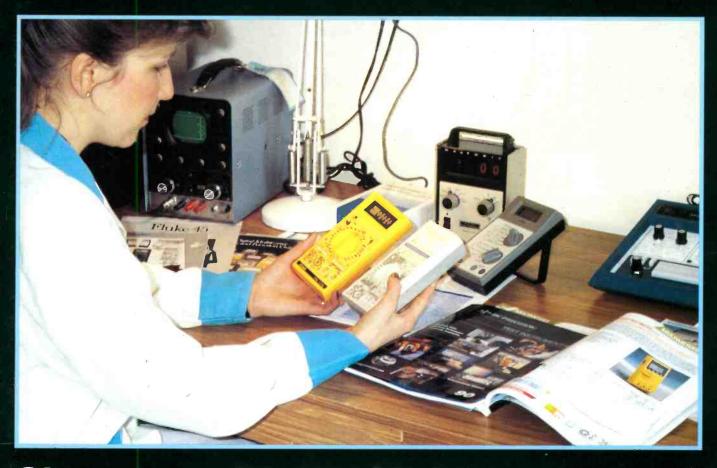
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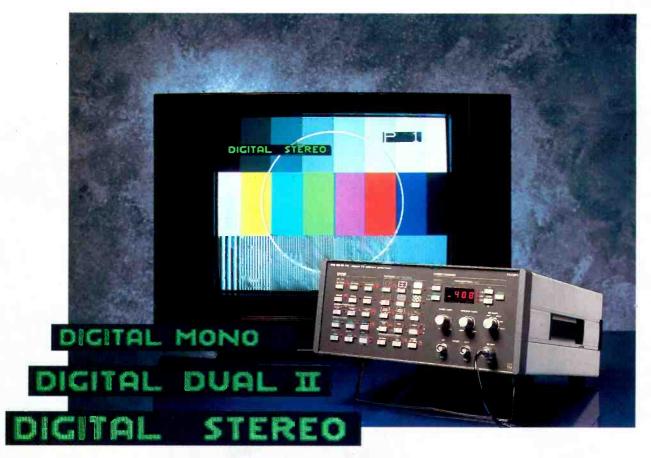


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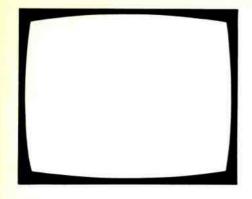
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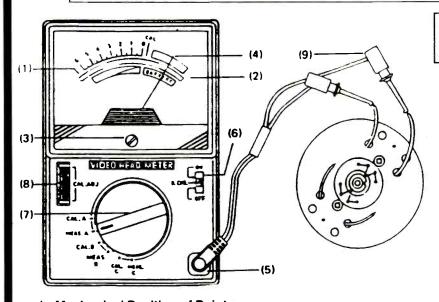
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TDA33018 380p TDA3303 400p TDA3310 120p TDA3310 170p TDA3420 250p TDA3420 250p TDA3501 400p TDA3502 600p	UPC1180C 200p UPC1182 110p UPC1183 200p UPC1185H 230p UPC1185H 230p UPC1186 80p UPC1187 150p UPC1188H 400p UPC1197 140p	2SA1084 100p 2SA1085 75p 2SA1091 100p 2SA1093 300p 2SA1094 190p 2SA1095 400p 2SA1096 125p 2SA1002 180p	2SB882 180p 2SB886 225p 2SB950 180p 2SB951 190p 2SB1009 110p 2SB1077 180p 2SB1109 100p 2SC182 75p	2SC1474 125p 2SC1475 60p 2SC1505 80p 2SC1506 75p 2SC1507 140p 2SC1507 45p 2SC1514 65p 2SC1515 60p	2SC2237 600p 2SC2238 70p 2SC2240 25p 2SC2245 1050p 2SC2258 120p 2SC2259 80p 2SC2270 75p 2SC2271 60p	2SC2825 90p 2SC2826 200p 2SC2827 200p 2SC2832 300p 2SC2834 400p 2SC2837 360p 2SC2839 40p 2SC2853 70p	2SC3446 150p 2SC3447 200p 2SC3450 350p 2SC3456 200p 2SC3457 200p 2SC3457 200p 2SC3460 300p 2SC3461 400p	2SD667 70p 2SD668 120p 2SD669 40p 2SD673 350p 2SD676 250p 2SD716 115p 2SD717 180p 2SD718 100p	VRH50 £10.00 VRP20 £10.00 VRP25 £10.00 VRP30 £33.60 BRANDF LECT VX3173435 £7.00 VX323439637/38/39/45/48/49/312/313/319/329/4195, £7.00 VX323439637/38/39/45/48/49/312/313/319/329/4195, £7.00
TDA3505 300p TDA3506 300p TDA3507 500p TDA3540 300p TDA3541 200p TDA3561 200p TDA3561 200p	UPC1198H 200p UPC1222 130p UPC1225H 220p UPC1230 210p UPC1238 120p UPC1252H 220p UPC1263 230p UPC1270H 250p	2SA1103 200p 2SA1104 200p 2SA1105 250p 2SA1106 160p 2SA1111 120p 2SA1111 150p 2SA1115 40p 2SA1123 70p	2SC369 80p 2SC372 80p 2SC380 20p 2SC382 120p 2SC388A 60p 2SC394 60p 2SC403 80p 2SC403 45p	2SC1520 120p 2SC1541 110p 2SC1545 120p 2SC1567 140p 2SC1568 75p 2SC1569 140p 2SC1570 40p 2SC1571 50p	2SC2274 40p 2SC2275 50p 2SC2278 120p 2SC2283 800p 2SC2284 1200p 2SC2287 1050p 2SC2290 1800p 2SC2291 125p	2SC2876 120p 2SC2877 120p 2SC2877 40p 2SC2879 3200p 2SC2898 60p 2SC2898 400p 2SC2899 120p 2SC2901 60p	2SC3466 350p 2SC3467 70p 2SC3468 70p 2SC3481 600p 2SC3482 300p 2SC3486 450p 2SC3502 120p 2SC3503 90p	2SD722 240p 2SD725 350p 2SD734 60p 2SD-741 120p 2SD-743 130p 2SD-756 100p 2SD-757 120p 2SD-758 140p	\(\) \(\) \(\) \(\) \(\) \(\) \(\) \(\)
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TDA3710 320p TDA3730 550p TDA3740 600p TDA3750 400p TDA3750 470p TDA3771 460p TDA3791 400p TDA3800 350p	UPC1373 85p UPC1377C 200p UPC1378 210p UPC1382 110p UPC1384 425p UPC1387C 250p UPC1397 450p	2SA1206 100p 2SA1208 70p 2SA1209 100p 2SA1210 120p 2SA1215 60p 2SA1216 550p 2SA1217 100p 2SA1217 100p	2SC643 500p 2SC644 25p 2SC647 300p 2SC681 340p 2SC683 120p 2SC708 100p 2SC710 20p 2SC711 40p	2SC1674 50p 2SC1675 200p 2SC1678 120p 2SC1683 100p 2SC1684 45p 2SC1785 60p 2SC1729 900p 2SC1730 40p 2SC1735 70p	2SC2347 60p 2SC2353 120p 2SC2360 120p 2SC2361 150p 2SC2362 500p 2SC2365 500p 2SC2363 6000p 2SC2369 100p	2SC2987 325p 2SC2988 280p 2SC2995 60p 2SC2999 50p 2SC3001 1400p 2SC3012 300p 2SC3019 320p	28C3696 4 650p 28C3606 60p 28C3606 100p 28C3607 150p 28C3608 120p 28C3631 130p 28C3636 280p 28C3651 600p	2SD-813 450p 2SD-820 450p 2SD-821 550p 2SD-826 100p 2SD-836 150p 2SD-836 200p 2SD-837 80p 2SD-838 400p	\(\text{K2132/512} \) £23.00 \(\text{K2132/512} \) £6.60 \(\text{K2530/2532/631/2541} \) £16.00 \(\text{K2530} \) £17.00 \(\text{K2637} \) £24.50 \(\text{K2637} \) £33.50 \(\text{K12639/439} \) £33.00 \(\text{FUNA1} \)
TDA3803A 500p TDA3810 300p TDA3950 300p TDA4050 250p TDA4180 400p TDA4200 380p TDA4280 400p TDA4280 400p	UPC- 1403CA 750p UPC- 1420CA 500p UPC- 1421CA 650p UPC- 1423CA 550p	2SA1227A 300p 2SA1232 275p 2SA1242 80p 2SA1244 120p 2SA1244 80p 2SA1249 100p 2SA1261 150p 2SA1261 160p 2SA1262 180p	28C717 50p 28C730 450p 28C732 40p 28C733 25p 28C735 40p 28C738 40p 28C739 150p 28C761 150p	2SC1735 70p 2SC1740 40p 2SC1741 45p 2SC1752 70p 2SC1755 90p 2SC1756 40p 2SC1758 30p 2SC1765 1000p 2SC1775 20p	2SC2371 45p 2SC2373 210p 2SC2383 50p 2SC2389 45p 2SC2407 110p 2SC2408 120p 2SC2412K 50p 2SC2413 50p 2SC2413 50p 2SC2429 900p	28C3021 1250p 28C3025 500p 28C3026 550p 28C3030 750p 28C3037 125p 28C3038 125p 28C3039 140p 28C3040 280p 28C3040 300p	2SC3657 400p 2SC3657 400p 2SC36659 600p 2SC36675 160p 2SC3678 280p 2SC3679 200p 2SC3680 380p 2SC3688 450p	2SD-838 400p 2SD-841 160p 2SD-844 200p 2SD-850 260p 2SD-856 80p 2SD-858 80p 2SD-868 60p 2SD-864 200p	E11/WIP100V/P1400VCR4000V125VCR450V 4800VCR520569064006600VIP3000 £12.00 VCR460054005800 £12.00 FISHER FVHP510520530615622710715720721722/ 910FVHP5207710959069089119159165000 WBS380079007600990V0F350071007500/
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TDA4437 450p TDA44439 300p TDA4440 250p TDA4442 320p TDA4480 250p TDA4480 280p TDA4500 360p TDA4501 450p TDA4501 900p	250p UPC1536C 550p ZN424 100p ZN425 320p ZN425 100p ZN426 260p ZN427 560p ZN427 560p ZN428 425p ZN429 215p	2SA1294 450p 2SA1295 500p 2SA1301 350p 2SA1302 400p 2SA1303 400p 2SA1304 110p 2SA1306 110p 2SA1307 160p 2SA1309 50p	25C839 25p 25C869 120p 25C870 100p 25C898 275p 25C900B 300p 25C930 20p 25C941 25p 25C943 160p 25C944 140p	2SC1827 120p 2SC1829 500p 2SC1832 400p 2SC1833 40p 2SC1834 50p 2SC1844 50p 2SC1845 20p 2SC1846 100p 2SC1847 120p	2SC2481 120p 2SC2481 120p 2SC2482 40p 2SC2483 120p 2SC2484 240p 2SC2491 200p 2SC2495 1900p 2SC2498 50p 2SC2500 80p	25C3075 150p 25C3075 150p 25C3077 120p 25C3089 150p 25C3089 250p 25C3098 100p 25C3099 100p 25C3101 750p 25C3102 2800p	2SC3719 450p 2SC3729 450p 2SC3743 270p 2SC3746 120p 2SC3747 120p 2SC3752 250p 2SC3769 700p 2SC3781 150p 2SC3783 600p	2SD-882 80p 2SD-892A 100p 2SD-894 120p 2SD-896 200p 2SD-906 200p 2SD-906 600p 2SD-916 130p 2SD-917 300p	FOR EVEN MORE BARGAINS SEE NEXT PAGE →

