories: clear (unscrambled); scrambled but free of charge; scrambled and charged to a monthly account; scrambled on a pay-as-you-view basis (including cost per hour). Customer related messages consist of country codes, group codes and the previously mentioned unique messages to individual subscribers. The

block diagram of how this is all organised is too horrendous to include in an introductory article such as this one. Far better to look at a hypothetical example to see how it will be applied.

How it will work

Let's say that an evening's sport is followed by the news, a commercial break and a very adult late night movie.

The sport will contain a service related message making access conditional on the user inserting a pay-as-you-view "smart card". This is a credit card containing a microprocessor and a memory "charged up" with a number of pre-paid units. While the sport is being watched the units will be erased at say two an hour.

The news that follows is free but scrambled, so the smart card will have to stay in but no units will be erased. The sound might be multi-lingual, with the user preselecting his chosen language.

The commercial break is not only free but unscrambled, so presumably everyone can pick it up. Not so. Say that it contains a cigarette advertisement which is banned in the UK: the customer related message will include a code that prevents access by all UK receivers and decoders.

The saucy film that ends the day's programming presents another problem. Say that it contains scenes of explicit sexual behaviour which are banned in a number of European countries. The customer related message is changed to bar access to the film by people in those countries. Where it can be watched however it may cost a small fortune, since the price code could be upped to say five units an hour. Still, the whole of the UK could see it

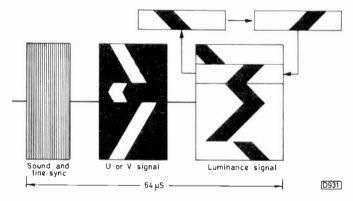
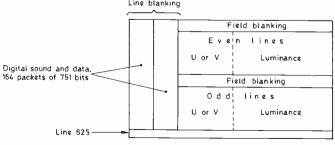


Fig. 1: Double-cut scrambling. For security, the code is changed every ten seconds.



D932

Fig. 2: Basic composition of a MAC frame.

except perhaps Harold Peters who failed to renew his subscription and has had his decoder turned off by a unique entitlement management message.

You mustn't take the example outlined as an exact description of how it will all come about. It's only what is being aimed at by the research people. Once the technology has been sorted out the politicians will have to agree – and they have a habit of voting against something simply because their country didn't think of it first. Anyway, it's question time . . .

What is there in it for the enthusiast and amateur?

Not a lot! It's a high-security system, and it's unlikely that DIY decoder kits will be available. The pseudo random binary sequence code is changed every ten seconds, so that's how long you have to crack it. But at least you know what you are up against and won't be taken in by anyone offering bogus equipment.

Could we listen to sound only, via a NICAM decoder?

This has also been though of. The sound will be scrambled on a pseudo random binary sequence basis different from the luminance and colour information.

What about servicing?

There's been a deathly hush on this one. It will presumably be a divided responsibility, similar to the arrangement when a rented set on a communal system fails.

Will one set of gear work on all transmissions?

Unlikely. Though the aim is for compatibility between D-MAC and D2-MAC the two are not at present compatible and they may be in use before dual-standard decoders have been developed. In addition, there's competition between two proposed and untried conditional access systems, while General Instruments is pushing its

VideoCipher system as a third contender. The latter has the advantage of being fully developed and in use in the USA.

How can a faulty decoder as opposed to denied access be recognised?

How dare you talk of faulty decoders! It might be possible for the decoder to generate a "no access" caption.

For unique over-air addressing, a decoder must surely be run all the time?

Correct. While we are on about decoders, remember that decoded MAC translated back to PAL for your present set looses all the quality advantage of the MAC system.

What about video recording?

This is another grey area. MAC VCRs are not on the cards at present, so it's back to PAL through your existing machine. The more inventive amongst you might be tempted to develop a gadget that lowers and raises the smart card in its slot in synchronism with the VCR timer.

How much will it all cost?

I'm glad you asked me that! There's a natural reluctance on the part of the British to pay more for their TV than they did twenty years ago. Prices of sets have fallen by more than the licence fee has gone up during this time, while the van needed to deliver the thing has risen tenfold in price over the period.

The idea at present seems to be that the cost of the extra gear required will be roughly the current price of a TV set, to which you have to add the decoder rent and the pay-as-vou-view charges.

To sum up, depending on how the authorities handle it, MAC could revolutionise TV as we know it while conditional access could kill it stone dead.

Test Report: Willow Vale Desoldering Tool

Alfred Damp

The electric desoldering tool available from Willow Vale Electronics Ltd. is basically a 30W soldering iron with a hollow tip. The element heats the tip in the conventional way, but surrounds a tube that connects the hollow tip to the solder sucker body, which is part of the handle.

The hollow tip is placed over the leg of the component to be unsoldered. This means that only the component leg and the surrounding solder pad are heated, not other parts of the print as with desoldering braid.

The great advantage is that the design gives you onehanded operation of the desoldering process. Your other hand is thus free to steady the board on which work is being done. For single-handed operation the tool is held as if it's a knife. This feels a little strange at first, but if you regard the tool as a solder sucker and hold it as such, with your thumb operating the plunger and the release button, you quickly get used to it.

With one-handed operation the board or panel can be held: you no longer have to balance or wedge the board only to have it move the first time you operate the sucker. Being able to hold the board and keep it stable while desoldering a component not only saves time, and thus money, but also saves frayed nerves.

Multiple-pin components such as integrated circuits, button units, switch banks, tuning banks and tuners are the most obvious candidates on which to use the tool. The only problem we've had to date has been with tuners, where the casing leg doesn't always desolder the first time, probably because of the heatsink effect of the case. It's also worth noting that if the iron is left plugged in continuously the handle gets quite hot. Remember that you have to wait for it to heat up – it's not an instant-heat iron.

The tool very quickly proved its worth in our workshops. Various chips, tuners and a couple of Sharp VC9300 button units were quickly and easily desoldered. I'm sure that field service engineers would find it useful for line output transformers, colour decoder chips and so on.

The desoldering iron is available from Willow Vale Electronics Ltd. for £14·49 trade plus VAT, a price that should be quickly recovered. The order code is 04-111. At the time of writing this report the iron had not been included in the Willow Vale catalogue. Willow Vale's headquarters address is 11 Arkwright Road, Reading, Berks, RG2 0LU (telephone 0734 876 444).

TELEVISION JUNE 1988

Letters

THE FLAT SQUARE TUBE

Until I bought one I believed that there were real advantages in having a TV set fitted with the comparatively recently introduced FS type of tube. The set I bought was a Toshiba model, but the point applies to others – that the convergence and focus set up are very critical with an FS tube. It seems that some manufacturers are not prepared to ensure that the setting up is carried out to an adequate standard. The performance of the new set was not up to that of the one-year old Decca/Tatung set it was supposed to replace, with a non-FS tube. A further check at the showroom revealed that all the sets with FS tubes had convergence/focus/grey scale errors. I decided to change the set for a Sony model that gives good if not outstanding results, and am beginning to think that this FST business is a bit of a gimmick.

Colin McCormick, Plymouth, Devon.

Editorial comment: We've looked ourselves and asked around and can't find anyone who supports this view. FS tubes are self-converging and seem to be very good. Perhaps other readers might like to comment?

MAINTAINING THE TV22

In reply to David Tilley's request for help with valves for the Bush Model TV22, The Vintage Wireless Company Ltd., Tudor House, Cossham Street, Mangotsfield, Bristol BS17 3EN should be able to supply a PL38 and PZ30. Alternatively the PZ30 could be replaced with a couple of silicon diodes in series with surge limiters, suitably camouflaged. If the set is to be used, every paper and electrolytic capacitor should be replaced. This can easily be done whilst maintaining the internal appearance. My TV22 worked well until Holme Moss ceased 405-line transmissions a couple of years ago.

Mike Phelan,

Liversedge, W. Yorks.

THE ONDRA RC UNIT

A review of the Ondra programmable remote control unit appeared in the January issue. It seemed to be ideal for use in the workshop, so we ordered one. When it arrived we programmed it to control Philips TV sets and Panasonic and Ferguson VCRs. Unfortunately we soon found that it was not suitable for use with the Philips TV range, as the same digit couldn't be selected twice running, e.g. channel 11 or teletext page 888. This point seems to have been overlooked by your reviewer. *Gareth Foster*.

Whitton, Middlesex.

Eugene Trundle comments: You are right of course. At the time when we tested the unit we didn't have any Philips products in the workshop – we don't see many of them, as our firm does not have Pye or Philips dealerships. Our apologies for missing this point.

The problem arises from the RC5 code used by Philips. The second bit in each transmitted command is a toggle bit which changes state each time a key is pressed, so that the receiver's decoder can discriminate between a "new

identical command" and an "end of transmission interruption", e.g. someone passes between you and the receiver. It seems that the Ondra unit cannot be programmed to cope with this and retain its compatibility with other remote control codes.

In experimenting with the unit we've found that a partial solution is to key between identical digits some command that's irrelevant to the wanted function, i.e. to get page 111 key in 1 x 1 x 1 where x is channel up, mute, granny button or whatever. The alternate commands included in this way satisfy the toggle system in the RC5 decoder. The situation arises only where identical numbers are keyed in consecutively, typically with page selection.

SONY SPARES

Your TV/VCR Spares Guide (April) is very helpful but with regard to Sony one point should be made. If you don't have an account with Sony, spares orders, trade or otherwise, should be sent to:

Specialised Electronic Services (Dulwich) Ltd.,

Unit 4, Goose Green Trading Estate,

47 East Dulwich Road,

London SE22 9BS.

Telephone no. 01-693 9622.

I hope this information will be helpful to other readers. *M.K. Hayter*,

Moseley, Birmingham.

BUZZING COIL

The r.f. suppression coil L1378 on the power supply panel in the Philips G8 chassis starts to buzz after a long life. The early, round type can be silenced by force fitting one or two Rawlplugs. To silence the later, square type, proceed as follows. Remove the inductor and cut from a piece of floor vinyl two thin strips approximately one millimetre thick. Fit these diagonally across between the inductor and chassis, with two self-tapping screws.

Paul Rowe, Camborne, Cornwall.

THE WYLEX MAINS OUTLET

While looking through some back issues I found several letters on mains plug safety. This got me thinking about the circular Wylex types that were at one time installed in the North Shields area. They were probably the first to have an internal fuse (see Fig. 1). There were two flat pins for neutral and live, a large circular pin sandwiched between them being used for earth. Five and 13A versions were available. The former had narrower pins, enabling them to fit into the 13A plug adaptors that were also available: both types were compatible with the socket outlets however, though the 5A plugs often made poor

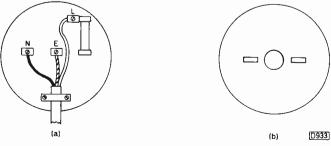


Fig. 1: The Wylex mains outlet, (a) plug, (b) socket.

contact – perfect for blowing G11 line output transistors!

In contrast with the present day 13A square-pin arrangement, these plugs were arranged so that the live lead was the longest of the three – and of course there were some who bypassed the cord grips . . .

The houses were rewired in 1978, much to the relief of the residents as the cost of the plugs had become prohibitive. The Electricity Board didn't supply replacement plugs, but it became cheaper in the long run. Does anyone else remember them, or still come across them? I can't say I miss them – I received my first electric shock from one of them some twenty years ago!

Brian Renforth, Newcastle upon Tyne.

SHARP SPARES

A member of the public wrote to Sharp complaining about the treatment he'd received at local shops in the Stevenage area when he tried to order new drive belts and capstan wheels for his Sharp RG955 stereo car eassette player. He's a fully qualified electronics design engineer well able to undertake routine maintenance but was told by the first shop he tried that, after three weeks, they couldn't obtain the parts. Several other shops refused to help. He then wrote to Sharp direct, who forwarded his letter to us as official Sharp spares stockists. We were able to send off a pro forma invoice for the parts within a week of the original letter of complaint.

This sort of thing happens all the time. It seems that the so-called service trade just isn't interested unless it looks like a meaty job with a tasty profit. I'd like to see some replies from Stevenage "dealers" stating why they were unable to help. Ask yourself why we should spend thousands of pounds producing a Sharp Spares Catalogue if we've no wish to supply spare parts?!

Brian Tuckfield, Sales Manager, Willow Vale Electronics Ltd., Reading.

FOR DISPOSAL

I have for disposal a Philips Model 21TG106U (BA5800) fitted with an AW53-88 tube. The set is in immaculate condition throughout, having been carefully looked after by its owner. It features a light-sensitive cell behind a small lens assembly at the front, beneath the tube screen. This produces picture bright-up when the room lighting is increased. To complete the ensemble, the original stand/magazine rack with two polished side wings is also available. I had acquired the set with a view to converting it into a more up-to-date one, but it occurs to me that this might be an act of sacrilege. If anyone who collects such things is interested, please contact me at the address below.

Brian Powell, 62 Ladysmith Road, Ashton-under-Lyne, Lancs. OL6 9BZ. Telephone 061 308 4639.

I have been given an old TV receiver without a cabinet – I believe it was once housed in a bookcase. It's not in very good condition, having been in a garden shed for the last twenty years. The tube looks to be about ten inches and appears to be still in good order: the valves all look to be in one piece, but the wiring etc. has deteriorated with age. Anyone who thinks it would be of some use to them can have it free of charge – buyer collects.

K. Wells, 21 Abottsfield Close, Hastings, East Sussex. TN34 2DT.

next month in

TELEVISION

DIGITAL VIDEO EFFECTS

Ir developing his account of the use of memory chips to store TV pictures and the possibilities that this provides for various special effects in domestic TV/video equipmert, Eugene Trundle looks at the digital video system used inthe Panasonic Model NV-D80 VCR. This uses eight-bit quantisation of the analogue videc signal, two fast 1Mbit DRAMs and a purpose-designed 98-pin memory control chip to give strobe, graphic effects and noise reduction in addition to very high quality noise-free still pictures.

TRANSISTOR LOAD MATCHING

A fundamental law of electronics states that maximum power is delivered to a load when the source and load resistances are equal. But electronics is full of surprises! This fundamental law apparently doesn't apply with power output transistors, where the normal load value is a small fraction of the device's output resistance. Stan Amos explains.

SERVICING WITH A VARIAC

The trouble with many common faults in modern receivers is that the fuse blows at switch on or a trip operates almost instantaneously, leaving very I ttle time for diagnosis. Attempts at repair can result in a pile of expensive dead transistors. In such a situation ife is made much simpler by powering the saet via a variac, so that the input voltage can be increased gradually. Eugene Trundle describes the technique and also how to use lamps to gain additional clues.