Marches						_		_	
Comparison					VCR			£0.60	
Comparison	FVHP990	£30.00 £32.00	NV366	£18.50	AKAI		VT14, VT17, VT19, VT35,		
Part	8000 3HSSDB	£19.00	NV370/NV380 NV788	£8.50 £43.50	VS1, VS2, VS3, VS4, VS5, VS6, VS9,		VT52, VT62, VT64, VT65,	0	51/4 inch DSDD
Comparison	VCP4200 GHV12321/1245/124682108215/GHVP1	240/	NV850/NV950	£38.00	VS105, VS112, VS115, VS116, VS126,	£3.20		£1.50	The second secon
Company	G.E.C.		NVG33 NVG30NVG31NVG130	£38.00	VS516 VS201, VS301, VS303, VS304, VS603.			£1.00	
Comparison Com	V4001HV4004	£16.00 £16.00	NVG10NVG11/NVG12NVG14/NVG15/ NVG16/NVG120NV250/NV280/ NV450NV466	£16.50	VS125, VS155, VS165, VS220, VS240,				
Comparison	CS1/DS2	£21.50	NVG18 NVG20NVG21NVG22NVG25NVG28/	£30.00	AMSTRAD				
Company	4312/4605/4905/4912/4913/P4833/TR4605	5/ 50 70	NVG50	£30.00	VCR4700 VCR5200	£3.20	HR3660		
## Commonwealth	4935/4943/4963/4985/4993/TR4833/4935	/	NVH70 NV688	£50.00 £32.00	FERGUSON		11117100		★ FOR AMSTRAD ★
The control of the	4920/4927/4930 4946/TR4906/4916	£16.00	NVH65	£50.00	3V29-3V30-3V31-3V32	£2.50 £2.50			
March Company Compan	TR4995		N.E.C.	210.00	3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V64, 3V65,		HR7650	£0.75	
March Marc	VS400/410/440/450/460/500/505/510	£17.00	N9015/N9016/N901A/N902A/N9033/		FISHER	£2.50	HR7700		
Temporary Company Co	VXL2VXL3VXL4VXL20VXL25VXL35	£13.00 £13.00	N906A N911AN915AN916AN917	£20.00 £27.00	FVHP420, FVHP520, FVHP530 FVHP615, FVHP710, FVHP715, FVHP716,		HRD225, HRD250, HRD455,		
MITCHING Company Com	VXL6 VXL8VXL9VXL10VXL11VTV100		PCV754/PV2300PV2400PV760 PV794/PV770PV774/PVC763E N380N381/N830N831/N832/N833/	£18.00	FVHP905, FVHP970, FVHP980,		HRD755	£1.00	Tension Band & Idler Tyres
## Company of the Com	VT11/VT14/16/30/33/34/330/340/503/		N834N835N836		HITACHI			£1.30	NATIONAL
This content is a content of the c	VT7/VT17/VT18/VT19	£25.00	4609-460V100V140V200V250		VT61, VT62, VT63, VT64, VT65, VT86. VT88, VT110, VT122, VT120, VT128,	12.00	MITSURISHI		
The control of the	VT100/110/111/112/113/115/118/120/12 128/220/225	25/ £21.00	V1001/V1005/V1015/V1025/V1035/		VT220	£2.50		£2.00	NV7000NV7200 £5.50p
The control of the	VT4000/4200/5000/5500	£15.00		£20.00	ITT	£2.60	NATIONAL		NV2000 £6.25p
The contract interface of the contract of th	8040/8100/8300/VT8500/8700/9000/930 9500/9700/9900	£13.50	V35QV500		[VR3913, VR3914, VR3943, VR3954,		NV300		IVC & EEDGUSON
Comparison Com	VT65	£34.00 £35.00	V1305	£33.50 £27.00	VR3963, VR3984	£3.20		£1.00	
The content of the	VT250/VT255 VT61E/VT62E/VT63/VT64	£20.00	V502/V503/V5005	£37.00	HR300, HR3330, HR3360, HR3660, HR4100, HR7700	£2.50			3V29/30 £6.25p
PRINCE 1.00	VT150 VT530	£35.00 £25.00	VH3VH555VH600VH700VH844VH900	£13.00	HR7200, HR7300, HR7600, HR7610. HR7650, HR7655		NV7000	£0.95	1
The control of the	HV1000/2000/3000		PHILIPS		HRD140, HRD150, HRD160, HRD225,	£2.50	NV8600	£1.60	
Commonwealth Comm	TT		VR6420 VR6711 4 HEAD	£41.00	MITSUBISHI HS200, HS300, HS301, HS302, HS303,		NV340, NV366	£1.40	НІТАСНІ
Company	VR3833VR3913VR3914VR3963/ VR3975	£6.50	VR6441/VR6540/VR6541/VR6640/		HS304, HS310, HS320, HS700 HS306, HS307, HS400, HS710	£2.50	NV230, 250, 280, 370, NV380	, 430,	VT11VT33 £6.25p
March Marc	JVC 3HSS	1.20.00	RANK	£18.00	NV100, NV180, NV300, NV333, NV340,	CA			
PROJECTION 1985 1.70	HR2200HR3300HR3320HR3330/ HR3350HR3360HR3660HR3750/ HR3860HR4100	£6 50	N830EA/RV300/RV310/RV320/RV330/		NV230, NV370, NV430, NV460, NV730, NV810, NV830, NV850	£2.50	Duu IDC		
## ACCUPATION OF THE PROPERTY	FERGUSON 3HSS	10.00		£17.00	NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800.	£2 E0		£1.70	SERVICE RIT
PRINCIPATION PRINCIPATION A SALVAPORTION C	89068922/8928/3VD1/3V06/3V22	£6.50		£23.00	NVG7, NVG19, NVG12, NVG18 NVG21, NVG25, NVH65	£3.20	CANVO		HITACHI T.V.
### Company of the co	HR7700HRD110HRD111HRD120/		4A104B20 6A106A70	£33.00	PHILIPS VR6460	£2.50	VTC5000		OUTPUT MODULE HM 6251
Comparison	FERGUSON 3HSSL PIN	£6.50	CVR6083VR6006VR6007/VR6008/		VR2020, VR2021, VR2022, VR2023,		VTC5500	£0.95	1121 : 2370337
## MARP (7.88) CASH (7.89) (7.	3V243V3V3V353V363V383V393V49	£6.50	PVR6068/PVR6070/PVR8070/VR2000/ VR6000/VR6010/VR6012/VR7000/	67.00	VHR1100, VHR1300, VHR1500, VHR2300	£3.20			
Tender Control Contr	HRD140HRD141HRD143HRD150HRD HRD158HRD160HRD5101HRS10	0157/ £15.75	VHR7000VR5005 VR6004VR6005VR6011VR6013		VTCM10, VTCM20	£2.50		-	
\$\frac{1}{2} \text{3}{2} \te	FERGUSON		VR6023VR6024VR7004VR7011V	67.00	VC381, VC386, VC2300, VC3300,			£1.25	V. HEAD CLEANER 125p
VERTICAL	3V47/3V52/3V54/3V55/3V56/3V57 89508951/3V64/FV10/FV11/3V65/FV20/		VR6018VR7018 VR6028	£30.00 £27.00	VC9300, VC9500, VC9700 VC387, VC481, VC483, VC486, VC496,		VC7300 7700 7500		
12.00 1.00	3V48 3V43/3V53	£24.50 £31.50	SAISHO	£24.00	VC581, VC582, VC583, VC585 VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787, VC793, VC772		VC8300	£1.50 £1.25	
High 2007 120 120 120 120 120 120 120 120 120 120	8945	£24.00	VR1000VR1100VR1200VR1600	£13.50	SONY	£3.20	VC9300, VC9500		ANTI-STATIC 140p
SALOSA S	JVC		VR3200VR3500	£16.00	SLC44, SLHF100, SLF1, SLF11, SLF25,		SONY		
REPROVED 1.00 1.0	HRD565-566 HRD725-HRD755	£24.50 £31.50		£21.50		£3.20	SL-C5, SL-C6	£1.40	PLASTIC SEAL 130p
## WASSING ## PROPERTY OF THE	HR7200/7300/7350/2650	£7.20	SVX301/VB900/VB910/VVT510/VT320/			£1 00	SL-C9	£1.65	GEAGG GEEARTER
\$\$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	JVC & FERGUSON	£22.00	VT5600VX510VX511VX520VX616/ VX626VX627VX717	£19.00	VS-1	£1.50 £1.00			than one Servisol
RENIVOS 12,30	3V328942HR7655 HRD1803V59FV12LHRD230	£30.50	SANYO VTC5000VTC5400VTC6000VTC6500V		VS4 VS5EG	£1.20	TOSHIBA	fn or	be \$2.00
Vision	HRD250	£27.00	VTCM20VTCM21VTCM25VTC2000' VTC5100VTC5150VTC5300'		VS9500 VS9700	£1.55 £1.60	V5250, V5280	£2.30	
Colin	KV901/KV903/KV905	£6.50 £24.50	VTC5400VTC5350VTC5370 VTCNX10VTCNX15VTCNX20	C+0	VS9800 AMSTRAD		V5475	£1.60	*****
VFR104Z09440	LOGIK VR960	£17.00	VTC5500VTC5550VTC9100VTC9300/ VTC9350VTC9355VTC9455VTC9500		VCR4600 & MKII	£2.10	V8600	£1.50	* TRIPLERS *
Control Cont	LOEWE	£21,50	VHR1110VHR1150VHR1300* VHR1700VHR2300		VCR5200 VCR7000	£2.10	¥ 3000	LU.85	
Second S	OC50/OC55/OC60/OC65	£24.00 £15.00	VHR3150VHR3300VHR3400	£18.00	3292, 3V00, 3V01, 3V16, 3V22	£1.50	SOLDERING IRO	N	*****
Victor V	9225	£21.50	SHARP	£28.00	3V29, 3V30 3V31, 3V32	£1.20	ANTEX XS25W 240V	FR KA	
Victor V	VX500EVX600AVX800AVX810A/ VX880AVX770BVX773B		VC300VC381VC383VC386VC387/ VC388VC482VC483VC486VC3300/ VC8381VC9100VC9300VC9500V		3V35, 3V36 3V38, 3V39	£0.80	Spare Element for XS25W		* SONY ONOFF *
H3309H5310H5310	VCRL3/VX730 VX735/VX755	£15.00 £16.00	VC9700VC9400VC9600 VC582VC583VC651WC681WC750/		3V44 3V45	£0.65	ANTEX C15W 240V	£3.40p	* SWITCHES *
H3306+H3318H5710	MITSUBISHI		VC/80VC/81VC683VC684 VC6000VC6200VC6300VC7300/ VC7700VC7750VC8000VC8300		8950, 8951, FV10, FV11, FV12, FV13,	£1.40	Soldering Iron 240Vcm	£6.50p	* 200p *
HS319	HS306HS318HS710 HS307	£23.00 £37.00	SONY		FISHER			£3.40p	
#\$511	HS319 HS330 HS338	£40.00	DSR-35R (FOR C20C30C40/ SLF1UB/SLF1E) 2 PIN		VBS9000 FVHP520, FVHP530	£1.20 £0.80			
HS207HS347	HSE11 HS300/HS301/HS302/HS310	£37.00 £23.50	DSR-43R (FOR SLC7 RANGE/SL5000/ SL5100/SL3000) 1 PIN		FVHP710, FVHP716 FVHP722, FVHP905, FVHP906,	£1.20	DESOLDERING PU		* SONY THYRISTOR *
National Parkasonic Vision Parkasonic Vi	HS200 HS337/HS347	£8.50 £22.00	TOSHIBA	£14.50	FVHP615, FVHP715, FVHP725, FHP830		CNissela		* SG264A 600P *
N777N/3030	4HSS-3HSSN	o⁄	V55V57 V71W73W74W75W81W82W83W84/	£7.00	GEC 4005		1	eo e=	1
NV9770AV9200AV94007 1/2500	NV7800NV7850NV322NV332NV340 NV390NV2000NV2010NV7000	v.	V85V86V87 V63	£18.00	НІТАСНІ	£1.00		£0.65p	
NY777NV330	NV8170NV8200NV8400/ NV8600NV8610NV8620	£6.50	V9680 V5470V5480	£42.00 £18.00	VT5000 VT5 500	£1.20	COLDED		
SEE PREVIOUS PAGES FOR MORE \$\cdot \cdot \cd	NV777/NV330		V8600V8700 TRIUMPH		VT8500 VT9300	£0.60	18 SWG 500g		
SEE PREVIOUS PAGES FOR MORE soldering iron stand * K30, K35, K40, KT3, KT4 *	NV460	£16.50		£13.00		£0.50	20 SWG 500g	£6.50p	* SWITCHES *
← GRANDATA BARGAINS Soldering Stand Spare Sponge \$\mathbb{\pmathcal{E}}\$2.60p \$\mathcal{\pmathcal{E}}\$2.65p \$\mathcal{\pmathcal{E}}\$2.55p \$\mathcal{\pmathcal{E}}\$2.60p \$\pmat	SEF	RE	VIOUS PAGE	SE	OR MORE		SOLDERING IRON ST	AND	
Spare Sponge £0.55p	OEE I	CE		DA.	AINIS		Soldering Stand	£2.60p	******
	←	7	MAINDATA DA	me.	AIIVO		Spare Sponge	£0.55p	

IDLERS & PULLEYS REPLACEMENTS IDLERS & PUL						MENTS Cont	VIDEO MO	FO MOTORS		
AMSTRAD	a rulle 13 MEPL	Reference		NATIONAL NATIONAL	OLLE TO HET LAUE					
VCR7000		150280	£1.50	NV777, NV788	IDLER UNIT	VXP0463	£3.00	VCR 7000	REEL MOTOR	£17.00
VS1-2, VS4-5, VS15 V9700	FF-REW IDLER T-UP IDLER IDLER IDLER ASSY	M1327773 BV327815 BV321979 MZ366960J2	£4.50 £6.00 £6.00 £11.00	NV333 NV333, NV366 NV333, NV366 NV333, NV3000	IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR	VXL0997 VXP0401 VXP0433 VDG0016	£3.60 £0.75 £3.00 £0.60	FERGUSON & JVC PU 45979, 3V16, 3V22, HR3300, HR3660 PU 55371V, 3V35, 3V36, 3V38, 3V39, 3V34, HRD110, HRD120, HRD121, HRD120	CAPSTAN MOTOR CAPSTAN MOTOR	£21.00 £19.50
VS125, 126, 155, VS165, 240, 244, VS245, 247, 248,	IDECT FOOT	.mesoudoue	2.1,00	NV333, NV2000, NV3000 NV7800 NV333, NV2000, NV3000		VXP0325 VXG0017	£2.00 £0.65	HRD225 PU 46414, 8904, 8922, HR3300, HR3320, HR3330, HR3360, HR3600, HR3660	ORUM MOTOR	£19.50
VS250, 512, 515, 516				NV333 NV366	CAM GEAR IOLER ARM	VXG0158 VXL0997	£1.00 £3.60	PU 51381V, 3V39, 3V30, 8930. HR7200, HR7300 PU 58635V, 3V58, 3V59, 3V64, 3V65,	CAPSTAN MOTOR	£26.50 £29.00
FERGUSON 3V16-22 3V16-22 3V23, 3V29-30,	T-UP IDLER T-UP IDLER REEL IDLER	PU47752 PU49280 PU48967	£4.50 £6.30 £3.00	NV370, NV430, NV730, NV830, NV850, NV870, NVG7, NVG10, NVG12, NVG18	IDLER ARM	VXP0521	£1.70	R950, 8951, FV10B, FV11R, FV12L, FV13H, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430 PU 58636W, 3V58, 3V59, 3V64, 3V65,	REEL MOTOR	£18.00
3V31-32, 3V35 3V23	ROLLER ASSY	PU49042A	£4.00	NV370, NV430, NV870, NV730, NV830, NV850 NV730	CAM GEAR IDLER UNIT	VDG0200 VXP0581	£1.20	8950, 8951, FV10B, FV11R, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370,		
3V35-36, 3V38-39, 3V49	T-UP IDLER T-UP CLUTCH REFL IDLER	51402 PU51380 PU55374	£1.45 £2.60 £2.85	NV2000, NV3000 NV2000, NV3000 NV2000, NV3000	IDLER UNIT IDLER UNIT CAM GEAR	VXP0331 VXP0329 VDG0069	£1.20 £1.20 £1.00	HRD430, HRD530 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947	LOADING MOTOR	\$8.00
3V35-36, 3V38-39, 3V49 3V58-59, 3V64-65, FV10-11, FV12-13, FV14	T-UP CLUTCH IDLER ARM	PU55373 PU58645	£2.25 £2.50	NV2000, NV3000 NV7000, 7200, 7800 NV7000, 7200, 7800 NV8400, NV8600,	ACTION GEAR IDLER UNIT CLUTCH IDLER UNIT	VDG0016 VXP0344 VXP0343 VXP0245	£0.60 £1.00 £5.50 £1.20	8948, HRD140, HRD150, HRD455, HRD565 HRD725, HRD755, HRP50, R73AF MITSUBISHI 288P02801, HS300, 301, 302, 310	MOTOR REEL SPOOLING	£33.50
3V42 3V44 3V42, 43, 48, 53, 56 3V42, 43, 48, 53, 56	CLUTCH ASSY CLUTCH ASSY T-UP CLUTCH SUPPORT CLUTCH	PU55822 PU57658 PU56043-1-4 PU56044-1-5	£13.50 £11.50 £2.80 £2.80	NV8610, NV8620 NV8600, NV8610, NV862 NV8620	O PLAY IDLER CLUTCH	VXP0243 VXP0343	£1.20 £5.50	288P02801, HS300, 301, 302, 310 288P02806, HS303, 304, 320, 330, 700 288P03401, HS303, 700	MOTOR REEL SPOOLING MOTOR REEL TAKE-UP GEN	£31.50
5V42, 45, 40, 33, 30	OST OTT DECTOR			NV600 NVG21-25, NVG40-45	IDLER PULLEY UNIT	VXP0488 VXP0767	£3.50 £5.80	MYN 135V5L, NV332, NV333, NV340, NV366	REEL MOTOR	£13.50
FVHP520, FVHP530 FVHP615 FVHP615	FF-REW PULLEY COMP. IDLER ASSY GEAR IDLER ASSY	HI638531 FI1430420400300 FI1430490400900	£1.00 £3.30 £5.50	ORION VH200-201 VH555-700, VH844-900, VH1000-1500, VH1800,	IDLER	850A200004	£3.50	VEM0212, NV7304V770 SANYO 4-529V-10800 (RM11), VTC5000, VTC5150	MOTOR REEL GEN	£30.00 £6.30
FVHP840 FVHP905, 906, 908, FVHP910, 916 FVHP975, 990, 999,	REEL T-UP ASSY GEAR IDLER ASSY IDLER	F11430410400900 F11430490402400 F11430420400700	£6.50 £6.20 £5.20	VP200, VH530 VH535-630, VH635-640, VH893-1440, VH2500- 2600, VH2700-4010,	IDLER	850A200005	£6.50	SNARP RMOTV 1008GEZZ, VC200, VC381, VC384, VC385, VC386, VC483, VC3300, VC8381, VC9100, VC9300, VC9500, VC9700		£13.50
FVHP5000, 5100				VH5010				RMOTV 1007GEZZ, VC387, VC483, VC486, VC585 RMOTV 1010GEZZ, VC300, VC402, VC471.	REEL MOTOR	£16.50 £16.00
G <mark>ol</mark> dstar	IDLER	435038A	£2.50	DV464, VR6462, VR6463 VR6660, VR6860 VR6460, VR6520, 6920	IDLER ARM	52220334 40340162	£2.50 £1.70	VC477, VC481, VC482, VC488, VC496, VC500, VC571, VC581, VC582, VC583, VC584, VC573, VC8481, VC8581		
HIT ACHI	FF-REW IDLER PLAY IDLER	6886971 V-6861482	£1.50 £3.20	DB532, VR6542, VR6843 SANYO VHR110, VHR1300,	IDLER	1430662T14730	£7.50 £5.00	SONY BHF 1100D, SLC7 CASSETTE F	CAPSTAN MOTOR	€25.00
VT11-33, VT63-64, VT14, 17, 19, 38, 57, VT86, 88 VT120-220 VT8000-8300,	CLUTCH ASSY CLUTCH ASSY FF-REW IDLER	6879515 6886824 6413663	£7.50 £7.50 £2.80	VHR1500 VTC5000, VTC5150 VTC9100, VTC9300 VTC9300	FF-REW IDLER IDLER FF ROLLER ASSY	1430741T20001 1430551T01400 1430547T00200	£3.00 £1.20 £2.20	FERGUSON & JVC 3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36 HRD121, HRD225	HRD110, HRD120,	£24.00
V18500-8700 V18000-8300, V18500-8700	PLAYIDLER	6414221	23.60	VTCM10-20 VHR2100, VHR2300 VTC5000, VTC5150	REEL DRIVE PULLEY IDLER PULLEY	1430662T10350 6130374899 143-0-662T-01201 143-0-662T-10350	£5.00 £5.00 £5.20 £5.50	3V42, 3V43, 3V44, 3V45, 8945, 8947, HRD: HRD455, HRD725 8948, 8950, FV10B, FV12L, FV13H, FV14T, HRD230, HRD430, HRD530	FV20B, FV21R, FV22L,	£24.00
V"8000-8300 V"8500-8700 V"9300-9500 V'9300-9500	FF-REW PULLEY FF-REW IDLER PLAYIDLER	6383531 8681471 6861482	£3.30 £3.20	VTCM10 SHARP VC651, VC681, VC685 VC7300, VC7700	PULLEY IDLER ASSY PLAYIDLER KIT	NPLYV0107GEZZ NPLYV0041+	£6.15	3V58, 3V59, 3V64, 3V65, FV11R, HRD170, VIDEO L UNIVERSAL VIDEO LAMPS 12V 60mA (300m	AMPS	£24.00
VF9300-9500 VF11-33, VT63-64	IDLER IDLER FF-REW IDLER	681505 687043 6886971	£3.00 £3.80 £1.50	VC7300, VC7700 VC381, VC383, VC386, VC8381, VC9100,	IDLER	NDA1V1007 NIDL0005GEZZ	£5.00 £1.50	PANASONIC VIDEO LAMPS SONY FLYBACK TI		£0.50
HIMARI VXL3, VXL20	REEL IDLER	40000009	£1.50	VC9300, VC9500, VC9700 VG300, VC387, VC481, VC482, VC483, VC496, VC571, VC585	IDLER	NIDL0006GEZZ	£1.50	1-439-289-21 KV-2705F, 2705FE, 2705UE	6ME, 2010ME ET, 2704E(A), 2704E EI, 2215FE, 2212EX, 2215ET B, 2705E, 2706UB, 2720EC	£14.00 £40.00 £30.50 £40.00
VR3905, VR3906 VR3906	T-UP IDLER REEL IDLER	PU51402 PU55374	£1.45 £2.85	VC780-781, VC785-787, VC793-VCT72	REEL IDLER	NPLTV0111GEZZ	£7.00	1-439-303-00 KV-2064EC, 20PS1, 2082N KV-2062E(ESP) 1-439-311-00 KV-1440AEC, 1440AS MK2		£22.75
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HR330, 3660, 4100 HR7200, HR7600, HR7650, HR7655 HR7200, HR7600	T-UP IDLER SML T-UP CLUTCH REEL IDLER	PU49280 PU53462A PU48967	£6.00 £3.00 £3.00	VK3500, VK3600 SAMSUNG VT510-511, VT520-610, VT611-616, VT620-621-	IDLER WHEEL	65224704220	£1.50	KV-2092UB, 2096UB NATIONAL LINE OUTP TLF 146-11B TLF 15542F	UT TRANSFORMER	
HR7650, HR7655, HR7700 HR3300, 3660, 4100 HR7200, 7600, 7650	ROLLER ASSY T-UP IDLER LRG T-UP IDLER	PU49042A PU47752 PU51402A	£4.00 £4.50 £1.45	626 VT510-511, VT520-610, VT611-616, VT620,621, 626	IDLER COMPLETE	69000250330	£4.50	TLF 14568F TLF 14567F TLF 14715F TLF 14749B		£26.00 £26.00 £27.00 £20.00
HR7655, HRD110, HRD120-121, HRD225 HRD110, HRD120-121, HRD225		PU55373	£2.25	SONY C6 C7 St-C5, St-C7	IDLER KIT ASSY IDLER ASSY REW PULLEY	A 6706391 X 36533100 A-6706-348-B	£3.50 £3.80 £4.00	NATIONAL TRA	NSFORMERS_	€23.00
HRD110, HRD120-121, HRD225	IDLER ARM	PU55374-3-8	£2.85	St-05, St-07	REW PULLEY CASSETTE DC MO	A-6706-391-A-B	£3.00	HITACHI TRAN	SFORMERS	£20.00
MATSUI VX730, 735, 750, 755, VX810, 820, 880, 990	CLUTCH	850A00005	€6.50	6V MOTOR 9V MOTOR 12V CW MOTOR 12V CCW MOTOR 13.2V CW MOTOR 13.2V CW MOTOR			£2.00 £2.00 £2.00 £2.00 £2.90 £2.90	GRANDA FOR ADDRES		
MITSUBISHI HS306, 307, 318, 319, HS410, 710	GEAR ASSY	Reference 522P00201	£6.25		CASSETTE TAPE I	IEADS	£0.90 £1.50 £2.30 £2.60	PLEASE SEE LEFT HANI		

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2114	150p	6850 110p 8080A 380p	74S289 180p 74S387 200p	4N27	50p
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2732A	280p	8088 480p	75110 75p	4N31	90p
2764	180p	8156 300p	75113 100p	4N32	100n
27C64	400p	81LS96 130p	75122 110p	4N33 1	100p
27128	190p	81LS97 130p 81LS98 130p	75150 95 p 75154 100 p	4N36	58p
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27512 4116	50p	8226 240p	75182 95p	4N38	68p
4164-15	110p	8243 250p	75183 95p	LED DISPLAY	
4164-12	120p	8250 750p	75188 55 p		
4164-10	130p 130p	8251 240p 8253 210p	75189 55p 75195 185p	MAN74 1 MAN8910 2	100p 200p
41256-15 41256-12	1400	8255 200p	75451 40p	DL747	120p

IDEO HEAD TESTER



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- 3. Pointer Adjusting Screw
- 4. Pointer
- 5. Measuring Socket
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- 8. CAL. ADJ (calibration volume)
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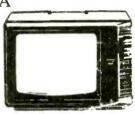
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- **SPECIFICATION**

 * 2 Channels

 * Bandwidth: DC 20MHz

 * Sens: Ch.!, Ch.2, 1mV/cm

 *Timebase: 0.1s 20ns/cm

 * Triggering: DC 40MHz

 * Active TV Sync Separator

 * Veriable held of
- Variable hold-off
- Trigger LED Indicator
 Calibrator: 1KHz Square wave
 Component tester

Plus many features

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- After delay trigger

* Delay line

* Delay line

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FEATURES

- Three bands
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 Digital display for direct frequency readout.
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 Hyper VHF : 300-470MHz
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 Satellite : 550-1750MHz
 Digital display for direct fre

- Digital display for direct frequency readout. Signal measurement VHF/UHF 20µV to 3V. Signal measurement satellite -70dBm to
- 10dBm
- -10dBm.

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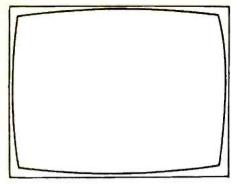
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John A. Reddihough

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TELEVISION

Over at Last?