● LOW-POWER BAND I TRANSMITTERS

Restoring and maintaining 405-line receivers has become quite a hobby. The problem is how to provide them with signals! A pattern generator can be used, but isn't really the answer. About six years ago Chas E. Miller acquired some equipment from the Radio Rentals factory at Bristol. It included vision and sound transmitters of relatively simple design but well able to serve as a source of 405-line signals for your sets. Full circuit details will be given.

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IF YOU DON'T SEE IT LISTED ASK FOR QUOTE. GIVE MAKE MODEL LOCATION. REMEMBER TO ADD 0:60 POST & HANDLING. ADD 15% VAT TO TOTAL		0.97 2SC515A DN'T SEE IT LIS	2.85 AF179 TED ASK FOR QU	0.55 BA6209	4.55 BC559B	0.11 BDX62A	2.15 BFY51	0.25 RYX71-600	0.95 HΔ1370 2.30

Television Questionnaire

Our aim is that Television should be as useful and as interesting as possible to readers. In this connection it would greatly assist us if you would take a few minutes to complete the following questionnaire. It will tell us what you think about Television and whether there are any improvements you would like to see.

Every reply is important as it will help us to cater for the needs of all our readers. In appreciation of your help we are running a prize draw with four prizes of Adcola soldering equipment - for details see page 601. All answers received will be kept strictly confidential and will be analysed in statistical form only.

The questionnaire has been designed so that it can be removed from the magazine without damaging the other contents, then folded and returned post-paid.

1	Are you emplo	yed in the TV/vi	deo ind	dustry in any of the fo	llowing jobs?			
	□ TV service er□ Development	ngineer only t engineer		☐ Video service engil☐ TV/video technical	neer only support engineer	□ TV/v	rideo servi	ce engineer
	Other — please	specify						
2	Are you emplo	yed by?						
	□ A setmaker's□ A retail/rental□ Self-employe	l outlet		☐ A retail shop ☐ A spares distributo ☐ Other — please sp	or ecify	□ A re	ntal brancl rvicing on	h ly company
3	Does your job i	involve servicing	g equip	ment other than TV o	r video?			
	□ Yes	□No	If yes,	please specify				
4	Are you employ	yed in any othe	branc	h of electronics?				
	□ Yes	□No	If yes,	please specify		• • • • • • • • • • • • • • • • • • • •		
5	Do you have ar	ny of the followi	ng qua	lifications?				
				☐ Engineering technic☐ Degree		□ Othe	nician eng r — please	e specify
6	Do you regard							
	☐ Your job only			Your hobby only?	□ Both	your jo	b and you	r hobby?
7	How interested	are you in the f	ollowir	ng subjects covered in	Television?			
						terested		Not at all
	Servicing TV se Servicing video TV/video circuit Electronics theo Constructional p Trade news	equipment ry/systems ry			interested □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □			interested
8	How interested	are you in the f	ollowir	ng items that appear re	egularly in <i>Televis</i>	ion?		
O	The leader Teletopics Letters TV Fault Finding VCR Clinic Micro Clinic Long-distance T Service Bureau Test Case Advertisements	3	ollowii	ig items that appear re		erested		Not at all interested
TEI	LEVISION JUNE 19	988						599

599

3	would you like to see wider coverage	of the following in Televi	ision?			
	☐ Microcomputer servicing☐ Compact disc player servicing☐ Satellite TV equipment	☐ Microcomputer ap☐ Audio equipment☐ Constructional pro	servicing			
	Others — please specify		•••••			
10	How interested would you be in seeing	g the scope of <i>Television</i>	widened to i	nclude the fol	lowing?	
				nterested Not		
	T)		interested		ested in	
	TV programme production Studio equipment					
	Cable TV			_		
	Information on new components				<u> </u>	
	News on new TV/video equipment					
	Detailed information on circuit operation					
	User reports/reviews on video equipme Servicing equipment/aids	ent				
	contioning equipmentalida				_	
11	Overall, how interesting do you find To	elevision?				
	☐ Very interesting ☐ In ☐ Not at all interesting	nteresting	□ Not	very interesti	ng	
12	How useful do you find Television in y	our work?				
	☐ Very useful ☐ U ☐ Not at all useful	Jseful	□ Not	very useful		
13	Do you find the articles in <i>Television</i>					
	·	About right?	□Тоо	basic?		
14	What do you think of the overall layou	t and presentation of the	contents of	Tolovicion?		
•		little dull		ropriate		
	_ mash too dan	t may dan		порнате		
15	Is there anything you particularly like a	•	, ,			
16	ls there anything you particularly dislik					•••••
17	In general, are there any improvement	s you would like to see in	n <i>Television</i> ?	- please spec	cify	
18	How often do you use the following te	et aquipment?				•••••
	•	ос очиринени:	Frequently	Occasionally	Rarely	Never
	Multimeter					
	Digital multimeter					
	Oscilloscope Frequency counter					
	Signal/pattern generator					
	- Ignar penant ganarata			Ь		
19	How often do you buy the following?		Eroguantly	Occasionally	Paraly	Novor
	Second-hand TV sets		Frequentiy	Occasionally	′ Kareiy □	Never
	Second-hand VCRs					
	Tubes					
	TV spares (LOPTs, triplers, etc.)					
	Video spares (heads, motors, etc.) Electronic components (transistors, cap	nacitors etc.)				
	Servicing equipment	nuontora, ett./				
	Servicing aids					
	Security systems			П	$\overline{\Box}$	П

600

20	How often do you buy from the	following sources?		Frequently	Occasionally	Rarely	Never
	Advertisers in <i>Television</i> Manufacturer's service department Trade distributors	ents					
	Mail order catalogue						
	Retail outlets						
21	How often do you buy Television	n?					
	□ Every issue	☐ Most issues		□ Occa	sional issues		
	200., 10000	•					
22	Are you more likely to buy Telev	vision:	V		. L Na daa		fluonos
			Yes, r	more likely to	buy No, doe my de	s not in ecision t	
	When something mentioned on When there's a free gift	the cover interests me	e		·		
23	How do you usually acquire the	copies of Television	you read?				
	☐ Bought from a newsagent				subscription	11	
	☐ Read a copy taken by my firm	n/organisation		⊔ K €	ead someone e	es co	эру
24	For how long have you been a r	reader of <i>Television</i> ?					
	□ Less than one year□ More than 10 years	☐ 1-4 years		□ 5-10	years		
25	Which if any of the following tra	de/radio/electronics m	nagazines d	do you read?			
					Occasionally	Rarely	Never
	Electronics and Wireless World						
	Electrical and Radio Trading Electronics Weekly						
	Electronics Times						
	Elektor Electronics			_			
	Any other — please specify						
26	Which if any video magazines d						
			•••••				
27	Which if any national daily news	spaper(s) do you read	l most ofter	n? — please	specify		
28	Please indicate your age group.	24	□ 25-34		□ 35-44		
	□ Under 16 □ 16- □ 45-54 □ 55-	- :	□ 25-34 □ 65+		□ 35-44		
£99 £61 VA	an incentive to returning, complet dering products as follows: first 0-19 plus VAT); second prize a U' 1-78 plus VAT); third prize a K4000 T); fourth prize a K2000 standard st be received in our offices by J	prize a U101 electro 1456 24V 50W temper dual-temperature sol 240V iron with safety	nically-cont rature-cont Idering iror / stand (tra	trolled 50W rolled iron w n with safety	soldering stati ith power sup stand (trade p	ion (trad ply (trad rice £25	de price de price 5.57 plus
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TELEVISION JUNE 1988

VCR Clinic

GEC V4001/Hitachi VT9300

This machine worked fine in E-E but produced just a blank raster in the playback mode. The scope showed that there was no video coming out of pin 22 of IC202, though it was going in at pin 1. Voltage checks around the i.c. revealed that pin 23 (squelch) was at 3V. The manual specifies the voltage as 4·2V, but if you trace the line back it goes to the base of Q214 which is shown as being at 0·3V. They can't both be right! The feed to this comes from the audio-jack PCB, where Q640 should be conducting in playback but wasn't – it was open-circuit. Alter your circuit diagram to show 0·3V at pin 23 of IC202 in playback!

Sharp VC6300

Don't be surprised if you find that you have no rewind after fitting a non-genuine belt kit in one of these machines – the rewind belt is often too small, preventing the idler from moving over far enough.

P.B.

Ferguson 3V31/JVC HR7650

For intermittent colour in the playback mode, check for dry-joints on crystal 401 on the chroma board. **P.B.**

Amstrad VCR4500

Crinkling of the lower edge of the tape as it re-enters the cassette has become a problem with these machines. The official modification involves reducing the take-up torque by replacing the clutch gear and fitting a smaller clutch spring. In one or two instances however some tapes continue to be damaged.

We've found that a more certain modification can be carried out by fitting, in addition to the previously mentioned items, the pinch-wheel tape support as used in the VCR4600. The only problem here is that the nylon nut doesn't have a part number and is thus presumably not available. A steel nut can be used provided the thread is varnished after setting up. Replacing the pinch-roller arm doesn't appear to be necessary since in all the machines we've come across the arm has been drilled ready to accommodate this part. The relevant part numbers are as

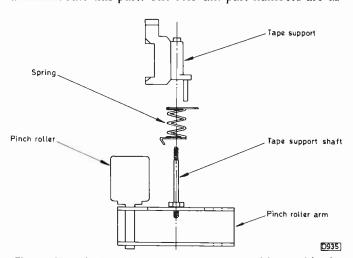


Fig. 1: The pinch wheel tape support assembly used in the Amstrad Model VCR4600.

Reports from Philip Blundell, Eng. Tech., Phil. H. Ireland, Alfred Damp, Nick Beer and Eugene Trundle

follows: tape support 151482; tape shaft 151483; tape spring 152484; pinch-roller arm if required 150769. Fig. 1 shows these items.

P.H.I.

Hitachi VT64

The complaint was noisy rewind, but after running two or three tapes through the machine nothing unusual could be heard. We decided to leave the machine on test on the soak bench, and after a few minutes the fault developed – but it was in playback, not rewind. Back on the work bench the machine worked normally when switched on. Time to leave it running in playback and make the tea. When I came back it was droning away nicely, but when the machine was tipped backwards to inspect its underside the noise went. Lowering it brought the noise back.

The help of a colleague was summoned: he held the machine while I looked up from beneath. Pushing the capstan flywheel up would clear the noise, and on inspection we saw that there were signs of rust deposits on the nylon plate in the middle of the flywheel support bracket. A smear of Vaseline on this plate cured the fault. A.D.

Fisher FVHP906

The clock worked but that was about all. The job ticket read "not playing" and the truth was that you couldn't switch the machine on. We found that the power control input to the main microcomputer chip was correct, but nothing happened at the power control output. Replacing the chip cured the fault.

A.D.

Ferguson 3V42/JVC HRD455

The job card read "cassette jammed", but the customer had released it. On removing the top we found that the deck was in the half-loaded state. When we switched on, the loading motor tried to return the loading poles to the unloaded position but was prevented from doing so because the tension pole jammed the supply loading pole. When the loading/mode control motor bracket was removed so that we could inspect the nylon gear assembly on the underside of the deck we found that the cogs were badly worn, as was the loading gear. Replacing both these parts and setting up the loading timing cleared the trouble.

A.D.

Amstrad VCR5200

A fully wound tape would be ejected as soon as it was inserted, but if a tape that was not fully wound was inserted it could at least be rewound, after which it would be ejected. A check on the inputs to the microcomputer chip revealed that there was a difference of 0.6V between the start and end sensor readings, the end sensor recording the lower voltage. Replacing the end sensor restored normal operation.

A.D.

Panasonic NV430

This one was being serviced after coming back off rental. When I switched it on the capstan ran at high speed and the loading ring arms continually laced and unlaced.

When the bottom cover was removed the mode switch retaining screw was seen to be loose while the switch itself had moved. Refitting it correctly had no effect however, so a new one was fitted. This improved matters, but full order was not restored until the main cam gear and the brake actuating arms were realigned. All that was then required was a new VDV0152 loading belt.

N.B.

Ferguson 3V45/JVC HRD140

We're now getting a lot of these machines with the "intermittent won't play or record" complaint, and of course the loading belt has stretched. Unlike the 3V29/3V30 series in which this was also a common complaint belt replacement in these models is very straightforward – just remove the top cover, hinge up the top PCB, remove the screening can and there it is right on top. No circlips etc. to remove!

Sony SL8000UB

After fitting new heads in this machine I noticed that two sections of the clock's minutes display were permanently partially illuminated. The cause of the trouble was leakage across the print leading to the digitron. Cutting out the offending areas and running leads across cured the fault.

NR

Mitsubishi HS300

The complaint with this machine was that it wouldn't play until it had been switched on for over an hour. On dismantling it the cause of the trouble was soon seen – a lazy capstan motor. New motors are no longer available, but Mitsubishi rebuild them. This necessitates return of the old one. Unfortunately the first motor I received back was completely seized due to a distorted tacho ring. **N.B.**

Panasonic NV-G25B

The complaint with this new machine was of intermittent sound and picture dropouts. A field engineer had collected it and had noticed that the machine creased the bottom edge of the tape. On inspection we could see that the creasing occurred when the tape moved in the fully laced position (this machine has the half-lace facility so that the control head can read the tape and produce a real-time counter display). Closer inspection revealed that the pinch roller was barrel shaped and was thus distorting the tape as it passed over the capstan and the associated guide – this roller is the one that descends from above, driven by the loading motor.

A point worth making about this and other machines that use the G mechanism is that there is nothing in the manual on replacing the mode switch. It's of the rotary type, and there will be no problems provided you carefully note the position of the old one before removing it. If you do get caught, Fig. 2 shows the position in the tape ejected mode.

N.B.

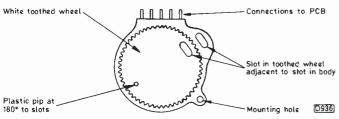


Fig. 2: Mode switch in the tape ejected mode.

Mitsubishi HS337

We've had two or three cases of "no go" with these models – sometimes intermittent. The symptoms have been as follows. On pressing the "power" button the channel indicator has come up momentarily on 1, but the "on" LED has not lit at all. The problem is caused by failure of the SW5V line as a result of dry-joints between Q9A2 and the control PCB. Note that the circuit diagram in the manual is correct but on the board itself and the board layout diagram in the manual Q9A2's base and emitter connections are transposed. Other joints in the area are worth checking. The "on" command from the syscon microcomputer chip establishes the TU-12V line which in turn brings on the SW5V supply.

Philips VR6462/Finlux 1010 etc.

The usual cause of insufficient reel torque in the record, playback and search modes in these machines is slippage (insufficient friction) in the "flying-shuttle" reel idler. We've had one or two cases where the trouble has been due to too much friction however.