The recession of 1990/1 has turned out to be one of the most exasperating on record. First we were told that it wasn't going to be. Then that it would be a comparatively mild affair. Then, through the period from late last year to the middle of this year, it took a real hold and turned out to be one of the deepest recessions since the war. It has been devastating for many small firms – and many not so small ones. In the second quarter of this year the number of business failures was 82 per cent higher than a year ago: some 1,970 firms are on record as having failed. We've now reached the point however where commentators are beginning to suggest that it's at last at an end. The Bank of England has talked of "bumping along the bottom"; the Organisation for Economic Co-operation and Development suggests that the "worst of the recession may be over"; the National Institute of Economic and Social Research speaks of a "slow and hesitant" recovery; while the Confederation of British Industry reports "widespread if modest optimism throughout British Industry". The Treasury and, of course, the government have been making optimistic noises, and commentators are now beginning to concern themselves with assessing exactly when the upturn will be, how strong it will be, and how lasting.

We're not wanting for advice and comment! Yet those who monitor events and issue forecasts have a very poor record. You'd think, with all the effort that's gone into the subject in recent years, that forecasters, including the Treasury and the Bank of England, would by now be rather better at it. Yet they keep getting caught out. Badly. It's of course difficult if you are using old figures and economic models, with only the past to act as a guide to an uncertain future. Maybe we should all ignore the economic forecasters. Yet it's their views and assessments that lead to interest rates hikes and, subsequently, all those business failures. One could make out an excuse for the forecasters by saying that economic activity in the UK since the mid-Eighties has been exceptionally volatile. It's relatively easy in hindsight to see what happened and what went wrong. Harder to suggest how things could have been managed better.

The history of recent economic events in the UK starts with deregulation of the banking system in the early Eighties. It was felt that the banks were a sort of cosy cartel and were not making their full contribution to the economy. Deregulate them, let others - the building societies, Continental banks and associated newcomers - compete with the major banks and all should be better. Well, at least we get some interest on our current accounts now. And yes the banks did respond and in consequence lent money hand over fist to all and sundry with few questions asked. Bank managers were ordered to increase their lending since if they didn't the business would go elsewhere. There was another mechanism that came into operation in the late Eighties and helped matters to get out of hand. Excessive lending led to excessively rising asset values - in particular rocketing house prices. This then provided the collateral for further lending. The whole thing began to bubble over and threatened to lead to collapse. Eventually the government, which had been slow to cotton on to what was happening, largely because of all those misleading forecasters, was forced to act. But following deregulation it had virtually no means of doing so save a savage hoist in interest rates. This works - eventually. Lowering interest rates takes a long time to have any appreciable effect and, as we saw late last year and earlier this year, raising them does too. There's an analogy about pulling a brick across a tabletop using a piece of elastic. Nothing happens for a long time, then wham!

We've now had our period of repressive interest rates and the recession they eventually created. We've heard all about the light at the end of the tunnel – it's been a rather long tunnel though. But at last there have been some genuine signs of reviving confidence. And confidence is the basis of economic activity in a market economy. Without it people stop buying and ordering. Businesses start to run down their stocks rather than replace them. Banks get edgy as bad debts mount and then start to curtail new lending and call in old. There was talk a few months ago of the possibility of economic collapse because of banks' unwillingness to make new loans. At the time that seemed to be a rather excessively pessimistic view. It may have been a major contributor to the depression in the early Thirties, but some lessons at least have been learnt since then. However that may be there comes a time when borrowing falls or is stabilised, savings rise and people start to think about new ventures and new purchases. It's this that gets things started again.

If the CBI is right about reviving confidence we should be grateful. It's a good sign: the CBI has been rather more accurate in its assessments and forecasts than more academically based organisations. It seems unlikely that we shall experience another full-bodied boom of the type we had in the late Eighties: too many people burnt their fingers. The question that is now being asked is whether the excesses that followed deregulation were a once-off adjustment to a new situation?

The effect of the recession on the radio and TV trade has been a curious one. As a result of market saturation, conditions in the consumer electronics field were already soft before the recession started. What the latter has done is to delay any uplift, despite the advent of new products like satellite TV. There are a lot of new products in the pipeline: if they come along at a time of renewed consumer confidence there will be good business to be done.

VCR Plus

George Cole

Many people have problems with VCR timers. Users complain that programming systems are over complex, with the result that the wrong programme at the wrong time is recorded – or the VCR fails to record anything at all. Some users simply ignore the timer, or leave programming to the resident "timer expert" (often the youngest member of the household). A fair number of service calls for "faults" are simply the result of incorrect programming.

It's fair to say that many timers seem to be more suitable for use by computer programmers than ordinary members of the public. In recent years however various companies have developed new, simpler systems. Examples are Panasonic's bar-code programming, Akai's on-screen displays, Hitachi's LCD remote programming and the teletext-based systems. There are even talking handsets (Sharp) that guide the user through the programming sequence. Despite these innovations, research carried out by Ferguson revealed that a third of adults have problems with setting the timer: some in the trade feel that the figure is much higher.

A new system called VCR Plus could make programming as simple as making a phone call. It was developed by a US company, Gemstar, and was launched in the USA last November. Since then it has sold remarkably well.

VCR Plus consists of a handset that looks like a basic VCR remote control unit and Plus codes. The latter are four- or five-digit numbers that are printed next to the TV programme details in newspapers and TV guides. The VCR Plus handset contains its own timer. To set this the user simply punches in the Plus code number. The handset is then left in sight of the VCR. At the relevant time it sends an IR command to the VCR to tell it to switch on. The Plus Codes contain details of the programme's date and time, the channel number and also the stop time. Thus the handset is able to switch the VCR off once the recording has been made. An alternative arrangement, adopted by Thomson for its US models, is to incorporate the VCR Plus system in the VCR and use a simplified handset to control it.

The Plus codes are now included in over a hundred newspapers and magazines in the USA. A VCR Plus handset costs around £37 there.

The system is to be launched in the UK this autumn or early next year. TV Times has already signed up with Gemstar to publish Plus codes. Meanwhile Gemstar is developing the handset to suit UK and European requirements – for example American date displays show the month first, then the day, while the US system has a heavy emphasis on cable channels.

The VCR Plus handsets are powered by four AA batteries, with in addition a lithium battery that acts as a backup. Layout of the handset (see the accompanying photograph) is clear and neat, with large keys and an LC display panel. Current handsets can store up to 14 events, which is more than most VCRs offer. It seems that the handsets store a number of IR command codes, enabling them to be used with the majority of remote-control VCRs.

Installation will be very straightforward if the instructions for the US handsets are anything to go by. A pull-up

flap at the top conceals eight buttons. To set up the unit a table of two-digit installation codes printed at the back of the instruction book is first consulted. One of these should match the VCR make – for example Panasonic is 03, Sony 13. The VCR is set to channel three or four and is then switched off. Pointing the VCR Plus handset at the VCR and pressing the enter button transmits a test code to it. If the VCR switches on and turns to channel nine the save button is pressed and the system is installed. If nothing happens you try other codes. The next procedure is to set the clock.

The LC display tells you the date and time and provides programming details. It uses time bars – a series of dashes – to tell the user how much tape is required to record a particular programme. Each dash represents an hour or less. There's also a low-battery indication. Another indication is a warning of programme clash – when programmes overlap. In this event the user can opt to cancel one of the programmes or instruct the VCR Plus to tell the VCR to record the first programme to the end then switch over to the second one. The system will record a programme once, daily or weekly.

Other handy features include a review button that lets you check your programming and a cancel button. The recording time can be extended by pressing a button that continues the recording after the preset stop time: it works in increments of a quarter of an hour and is useful for programmes that tend to overrun, such as sports events.

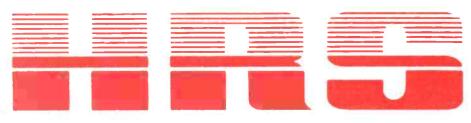
Once the user has entered the Plus codes he requires, the handset is placed in its caddy pointing at the VCR – the system will work at a range of up to fifteen feet. As the system in its usual form is independent of the clock in the VCR, mains failure doesn't affect its operation.

When recording is about to start, a small red light at the end of the handset flashes to provide a reminder to load a blank tape.

United Media is acting as Gemstar's European agent. Price of the handsets in the UK is expected to be around £50. The system's simplicity could make it a winner. Though it doesn't have the advantage of the teletext-based PDC (programme delivery control) system, which identifies the programmes rather then their scheduled times, it's easier to use. The only problem is that the public is likely to be confused by the multiplicity of systems on offer, especially now that PDC has been given yet another name, Startex – which is all right so long as you realise that it's start-tex and not star-tex.



The VCR Plus handset in its caddy.



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PHILIPS' LINKS

A joint venture, D2B Systems, set up by Philips and Matsushita to pool electronics standardisation know-how has been given provisional approval by the EC Commission. The two companies had asked the Commission a year ago for exemption from EC competition rules. In its initial finding the Commission states that though the venture limits competition it will yield technological advances and benefit consumers. It has taken a "favourable position" but asks for comments from others. The venture is 75 per cent owned by Philips, 25 per cent by Matsushita.

Meanwhile Philips and Sony have been holding talks on cross-licensing their new audio recording systems – the Philips DCC and Sony Mini Disc. Both are due to be launched next year.

TV SETS

Ferguson has decided to postpone the launch of its 16:9 wide-screen TV set that was demonstrated at the trade shows earlier this year. It was expected to be launched this autumn at a price of around £3,500. Launch will now be early next year. Ferguson puts the blame for the delay on the continuing recession.

Grundig launched two 16:9 sets at the Berlin Funkaustellung. The 36in. model is fitted with a conventional tube while the 46in. model uses a projection system. Both models are due for launch in the UK this month, the smaller-screen one at a price of around £3,000

and the projection set at around £5,000.

Ferguson has added a 10in. colour portable, Model A10R, to its range. It's fitted with the new TX80 chassis (see Teletopics August). Features include 40-programme direct access tuning, on-screen graphics, child lock and a menu control system that provides simple operation via the remote control handset. A sleep timer puts the set into standby half an hour after pressing a button and provides auto switch-off that's variable between a quarter of an hour and two hours. A 12V battery adaptor and an optional swivel bracket for mounting the set under shelves or cupboards are available.

The latest addition to the JVC range, Model AV25FX11, features a 25in. Blackline Invar-mask tube, colour transient improvement and video noise reduction circuitry, simulated surround and Nicam sound, comprehensive on-screen menus, Fastext, an S-video socket, 100 station presets and the ability to detect 16:9 MAC/D-MAC signals and display them letterbox style. Suggested price is

£729.

SATELLITE TV

The latest satellite TV receiver packages from Amstrad feature a dual-output LNB than enables the user to run two receivers from a single dish.

Electronic Mailorder, 62 Bridge Street, Ramsbottom, Bury, Lancs has introduced a tunable satellite audio module that enables more radio stations, including the ITN news channel and many pop stations, to be received. It can be fixed to the front, back or side of a satellite TV receiver with only three connections being required. Price is £18 in kit form, £24 assembled, plus £1 post and packing.

BSkyB is actively monitoring the promotion of pirate Filmnet decoders and will withdraw Authorised Sky Agent status from any dealers who continue to sell, advertise or display these decoders. BSkyB is at present losing £1.6m a week, a dramatic reduction on the losses being made at the time of the Sky/BSB merger.

A booklet entitled A Householder's Planning Guide for the Installation of Satellite Television Dishes is available from the Department of the Environment, PO Box 135, Bradford, West Yorkshire BD9 4HU.

TRADE NEWS

Pace Micro Technology Ltd. has appointed CPC plc, 180-200 North Road, Preston PR1 1YP (0772 555 034) official spares distributor for Pace satellite receivers. Pace is the largest satellite receiver manufacturer in Europe – total production has now passed the half million mark.

Spares for ITT products continue to be available from Hoopwell Ltd., Unit B9, Larkfield Trading Estate, Larkfield, Maidstone, Kent ME20 6SW (0622 882 285) but not for current in-guarantee ITT Nokia products. A new, expanded catalogue is in preparation.

Two firms are in talks with Loewe Opta on the distribution of spares in the UK.

Pioneer is moving production of stereo radio tuners from Belgium to its new plant in Wakefield, West Yorkshire. The plant will also make CD players.

DEVELOPMENTS

The BBC held the first UK demonstration of its Digital Audio Broadcasting (DAB) system in Birmingham at the end of July. DAB offers CD quality reception from simple push-button radios at home or on the move and is highly efficient in frequency use – up to twelve stereo radio channels occupy the space normally taken by just two. A coach was used to demonstrate the ruggedness of the system in a city-centre environment. The BBC has been carrying out research on DAB for several years.

A method of transmitting full-colour pictures from one PC to another via the cellular radio network has been developed by software company Origin Technology in Business, Redhill, Surrey. Transmission takes less than half a minute. The technique is based on a fractal transform process – the transmitting PC scans the picture looking for parts that are the same as images held in memory. When identifiction is made the system transmits the formula representing the pattern, not the pattern itself. The formula is compressed for transmission. Special software is required for decoding at the receiver end. Since this requires little memory space it can be sent along with the picture.

Panasonic has opened an R and D centre at Langen, Germany. Its main activities will be to gather information on the standardisation of TV specifications and to undertake research into European HD-TV systems.