The idler is retained by an elliptical spring and a circular baseplate, upon which it revolves. Excessive friction can sometimes develop between the underside of the idler and the top of the plate – the friction can be sufficient to bring the reel motor to almost a standstill in any but the fast forward and rewind modes. Once it has been confirmed that the reel brakes are not binding, i.e. the brake solenoid is not sticky, the point can be proved by pulling the idler clear of the motor drive boss, when the speed of the reel motor should zoom up for a second. Cleaning and polishing both face surfaces will cure the binding, but it's best to replace both the idler and the plate.

Sanyo VHR3300

This was a difficult puzzle to solve. The machine stood accused of intermittently chewing tapes and failing to eject the cassette. It took some time to discover, while the machine was going through bouts of working and not working, that fuse 5001 on the power supply panel (PW1) was going open-circuit intermittently. When it opened and closed the sequence was that the loading arms retracted but the tape was not wound into the cassette. Eject was then permitted, with some 20cm of tape at large in the machine. Messy!

Hitachi VT410

There was no colour at all during playback, though the machine recorded good colour. The chroma signal path was present and correct throughout the up-conversion circuitry, but the signal was lost at R307 which was dryjointed to the PCB. This resistor provides matching for the 2H delay line.

Baird 8940/JVC HR7350

"One channel down" said the job card. These guessing games are part of workshop life. The TV channels were all o.k., so we turned our attention to the audio channels – this machine has stereo capability on longitudinal tracks. The front-mounted audio monitor switch gave us good sound when pushed to the left, reasonable sound at its centre setting and no sound at all when pushed to the right-most position. During playback there was no output from pin 3 of the audio DIN socket unless the monitor

switch was pushed to the left: the E-E sound here was o.k. however. Plainly the LH (channel 1) playback channel was in trouble.

With two identical circuits, fault-finding in one of them is easy. IC2 on the audio/video panel looks after the LH

sound, and we found a big oscillation at some supersonic frequency at pin 1. There was a bigger dose of the same at pin 4. Playback equalisation is applied here and C9 (22μ F, 16V), which is part of the feedback network, turned out to be open-circuit.

A Guide to Microwave Techniques

Part 3: Aerials Andrew J. Heron

In the previous two instalments we have seen how a TEM wave can be propagated along a waveguide and have looked at various components that can be used in a transmission system. With any transmission system the aerial is of prime importance, since the overall performance of a transmitting or receiving system depends on its efficiency.

In general an aerial's gain is proportional to, and its beamwidth is inversely proportional to, the aerial's physical size, which is defined in terms of wavelengths. At v.h.f. and u.h.f. the dimensions of a practical aerial cannot be much greater than a few wavelengths. This is not the case at s.h.f.: for example, at 10GHz an aerial whose dimensions are equivalent to ten wavelengths is only about 30cm. It will be apparent therefore that at s.h.f. we can have physically small aerials with a high gain and narrow beamwidth.

Waveguide Horns

A length of waveguide that's open at one end will radiate from the aperture. This could be considered to be the most basic form of aerial. As we have seen the dimensions of a waveguide supporting the dominant mode are close to one wavelength. Thus in terms of wavelengths the aperture is small, resulting in a broad distribution of radiation. If the waveguide's a and b dimensions are extended to form a flare we obtain a horn-shaped aperture – see Fig. 21(a). This is referred to as a pyramidal waveguide horn. The net

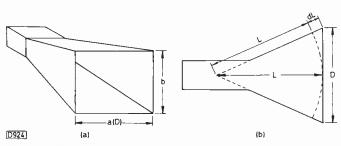


Fig. 21: The pyramidal waveguide horn.

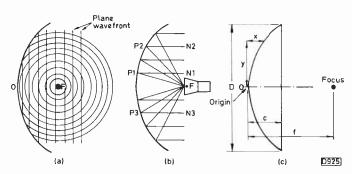


Fig. 22: Principles of the parabolic dish aerial. The distances F-P1-N1, F-P2-N2 and F-P3-N3 in (b) are all the same.

effect of the flaring is to increase the aperture size and thus achieve greater directivity, i.e. a narrower beamwidth.

It can be seen from Fig. 21(b) that by flaring the aperture the path length from a point within the aperture of the main guide to the end of the flared section varies across the horn aperture. This varying path length produces phase variations across the aperture of the horn, an undesirable feature since it results in large sidelobes. Sidelobes constitute radiation in a direction other than that of the main beam and represent a waste of power.

Such path length variations can be minimised by using a very long yet shallow flare, but this is obviously impractical. A compromise length is usually adopted. The general rule is to limit the phase variations to 90°. Since the maximum phase variation occurs at the extreme of the aperture, this means that the value of dL is $\lambda/4$. The optimum horn length is then defined as follows:

$$L = (D^2/2\lambda) - (\lambda/8),$$

while the approximate gain relative to a half-wave dipole is given by:

$$G = 4.5 \text{ (ab/}\lambda2\text{)}.$$

The pyramidal horn produces a relatively broad beamwidth and in consequence has few applications as a transmitting source in communications systems. The horn's properties make it suitable for use as a transmitting source in measuring systems however, an application where the

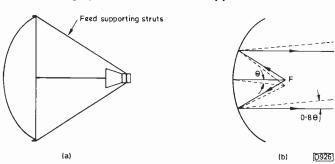


Fig. 23: Direct-feed system.

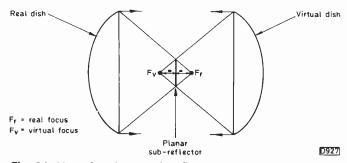


Fig. 24: Use of a planar sub-reflector.

transmitting aerial is required to produce a fairly broad beam.

The typical gain of a horn is up to about 25dB – the actual gain varies with frequency and also the waveguide size. Horns which have been accurately calibrated for gain against frequency are referred to as standard gain horns. They are frequently used in measurements to determine the gain of a test aerial.

The Parabolic Reflector

The requirements of an aerial used for a terrestrial point-to-point link are: (1) High gain, to increase the level of the extremely low received signals. A high-gain aerial will reduce the gain requirements of the receiving equipment. (2) Narrow beamwidth in both the horizontal and the vertical planes, typically less than 2°, to minimise interference between neighbouring links.

Metal plate reflectors are extensively used at microwave frequencies to form the radiation into a narrow beam. Many shapes can be used, but the narrowest beamwidth for a given reflector size is obtained with a parabolic profile – see Fig. 22(a). The profile shown here is a two-dimensional curve called a parabola: a three-dimensional reflector is called a paraboloid and can be considered as the three-dimensional profile that would be produced by rotating Fig. 22(a) about its axis OF.

The major properties of the paraboloid reflector are that a spherical wavefront from a point source F – see Fig. 22(a) – will be reflected from the surface and converted to a plane wavefront. Similarly, radiation entering the aperture of the paraboloid reflector will be reflected from the surface and will from every point on the surface be directed towards point F – see Fig. 22(b). Point F is referred to as the focus and is the point at which the reflected energy converges. The distance FO is the focal length, i.e. the distance between the focal point and the centre of the paraboloid. The focal length depends on the profile of the paraboloid.

It will be noticed that a point source F, Fig. 22(a), will also radiate energy directly. This energy does not reach the reflector and is a waste of power. The problem is avoided by mounting a feed at point F so that the radiation is propagated only in the direction of the reflector. Notice that the path length between the focus, the reflector and the plane of the feed is at all points equal.

Fig. 22(c) shows the various paraboloid dimensions. D is the aperture diameter, f is the focal length, c is the depth of the paraboloid at its centre, y is any vertical distance from the origin and x the distance between the parabola and a line perpendicular to the origin at a vertical distance y. The following relationships are used for paraboloid calculations:

$$y^2 = 4fx$$
, $y^2 = 4Dx(f/D)$ and $f = D^2/16c$,

where f/D is the ratio of the focal length to the dish diameter.

For a given diameter the f/D ratio determines the depth of the dish. A low f/D ratio means a deep dish. If the focus is inside the aperture the radiated signal will not illuminate the entire dish uniformly. Efficiency is therefore reduced, but a deep dish provides a high degree of sidelobe suppression. A large f/D ratio means a shallow dish with the focus some distance from its surface. The radiated signal will illuminate a greater area than that of the dish, again reducing the efficiency. With an f/D ratio of 0-25 the focus will lie in the plane of the paraboloid's rim. This gives

maximum gain and efficiency since the source illuminates the entire dish area uniformly.

Dish Size

Dish size determines the maximum theoretical gain that can be achieved at a given frequency. The maximum theoretical gain is given by:

$$G = \eta(\pi^2 D^2/\lambda^2)$$

where η is the dish efficiency.

At a given frequency, if the dish diameter is doubled the maximum gain will be quadrupled. Gain will also be quadrupled by doubling the frequency, for a given dish diameter. In practice maximum gain is determined by efficiency, which is generally assumed to be 50 per cent.

If the diameter of the dish is halved the f/D ratio is doubled. It's possible however to simulate reduced diameter electrically by under illuminating the dish.

Dish Illumination

The term illumination means the direction of radiation towards a reflective dish. The ideal case is with the feed situated at the focus so that its radiation illuminates the entire area of the reflector and no more. In practice this is never achieved and all dish aerials are to some degree inefficient. The area actually illuminated, relative to the total area, is a measure of the illumination efficiency K. It's defined by:

 $K = (Area illuminated by feed/total reflector area) <math>\times 100\%$, or

 $K = (Actual gain/maximum theoretical gain) \times 100\%.$

Illumination is ultimately governed by the feed however. It must be designed to suit the diameter and focal length of the dish. Although the illumination efficiency contributes to the overall aerial efficiency, factors such as phase errors across the aperture and blocking loss due to the obstruction caused by the feed also have a significant effect.

Direct Feed

The simplest feed system consists of a single horn mounted with its phase centre at the focal point, supported by three struts attached to the rim of the dish – the phase centre of a horn is the point from which radiation appears to emanate. This arrangement, called a front-feed or direct feed aerial, is shown in Fig. 23(a). The main disadvantage is the obstruction caused by the feed and its mounting struts, but by careful mounting these effects can be minimised. Poor positioning of the feed, i.e. deviation from the focal point, will shift the direction of the beam relative to the dish. This is shown in Fig. 23(b). Minor errors will not result in a significant gain reduction however. For a given degree of shift, the feed displacement will increase with increased focal length.

From a practical point of view, the front-feed arrangement is convenient as it leaves the back of the dish unobstructed for ease of mounting. It's the easiest arrangement to set up.

Indirect Feed

If a second reflector is placed between the dish and its focal point the aerial can be fed from the back of the dish.

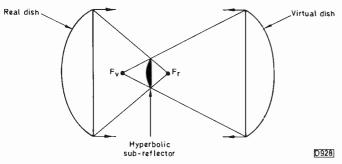


Fig. 25: Use of a hyperbolic sub-reflector – the Cassegrain-feed system.

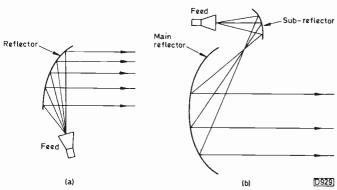


Fig. 26: Offset-fed systems.

In the arrangement shown in Fig. 24 the sub-reflector is planar: it should be a few wavelengths in diameter but as a general rule, to avoid significant gain reduction, should not be greater than 0.3 times the diameter of the dish. As the sub-reflector is planar the feed system can be of the same type as with a front-fed aerial.

The sub-reflector's position can be found by projecting lines from the focal point to both extremes of the dish: the sub-reflector is then positioned so that it fits between these two lines. The feed should be mounted at the same distance from the sub-reflector as the sub-reflector from the focal point – at point Fv in Fig. 24. This is best envisaged, as shown, by imagining a reflection of the main dish in the plane of the sub-reflector. The reflection is called the virtual dish and its focal point the virtual focus. It can be seen that this geometric construction serves to determine the position of the feed – at the virtual focal point Fv.

Although this arrangement complicates the mounting system slightly, it has the advantage that the feed enters at the rear of the main dish while the support required for the

	Rectangular waveguide	\Diamond	Hybrid (magic) tee	- 	Isolator
~	Twisted waveguide	+	Sliding probe coupled to a transmission path	1	Probe
_	Matched termination	-8-(Parabolic aerial with rectangular waveguide feeder		Two port junction
4	Variable resistive attenuator	~	Flexible waveguide	X	Directional coupler
<u></u>	Wavegulde aperture		Short circuit	-<	Horn aerial cr horn feed
- B	Phase changer	A	Multi-screw tuner	¤	Space station

Fig. 27: Graphical symbols used in waveguide diagrams.

sub-reflector is of a lighter type than that required for a front-feed horn. The major disadvantage is that aerials employing sub-reflectors are generally more difficult to set up.

Cassegrain Feed

A variation on this theme is the Cassegrain-feed system which employs a sub-reflector with a hyperbolic profile – see Fig. 25. With a hyperbolic sub-reflector the focal length of the virtual dish is greater than that of the real dish. Thus a dish with a short focal length can be efficiently illuminated.

The main advantage of the Cassegrain-feed system is that the position of the feed relative to the sub-reflector is far less critical. It's common practice to mount the feed behind the dish, firing the radiation through a suitably sized hole at the centre of the dish.

Offset Feed

Offset-feed systems may also be of the front-fed or indirect type. The front-fed arrangement is shown in Fig. 26(a). It employs a main reflector and a horn feed, the principle being that the dish is illuminated from the bottom, at an angle. The dish is neither symmetrical nor a paraboloid, so both design and manufacture are more difficult. A variation is the offset-Gregorian aerial shown in Fig. 26(b), employing a shaped sub-reflector to form an indirect feed.

The major attraction of offset-fed aerials is that the dish is unobstructed, which results in increased efficiency and thus gain. The problem with all offset feeds however is that setting up is difficult and critical. With the offset-Gregorian system the sub-reflector is usually mounted on an arm that extends from the dish and includes a means of adjustment. This structure is very critical and must be free from vibration, since the slightest movement of the sub-reflector will cause severe degradation of both the gain and the radiation pattern.

Micro Strip

Although waveguides and waveguide components are expensive and often difficult to produce, they remain the most efficient method of high-power transmission at microwave frequencies.

In recent years however considerable progress has been made in the field of microwave circuitry. Microstrip transmission lines – miniature transmission lines on printed circuit board – are frequently used. Conventional PCB technology is generally employed for this purpose. Matching components, i.e. capacitors and inductors, can be readily produced in microstrip form and are much cheaper than their waveguide equivalents. Microstrip aerials can be produced, though these are not widely used at present. Further development is likely to produce aerials that are smaller and of lower cost than the present generation of dish aerials. The Matsushita flat-panel aerial, at present still in the development stage, was illustrated in the June 1987 issue of *Television*.