VIDEO NEWS

Sony has launched three new Video 8 camcorders. Model CCD-F455 has a ×8 zoom and costs £800; Model CCD-F555 at £900 has a $\times 10$ zoom and hi-fi stereo sound; Model CCD-V600 at £1,000 has Hi-8 picture quality, hi-fi stereo sound and a $\times 8$ zoom.

Philips has introduced a low-price, three-head VHS VCR at £299, Model VR312. Features include remote control, a one month/six event timer, still frame and slow motion. Also from Philips comes a portable TV/VHS recorder, Model PVR200, at £1,000. Features include a PAL I and B/G tuner, a 24-hour timer and a 4in. LCD screen. Weight is 3.9kg including batteries.

Ferguson's new budget-priced VCR, Model FV50B at

around £279, features remote control, a one year/eight event timer, four-speed variable picture search, assemble edit control and a full digital servo system.

NEW PUBLICATIONS

Various new publications from Mauritron Technical Services, 8 Cherry Tree Road, Chinnor, Oxfordshire OX9 4QY (0844 51694) should make life easier in the service department. They include books containing VCR equivalents listings, TV models/chassis listings and trade addresses. The latter includes TV, video, test equipment and computer firms and is revised and reprinted approximately every three months.

Infotech, 76 Church Street, Larkhall, Lanarkshire ML9 1HE (0698 883 334) has available a wide range of practical VCR fault-finding guides. The latest, by John Coombes, covers the Panasonic 700 series. The company also publishes TV/Audio/Radio repair and servicing yearbooks that contain numerous adjustment details and fault lists for particular models/chassis. They are intended for use with the company's large-scale circuit diagram collections.

Tandy's 1991/2 electronics catalogue is now available

free of charge from over 500 Tandy stores and authorised dealers throughout the UK. There are 135 full-colour pages featuring 2,400 products of which 380 are new.

PHILIPS' LATEST PATTERN GENERATOR

Philips Test and Measurement, Colonial Way, Watford, Herts WD2 4TT (0923 240 511) has introduced a new top-of-the-range TV pattern generator that offers just about every feature likely to be required for testing the latest TV sets, monitors and VCRs, including those with Nicam and teletext facilities. The PM5518TNI even has an optional built-in IEEE interface to allow its outputs to be selected remotely with IEEE-based automated test systems. There are over seventy patterns, including special test patterns for VCRs, teletext and video programming. Up to 55 different sound test signals are available for Nicam stereo, standard f.m. stereo and dual/mono sound channels. An RGB option is available. The 5518 is a multi-standard generator for use with PAL, SECAM and NTSC systems.

All PM5515/5518 teletext versions now offer extended test facilities with a selection of teletext pages including standard, FLOF, TOP, VPT and VPS.

CD Player Casebook

Reports from Mike Leach and Philip Blundell, AMIEIE

Philips CD104

This player wouldn't read discs. When a disc was loaded it immediately span very fast and wouldn't stop. The laser whistled a bit and the error light on the front panel came on. I started by checking the earth-through connections on the servo and decoder panels, but for once they were all in order. My next checks were on the supplies, but again everything was o.k.

I then noticed that the turntable span fiercely with no disc inserted. This was a good indication that the fault lay somewhere in the turntable motor servo or its associated circuits. Voltage checks were made around the MC1458 chip IC6209 on the servo board: this chip, along with transistors 6233 and 6234, provide the turntable motor drive. Apart from the supplies most of the voltages were incorrect. When I moved back to the LM339 chip IC6205 I found that the voltages were again wrong. With a working machine pin 13 should be at 0V in the stop mode and at 4V when play is selected. It was high at 4.6V in the stop mode and fell to 2.1V when play was selected. As a result the turntable servo became unstable, causing the reported fault. A new LM339 chip cured the problem. The machine then performed quite well – all that was now needed was a quick laser lens clean and a soak test for possible intermittencies with regard to those earth-through connections.

Goodmans GCD550 Multiplay

This player first came in about a year ago. The trouble seemed to be quite straightforward. When the disc magazine was inserted and the play button was pressed a very loud rattling noise could be heard as the disc tried to load. Fortunately the disc wasn't damaged, but it sounded as if the mechanism was suffering. I found that the magazine would load all right if pressure was applied to the top of the mechanism. After much stripping down, with modifications and grease everywhere, I gave up and used a complete mechanism from a scrap machine (cheat!). The customer was happy however and so was I. The machine

worked correctly for many months then a few weeks ago came back again. The note on the job ticket suggested that the fault symptom was the same as before. Sure enough the player rattled fiercely while trying to load a disc.

My first thought was that the cause of the trouble was to do with the magazine itself, but the same thing happened with a different one. So that ruled the magazine out. When the disc loading motor, on the left-hand side, has been removed you can turn the feeding gear by hand. At the point where the disc is loaded into the mechanism the gear became very tight and started to slip against the feeding rack. I lifted the feeding gear from the chassis at this point, exposing the rack. The teeth on both were badly worn and it was this that caused failure of the disc to load and the rattling. The part numbers are as follows: feeding rack 21W8135, feeding gear 21W8141.

M.L.

Denon DCD800

This machine read the TOC all right and played the first few tracks normally. Occasionally however it would skip and jump at the outer edge of the disc. With many players this fault is often caused by a worn or faulty laser unit. Turntable motor problems or mechanical failure are other causes. Not this time though. As with all cases of tracking problems I went through the setting-up procedure. The PLL adjustment was slightly off: correcting this cured the tracking problem with all discs. This is a fault condition I've not come across before.

M.L.

Philips CD350

This machine wouldn't read the TOC. Focus was obtained and the h.f. signal was present, but the disc rotated much too fast. The motor control signal (MCES) should be present even in standby. In this case it was missing. Checks around the SAA7020 chip showed that the chassis pin (38) was at 5V. The earth return is via C2362's negative lead, which is soldered on both sides of the board. Not in this case however – there was a dry-joint on the underside. **P.B.**

Adding a Scart Connector

K. Wevill, B.Sc.

The scart connector is nowadays a standard fitting in most current TV sets, satellite TV receivers and VCRs, enabling video and audio signals to be fed in and taken out directly instead of having to go through a u.h.f. modulation/demodulation process. This results in improved quality and permits RGB inputs and stereo sound, both inputs and outputs, to be used. RGB inputs enable a TV set to be employed as a computer monitor or, with a MAC decoder, to obtain better resolution than is possible with a composite PAL signal, with no cross-colour effects. The stereo audio outputs can be used with an external stereo amplifier or hi-fi system.

The interface described in this article enables many older TV chassis, without video and audio input or output facilities, to be fitted with a scart connector. It was designed primarily for chassis that use a TDA2540 i.f. chip, a TDA1035 intercarrier sound/audio chip and a TDA3560 PAL decoder chip. It could however be adapted for use with chassis that employ similar i.c.s. The chassis with which it was developed was an ITT CVC800. Examples of other chassis that use the same chips are the Ferguson TX9 and TX10: these are equally suitable for the modifications described here.

Fig. 2 shows the scart connector, which is also known as a Peritel connector or Euroconnector. The signal levels and impedances expected at each pin are listed in Table 1. The function switching, blanking and RGB signals are inputs with a TV set and outputs with a VCR, computer or satellite receiver. As yet the communication lines are undefined.

Safety

The most important aspect of the modification process is to ensure that the TV chassis used is isolated from the mains. Many chassis that are suitable for the modification have a non-isolated switch-mode power supply and a bridge rectifier that's fed straight from the mains supply. This means that the chassis will be live at all times, irrespective of which way the mains plug is wired. To overcome the problem, an isolating transformer must be used. It must be a toroidal type, as this has a negligible external magnetic field and thus avoids magnetic interference to the c.r.t. The transformer should be rated to cope with the TV set's power requirements: 120VA is adequate for the TX9 and CVC800 chassis and should be suitable for most, but it's as well to check the set's power consumption before obtaining the transformer. Transformers rated at 80VA and 120VA are available from Jaytee Electronic Services, 143 Reculver Road, Herne Bay, Kent CT6 6PL. Many modern TV chassis are designed with mains isolation in mind and thus don't call for the use of an isolation transformer. Examples are the Ferguson TX10 and TX100.

Mode of Operation

Fig. 1 shows a block diagram of the interface, which consists of a video input amplifier, a video output buffer, a stereo audio switch, audio output buffers, RGB interfacing and switching circuits.

The external 1V composite video (CVBS) signal is fed to

the video input amplifier which has a gain of 2.5 times. Its output is similar to that produced by a TDA2540 i.f. chip. The video output (CVBS) is taken from the same point, making loop-through of the video signal possible.

The audio circuit is a little more complex, as the inputs and outputs are stereo while the set's internal audio amplifier is mono. In the internal off-air mode audio from the intercarrier sound i.f. section is fed via the input buffer and two of the switches in IC1 (4053) to the left and right output buffers. When the external mode is selected, the left and right output buffers are fed with left and right inputs via the switching. The left and right inputs are also summed and fed to the TV set's internal audio amplifier as a mono signal. Thus if a stereo signal from for example a stereo VCR is fed into the interface the TV set's output will be in mono but the stereo signals will also be available to feed to an external hi-fi system. There's provision to adjust the signal levels to and from the TV audio amplifier to maintain the same volume control settings for both internal and external use.

The RGB inputs go straight through to the TDA3560 PAL decoder chip along with the fast blanking input. Note that when RGB inputs are used a sync signal must be provided and fed into the external video (CVBS) input, otherwise the picture will be unlocked.

Switching between internal and external signal sources is achieved by using one or more of three methods: (1) control by pin 8 of the scart socket; (2) control by external switching; (3) control from the channel selector.

When the internal mode is selected, the video amplifier is turned off and the external input to the TV audio

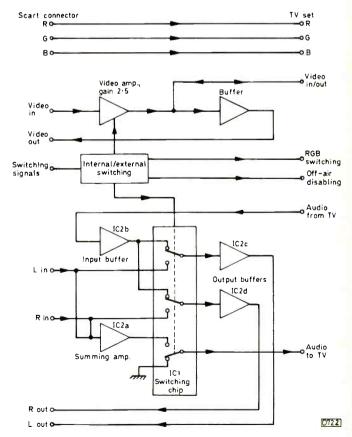


Fig. 1: Block diagram of the Scart interface system.

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Circuit Description

Fig. 3 shows the full circuit of the scart interface. The video input amplifier consists of TR3/4, with TR5 forming the output buffer. The amplifier is switched on and off by TR2 which either connects or disconnects the bias to TR3.

Audio switching is done by IC1, which is a triple, two-way CMOS switch. IC2c/d are the output buffers, IC2a is the summing amplifier/buffer that generates the mono signal for the set's internal audio amplifier while IC2b acts as a buffer for the internal audio signal from the intercarrier sound circuit. Use of these two input buffers enables the signal levels to be altered easily to match the internal and external signal levels. To alter the output level, increase the value of R30 to raise the level or decrease its value to reduce the level. Alter the value of R29 similarly to increase or decrease the volume from the TV set's loudspeaker. The levels should be such that the volume is the same in both the internal and external modes.

Switching between the internal and external mode is achieved by TR1/2. When the external input is required,

Table 1: Scart pin connections.

Pin	Function	Level/impedance		
1	R audio out	0·5V/<1kΩ		
2	R audio in	0·5V/>10kΩ		
3	L audio out	0·5V/<1kΩ		
4	Audio earth	_		
5	B video earth	_		
6	L audio in	0·5V/>10kΩ		
7	B video in	0.7V/75Ω		
8	Source switching	Internal mode 0-2V,		
	· ·	external mode 9·5-12V/		
		$>$ 10k Ω		
9	G video earth	_		
10	Communication data 2	_		
11	G video in	0·7V/75Ω		
	Communication data 1	_		
13	R video earth	_		
14	Communication data earth	_		
15	R video in	0·7V/75Ω		
16	Blanking	Composite video source		
		0V-0·4V; ext. RGB 1-3V/75Ω		
17	Composite video earth			
18	Blanking earth			
19	Composite video (CVBS)	1V/75Ω		
	out			
20	Composite video (CVBS)	1V/75Ω		
	in			
21	Common earth (shell)	_		
_	20 18 16 14 12 1	0 8 6 4 2		
1				

Fig. 2: Scart connector pin layout.

either pin 8 of the scart socket is taken to 12V or switch SW1 is set to the Ext position (12V). This switches TR1 and in turn TR2 on, enabling the video input amplifier. The i.f. amplifier is turned off by taking pin 14 of the TDA2540 chip low via D6, while the TDA1035's intercarrier section is turned off by taking pin 2 high via D7 and R21. The line generator chip's time-constant is changed by applying 12V to the selector pin via D8.

The RGB inputs are much easier to implement, as the TDA3560 PAL decoder chip is designed to accept analogue RGB video signals – these inputs are normally used for teletext. RGB selection is done by setting the blanking signal input to 5V. The RGB inputs must be a.c. coupled: C1/2/3 and the terminating resistors R1/2/3 are included for this purpose. Some TV chassis may already have these components fitted, or there may be provision to incorporate them. In this case they need not be fitted on the interface PCB.

Construction

Construction is not unduly critical – the circuit can be built on Veroboard. The leads to the video amplifier should be kept short however. It's best to use a socket for IC1 as this is a CMOS device. Fit it after all the other components. Layout depends on the space available for the interface and which of the facilities are required. For example it's not necessary to include the RGB interface if this is not required or the set's colour decoder chip has no provision for RGB inputs.