In Conclusion

In conclusion, Fig. 27 shows some of the graphical symbols used in waveguide diagrams. The aim of this series has been to outline the fundamental features of the subject without going into detail.

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.

FERGUSON TX100 CHASSIS

The fault with a Model 51A3 is unstable tuning and control (sound, brightness, etc.). Sometimes the vision and sound will disappear, leaving only a raster, and the channel number will change, with the mute light coming into operation. At other times the sound only will go off, while sometimes it suddently rises to full volume. Even the brightness has been affected. The faults are intermittent, occurring maybe two-three times a day or perhaps only once or twice a week.

First ensure that the 5V supply is present and correct at R1905 on the remote preamplifier panel PC1543-003. If so, check the board for poor connections and dry-joints before suspecting IC1902 (TDA3047) and IC1901 (SAA3004P) in that order.

VCR HEAD CLEANING

I used a cleaning tape and although it cleaned the heads the results are not good enough. It would seem to be better to wet clean the heads. Can you suggest a suitable fluid to use?

Though proprietary head-cleaning fluids are available we use surgical spirit with complete success, on a single layer of felt-free cloth held taught over the index finger. Hold the finger still, pressing moderately hard, and rotate the head drum anticlockwise against it. Also do the stationary heads, guides and capstan. Leave to dry fully before using the machine with a tape.

AMSTRAD VCR7000

Apart from failure to eject, this machine works perfectly. The solenoid moves slightly when the eject button is pressed and works when powered by an external 12V supply. We've tried using a digital meter to take voltage readings at the solenoid when the eject button is pressed and find that the voltage seems to vary slightly.

A meter, whether of the digital or analogue variety, is too slow to indicate the "depth" of the eject solenoid drive pulse. First confirm that the "unreg 18V" supply is present at both ends of the solenoid. Then press eject and confirm that "EJ. SOL-" (P1007/2) momentarily drops below 2V. If it does, replace the solenoid. If not, IC1004 is suspect so long as pin 4 of IC1001 is going fully high.

GEC 20AX Mk II CHASSIS

The power supply panel will provide the specified 1.2A h.t. current with a dummy load, but when connected to the set it keeps tripping. Adjusting the set over-current trip control to a slightly higher value sometimes enables the set to run, provided it quickly locks to incoming line sync

pulses. When it does run however there are two vertical white lines, caused by interference generated by the chopper driver transistor TR501 as it switches off and on. The hash interferes with other sets several yards away. The power supply will also work in the set if the h.t. is kept below about 125V instead of the specified 133V. Replacing the chopper control chip and the driver and chopper transistors has made no difference.

We suggest you replace the h.t. rectifier diode D510 and the associated reservoir/smoothing electrolytic block C527 which, in our experience, can fail giving peculiar results. We have also found that the two zener diodes D503 and D504 can sometimes "hiccup", upsetting the operation of the TDA2640 chopper control chip.

AKAI VS2

The fault with this machine occurred after the customer had replaced the cassette bulb with one obtained from a local shop. Everything would work all right for a couple of seconds, then the machine would shut down. I decided that the bulb was the wrong one and fitted a Thorn replacement. The timer and play functions then worked but two days later the machine was back again. Now in one out of six tries the machine shuts down as before.

The cassette lamp circuit in this model is unusual, and all sorts of strange symptoms occur when the incorrect type of lamp is fitted. Fit the correct type, part no. EL-330446, which will have to be obtained from Akai or through an agent.

DECCA/TATUNG 120 CHASSIS

This set required a new tripler. It subsequently started to change channel from 3 to 4 or 1 to 2.

The most likely cause of this problem is intermittent flashover in the focus sparkgap on the tube base panel. An improved type, part no. 25-1990-9, is available. Also check that the h.t. is not excessive.

HITACHI VT64

There's a cassette eject fault with this machine. When eject is selected the cassette motor continues to run in the eject direction then reverses and stops when SW1 (load cassette position) next closes. When the machine is switched on the cassette is instantly loaded. SW1 and SW2 are initially open. The switch states are: cassette loaded SW1 open, SW2 closed; cassette ejected SW1 and SW2 open; load cassette SW2 closed then SW1 closed. The syscon and motor drive chips are in order.

Operation of the cassette cradle is largely controlled by the tape-end sensor phototransistors Q141 and Q142 which are particularly troublesome in this model. We suggest you replace them – part nos. 5381681 and 5381682.

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TELEVISION JUNE 1988

FERGUSON TX10 CHASSIS WITH TELETEXT

There had been a flashover in the focus control which was replaced along with the SAA5012 remote control chip – the latter had been killed by the flashover. The set now works correctly except that when teletext is selected all that appears is random lines of the same digit, with no page number or date and day.

We have often experienced this sequence of events. Almost invariably the SAA5030 chip in the teletext decoder has proved to be faulty. It seems to be more vulnerable than the other i.c.s on the teletext panel.



306

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.

It's summer time and there's been a slight decline in the numer of TV sets and videos coming in for repair. This is just as well, with staff thin on the ground as a result of holidays. The respite has enabled us to wade into a big pile of stock sets and VCRs. One of them, a Sanyo Model VHR3300 VCR, gave us a bit of practice at logical fault-finding. Not all faults have such logical causes and cures as this one!

A customer had returned the machine which was labelled "please exchange – poor colour". So we fed in a test tape with a colour-bar recording. Perfect colour came up on the monitor. The E-E picture was good too, so we made a recording from Channel 4. If the replay was all right the machine would go back to the shop! The colours were terrible however – there were lines and streaks of incorrect colour, reds turned to greens and vice versa in horizontal bands, and sometimes there was no colour at all. Ugh!

The tape was rewound and removed from the machine so that it could be tried on another machine whose signal circuits were known to be in good order. The results were virtually the same. So we had a chroma fault that was confined to the record mode. When in doubt in a case like this, it's as well to go through the manufacturer's alignment instructions. Realignment will not necessarily solve the problem, but can provide some concrete evidence as to where the source of the trouble lies. If something won't set up, finding out why will usually provide the key to the diagnosis.

Compared to the twiddler's delights of five to ten years ago, very little setting up is required with modern machines. In this case only two adjustments on the chroma side of things are detailed in the service manual – the single voltage-controlled crystal oscillator (VXO), to provide a 4·433619MHz signal on playback of a blank tape, and the chrominance writing current. This latter adjustment is somewhat confusing due to an error of some sort in the

service manual. Both factory settings were found to be correct, and an examination of the 627kHz colour-under signal going on to the tape showed that there was nothing wrong with the "envelope" pattern of the chroma component of a colour-bar signal.

The man on the job's first impulse would perhaps have been to change the colour processing chip – in this machine a single TA8632N carries out all the chroma signal processing in the record and playback modes. Wiser councils prevailed however. The problem could have been within the i.c., but most of its circuitry works during playback as well as during record. In fact had the chip been changed the results would have been just as before. The signal and pulse input and output routes are also similar in both modes, but come from and go to different sources.

Here lay the essential clue – and it's not necessary to have the service manual or a detailed knowledge of the circuitry involved to be able to make a reasoned guess as to the cause of the problem. Indeed the advice a colleage shouted across the busy workshop was given without any reference to the service manual and was well on target.

Use of an oscilloscope together with a reasonable knowledge of the VHS colour-under system and a careful analysis of the clues enabled the source of the problem to be found. Where would you have connected the scope's probe and what would you have expected to see? What are the characteristics of the colour-under signal recorded on the tape, and on what do they depend? Next month's issue will reveal all . . .

ANSWER TO TEST CASE 305 - page 528 last month -

The kerfuffle described last month culminated in an accusation that Super Tuner Repairs Ltd. was not up to the job. Despite fitting two new chips and a service-exchange tuner, the grainy picture displayed by a Fidelity CTV14R colour portable obstinately remained. As a final check on the aerial link, the off-air signal in the workshop was applied directly to the input point inside the tuner, a fair enough procedure so long as the TV chassis is fully isolated from the mains supply by one means or another. In this case the bench power supply was provided by an isolating transformer. But direct aerial connection in his way did nothing for the poor picture display.

There remained only one real possibility – the SAW filter, which provides the i.f. bandpass shaping. It was in fact the culprit, and also accounted for the slight ringing effect that had been noticed on the test card. Whatever had happened inside this one had increased its loss and caused an impedance mismatch.

Failure of one of these devices – this one was an SW153 – is very rare. Indeed it's the first time we've had this fault, which is why we'd left the SAWF out of the reckoning during our attempts at diagnosis.

When a glass delay line fails our curiosity usually leads us to break it open and have a look inside to see what's gone wrong. The solid easing of this little wonder precludes such action however, so we'll never know. The piezo element is probably too small for easy inspection anyway.

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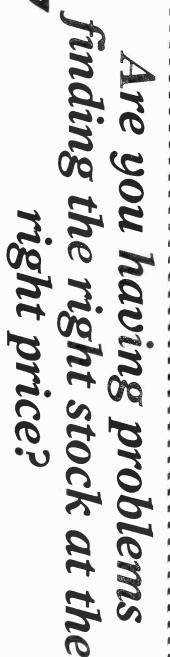
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VP2 VP4	300 200		£1.00	VP200	30 OC71 type germanium AF Transistors, uncoded	VP178	5 Assorted Battery Holders and Clips, PP3/9, AA/D, etc. £1,00
VP16		Wirewound Resistors, mixed watt values	£1.00	VP201 VP261	25 0C45 germanium RF Transistors £1.00 4 Programmable Unijunction Transistors, MEU22 £1.00	VP223A VP225	6 Tag Boards, 18 way paxaline £1 30
VP140	50	Precision Resistors, 1% tolerance	£1.00	VP270	10 FET's UHF/VHF Amplifiers, switching & choppers, data. £1.00	VP225 VP226	20 DIN Plugs, plastic 2-8 pin, 180°/240°/360° mixed
VP181 VP287	100	1 and 2 watt Resistors, assorted values	£1.00	VP271	10 FET's general purpose like 2N3819 2N5457, data £1.08	VP227	18 DIN In-line Skts, plastic, 2-8 pin 180°/240°/360° mixed £2.50
VP287 VP288	100	Close tolerance Resistors, 05 2%, 10-910 ohms, mixed Close tolerance Resistors, 05-2%, 1K-820K, mixed	£1.50	VP272 VP280	10 MOS-FET's Signetics, SD304	VP228	10 C15 Computer Cassette Tapes, leadless £3.00
VP289	100	Metal oxide high stab. Resistors, 14w 2%, mixed values	£1.50	VP290	15 MPSA06 Sil. Transistors. NPN 80v 500ma Hfe50 + T092	VP232 VP233	1 Cassette Head Cleaner/Demagnetizer, in case 52.00 1 Revolving Cassette Rack, holds 32, smokey perspex. 62.50
		CAPACITORS.		VP428	10 AC128K PNP Germanium Transistors, 1A 32v	VP244	Revolving Cassette Rack, holds 32, smokey perspex
VP5		Assorted Capacitors, all types	£1.00	VP429	10 AC176K NPN Germanium Transistors, 1A 32v. [1.00]	1	alarm White plastic body with mounting bracket. Power 12vDC 150mA
VP6	200	Ceramic Capacitors, min. mixed values	£1.00	VP430 VP431	4 2N3055 Sil. Power Transistors, full spec. £2.00 25 PNP Sil. Transistors, TO-39 like 2N2905A. £1.00	VP260	Output 100dB (A) at 1m typ. freq. 2.5KHz. Size: 57 x 42 x 37mm66.00
VP9 VP10	100	Assorted Polyester/Polystyrene Capacitors C280 Capacitors, metal foil, mixed values	£1.00		ES THE OIL TRANSCORS, TO-53 TIRE 2142300M	VF 200	 9" x 6" Elliptical 8 ohms 10W RMS Speaker. Freq. Res. 60-10000 Hz. Gaus 10000. Centre HF cone. £4.50
VP11	50	Electrolytics, all sorts	£1.00		I.C.S	VP260A	1 21/4" Transducer Waterproof Speaker, Polyester film diaphragm, Moistur
VP12	40	Electrolytics, .47mf-150mf, mixed volts	£1.00	VP40	40 TTL I.C.S all new gates - Flip Flop - MSI, data	VP273	res. 8 ohms 300mW Freq. Res. 20-20000 Hz £1.00
VP13 VP14	30	Electrolytics, 150mf-1000mf, mixed volts	£1.00	VP54 VP59	20 Assorted I.C. DIL Sockets, 8-40 pm (2.59) 20 Assorted I.C.s linear, etc, all coded (2.00)	VP2/3 VP281	10 10K Lin Rotary Potentiometers, slim spindle. £1.00 4 Plug-in Relays. Moxed volts, etc. £1.00
VP15	25) Silver Mica Caps, mixed values 5 .01:250v Min. Layer Metal Caps	£1,00 £1,00	VP209	12 74LS00 £2.00	11 251	4 Plug-in Relays, Moted volts, etc
VP180	25	Tantalum Bead Caps, assorted values	£1.00	VP210	12 74LS74	VP95	1 Plastic Vice, small, with suction base
VP182	4	1 1000uf 50v Electrolytics	£1.00	VP211 VP212	10 CD40018 £2.00 10 CD4011B £2.00	VP97	1 Logic Probe/Tester, supply 4.5v-18v, OTL, TTL, CMOS 28.50
VP192 VP193	30	Min Electrolytics, mixed values 47mf-1000mf 6/16v	E1.00	VP212 VP214	10 CD4011B	VP99 VP103	1 Universal Tester, with ceramic buzzer
VF 133		5 Sub Min. Electrolytics, 2 x 1000/2200/3300ml, 10/16v	£1.00	VP215	10 741P 8 pin	VP103	1 6 Pc STANLEY Screwdriver Set. Flat and crosspoint 53:50 1 Pick-up Tool, spring loaded 51.75
VP24		OPTOS.		VP216	10 555 Timers 8 pin 67 00	VP217	1 Helping Hand FA00
VP25	10	1.125" clear lens showing Red LED's 1. Mixed shape and colour LEO's	£1.00	VP223 VP224	50 Asst 74 TTL I.C.s. "ALL GATES" new & coded our mix 7400-7453. CS.00	VP218	1 Watchmakers Screwdriver Set, 6 pieces £1.75
VP26		Small .125" Red LED's	£1.00	VP282	100 Asst 74 TTL I C.s "ALL GATES" new & coded our mix 7400-7453 £18.00 1 Prog. Sound Gen. Chip. AY-3-8912	VP219 VP220	1 Miniature Side Cutters £1.56 1 Miniature Bent-nose Piers £1.55
VP27	15	Large 2" Red LED's	£1.00	VP291	1 Z80ACPU Microprocessor. 40 pin DIL	VP221	1 Miniature Bent-nose Pliers
VP28 VP57	10	Rectangular 2" Red LED's	£1.00	VP292	1 Z80AP10 Parallel Interface Controller, 40 pin DIL	VP237	1 Universal Ni-Cad Battery Charger, AA-HP11-HP2-PHP3 £6.00
VP57 VP130	/S	5 Opto Special Pack. Assorted, super value. 5 RED 7 Seg. CC 14mm x 7.5mm RDP FND353 LED Display	£3.00 £2.00	VP293 VP294	1 Z80ACTC Counter Timer Circuit, 28 pin OIL	VP238	4 AA Ni-Cad Batteries, 1.25v 500mAH C/R mA 64 nn
VP131	- 4	GREEN 7 Seg. CA .6" LDP XAN6520 LED Display	£2.00	VP299 VP295	1 2732D 32K Eprom	VP239 VP240	2 C-HP11 Ni-Cad Batteries, Rechargeable. £3.50 2 D-HP2 Ni-Cad Batteries, Rechargeable £4.00
VP133 VP134	6	RED Overflow .6" 3 x CA 3 x CC 6630/50 LED Display	£2.00	VP296	6 LM324 14 pin DIL Quad Dp Amp £2.00	VP246	1 25w Quality Low Cost Soldering Iron, 240vAC #3.50
VP134 VP138	20	GREEN Overflow .6" CA XAN6530 LED Display Assorted LED Displays. Our mix, with data	£2.00 £5.00	VP297 VP298	5 CA3130E MOS FET I/P, CMOS O/P, Op-Amp	VP247	1 15w "Lightweight" Quality Low Cost Soldering Iron, 240vACE3.50
VP147	- 1	Pair Opto Coupled Modules		VP298 VP299	3 MC1310P Stereo Decoder, 14 pin DIL	VP248	1 High Suction Desoldering Pump, Teffon nozzle, Auto eject heavy duty return spring
VP199	4	LD707R LED Displays, CA	£1.00	VP400	1 27128 128K Eprom	VP250	1 Long Finger Gnp. Soldening aid Heavy metal base Serrated laws with
VP203 VP204	15	i Triangular shape LED's, mixed colours Large Green LED's, 5mm	£1.00	VP401	2 LM317T Adjst, Voltage Regulator, 15A		rev. tweezer action. Ideal for holding small components full-
VP205	10	Small Green LED's, 3mm	£1.00	VP402 VP403	1 2114 4K Static Ram	VP254	adjustable (3.80
VP206	10	Large Yellow LED's, 5mm	£1.00	VP404	1 TBA461 Audio Power Amp, 4.5w £1.50	VP254 VP255	1 250 grams Etchant Granules (Ferric Chloride) makes 1/2 pint 1 Etching Pen, Etch resistant. Spare tip, Blue 11.00
VP207	10	Small Yellow LED's, 3mm	£1,00	VP432	8 CD4016B £2.00	VP258	1 Multicore Solder, 5m total, 10 and 22 SWG £1,00
VP208 VP241	10	Large LED's clear showing Red, 2"	£1.00 £1.50	VP433 VP434	6 CD4017B £2.00	VP259	PCB Holder Fully adjustable from 0-320mm wide and to any apple
VP242	3	Tricolour LED's, 5mm tha., 5mA 2v R G Y	£1.00	VP434 VP435	10 CD40248		Complete with iron stand and sponge. Strong metal construction with
VP243	3	Fri-colour LFD's Rectangular 5mm R.G.Y	£1.00	VP7413	4 7413 Dual Nand Schmitt Trigger, 4-input £1.00	VP286	rubber feet. Very high quality
VP266 VP267	10 8	Orange LED's, 5mm large	£1.00	VP7440 VP7470	4 7440 Dual 4-input, Positive-Nand Buffer. £1.00	VP405	2 Steel Rules 1 x 4", 1 x 10", measuring ins and mm £1 00
VP268		Stackable LED's. Rectangular, mixed, R.G.Y LED Panel Mounting Clips, metal and plastic. 3-5mm	£1.00	VP7470 VP7480	4 And gated Positive-edge-triggered Flip-Flop with preset . £1.00 4 7480 Gated full Adder . £1.00	VP406 VP407	1 Junior Hacksaw & 3 blades + hobby knife & 2 blades
WP269	2	Red Flashing LED's, 5mm	£1.00	VP7481	4 7481 16-bit Random Access memories £1.00	VP407 VP408	1 10 Piece Needle File Set £3.00 1 4 Piece Stainiess Steel Tweezer Set £4.00
VP284 VP285	2	Opto-Isolator IL74-4N27, single	£1.00	VP7490	4 7490 Decade Counter	VP409	1 Set of 4 min. low cost Side & End Cutters, snipe & combination Pliers 5"
ALTQD		Dual Opton-Isolator ILD74	£1.00	VP7491	4 7491 8-Bit Shift Register		insul. handles £4.50
Pak		DIODES & SCRS.		n	100	~	
No	Ottv	DRODES & SCRS. Description	Price	Pak No.	I.C.S. Only Description Price	Pak	TOOLS.
			LILCA	140		No	
VP29	30	Assorted volt Zeners 50mw-2w	£1.00	VP7492	4 7492 Divide by 12 Counter	VP410	Oty Description Price
VP30	10	Assorted volt Zeners, 10w, coded	£1.00	VP7493	4 7492 Divide by 12 Counter C1.00 4 7493 4-brt Binary Counter C1.00	VP410 VP411	1 18 Pc Hex Wrench Keys, AF sizes in wallet 61 56
VP30 VP31	10 10	Assorted volt Zeners 10w, coded	£1.00 £1.00	VP7493 VP7494	4 7492 Divide by 12 Counter £1.00 4 7493 4-brt Binary Counter £1.00 4 7494 4-bit Shift Register £1.00	VP411 VP412	1 18 Pc Hax Wrench Keys, AF sues in walter
VP30 VP31 VP32 VP33	10 10 20 100	Assorted volt Zeners 10w, coded 5A SCR's T066, 59-400v, coded 3A SCR's T066, up to 400v, uncoded Sil. Diodes like 1M148	£1.00 £1.00 £1.00	VP7493 VP7494 VP7495	4 7492 Divide by 12 Counter C100 4 7493 4-brt Binary Counter C100 4 7494 4-bit Shift Register C100 4 7494 4-bit Shift Register C100	VP411 VP412 VP413	1 18 Pc Hex Wrench Keys, AF sizes in wallet £1.50 1 16 Pc Hex Key Wrench Set SAE and Metric £2.00 1 Crimping Pilers, Wire Strippers & Bolt Cutters £1.00 2 (C Extraction Tools, jaw width 18 and 29mm £2.00
VP30 VP31 VP32 VP33 VP34	10 10 20 100 200	Assorted volt Zeners 10w, coded 5A SCR's T066, 59-400v, coded 3A SCR's T066, up to 400v, uncoded SI. Duodes kite IN4148 SI. Duodes kite IN4148	£1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74141	4 7492 Divide by 12 Counter	VP411 VP412	1 18 Pc Hex Wirench Keys, AF sues in wallet 1 16 Pc Hex Key Wench Set SAE and Metric 2 100 1 Crimping Pliers, Wire Strippers & Bott Cutters 2 10 Extraction Tools, jaw width 18 and 29mm 1 End Action Stripping Pliers Adjustable jaws 5 1000
VP30 VP31 VP32 VP33 VP34 VP35	10 10 20 100 200 50	Assorted volt Zeners 10w, coded 5A SCR's T066, 50-400v, coded 3A SCR's T066, up to 400v, uncoded Sil. Duodes like 104148 SII. Duodes like 0A200/BAX13-16, 40v 200mA 1A IN4000 Duodes, all good, uncoded, 50v min	£1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74141 VP74151	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416	118 Pc. Hax Wiench Keys. AF suess in wallet 11.58 116 Pc. Hex Key Wiench S. Ds. SAE and Metric 12.00 12 Cimping Pliers, Wire Strippers & Boll Cutters 11.00 12 Cixtraction Tools, jaw windth 18 and 25mm 12.00 15 Chap Control Stripping Pliers Adjustable jaws 1.00 15 Chap Cocking Pliers 12.00 15 Chap Nose Giro Locking Pliers 12.00 16 Chap Nose Giro Locking Pliers 12.00 17 Loop Nose Giro Locking Pliers 12.00 18 Loop Nose Giro Locking Pliers 12.00 18 Loop Nose Giro Locking Pliers 12.00 19 Loop Nose Giro Locking Pliers 12.00 10 Loop Nose Giro Locking Pliers 12.00 11 Loop Nose Giro Locking Pliers 12.00 12 Loop Nose Giro Locking Pliers 12.00 13 Loop Nose Giro Locking Pliers 12.00 14 Loop Nose Giro Locking Pliers 12.00 15 Loop Nose Giro Locking Pliers 12.00 15 Loop Nose Giro Locking Pliers 12.00 16 Loop Nose Giro Locking Pliers 12.00 17 Loop Nose Giro Locking Pliers 12.00 18 Loop
VP30 VP31 VP32 VP33 VP34 VP35 VP49 VP141	10 10 20 100 200 50 30	Assorted volt Zeners 10w, coded 5A SCR's 1066, 99-000, coded 3A SCR's 1066, up to 400v, uncoded SI. Dudoes kike 1M41848 SI Dudoes kike 10A200/BAX13-16, 40v 200mA 1A 1N4000 Dudes, all good, uncoded, 50v min Assorted SI Recrifers 1A 1AIA mained with	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74141 VP74151 VP74153	4 7492 Divide by 12 Counter C100 4 7493 4-bit Binary Countee C100 4 7494 4-bit Shirt Register C100 4 7494 4-bit Shirt Register C100 4 7495 4-bit Shirt Register C100 5 7495 4-bit Shirt Register C100 5 7495 4-bit Shirt Register C100 6 7495 4-bit Shirt Register C100	VP411 VP412 VP413 VP414 VP415 VP416 VP417	118 Pc. Hax Wirench Keys. AF sures in waiter 1150 116 Pc. Hex Key Wirench. Set SAE and Metric 1200 116 Pc. Hex Key Wirench. Set SAE and Metric 1200 12 Cit attraction Tools, jaw width 18 and 29mm 1200 12 Cit attraction Tools, jaw width 18 and 29mm 1200 13 Cit attraction Tools, jaw width 18 and 29mm 1200 15 Glob Cocking Piters 1200 15 Cady Satable Wirench Forged alloy steel 1200 15 Ady Satable Wirench Forged alloy steel 1200 12 Cocking Piters 1200 12 Cocking Piters 1200 13 Ady Satable Wirench Forged alloy steel 1200 14 Cocking Piters 1200 15 Ady Satable Wirench Forged alloy steel 1200 15 Cocking Piters 1200 15 Ady Satable Wirench Forged alloy steel 1200 15 Ady Satable Satable Satable Satable Satable Satable Satable Satabl
VP30 VP31 VP32 VP33 VP34 VP35 VP49 VP141 VP142	10 10 20 100 200 50 30 40 4	Assorted volt Zeners IDw, coded 5A SCR's TOS6, 59-400v, coded 3A SCR's TOS6, up to 400v, uncoded 3A SCR's TOS6, up to 400v, uncoded SI. Dodes like 194148 SI. Dodes like 0A200/BAX13-16, 40v 200mA 1A IN4000 Diodes, all good, uncoded, 50v min Assorted SI. Recriflers IA 100, preformed ptch 1N4002 SI. Recriflers, silcon, TO88 300 PtV	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7433 VP7494 VP7495 VP74111 VP74141 VP74151 VP74153 VP74164 VP74167	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416	118 Pc. Hax Wienech Keys. AF suess in wallet 1159 116 Pc. Hex Key Wienech Set. SAE and Metric 1200 116 Pc. Hex Key Wienech Set. SAE and Metric 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 1200 12
VP30 VP31 VP32 VP33 VP34 VP35 VP49 VP141 VP142 VP143	10 10 20 100 200 50 30 40 4	Assorted volt Zeners IDw, coded 5A SCR's T066, 59-400v, coded 3A SCR's T066, 59-400v, coded 3A SCR's T066, up to 400v, uncoded 3A SCR's T066, up to 400v, uncoded Sil. Dodes like HM148 Sil. Dodes like IOA2000FAX13-16, 40v 200mA 1A IN4000 Dides, all good, uncoded, 50v min Assorted Sil. Rictifiers IA-100v, preformed pitch 40A Power Rectifiers, IA 100v, preformed pitch 40A Power Rectifiers, Silicon, T048 200 PIV BVIR 1/20V SC Dides like acraiges 25-MA	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74151 VP74153 VP74164 VP74167 VP74174	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416 VP417 VP418 VP419 VP420	118 Pc. Hax Wirench Keys. AF sures in waiter 1159 116 Pc. Hex Key Wirench Set Ja Ea and Metric 1200 116 Pc. Hex Key Wirench Set Ja Ea and Metric 1200 12 Cit attaction Tools, jaw width 18 and 29mm 1200 12 Cit attaction Tools, jaw width 18 and 29mm 1200 15 Ging Locking Piters 1200 15 Ging Locking Piters 1200 16 Cit Augustable Wirench Forgrad alloy steel 12 50 17 Tin Snips Hardened steek spring joint 1200 12 Cit Dubby Screwdrivers (rosspoint No 1 and 2 1150 15 Cit Augustable Wirench Forgrad siley steel 12 50 15 Cit Cit Cosposition 12 100 15 Cit Cit Cosposition 12 100 15 Cit
VP30 VP31 VP32 VP33 VP34 VP35 VP49 VP141 VP142 VP143 VP184	10 10 20 100 200 50 30 40 4 5	Assorted volt Zeners IDw, coded 5A SCR's TOBG, 59 400V, coded 3A SCR's TOBG, 59 400V, coded 3A SCR's TOBG, up to 400V, uncoded 3A SCR's TOBG, up to 400V, uncoded Sil. Dodes like 104200'BAX13-16, 40V 200mA 1A IN4000 Bindes, all good, uncoded, 50V min Assorted Sir. Recrifers IA 100V, preformed pitch IN4000 Sir. Recrifers, 13 100V, preformed pitch 40A Power Recrifers, salicon, 1048 3000 PIV BY187 12KV Sil. Diodes, in carriers, 25MA 44 400V Triacs, plastic	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74141 VP74151 VP74153 VP74164 VP74167 VP74174 VP74181	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416 VP417 VP418 VP419 VP420 VP420 VP421	118 Pc. Hax Wirench Keys. AF sures in waiter 1159 116 Pc. Hex Key Wirench Set Ja Ea and Metric 1200 116 Pc. Hex Key Wirench Set Ja Ea and Metric 1200 12 Cit attaction Tools, jaw width 18 and 29mm 1200 12 Cit attaction Tools, jaw width 18 and 29mm 1200 15 Gino Locking Piters 1200 15 Gino Locking Piters 1200 16 Talong Nose Girp Locking Piters 1200 16 Talong Nose Girp Locking Piters 1200 17 Tin Snips Hardened steek, spring joint 1200 17 Tin Snips Hardened steek, spring joint 1200 17 Chubby' Screwdrivers (Crosspoint No 1 and 2 1150 15 Crewdrivers (Crosspoint No 1 and 2 1150 15 Crewdrivers (Palmo lings) (mm flat blade 1200 1200 15 Crewdrivers (Palmo lings) (mm flat blade 1200 1200 15 Crewdrivers (Palmo lings) (mm flat blade 1200 1200 15 Crewdrivers (Palmo lings) (mm flat blade 1200 1200 15 Crewdrivers (Palmo lings) (mm flat blade 1200 1200 16 Company (1200 120
VP30 VP31 VP32 VP33 VP34 VP35 VP49 VP141 VP142 VP143 VP187 VP194	10 20 100 200 50 30 40 4 4 5 3	Assorted volt Zeners IDw, coded 5A SCR's TOBG, 59 400V, coded 3A SCR's TOBG, 59 400V, coded 3A SCR's TOBG, up to 400V, uncoded 3A SCR's TOBG, up to 400V, uncoded 3A SCR's TOBG, up to 400V, uncoded 5II. Dodds like 104200/BAX13-16, 40V 200mA 1A IN400D Biodes, all good, uncoded, 50V min Assorted SK Rectifiers, 1A 100V, preformed pitch 1N400Z SK Rectifiers, 1A 100V, preformed pitch 4AP Power Rectifiers, silicon, 1048-3000 PIV BY187 12KV SI. Diodes, in carriers, 25MA 4A 400V, Triacs, plastic. SCR's 800MA 200V, 2V5064, plastic, 1032 DASI notic contact of permanent Diodes, uncoded	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74151 VP74153 VP74164 VP74167 VP74174 VP74181 VP74193	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416 VP417 VP418 VP419 VP420 VP421 VP421 VP422	1 18 Pc. Hax Wirench Keys. AF sures in walter 1 16 Pc. Hex Key Wirench Set. SAE and Metric 1 Cimping Piters. Wire Strippers & Bott Cutters 2 Cil Extraction Tools, jaw width 18 and 29mm 2 Cil Citatraction Tools, jaw width 18 and 29mm 2 Cill Extraction Tools, jaw width 18 and 29mm 2 Cill Extraction Tools, jaw width 18 and 29mm 2 Tool Rose Girp Locking Piters 2 Cill Tools Rose Girp Locking Piters 2 Cill Rose Tools Rose Cill Rose
VP30 VP31 VP32 VP33 VP34 VP35 VP49 VP141 VP142 VP184 VP187 VP187 VP194 VP195	10 20 100 200 50 30 40 4 5 3 10 50	Assorted volt Zeners 10w, coded 5A SCR's 1066, 59-400v, coded 3A SCR's 1066, 59-400v, coded 3A SCR's 1066, 59-400v, coded 3A SCR's 1066, up to 400v, uncoded 5I Dodes like 104420 5I Dodes like 1042001BAX13-16, 40v 200mA 1A IN4000 Dides, all good, uncoded, 50v mn Assorted Si Rictifiers 1A-10A, moad volt 1M4007 SI Rectifiers, 1A 100v, preformed ptch 40A Power Rectifiers, silicon, T048 300 PIV BY187 12XV SCI, Dodes, in carriers, 2.5MA 4A 400v Triacs, plastic SCR's 800MA 200v, 24V5064, plastic, T032 0A91 point contact germanum Dodes, uncoded	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74141 VP74151 VP74153 VP74164 VP74167 VP74174 VP74181	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416 VP417 VP418 VP419 VP420 VP420 VP421	118 Pc. Hax Wirench Keys. AF sures in waiter 1150 116 Pc. Hex Key Wirench Set SAE and Metric 1200 116 Pc. Hex Key Wirench Set SAE and Metric 1200 12 Cit actuation Tools, jaw width 18 and 29mm 1200 12 Cit actuation Tools, jaw width 18 and 29mm 1200 15 Ghou Locking Piters 1200 15 Ghou Locking Piters 1200 16 Adjustable Wirench Forged alloy steel 1250 16 Adjustable Wirench Forged alloy steel 1250 17 Tin Snips. Hardened steel, spring joint 1200 17 Chubby' Screwdrivers (Cosspoint No 1 and 2 1150 15 Crewdriver 400mm long, Mo 2 crosspoint 1200 15 Screwdriver 400mm long, Mo 2 crosspoint 1200 16 Screwdriver 400mm long, No 2 crosspoint 1200 17 Chubby Laber Crosspoint 1200 18 Crewdriver 400mm long, No 2 crosspoint 1200 18 Crewdrive
VP30 VP31 VP32 VP33 VP34 VP35 VP49 VP141 VP143 VP184 VP187 VP194 VP194 VP196	10 20 100 200 50 30 40 4 5 3 10 50 50	Assorted volt Zeners IDw, coded 5A SCR's TOB6, 59 400v, coded 3A SCR's TOB6, 59 400v, coded 3A SCR's TOB6, 59 10 to 400v, uncoded 3A SCR's TOB6, 59 10 to 400v, uncoded Sil Dodes like 10 A2001BAX13-16, 40v 200mA 1A IN4000 Dodes, all good, uncoded, 50v min Assorted Sil Rectifiers, 1A-10A, moxed volt 1M4002 Sil Rectifiers, 1A-10Dw, preformed přích 40A Power Rectifiers, silicon, 17048 300 PIV BY187 12KV Sil Dodes, in carners, 25MA 44 400v Tracs, plastic SCR's 800MA 200v, 24V5064, plastic, TD92 DS41 pont contact germanium Dodes, uncoded DA47 gold bonded germanium Dodes, uncoded DA47 gold bonded germanium Dodes, uncoded	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74151 VP74153 VP74167 VP74167 VP74174 VP74183 VP74193 VP74279	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416 VP417 VP418 VP419 VP420 VP421 VP422 VP423 VP424	1 18 Pc. Hax Wirench Keys. AF suess in waiter 1 16 Pc. Hex Key Wirench Set SAE and Metric 1 Cimping Piters, Wire Strippers & Bolt Cutters 2 Cil Cattraction Tools, jaw width 18 and 29mm 1 Cattraction Tools, jaw width 18 and 29mm 1 Cattraction Stripping Piters Adjustable jaws 1 1000 1 ST Ging Locking Piters 1 Cattraction 1 Stripping Piters 2 Cattraction 2 Stripping Piters 2 Stripping
VP30 VP31 VP32 VP32 VP33 VP35 VP49 VP141 VP142 VP187 VP184 VP195 VP196 VP197 VP198	10 20 100 200 50 30 40 4 5 3 10 50 50 50	Assorted volt Zeners IDw, coded 5A SCR's TOB6, 59 400v, coded 3A SCR's TOB6, 59 400v, coded 3A SCR's TOB6, 59 10 to 400v, uncoded 3A SCR's TOB6, 59 10 to 400v, uncoded Sil Dudes like 10 A2000BAX13-16, 40v 200mA 1A IN4000 Indees, sil good, uncoded, 50v min Assorted Sil Rectifiers, 1A 10A, maked voln 1M4000 Sil Rectifiers, 1A 100v, preformed pitch 40A Power Rectifiers, silcon, 17 048 300 PIV BY187 12RV Sil Duddes, in carmers, 25MA 4A 400v Tracs, plastic SCR's 900MA 200v, 2N*506, plastic, TD92 OAS1 point contact germanium Dudes, uncoded DA47 gold bonded germanium Dudes, uncoded DA47 by detector germanium Dudes 0A90 type germanium Dudes 0A90 type germanium Dudes 1A248 Sil Duddes, 350v Zil Rat racovery	£1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00 £1.00	VP7493 VP7494 VP7495 VP74111 VP74151 VP74153 VP74164 VP74167 VP74174 VP74181 VP74193 VP74279 BPX6	4 7492 Divide by 12 Counter	VP411 VP412 VP413 VP414 VP415 VP416 VP417 VP418 VP419 VP420 VP421 VP422 VP422 VP423 VP424 VP424	1 18 Pc. Hax Wirench Keys. AF sures in wallet 1 16 Pc. Hex Key Wirench Set. SAE and Metric 1 Cimping Piters. Wire Strippers. & Bott Cutters 2 Cil. Extraction Tools, Jaw world 18 and 29mm 1 End Action Stripping Piters Adjustable jaws 1 Si Gho Locking Piters 1 Si Timp Cocking Piters 2 Cil. Stripping Piters Adjustable jaws 1 Si Timp Cocking Piters 2 Cil. Si Si Lord Stripping Piters Adjustable jaws 1 Si Lorg Nose Girp Locking Piters 2 Cil. Cocking Piters 2 Cil. Cocking Piters 2 Cil. Si Si Lorg Stripping Piters Cil. Si Si Lorg Stripping Cil. Si Cil.
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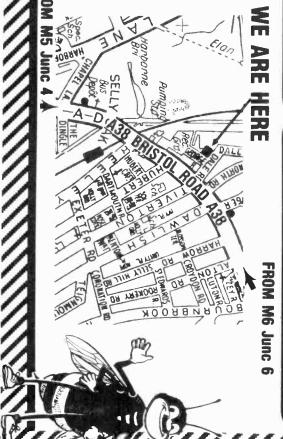
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VTC9300 Sony SLC5, SLC7 SLC6... SL8000, SL8080 Sharp VC7300, VC7700, VC7780 VC8300