Interfacing with the Set

The interface circuit requires a 12V supply, which can usually be obtained from the PAL decoder supply or some other convenient point in the set. The video input/output must be connected to the TDA2540 chip's output (pin 12) after the intercarrier sound take-off point. In many sets this is contained within an i.f. module, so connection can be made at the module's video output pin.

With the Ferguson TX9 and TX10 chassis the relevant point is pin 8 of the i.f. module, at PL4: in the ITT CVC800 it's at pin 23 of the tuner/i.f. module.

The i.f. disable output is connected to pin 14 of the TDA2540 chip, via the a.g.c. time-constant circuit. With the TX9/10, make the connection at pin 9 of PL4; with the CVC800, make it at pin 22 of the i.f. module.

If there's no module, make the connections to the TDA2540's video output (pin 12) after the intercarrier sound take-off and to pin 14 (i.f. disable) via a 100Ω resistor.

Audio input and output connections to the TDA1035 chip are made at pins 7 and 3 respectively. In some versions of the TX9 pin 3 is available at PL21. In others and in the CVC800 pin 3 is connected to chassis. In this case the PCB track will have to be cut and a $4.7 \mathrm{k}\Omega$ resistor and 10nF capacitor in parallel will have to be added between pin 3 and chassis.

The a.f. disable can be connected directly to pin 2 of the TDA1035 or, if the chip is in a module, as in the CVC800, the connection can be made to the relevant module pin (29 with the CVC800).

With other chassis check the circuit diagram for suitable points to connect the interface.

Connect the AV time-constant line to the line generator chip's VCR select input. The pin to use depends on the chip. With the CVC800 it's available at TC6. In the TX9 it's at PL23. An alternative point is the set's VCR time-

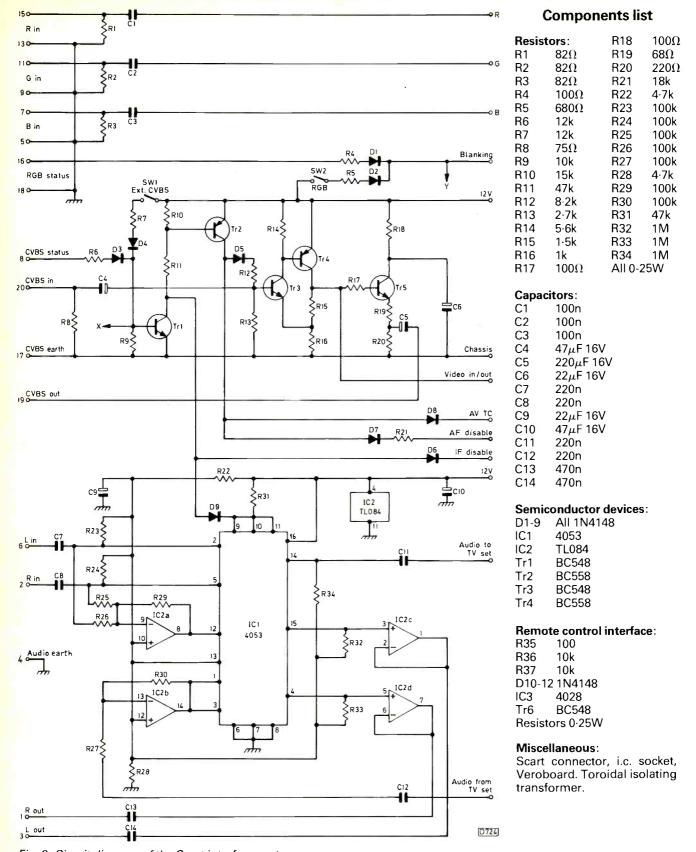


Fig. 3: Circuit diagram of the Scart interface system.

constant control line, usually found on the channel selector or the remote control receiver/decoder.

Installation

The first step in carrying out the installation is to fit the isolation transformer (where required). Space can be found in most sets. Keep it as far as possible from the c.r.t. Some experimentation to find the best compromise

position will usually be necessary, and a bracket may have to be made to fix it in place. In most sets it can be wired up immediately after the mains on/off switch, but in chassis with a remote control system that uses a relay to switch the set on and off the transformer should be wired after the relay contacts. The TX9 is an example of the former arrangement, the CVC800 an example of the latter. Ensure that the position chosen doesn't cause any magnetic interference to the c.r.t.

Once the position of the transformer has been decided, find a suitable place to fit the scart connector and the interface board. It will be necessary to make up a bracket to support the connector, the switches and the board and to cut a hole in the case. The board and connector should be mounted close together, with the connections to the TV circuitry kept as short as possible. Use screened cable for the audio leads.

Remote Control

It's possible to control the interface switching from the TV set's remote control system, where fitted. This can be done without affecting the normal off-air channel selection as many systems are actually capable of 16-channel operation but use only eight. If this is the case, connect the four channel select outputs A, B, C and D to a 4028 decoder chip as shown in Fig. 4. Also connect the D output to the D input of the channel number display decoder. This input is usually earthed, so the track may have to be cut. Output 8 of the 4028 is connected to the base of TR1 via

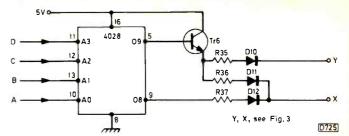


Fig. 4: Remote control interface system.

R37 and D12. Then, when channel 9 is pressed on the remote control unit, the scart interface is selected and 9 is displayed by the channel indicator.

Fig. 4 also shows how RGB selection can be made via the remote control so that when input ten is selected the RGB input is enabled and zero is displayed by the channel selector. Note that the interface is switched to the external mode so a sync signal must be fed into the video (CVBS) input to provide sync pulses.

In Baird's Footsteps

J. LeJeune

It's easy to be blasé about the achievements of those who first developed television. Not so long since I began to wonder what went on in the mind of J.L. Baird in those early days of mechanical television in the early Thirties. Just what problems did he face? There seemed to be only one way to find out: to recreate the situation by reinventing the 30-line system. Much of my effort was done on paper only, as a sort of mental exercise, saving a lot of time that would otherwise have had to be spent on trial-and-error experiments.

Basic Decisions

I'll begin by saying that the exercise was not as easy as you might think. Basic decisions had to be taken then subsequently altered, mainly about the size of major items like the scanning disc. This affects the picture size and curvature. Following logically, the next decision concerned the size of the scanned aperture. This affects the amount of light needed at the transmitter and the brightness of the received image. All this had to be considered before a sketch of a workable system could be made.

There's probably nothing simpler than the idea of a spinning disc with holes around the perimeter, arranged so that they scan a subject with a spot-beam of light. The main problem was to get enough light through the holes then reflected with sufficient intensity from the subject to the pick-up photocells. Compromise was necessary right at the start. I'd neither the room nor the spare cash to make a sizeable disc so that largish holes that would allow significant light through them could be used, and eventually settled on a 23.6cm diameter disc.

Baird must have considered scanning photographic negatives at some stage, but live television was his real goal and this was more difficult. I chose a 24×30 mm aperture, behind which a 24×36 mm (35mm) transparency could be placed. This would cut about 3mm from the top and bottom of the transparency, not enough seriously to impair the picture obtained from the scanned slide. The light source was to be a 300W slide projector, focused on the

aperture, with the scanned slide on the far side of the disc, away from the intense heat of the focused light. The idea of scanning an object and picking up the reflected light was abandoned. Fig. 1 shows the arrangement adopted.

I decided to use interlacing, which is easy enough to arrange with a mechanical system. A subsidiary lamp and photocell would be used to generate field sync pulses via another hole in the disc placed in a convenient position. Why didn't Baird think of interlacing? It would have made even the 30-line system more acceptable! Synchronisation was another of his troubles – it was more a matter of luck than lock!

On the receiver side I decided to use a modern servo system, unashamedly copied from VCR technology, to synchronise the disc. In fact the motors used to drive the rotating discs were rescued from the scrap bin, having been pronounced too noisy for a couple of Ferguson 3V35s. A drop of 3-in-1 oil at the base of the shaft quietened things down a bit – don't try this on your VCR, as the motor operates shaft-down and the oil will thus run out on to the pulley and belt.

The remainder of the video system looked simple enough and was left till last. How different that would have been in Baird's day! Servo techniques were in their infancy

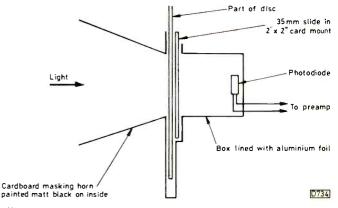


Fig. 1: Transmitter arrangement.

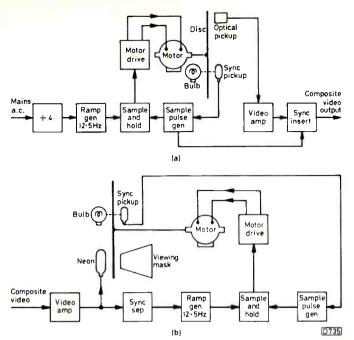


Fig. 2: Block diagrams of the transmitter (a) and the receiver (b).

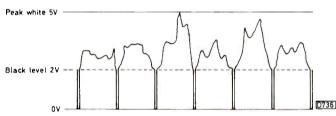


Fig. 3: The composite video waveform.

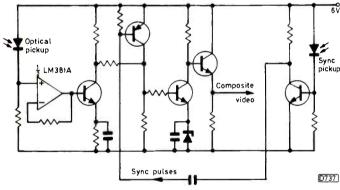


Fig. 4: The transmitter video amplifier circuit.

in the late Twenties and early Thirites. Valves were crude, noisy devices until the mid-Thirties, with a limited high-frequency performance.

The discs rotate at 750 r.p.m. to give a 30-line, 12.5 frames per second scanning rate. Line frequency is therefore $12.5 \times 30 = 375$ Hz. With the 4:5 format of the picture, the highest video frequency to be handled would be around 100kHz for a good squarewave response. Thus a good, low-noise video amplifier could be devised with very little trouble. I decided to use semiconductor devices wherever possible. Although trouble was anticipated with the receiver light source it was not experienced. At the start I thought that a solid-state light source could be used, but this had to be abandoned because of inadequate size and intensity. So it was back to the neon lamp. Unfortunately a neon lamp's response is somewhat slower than that of a solid-state light emitter, but it was the most practical and cheapest light source available. Photodiodes

were used at the transmitter to convert the light from the /scanner into a video signal.

Mechanical Parts

In due course the scanning disc was made. You can get the rigidity required by using a thick duralumin disc, but the light has to travel through a tunnel-like hole. The diameter of the latter was 1mm – and the disc was 1mm deep! To get round this problem the holes were countersunk on the illumination source side of the disc. This worked extremely well.

With a 24×30 mm aperture there's considerable curvature of the scanning lines. Horizontal scanning is used, with the narrower side of the picture uppermost. The disc rotates clockwise viewed from the light source/viewing side. Overall diameter of the disc is 235mm and the radius of the outermost scanning hole is 114mm. Line one is scanned by the innermost hole.

Disc drilling must be done very precisely and shouldn't be undertaken lightly. A friend with a good sheet-metal working facility is a valuable asset! Both discs were made simultaneously by employing the simple expedient of bolting them together. Countersinking of the holes was done with a stand drill set up to permit only 0.8mm penetration of the bit.

Disc Drive

Making the disc is the hardest part, but as this is a mechanical operation it's straightforward for an experienced sheet-metal worker. Fig. 2 shows a block diagram of the transmitter and the receiver. I decided to lock the transmitter to the mains frequency: the servo used was pinched directly from modern VCR technology. The incoming 50Hz is divided by four to obtain a 12-5Hz reference. Locking to the mains was decided upon because of the use of an a.c.-powered lamp, though the 300W mains-voltage projector lamp didn't produce any noticeable flicker-beat when free-running.

The disc shouldn't be eccentric, though this gives rise to some quite comic effects. Disc mass is sufficient to give some flywheel action to the servo systems: phase locking was necessary only to keep the synchronism steady. Because of their mass, the discs take a time to run up to speed. They are steady and reliable when the servo is in full operati a 750 r.p.m.

The Electronics

The 30-line system electronics are simple, and one is left wondering what sort of system Baird would have developed had transistors been available in the early Thirites.

Phase-controlled servos are used to synchronise the discs, mains locking is used at the transmitter, and a sync pulse is generated by a subsidiary hole in the transmitter disc. This pulse is used to synchronise the disc servo at the receiver directly. There are no line sync pulses. The disc sync pulse is inserted at the end of each frame and is negative-going. The video signal is positive-going, the transmitter producing 3V of it. Sync pulse amplitude is 2V, so the composite video waveform is as shown in Fig. 3, with a peak-to-peak amplitude of 5V.

The transmitter amplifier (see Fig. 4) uses conventional a.f. techniques and commonly available low-noise devices. D.C. stabilisation is incorporated. The black level is 2V: this is the d.c. pedestal on which the video waveform sits.