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VC8300
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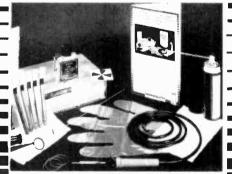
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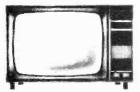
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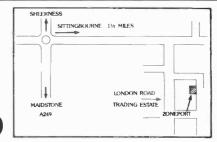
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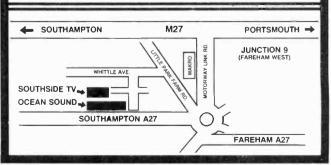
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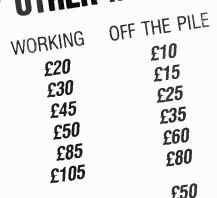


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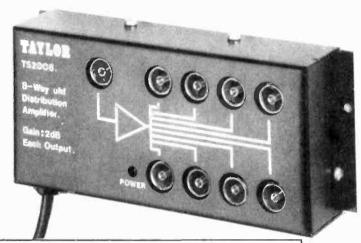
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PANASONIC C NV100/200 NV100/200 NV100/200 NV100 NV100 NV100 NV200 NV200 NV700 NV700 NV700 NV700 NV700 NV800	DRIGINAL HEAVENDY THE PROPERTY OF THE PROPERTY	41.40 62.10 41.44 41.40 62.10 62.10 62.10 62.10 70.38 70.38 70.38 93.84 41.40 41.40 41.40

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SANYO VTC5000/6500		44.50 44.50
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SL-F1/C20/30/40	DSR-36R	48.60
SL-C9	DSR-21R	48.60
SL-C5/6/7 8000	DSR-36R	48.60

ORIGINAL PANASONIC

VIDEO	SPARES	
NV333366 IDLR NV333396 (PLAV/TAKE UP) NV370430 DID IDLE NV370430 DID IDLE NV37040 DID IDLE NV37040 DIDLE NV37040 DIDLE NV37040 DIDLE NV3706 (PLAV/TAKE UP) NV3707 (PLAV/TAKE UP) NV3706 (PLAV/TAKE UP) NV3707 (PLAV/TAKE UP)	VXP0401	1.24
NV333/366 (PLAY/TAKE UP)	VXP0433	3.06
NV370/430 IDLER	VXP0521	2.56
NV810/30/50/70 10LER	VXP0521	2.56
NV600/688 IDLER	VXP0515	3.18
NV730 IDLER	VXP0581	3.18
NV777/778 IDLER	VXP0463	3.18
NV2000 SERIES IDLER	VXP0329	1.24
NV2000 (PLAY/TAKE UP)	VXP0331	1.24
NV7000 SERIES IDLER	VXP0344	1.24
NV7000 (PLAY/TAKE UP)	VXP0343	5.76
NVG7/G10 IDLER	VXP0521	2.56
P. ROLLER NV333:366	VXP0432	8.51
P ROLLER NV730	VXL1154	7.93
P. ROLLER BV730	VXI.1209	7.58
P. ROLLER NV2000	VXP0330	10.56
P. ROLLER NV7000	VXL0776	7.85
P. ROLLER NV7000 TENS. BAND NV333/66/777 TENS. BAND NV370/730	VXZ0129	2.08
TENS. BAND NV370/730	VXZ0165	1.95
TENO. DANU NYZUUUZUZU	VXZ0076	5.92
TENS. BAND NV7000/7200	VXZ0078	3.00
REEL MOTOR NV333/366	MYN13V5L	15.03

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S	ANYO REEL DRIVE PULLEY VTC5000	6.50
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	ITACHI HM6251 FRAME O/P MOD.	4.50
	HARP REEL MOTOR VC9300 ETC.	17,70
	HARP REEL DR IDLER VC9300 ETC	2.55
S	HARP REEL DR. IOLER VC481 ETC	2.85
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	CAPSTAN MOTOR HRD120/3V35	24.75
	DRUM MOTOR HR3660 3V22	24.7
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	REEL IDLER HR7200/3V29	2.9
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	T/UP CLUTCH HR0110/120/125	2.8
		2.21
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i	CASSETTE CARRIAGE 3V35/HRD120	26.4
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	VIDEO DELT KITC (SPISSIO)	
į	VIDEO BELT KITS (ORIGINAL)	
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	PANASONIC NV777/788	2.3
	PANASONIC NV230/430/870	1.45
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	SONA SI CE /7	E 46

SONY SL8000/8080	8.26 8.82
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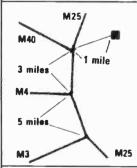
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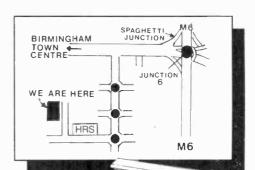
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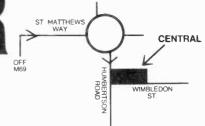
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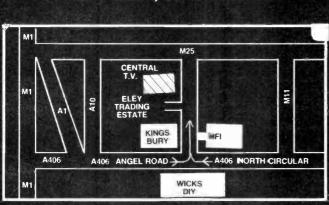


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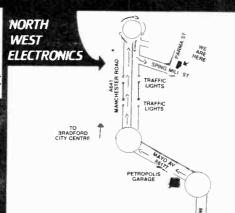
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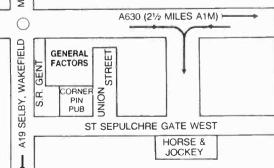
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Rediffusion Mark 4 & 7 Push Button unit £10	R 2305 R 2306 R 2322/2323	50p 30p pair 80p	200 + 100 + 100 + 50 300 150 + 200 + 250M 300V			with drive	r I.Ć.	Export PYE731 6 Push Button unit with VHF) band switch	(UHF-
Tuner IF Cans ITT CMR200 £10	R 2323 R 2396	15p 50p	Computer Transformer 20v/2.25A; 20v/1.5A;		$470/40v \times 10$ £1 $22/100v \times 10$ £1 100/350v 70p	PHILI		ITT Micro Phone M5 5 switch	Op with
ITT SEL HF Modul 2	R 2461 R 2030 R 2443=BD124	15p 50p 80p 50p 30p	17/.5A; 19/.5A; 28/.05A	£3	400/350v 70p .47/500v 25p	MIN. HEAD		1½ Volt Sub Min Relays	
UK IF Tuner £8	R 2540 R 2737 R 2738=TIP41	£2 40p 30p	OLD TYPE TEX. I. TX004F TX005GN	£3.50 £3.00	1/600v 25p .022/1kv 10p	Electronic		Philips Solar Scienti SBC1730 Calculator	fic £12
4 types of front panels Fidelity 2000/3000 types £5	R 2775=TIP41c R 3129=TIP47	40p 40p £1.00	TX904 X908	£3.00 £4.00	Hills £4.50 NI.CD 5 Hours Battery	6 volt, 12 v	COIC 4Up	15v-0-15v 1 Amp Transformers £1	
types £5 CVC20, CVC32 l.F.	R 4050 S 2008b 2SD898B	£1.00 80p £1	MM2102AN	£2.00	Charger with battery test £6	Print Type Tran		RGP30K RGP30G RGP10B	10p 8p 5p
CVC40 Cans £5	2SC1942 Hitachi sets etc.	ξi	Voltage Regulators +5V/UA78PO5SC -8V/79M08c	30p 30p	Multi Core 60-40 Soldar 500G 20 SWG		£4.50 £5.00	RGP15G F6024WGI GP15O	6p 10p 10p
20AX Line lin coil 50p GEC switch mode	STR441 STR454 STR6020	£2.50 £2	+6V/78M06c +10v/78LA10	30p 20p	15 Watt Stereo Amp Sanyo I PHILIPS	Module with Data	- 1	THORN RGP80G	30p
trans 20AX ITT mains CVC9 to	\$ 2000AF line o.p. 2SC940	£2 £1 £1	LM 337 LM 342/18	30p 30p	25 Watt Solder Iron	Various Tools an	£4.00 d Accessories		-
CVC33 print type 60p	BU 105/04 BU 108	80p £1	LM 340T 5.0 +12V/LM 340T12	50p 50p	T/V V/Aerial 300Ω or 75Ω L.C.D. clock display with ala	ırm			£1.50 75p
remote switch 50p	BU 124 BU 126	50n	+15V/78M15 +18V/MC78M18	15p 20p	* D/P push mains switch Mains lead & two pin socket	for radio cassette		20	p each 35p
NEW	BU 180a BU 204 BU 205	80p 65p 60p 75p £1	+24V/78M24 MC 7724cp	30p 40p	T/V loop aerial Radio Telescopic Aerial				75p £1.00
2110 GEC Sound O/P Panel £1	BU 206 BU 207	£1 £1	MC 7824	40p	Philips Neon Lamps for TV: Freeze Philips	sets			5p £1.20
2110 GEC L.O.P.T. Panel £6	BÚ 208 BU 208A	80n	TIS 90 TIS 92	10p 20p	Foam Cleaner Philips Contact Cleaner Philips				£1.20 £1.20
2110 GEC Power	BU 208D BU 222 BU 326	75p 90p £1 £1	TIS 93	20p	Cans of Anti Static, Degreas Lorlin Full Remote Relay Sv	vitch fit most T/V	sets, mains 4	tag, 2 tag 12 volt	£1.40 £1.00
Panel £5	BU 407 BU 426A	60p £45	U 19885 U 3832	40p 15p	Mains timer. 13 amp — up t Screen locking agent, large of Red E.H.T. LAED and And	o 2 hours: easy to an	use, plugs in	to socket	£3.00 £1.50
Line o/p frame panels GEC 20AX £10.00	BU 426V BU 500 BU 500D	60p £1.10	U 3845 MR 508	15p 10p	Weller solder iron 15 watt/25	watt	C 6D44 1 537		£1.00 £5.00
ITT CVC40 Push Button Unit & Mains Switch £12	BU 508A BU 508V	£1 90p £1	MR 501 MR 502	10p 10p	Hitachi Silver Oxide Battery 100 Coax Plugs De-solder pump + 2 nozzels		2 SK44 1,5V	•	60p £12.00 £4.00
▽ 25% OFF ▽	BU 705 BU 807	£1	BCW 71R BYF 1202	30p 10p	Flat Red LED and Green 500gm 60/40 solder reel	1 maps			5p £6
Rank Panels	BU 824 BUT 11 BUW 11	50p 50p 50p	BYF 1204 BYF 3126 BYF 3214	10р 40р 40р	Solder 1 kilo reel Dual v/u meter -20 = +10db				£5.50 £1
Z736 Tuner I.F. £10	BUW 84 BYW 20-08-9	60p (BYX 10 BYX 36/600	10p	K30 thermistor 232266298009 De-solder Pump				75p £2.50
A805 Conv. 7/8 £2 Z780 Line O/P £10	BYW 95 BUX84 BUX85	10p 50p 50p	BYX 38/300 BYX49/600R	35p 25p 75p	Portasol Flameless Gas Solde Green & Red, LED pack mi			100 for	£16.00 r £1.00
Z968 £10	TIC 106a TIC 116m	30p 30p	BYX 55/350 BYX 55/600 (Bead)	10p 10p	Miniature Linesman Pliers	HILI. £2.2		re Pliers	£2.20
Z582 I.F. Panel £5 KT3 Teletext Power	TIC 116n/Y 1003 TIC 126N	30p 30p	BYX 71/350 BYX 71/600	20p 50p	Miniature Side Cutters	KT3 PA			£2.20
Supply £10	TIC 225S TIC 226E	30p 30p	BYX 72/300 BYX 36/600	20p 50p	Sound Output RGB Output	Chroma Panel, I.I	Plastic Boxe	Line OSC £7.0 s 4½ × 4 × 1 × ½	00 each 50p
BA 301 £1 TA 4127 £1	TIC 226m TIC 236m TAG 226/600 TICV 106D	30p 30p 30p	BYV 95B BVY 95C	10p 12p	SONY 1400KV Chroma Pane SONY 1400KV Touch buttor		100 Fuses 100 W/W Ro BF 199		£2.00 £1.50 for £1
HD 3884 2A23 £3 TA 4184 £1 TA 2125 £1	TICV 106D (T092 case 2A/400V) TIP 29	10p	BYV 96D BYZ 106	10p 10p	GEC Decoder Panel PC772A	۸3		rn 100k pots. Rank	£2 for £2
TA 4190 £1 TA 4138 £1	TIP 30	25p 25p 25p	BPW 41 BYW 56 2A/1000v G11	15p 8p	PC446A	√5 £6 _	6 Mixed UF	IF Aerial Isolating Soci	kets,
TA 4196 £1 TA 4174 £1	TIP 30A TIP 30B TIP 30C TIP 31	25p 25p 25p 25p 25p 25p 25p 50p 70p 50p 70p	BYW 29/50 BZU 15/24	15p 54p	Tube Base 20AX GEC PC85	52B3 £1	some with to Philips, Pye	ong leads. Fit ITT, GE	€1.00
TA 4198 £1 TA 4167 £1	TIP 32 TIP 33B	25p 25p 50n	BZY 93c75 BZV 15/18	50p 30p	Thorn Aerial Socket TX10	£1	TVV	Mixed Packs	NIPNI
TA 4199 £1 BA 546 £1 BA 328 £1	TIP 33C TIP 34A TIP 34B	70p 50p	BZV 15/30 BZW 70c6v2	30p 10p	12 Volt Mains Trans 500M/A	£1.00		wer Trans RCA 16182 t for BD124 and Moun	
TA 4176 £1 TA 4145 £1	TIP 34C TIP 35B	өөр 70р 50р	BZX 79.3v Bush thyristor RCA 7612	10p	Double 1.5 Digital Display, High brightness	20p		ount Bulbs & Neons	£1.50 £1.50
TA 4191 £1 HA 11710 £1	TIP 35C TIP 35D	50p 70p 80p 50p 70p	Transformer 240v/20v-500 Chassis type Transformer	Ma 75p	- ngn tragnuscas	2-ф	25 LED red 20I/C Holde		£1.50 £1.20
TA 4188 £1 TA 4197 £1 TA 4183 £1	TIP 36 TIP 36C TIP 41B	50p 70p 40m	240v/12 Volts 500m/a CVC 20 tube base	75p £2	Quantity Reduction		20 Large LE 20 Small LE	D Red	£1.00 £1.00
TA 4197 £1 TA 4183 £1	TIP 41D TIP 42/BRC 6109	70p 30p	Tube Base Rank & G11	£1.20	BY204/4 BY206	25 for £1.00 25 for £1.00	10×20 Turn		£1,00
TA 4195 £1 TA 4175 £1 TA 4177 £1	TIP 48 TIP 49 TIP 57	40p 30p 30⊨	Infra red led LD57CA	15p	KT3 touch button black G11 touch button red K30 full remote Dawer Ass	6 for £1 6 for £1		Fransistor B.F. and B.C	p each
TA 4192 £1 TA 4146 £1	TIP 110 TIP 100	20p 30p	AT 4041/41 transductor 15K-20 turn pots	£1 20p	I.C. K30 VHF. UHF Dawer Ass	£7.00 £6.00	PET	£1.50 1000 for	£10.00
TA 7265 TA 7699P £3	TIP 102 TIP 115 TIP 117	40p 70p 30p 40p 30p 30p 30p 30p 50p 50p 50p	Thorn 3500 2A cut out	50p	BY298 3 amp/fast/R BU126 BU205	20 for £1.50 10 for £6.00 10 for £8.00	12 Volt 4 A Type D Cell	mp Video Battery Pack ls	£8,50
The Service Engineers Guide to Teletex £2	TIP 125 TIP 126 TIP 127	40n	BBH/SAFETY MAINS ISOLATING TRANSFORMER	G	BU105 BF458	10 for £6.00 10 for £1.00	40 glass reed 10 press to r	d switch make switch	£1 70p
4 Types Fedility front panels with i.c. & pats	TTP 130	40p 30p 12p	250V-250V/A	£10	BF224 OA90	20 for £1.40 40 for £1.00	40 Pots With Focus	Pin, 10 Tube Bases.	£1.50
panels with i.c. & pats £2 each BB 103 100	TIP 136 TIP 140 TIP 142	30p 50p	BRIDGES KBL 005	30p	50 Ceramic Condensers Mixed Mounting Kit for Pow Transistors	er £1.50	mixed 1,000 Diode: Bandolier	s, Condensers, Resistor	£2.00 rs on £1.00
BB 105A×12 £1 BB 105B×12 £1	TIP 640 TIP 2955	80p 50p 35p 75p 30p 40p 40p	KBL 02 KBP 04	30p 30p	300 Condensers 300 Resistors	£1.50 £1.50	20mm Fuse Chassis Mou	int 20	for £1
BB 105G×12 £1 BB 121a 10p 47 10p each	TIP L761 A-1000V/4Am T 6032 T 6036	p 75p 30p 40n	W02 W004	15p 15p	150 Electrolytics 15 Bulbs Philips	£2.00 40p	EHT Diodes 300 Mixed I		for £1
1A/1600V 10p	T 6040 T 6047	40o	W005 800V Bridges 2½ Amp	20p 30p	GEC-Hitachi Thick Film Fra	me £5	100 500M/A		£1
DG3P EQV-BY228 10 for £1	T 6049 T 6051 T 6052	40p 40p 40p	MAINS		SENDZ Con	MP()NFNTS	Mixed V/Ca Philips etc,	p Pots ITT-GEC-Hitaci 20	
2 amp bridge rec. wire end 15p	T 9004 T 9005	40p 40p	MICRO SWITCH GEC & Double etc.	£I	TO ORDER SEE BA	CK PAGE	ITT Mains 5 CMC113	Switch with Remont	£1
			-						