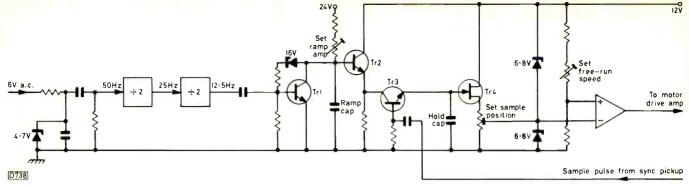


Fig. 5: The transmitter servo circuit.

The disc sync pulse is inserted into this 2V pedestal by taking it to chassis potential. When you consider the simple circuit shown, one's thoughts must again be with Baird, working as he did with selenium cells and thermionic devices for amplification. Think of triodes with the Miller effect crunching the h.f. response and pentodes with their noise contributing snowflakes to the hot shade of pink provided by the neon discharge.

At the receiver the incoming video signal is amplified to a level of approximately 85V peak-to-peak to modulate the neon lamp. Although I had a kind offer from Thorn Lighting in the form of a specially-made neon, I decided to forgo this in favour of a lamp that could be purchased at an electrical retailer anywhere and could be easily modified for the purpose. The modification is necessary to remove the series resistor incorporated in the lamp cap for 240V operation. You can remove the cap by desoldering the contacts, with the help of a pump and wick, then sawing off the end of the cap using a junior hacksaw judiciously either on the insulator or on the cap itself very close to the insulator. Any attempt to remove the cap in its entirety will end with breakage of the bulb.

I must emphasise that neon lamps don't give out a lot of light. So the resultant image at the receiver is very dim. Darkness is necessary to view the "picture".

Baird would have loved the LED. When I read about his demonstrations of large-screen TV using arrays of incandescent bulbs I'm tempted to think "if only the poor man could have had some LEDs"!

Mirror-drum Alternative

On the face of it the mirror-drum system appears to be a better way of getting adequate light, but a word of warning is necessary here for the amateur experimenter. If anything, the allowable error in the construction of a mirror-drum scanner is even less than that with a disc, while a remarkably good adhesive is required to fix the individual mirror sections to the drum. The adhesive must be very strong and mustn't attack the mirror backing. Attaining even a passable assembly of this type is not easy for the amateur working on the kitchen table. Remember that a fragment of mirror flung from a drum rotating at 750 r.p.m. can hurt. This is a hazard even with today's modern adhesives: when Baird was attempting such things in the Thirties danger money should have been paid to people operating the equipment!.

Servo Systems

A servo system is used to maintain the correct disc speed and position (phase). As previously mentioned, mainsfrequency locking is used to keep the rotational (angular)

velocity of the transmitter disc constant. Fig. 5 shows the servo circuit. A.c. from a secondary winding on the mains transformer is clipped and differentiated. Division by four is then performed by two bistables within a chip. The output from the second bistable, at 12.5Hz, is again differentiated. The negative-going pulse is discarded while the positive-going pulse is used to trigger the discharge transistor (Tr1) in a ramp generator stage. This ramp forms the reference signal. The sample signal is derived directly from the frame sync hole in the disc, via a lamp and photodiode that are on opposite sides of the disc and 180° away from the scanning aperture. The photocell sees the lamp as line thirty's hole is leaving the aperture and line one's hole is about to scan it. As a result, the sample pulse occurs roughly half way up the ramp. It closes a switch (Tr3) momentarily, charging the hold capacitor via a current amplifier (Tr2) to the voltage attained by the ramp at that instant – this is the famous sample-and-hold circuit used in the early second-generation VCRs like the Ferguson 3V00. The voltage produced by this arrangement is used to control the disc motor's speed via its drive system.

Simple circuitry is used throughout: the "televisor" is sufficiently lacking in sophistication to allow it. A similar servo arrangement holds the receiver disc in sync. The reference signal is generated by the frame sync pulse which triggers a ramp generator, the sample pulse being provided by a lamp, a photodiode and a hole in the disc. A similar sample-and-hold circuit is used, but the sample pulse is arranged to occur between lines fifteen and two – half way through one frame scan and half way through one complete revolution of the receiving disc.

In Conclusion

There are better ways of displaying the received picture – a small c.r.t., an array of LEDs, and so on – but superior displays call for the insertion of line sync pulses in the video waveform. If anyone is tempted to try such improvements, line sync is the first requirement. It's easy enough to generate and insert, but is unnecessary with the original disc system. Incidentally you'll need over 1,100 LEDs to obtain a display with equal vertical and horizontal resolution.

The results obtained with this Baird-type system were of barely entertainment quality. Its achievement sixty years ago would have been considerable, but today it's of curiosity interest only. Once I'd got it working I discarded the equipment: it had served its purpose. What it showed was that Baird, working in an entirely new sphere with only the efforts of Campbell-Swinton and Paul Nipkow before him to act as starting points, must have had a terrible time trying to get his crude apparatus to work.

The Photo CD Format

George Cole

The Photo CD format has been jointly developed by Philips and photographic giant Kodak. It enables up to a hundred photographic images to be stored on a compact disc, with playback via a TV set acting as a monitor. The system employs a mixture of film, video, compact disc and computer technologies and is aimed at both the consumer and business markets.

This is not the first time that photography and video have converged as a single system. In 1985 Fuji offered Japanese consumers a TV-Photo system that enabled the user to view his shots in video form and select the best ones for development on film. There's also still video, which records video images on a floppy disc or SRAM card for TV viewing. Neither of these formats has proved to be popular with consumers. Kodak is nevertheless confident that Photo CD will be a success. It points out that systems like still video suffer from poor image quality, and that users want hard copy prints as well as TV images. Photo CD can provide high-quality pictures with a resolution sixteen times better than current TV systems and four times better than any proposed HD-TV system. Users can get the usual prints and negatives from their film, and highquality prints can be produced from a Photo CD disc.

According to Kodak some 300 million 35mm cameras are in use worldwide: around sixty billion photographs are taken each year. Thus the potential market is enormous. Photo CD discs will be available anywhere in the world, though the players will have to be produced to suit the

NTSC/PAL/SECAM markets. An advantage is that as the images are stored in digital form it's possible to perform effects such as cropping, panning and zooming, also colour correction.

Basic Principles

The basic idea is that camera users will be able to take their film to a photofinishing retail outlet that will supply them with a recorded Photo CD disc and/or film negatives/prints. Disc playback can be via a Photo CD, a CD-I or a CD-ROM-XA player. The former two use a standard TV set as a monitor while the later can be connected to a desk-top computer with a monitor. The Photo CD format is also suitable for use as an image store for computers. While the format was originally designed for use with 35mm film, it can now be used with other types of film such as 120 rolls.

Photofinishers will use a £60,000 Photo CD (PCD) processing system produced by Kodak. The disc production system is as follows. First a human operator checks the film orientation. The Kodak PCD scanner then scans the slides or negatives using 2,048 lines with 3,072 pixels each and twelve bits for each of the primary-colour (red, green and blue) components. A PCD Data Manager 100, which contains a Sun SPARCstation computer, then performs colour correction. After this a PCD writer stores the processed data on the disc. Index prints for a Photo CD

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"jewel case" and standard prints and enlargements can then be produced by a Kodak Index Printer. A CD-ROM-XA reader will be used for producing image copies, prints and enlargements.

Photo CD Images

The colour encoding system used by Photo CD is known as Photo YCC: each colour pixel is represented by an eight-bit luminance (Y) component and two eight-bit chrominance (C) components. YCC is converted back to RGB form for display purposes.

Each Photo CD image is stored on the disc as a hierarchy of components: this enables various options from a relatively low-resolution image with 128 lines by 192 pixels to a high-resolution image with 2,048 lines by 3,072 pixels to be obtained. The low-resolution images are used for index prints and PIP effects, and are uncompressed. A Base image, also uncompressed, is used for TV and computer displays. The high-resolution images are used for HD-TV displays and hard copy enlargements.

The image hierarchy is arranged as an Image Pac which has an average size of 4.5Mbytes – Image Pacs can consist of anything from three to six Mbytes. Since a compact disc has a storage capacity of around 600Mbytes, it follows that a hundred or so Photo CD images can be stored on a single disc

Each Image Pac is stored on the disc as a standard CD-ROM file known as ISO 9660. It can therefore be read by a computer. Additional data such as Microcontroller Readable Sectors (MRS) are included so that the Image Pacs can be read by consumer (Photo CD and CD-I) players as well.

Encoding Process

The first step in Photo YCC encoding is to scan the slide or negative. An initial problem is that the light and colour vary from scene to scene and film to film. In addition, the image quality with a hard copy print is quite different to that obtained from a video display system. For these reasons the Photo YCC system assumes that the light level in the original scene conforms to an international standard for luminance. The scanner is also calibrated to meet CCIR recommendations for colour phosphor displays. Photo YCC also includes colours outside the CCIR's recommendations however.

The RGB signal components obtained by image scanning are converted into YCC form in three stages. First, a non-linear transformation is applied to maintain compatibility with the most popular display systems. After this the non-linear values are converted into one Y and two C components. The final step is to convert the three YCC components into 8-bit data for storage on the disc.

Image Structure

To improve access time and increase the storage capacity, the Photo CD images are stored on the disc in a compressed form. The need for this is apparent when you consider that a full-resolution 2,048 × 3,072 × 24-bit colour image uses 18Mbytes of data: since the transfer rate of a CD player is 150kbytes/sec, it would take two minutes to call up such a high-resolution image while the disc would be able to store only some thirty images. Compression takes the following form. High-resolution components are removed from a standard base image, compressed and stored as data in residual files. Table 1 shows the various

Table 1: Forms of Photo CD image.

lmage	Lines	Pixels/line
Base/16	128	192
Base/4	256	384
Base	512	768
Base 4	1,024	1,536
Base 16	2,048	3,072

forms of image in the hierarchy: base, base/4 and base/16 are not compressed while base 4 and base 16 employ compression. In addition the chrominance data is subsampled twice in the horizontal and vertical directions.

These processes reduce the image to around 9Mbytes. Further reduction is achieved by compressing the highest-resolution elements. This is done by using a data compression algorithm known as Huffman encoding.

Forming a High-resolution Image

So how is a high-resolution image produced? Let's take conversion of a 512×768 lines/pixels base image into a $1,024 \times 1,536$ base 4 image. Interpolation is used to convert the base image to $1,024 \times 1,536$ form. The residual base 4 data is then decoded, decompressed and added to the pixels to increase the resolution. The same process is used to convert from a base 4 to a base 16 image, except that this time the process is also applied to the chrominance data. Figs. 1 and 2 show the processing steps.

Image Pacs

Fig. 3 shows the structure of an Image Pac. The first section, the Image Pac Attribute (IPA), stores information such as where and when it was produced. The various base sections are shown to the right, with increasing resolution: between each there's a Microcontroller Readable Sector (MRS). The final section, Image Pac Extension (IPE), is currently undefined – it could be used for features such as audio recording or obtaining even higher resolution.

Fig. 4 shows the arrangement used for base, base/4 and base/16. The ICA sector, which is microcontroller readable, contains attribute information on the image, such as its rotation (in 90° increments), highest resolution and whether there's an IPE. ICD stands for the image data.

The base 4 and base 16 data structure is different, see Fig. 5. Line pointers (LPT) in player and computer-

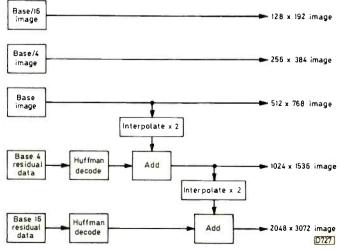


Fig. 1: Reconstituting luminance images.

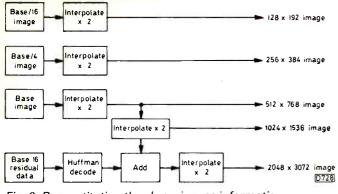


Fig. 2: Reconstituting the chrominance information.

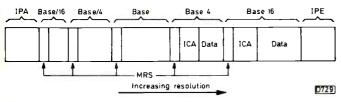


Fig. 3: Image Pac structure.

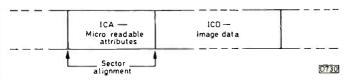


Fig. 4: Base, base/4 and base/16 data structure. The length of the ICD sector depends on the image type.

readable formats are included to give the location of the last lead-out track. The Huffman Quantiser Table (HQT) is used for residual file decoding.

The base/16 images are all stored as an Overview Pac (see Fig. 6), forming a central information store. There are two OPAs (Overview Pac Attributes), one for computer reading and the other (MRS) for consumer player reading.

File System

Photo CD uses a hierarchical directory system for computer search to find the relevant data and instructions. On each disc there's a directory (list of files) that contains in turn an image directory, overview file and other files. The image directory contains a file for each image. The other files are Photo CD Information, which is used for computer applications, and CD-I for CD-I players.

Disc Format

The Photo CD disc format is an extension of the CD-ROM-XA (XA = extended architecture) format known as the Mode 2, Form 1 sector structure. It enables the discs to be used with CD-ROM-XA drives and CD-I players. Fig. 7 shows the layout of a sector. First comes sector sync, with twelve bytes, for synchronisation. The header part contains the file name and additional file information. At present the subheader part is unused. After the user data part there are the error detection code (EDC) and the error correction code (ECC) sections. The latter has 172 bytes for P parity and 104 bytes for Q parity.