SENDZ TO ORDER SE	COMPONENTS E BACK PAGE	Rank T20 Z136 Panel NEW GEC 20AX Power Supply Switch N Field + Jungle panel for GEC 3133/3135 GEC 2110 line panel with transformer GEC 2110 tuner unit + IF Panel	40de £1: £ £ £1:	5.00 2.20 MED Sprague 5 3.50 3.50 V 3.00M + 50.00M 7.00 3.50 V 4.00M 3.00 4.00M 5.00 1.50 V 4.00M
	K35 Decoder £8.00 K35 Sound OP £4.00 K35 Split Dode 3122-138-35930 £10.00 Thick Film Daughter K F3 3122-127-43891 £3	Pye/Chelsea Line op panel Pye 205 T/unt Pye 713 II panel and tuner Pye 713 Chroma Pye/Chelsea Timebase panel with LOPTI Pye 731 Frame Panel	£ £ £10	2.00 175/100/100/350V 5.00 K173/00/25/25/385V K173-K50-220+40+40 5.00 2001-2001-25/10-55 5.00 3001-3001-150+1001-50ME1D 350V 5.00 G11_CAP 470/250 2.2.00
Thorn Spares New 9000 Decoder	12 C H K30 Tex Rec Front Panel with C £5 K35 IF £5,00	Pye 731 Convergence Panel Pye 731 Chroma Pye 731 IF panel + tuner GEC portable chassis + LOPTI 2114 Nev	OFF ξ_1^{ϵ}	5.00 47/220/350v 60p 5.00 150/150/100/100/100/320v £2.00 1.00 2500/2500/63v 50p 1.00 150/200/200/300v 70p
9000 Cyclops panel £1.50 8800 convergence panel £6 8500 convergence panel £6	Plug In K4 Locus Pot £1.00	G9 Power Panel Mono RANK Chassis 127A NEW NEW G9 Frame Panel	ALL E	0.00 3(k)(10k)(10k)(16/275\(\sigma\) 40p 40p 500 500/15(0/10k)(375\(\sigma\) 5(k)(15(0/10k)(375\(\sigma\) 5(k)(15(0/10k)(375\(\sigma\) 5(k)(15(0/10k)(375\(\sigma\) 5(k)(15(0/10k)(375\(\sigma\) 5(k)(15(0/10k)(3/10k)(10k)(3/13k)(10k)(10k)(3/13k)(10k) 2(k)(15(0/10k)(10k)(10k)(10k)(10k)(10k)(10k)(10k)(
######################################	Fidelity Tube Base with transitor & focus pot £1.50 Bush Tube Base on panel £1.00	NEW GILLE Panel		1500/2000/30V 500 150/150/100/100/320V £2.00 100/350 + 300/200/100/16/275v £2.00
3500 Mains Trans	TX10 Tube Base on Panel £3.00	G8 Tuner Umt + Panel £4.00 G8 IF & Chroma £6.00 G8 Chroma £3.00	1+1 MFD Mains Filter ITT 3 Pin	15p 225 + 25/380 G1-C 70p 20x10x0/10x/350 £1.50 5xx/5xx/25x 55p 150/150/150/30x 75p 20x1/50/150/30x 1.00
3500 Line panel £3 3500 A1 Diode 20p Export 3500 IF panel £2 IC board with set of SN74LS £1	Line Fransformers Line O P Frans Mono T X 12"-14" Philips 27482 £10	G11 IF Detector £3.00 G11 Selector gain module £3 Complete CVC 825 Chassis (both panels) £40.00	22'100 4 7M/100	30p TT1 8 and 6 Push Button £1.00 pye 725 1 OPT £6.00 pye 725 1 OPT £6.00 pye 731 1 OPT £6.00 £5.00
#000 Tube base £4 3500 A1 pots 50p Beam limiter panel £1.50	24962 210 4822 210 10273 210 Thorn 1690 LOPT 27.50 2 J/Pots 3.500 Loff each type 23.00	AFC V/Cap Resistor Unit UHF with IC SAS660 SAS670 £3.00 Z714 RANK IF Panels 6MHz 1 LC. \$1.4371: £3.00	47(X)/100 47/160 3(0) 3(0)/3(0)/	75p CMC 301 (ront panel £8.06 80p CMC 303 (ront panel £8.06 50p CMC 302 Panel with TC mains switch
\$500 Power panel with Y969 \$\mathbf{\pmu}\$ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	G8 Frans Philips	Z909B RANK IF Panels Export 5.5MHz 2 LC 's TBA1205B TCA2705O £2.50	.1 250 Pulse 2,2 250v	5p etc £8.00 10p CMD 800 Decoder £8.00
5 Push button VHE/UHF for //cap. GEC-Decca type	Lead £1.50 62.00 62.00 63.00 6EC 2110 67.00 Mullard A1 2036 £1.50	K35 IF	.33/250V 39/250V	G11
KT3 (Export) 12 P.B.u 6 Push button Unit Thorn 6 Push button GRC £1.00 £6.00	Pyc 169 Line Trans £3.00 Pyc mono £3.00 Rank mono 1704A £3.50 Solit Diode Trans £7.00	SC9503P £1.50 Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead £5.00 Pye 6 button switch portable £1.00	47/250 100/250 G11 470/250V £	10p 20p PHII IPS SBC 469 Stereo Microphone
6 Push button PYE 731 £6.00 Hearing aid unit £3 Rank Z718 4 P/B/Unit MECH £4 7 Button Unit GEC with Lamps £7 197 Push Button Unit £6.00	GEC 20 AX Rank Z522 £3.00 Rank 1 O P 1 Z970 £3.00 CVC32 £6.00 A 12080 45 £5.00	GEC V/cap V1H/UHF tuner and IF+ sound O/P PC 706B3 (Export) £12.00 GEC Line O/P PC 659B3 £6.00 2110 GEC Power Panel £8.00	700/250 300 ± 300 MFD 350v &: 800/250	\$1 Hills HD5000 Digital Meter 1000V DC 1.00 750AC 10 Amp 20 MRG Rangers £23
2916B panel £5.00 E513AP panel £5.00 Mains Droppers	CVC30 LIT	CVC 20 Front panel with sliders + mains input panel £4 CVC 40 PUSH BUTTON ASSY with	4/350 8/350 4 7M 350k	5p HT 300 Multimeter
Pyc 731 3+56+27R 50p Thorn 50/17/1K5 £1.00 120/20/20/48/117 £1.00 270/10/6 for Thorn 4000 50p	GEC Portable G10T2041 £3,00 GEC Portable G10T2046 £3,00 F1F1 Split Diode Leads IT1 3500 L. O. P. F. & HT Trans each £2,00	sliders: complete with lamp assy + pots 8 button units £9.00 CVC9 slider pots panel 50p Universal Focus Fits Pye, Thorn and	220/350 300/350 400/350	20b 1115/0001 Digital
18/320/70/39 £1.10 Thorn 50-40R-1K5 50p Ac Socket & Lead GEÇ, FFT, Philips, Pyc 25p	LOPT Rank Z763 £5.00 K35 Split Diode 3122/13835930 £10.00	Decca Units. F147 Rank tube base on panel £1.00 Z718 Focus Unit £1.50 T20 Focus Unit £1.00	220/385 (ITT) 330/385 CVC 820HT 0 1/400	75p Infra Red 60p Hanset Tester 15p Works at 24 feet – Sound repeater
**33/4 Thorn £1 Thorn 16(0)-17(0) £1.50 Rank Toshiba Tube Bases 30p	Universal Tripler with small focus pot Green type £7.00 Black Triplers	Large Type 75p Decca Small 75p KT3 Focus Unit 75p K30 Focus Pot 75p	.56K-400k 4700pf/400 .22/400	20p Fits in top pocket. 10p Handset Fester with LCD 64.5
Speakers £1,00	KT3 Triplers £6.00 S T C. Universal Tripler £6.00 H 131 £2.50 H 15A £2.00	K30 Tube base on panel £1.00 TX10 Focus Units £8,50 CVC 32 Focus Unit 75p	33/400 400/400 394K/400V	10p
i×3 50 ohm 50p i×3 35 ohm 70p o×4 15 ohm £1.00 o×4 speaker 16 ohm	HT CVC 5-8-9 £3.50 Rank T251.E Tripler £2.00 Rank 111CP A823 £3.50 1 TV 25 30K Rank £3.00	Fedility Focus Unit 14R-14S 30p 3500 Thorn Focus Unit £1.00 ITT Small for use with Split Z718 Bush Focus £2.00	.47/500 0.1/600 0.1/1200V wire end	40p RC34001 Full Remote KT3 K30 Teletext Handsets exchanged £15.0 15p NEW Type RC3001 9 buttons not 12 £7.0
X3	11 TFZ Rank £3.00 G9 Philips £4.00 GEC 2110 £4.00 3500 Thorn £3.00	Diode 50p Remo TV12SP 50p 1600 Thorn EHT Rec and Lead 50p TV14 50p	.22/1000 .347/600 0.047/1000	20p GFC Full Remote Infra-red, 1983 model 15p £15.0 10p Timers, 60 mins, small £1.0
×3 16 ohm £1.00 " dia 16 ohm £1.00 " dia 8 ohm £1.50 12" dia 4 ohm £1.50	SS(0) Thorn £4,00 9000 Thorn £4,50 9000 Thorn £4,50 9000 Thorn £4,00	TV20 E1.00 TV45 50p Thorn 14/1500 rec stick 5p	(0.1/1000) .47/1000v .47/250V A.C.	10p
JC dia 3 ohm £1.50 24" dia 8 ohm 75p " dia 8 ohm 75p JC" sq 15 ohm 75p CT3 speaker K30 75p	2040 GLC	TX10 8 Button Unit	1.901K/1250 - 0.0047/1500 1.905/1500	10p
"dia 15 ohm 60p 690 5×3 12 ohm £1 45 Philip 15 ohm 75p 30 15 watt £1	CV 20-52 25-00	G11 drawer ASS 3 pots Mains switch and lead £2.00 K30 Drawer Ass with pots cable	2n0/1500 2n2/1500	110p Handset £15.0 GFC Ultrasonic 8CH Full Remote £15.0
0F-425 0F-550 E.W 10p	D22 for Pve 18" colour portable \$4.00 LP [193/63 £4.00 BG 100/4] £3.25 ERO Fripler print type with foaes PO7	torme £1.00 EX10 Drawer with 8 way pots, ass, £2.50	G11.8200/2KV 0 1/2KV 3n9/2KV	15p
DF-513 correction 10p DF-557 50p DF-557 DFODES 10p	BG2087 £5 T/text ultrasonic rec'r panel £14.00 12-14V 20 for £5.00 200 for £5.00 G1 C 8 touch unit assy complete with all	TX10 Ex. port with band switch (drawer) £2.50 Line O/P panel GFC 2217/2218/2213/	on2/2KV 2n0/2KV 2n2/2KV 474pf 4KV	15p Full Remote £12.0
8Y 127 10p YY 133 10p YY 154 10p YY 164 50p	1 C 's + pots	2214/2226/2227/2228 £10 PHILIPS BATTERIES (Small Types) HAND SETS	3000PF/3000V 4n7/2KV	10p G11 Infra-red full teletext 224.0 10p 10p 15p 15p 10p 10
Y 176 25p Y 179 40p Y 184 25p Y 187 10p	G11 Scar Coils £5.00 G11 100k tuner pots 12 for £1 K 13 II panel £6 (0) K 13 line OSC transformer £1	SR41 40p SR43 40p SR44 40p SR54 40p SR5	8n2/1500V 9n1/2000V 8n2/2KV	10p G11, Full remote top button assy £12.0 G11, Full remote repair service (exchang 15p unit) £18.0
Y 190 40p Y 196 30p Y 198 10p Y 2044 8p Y 206 8p	K F3/K 30 infra-red receiver head £1 K30 drawer unit with IC's (thome) £10 K30 drawer unit with IC's	LR43 40p 1 R44 40p LR54 40p CR2032 40p	150/3500 1800/4KV 4 7nf/5KV	15p GFC infra red full remote 8 channel GFC infra red full remote 8 channel GFC infra red full remote 9 channel to GFC infra red full remote 9 channel to GFC infra red full remote 9 channel to GFC infra red full remote 8 channel to GFC infra red full remote 9 channel to GFC infra red full remote 9 channel to GFC infra red full remote new ultrasonic E32.0 GFC infra red full remote new ultrasonic E32.0 GFC infra red full remote 8 channel GFC infra red full remote 9 ch
EY 208/800 - 8p FY 210/400 - 5p EY 210/800 - 10p EY 223 - 60u	(export) £10 KT3 AF Sockets 50p KT3 receiver panel £8 KT3 line driver transformer 50p	10 500PF 2KV 20p .22/1000 20p .1/250AC 20p .1/100 5p	170/8KV 180/8KV 210/8KV 1000/10KV	Philips infra red full remote 12 channel 10p for 60 CP2605 £12.0 10p K35 KT3/K30 T/Text £15.0
Y 224/600 4 8A/6000 bridge 50p Y 226 15p IV 227 15p Y 228 15000 20p	Pye, K30, GEC, etc. Pre-mains stand-by switch £1 Decca 80/100 IF panel £5 NPN PNP 80V 6 Amp TO66 O P	1MFD-250AC 25p	Tube Thermpath 167 £1 Rank Secam Decoder Panel UHF VHF 1115A £13	3.00 GEC push pad handset button blobs 10
lat BY229 black 15p Y 299 Red 20p Y 299/400 30p Y 299/40p 1ag 30p	Frans		10 off -91 CAP G11	2.00 each Pye & Philips handset KT3-K30 chassis. No RCS150-RCS176-RCS171-RCS177 Special Price £13.0
\$Y 237	GET Line O/P Trans. A Rec Suck for	CVC 20-25-30 Mains Switches Infra Red and Ultrasonic GTI Teletext D RANK & ITT Mains Remote On-Off Swi	ecoder Panel	60p IT CVC 32 handset repaired £15.0 CVC 32 Hand Set £15.0 £15.0 CVC 45 3 and 2 Pin CVC 45 3 land Set Text £19.0 C
6Y 299 10p 5Y 406 8p 5Y 527 20p 5Y 407a 10p 5Y 527 10p	GEC Line O/P Trans, & Rec Stick for Portable CVC 20/25/30/35/40 decoder panel CVC 20/25/30/35/40 decoder panel funtested funtested £5	RANK & ITT Remote Switch 2800 ohm GH Mans Switch 4 amp Mans Switch GEC Mans Switch 4 amp	£I	TX9 with Text
13 527 10p 17 602 10p 247 10p 3P20G 5p 3RP80G (UX10) 60p	(untested) £5 CVC 40/45 IF panel £5 40K Transducer 50p PHII IPS NF51IN £1.20 1 M337M Reg 30p 20 GEC Black Spark Gaps £1.00	GENERAL SWICH A LIP KT3 Mains witch GENERAL SWITCH GENERAL SWITCH GENERAL SWITCH RANK TOSHIBA Fransductors TPC-201	£i	.00 PHILIPS 75p UNIVERSAL HAND SET £15,00 KT3 - K45
(K 3102 50p 3YV 28/200 20p 3ridge TX10 800/3 amps 30p	20 GFC Black Spark Gaps	Mains Switch ITT Long Type Print Mains Switch Philip Long Type TAG Mains Switch GEC Long Type TAG Mains Switch GEC Long Type TAG 2000 Chassis Fidelity Mains Switch (4 TA)		We have all parts for Philips Handsets 75p RC\$353 £15.0 RC\$300 £12.0 £15
nternational Rectifier EHT Diodes G7 A/600V Stud Diodes 20p		250V/4A White Lorlin Mains Switch (4-14) K-T3-K-30-K-35 Full Remote Mains Switch Teletext Adaptor Kit I'Y-500 Panasonic	(6 TAG)	Philips RCS £15.0

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2N.3944 15p BC141 2N.4355 10p BC143 2N.4442 £1.00 BC147 2N.4444 £1.00 BC148 2N.5278 40p BC148 2N.5296 40p BC153 2N.5983 30p BC153 2N.6109 40p 2N.6109 40p 2N.6133 20p BC154 2N.6348 20p BC174 2N.6348 20p BC184 2N.6348 20p BC174 2N.6348 20p BC184 2N.6348 2N.6348	25p BD136 34p MC 1402 15p BD136 34p MC 14016 16p BD140 16p BD140 25p MC 14514 16p BD156 25p MC 14514 16p BD158 25p MC 14514 16p BD158 25p MC 14514 16p BD158 25p MC 24514 16p BD158 25p MC 24514 16p BD202 24p MF M123 25p BD1222 26p M1 23c 26p	15p	DA 102	H1 184 206 184