Photo CD uses a "hybrid disc", the standard being laid down in the Sony/Philips Orange Book for recordable compact discs. The discs are referred to as hybrid because they contain elements of the audio CD, CD-I, CD-ROM and CD-R systems.

The discs contain multiple program areas called



Fig. 5: Base 4 and base 16 data structure.

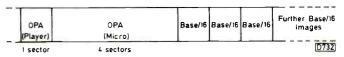


Fig. 6: Base/16 images stored as an Overview Pac.



Fig. 7: Layout of a Mode 2, Form 1 sector.

"sessions" that allow additional recordings to be made on a disc (there's normally only a write-once facility with recordable discs). These enable the user to take a partly-filed disc to a photofinisher for additional images to be recorded. When this feature was first announced there was some puzzlement as to how it could be done. Audio discs have a table of contents (TOC) that stores details of the tracks and timings on the disc. Since this is written only once, any additional recordings wouldn't be listed in the TOC and would, as far as the player is concerned, not be there. Likewise anything beyond the lead-out track would normally be ignored by a CD-ROM drive. The answer is to incorporate additional software that instructs the player/drive to look beyond the last lead-out track to see whether any additional tracks are present.

Future Developments

Photo CD can offer two extensions to image resolution, currently unused. The format can also incorporate audio recording to add words to pictures.

Marketing

Finalisation of the CD Photo standard is expected by the end of this month (October). The European launch is due later next year, with Photo CD players costing around £300 – they will also play conventional audio compact discs. Upon finalisation of the standard by Philips and Kodak the specifications will be released to manufacturers worldwide, the hope being that they will start to include Photo CD in some of their models. The Photo CD facility adds around £100 to the price of a CD player. CD-I decks will play Photo CD discs and when the price of CD-I hardware falls it seems likely that dedicated Photo CD players will cease to be produced.

According to Kodak the Photo CD service should cost the user around £12-£13 for a Photo CD disc plus prints and negatives (the price is for 24 exposures). Additional Photo CD recordings will cost around 45 pence per exposure.

As we go to press there are conflicting claims as to whether Photo CD will be available with Commodore's CD-TV format, which is a rival to the CD-I system.

Acknowledgement

Acknowledgement is due to Scott Brownstein, manager of advanced development at the Eastman Kodak company, for his help in the preparation of this article.

VCR Clinic

Philips VR6463

This machine was dead with no 5V output from the power supply because of a short to chassis. If plug P12 was removed the short disappeared, so the search continued on the P603 module. There are quite a lot of decoupling capacitors here. Fortunately the second one I tried was the cause of the short – C2919 $(47\mu F, 16V)$. P.B.

JVC HRD520

For mechanical malfunctions such as the tape being ejected while still laced up try changing the control cam, part no. PQ32413. The latest type is made of grey plastic instead of white.

P.B.

Philips VR2022

For a dead machine with a rattling deck solenoid check for dry-joints on bridge rectifier 6005 in the power supply.

P.B.

Grundig VS200/220

If the machine is completely dead check whether D410 (ZD16) is short-circuit. While you have the panel out look at the centre pin of C407. When this electrolytic capacitor begins to swell it pushes the positive pin through the board, cracking the solder.

P.B.

Osaki VCR31

There were no E-E signals with this machine as the 12V supply to the tuner/i.f. section was absent. The cause of the trouble was failure of the 2SA966A transistor Q410 which is on the bottom PCB. As we didn't have this type of transistor in stock we fitted a TIP32. This restored normal operation.

E.R.

Ferguson 3V23/JVC HR7700

Destruction of F3 (1.6AT) at switch on proved to be the result of a faulty d.c.-d.c. converter on the display control PCB.

E.R.

Alba VCR4000X

As reported by others in these pages, the Nikkai chassis used in this and similar models can cause confusion when the reset fails to work. In this one the machine appeared to be in the timer record mode, with the operate and record LEDs on and no display. When a cassette was inserted the machine set itself to record. To stop it the plug had to be pulled out. When this was refitted the cassette was ejected. All very confusing!

R.B.

Panasonic NV-L25B

This unit was inoperative with just the timer flashing zeros. There was no power up. When offered a tape the machine loaded it and kept it. The dealer who had brought this one in had changed the systems and servo control chip IC2001 and the operation and timer chip IC7501.

I started by carefully checking all the supply lines.

Reports from Philip Blundell, AMIEIE, Ed Rowland, Roger Burchett, Brian Storm, Nick Beer, Chris Avis, J. Edwards and Mick Dutton

Everything here was fine. Something was inhibiting IC2001 and IC7501 however, but what? I decided to scope the serial clock and data lines between these two chips – this can sometimes show up problems. To my surprise there was 5V on both lines. I disconnected the serial clock and data feeds to the front panel. The 5V remained on the main PCB. Where else do the clock and data lines go? Well on this model there's an additional subsystems circuit for control of the audio dub and insert edit operations. It's undertaken by the MN15522VMS chip IC6801. A quick check showed that it was short-circuit between the 5V line and the data and clock lines. When these lines were disconnected the machine powered up and returned my test tape. Replacing IC6801 restored normal operation.

B.S.

Ferguson FV41R

This new machine was pretty inactive. The clock display showed "3:7" but otherwise it wouldn't do anything. Checks on the power supply showed that everything was all right here. Next step was over to the system microcomputer chip on the front panel. The supplies were o.k., as were the reset line and the main oscillator. SCL wasn't being generated however. As there was no excessive loading on this line it seemed that the micro chip was at fault, which proved to be the case. The circuit for these machines isn't very good—there are few voltages, the connection notation is confusing and a high or low chip reset both have the simple label "reset".

Panasonic NV7200

There was a very loud knock from the mechanism when lacing or entering the cue mode – but not review. It suggested noisy loading motor bearings, but in fact the cause was a very worn capstan bearing.

N.B.

Philips VR6180/6185/6285, Pye DV186

No fluorescent display was the complaint. I found that there was no -28V supply to the operation panel though it was present at the power supply output plug. The supply goes via the P90 panel, where it's fused by ICP1001 (80mA). This fuse was open-circuit, but no cause for its failure could be found.

Luxor 9272

The problem with this machine was tape path distortion: as the tape went around the entry guide it buckled cyclically. The frequency of the effect was the same as the rotational frequency of the guide pole sleeve, which provided a clue. When the pole was removed we saw that the sleeve had a very slight dig in it. This dig seemed quite disproportionate to the effect it created, but was the cause of the trouble.

NR

Ferguson 3V53/5/7, JVC HRD755

The red LED was lit but there were no functions and no clock display. Integrated circuit protector CP3 in the power supply had failed, causing loss of the unswitched 12V

supply. Failure of one or other of the four ICPs in the power supply circuit for no apparent reason is not uncommon. The engineer can be responsible however when the screening can is removed from the mechanism with the unit powered – switch off first.

N.B.

Ferguson FV31R

The card said that this machine was dead. When checked on the bench the power supply was pumping and whistled at me. With the covers removed I switched back on at the mains to find that the machine started up all right. Now for a bit of highly technical fault-finding: I tapped the tuner/i.f./signals PCB that sits across the top of the machine. Doing this would stop and start the machine. In my experience this is very often the area in which the fault lies, however strange the symptoms. After looking at thousands of perfectly good joints I found an intermittent short in the tuner/r.f. amplifier.

Telefunken 1930i/Ferguson 3V35

No playback colour was quickly traced to the usual XB401 oscillator block. One was ordered and fitted, whereupon the machine refused to turn on! A gremlin in the waiting room had struck at the SW9V rail on the video board, shorting it out. As we expected, the cause was a short-circuit in the $4.7\mu\text{F}$ decoupling capacitor C419, which is of the dreaded blue tant variety. In the Ferguson version it's a $100\mu\text{F}$, 10V type.

Saisho VR1200/Matsui VX820

"Recording problems" said the ticket. "Worn head" said the pictures on the monitor. So a replacement was ordered and fitted. This seemed to put matters right, and the machine was duly collected and paid for. Next day it was back again. "It's just the same" protested the owner, "it records for only five minutes, then nothing." As I'd given the machine a full three hour record/playback test this seemed unlikely, but I checked it again. After five minutes the f.m. luminance record signal disappeared in a snow storm.

I found that the signal could be restored or killed by flexing the luminance subpanel on the YC board. As the print side of the panel is inaccessible when in situ I solderwicked all 29 pins, removed the sub-panel then wired it temporarily to the print side of the YC board for detailed inspection. There are printed pads along the edges of several subassemblies on the luminance panel. These assemblies are inserted into the panel at right angles, then soldered. It's rather like a microscopic version of the old ITT CVC5 i.f. module. The assemblies suffer from the same problem too - hairline cracks across the thinly soldered junctions. When I'd resoldered actual and suspect cracks, using a fine tip, I found that the panel could be flexed without any faults arising. So it was refitted in the normal manner. This wire-looping technique may sound lengthy and laborious, but it's a useful aid to diagnosis with an inaccessible board. This particular job took less than an hour to complete.

Ferguson FV31R

It seemed that this machine had damaged heads, but a new drum produced no improvement. A look at the circuit showed that the outputs from the heads enter the TA7772P preamplifier chip IQ80 at pins 2 and 6, the output

appearing at pin 10 where there should be an 0.3V peak-to-peak f.m. waveform. In fact the output from only one head was present, a straight line being displayed where the other head's output should have appeared. So we had a head switching problem or a lower drum fault.

The head drum flip-flop signal from the servo panel is connected to the signals panel at pin 8 of connector BW04. There's a test point, BW11, and the amplitude should be 3.6V peak-to-peak. The waveform was missing however. So it was back to the servo panel, where the drum FF squarewaye is generated by the microcomputer chip IT01. The output, at pin 14, depends on pin 8 receiving a pulse from the drum optocoupler via IM01. As there was a signal at pin 8 but not at pin 14 we replaced IT01. To our relief this cured the trouble. Unfortunately the manual provides no details of the voltages or waveforms around this chip. Note also that two types have been fitted in these machines. If, as in this one, there are two small subpanels mounted vertically on the servo/power supply panel, use type ZC93168P. The other type is EF6801U4DTD243.

Conclusion: if a badly damaged head is suspected, check the drum FF signal.

J.E.

Hinari VLX5

The E-E and playback pictures were unstable with very poor contrast, There was hardly any vertical or horizontal lock and no colour. A scope check at the video input pin on the r.f. in/out converter module showed that whilst the luminance signal was normal there were no field or line sync pulses. Tracing back from this point – we'd no manual – we came to a $47\mu F$, 16V electrolytic capacitor (C354) which is connected to the collector of a transistor. At this transistor's base the video signal was correct. It was also correct at the collector once C354 had been disconnected. The capacitor checked out all right with our scope tester but we decided to fit a replacement. This restored normal operation.

Akai VS1

This machine would lace up but not run. The head drum rotated but the capstan motor didn't start. It's driven by the BA6209 chip IC7 which contains a logic circuit, preamplifier and the motor drive stage. Checks on the driver stage, after finding that the logic inputs were o.k., showed that the servo input was high at 24V instead of 1.4V. This input comes via an operational amplifier in IC11 which seemed to be o.k. when checked. We concluded that there was a short-circuit in IC7 and a replacement provided the cure.

M.D.

Logik VR950/Samsung VI611

The complaint was of tape chewing. I thought I had an easy idler job, but when I ran the machine up it laced all right and started to play. Then the tape looped around the pinch wheel and stopped. In wind and rewind the tape moved, but very slowly. Further investigation showed that the operation of the reel motor was sluggish. Checks around the BA6209 driver chip IC0212 revealed that the supply at pin 8 was low at 9-2V instead of 12V. Also the chip was running warm. The 13V supply was correct and regulator Q0221 was o.k., but there was nearly 3V across R0282. The circuit gives the value of this resistor as $3\cdot 3\Omega$, but it read $12\cdot 6\Omega$ when checked. A replacement of the correct value cured the problem. Incidentally this machine is of Samsung manufacture.

What a Life!

Donald Bullock

Comes on then dies said the report with Mrs Laird's Fidelity CTV140 colour portable. And so it did. At switch on there was sound, accompanied by the rustle of e.h.t., then the set expired. I figured that either the h.t. was decaying or a short was dragging it down. So I reached for my new Cirkit TM175 meter – and found that I'd left it switched on over the weekend. A little word looked up at me from the display: "Bat".

Expensive things these PP9s, as I've come to learn in the short time I've had the meter. I've had to buy several of them. They used to be ten pence – ten old pennies, four pence in today's joke money. Now they are a couple of quid. I'd had enough, so I set to work and knocked up a little 9V power pack. The meter is now mains driven.

I soon found that the trouble with the Fidelity CTV was that the h.t. faded away, which is not unusual in these little sets. So I disconnected the set from the mains supply, dived in and checked the bits and pieces that I suspected in the power supply. An hour later I was no further forward. It was then that Greeneyes breezed in.

"I bought an Elvis Presley CD record at the village hall sale" she announced. "Can't wait to hear it, but every time I put it in the Sony player and press the drawer in it comes back out. It's been doing this for quite a while."

"Perhaps the machine's got it's pride!" I said. "It's been used to proper singers like Bing and Ella."

"What's wrong with the player though" she persisted.

"Can't imagine" I said, "at first it did it only occasionally but now it refuses to accept a disc at all – not even if I hold the drawer shut."

"Shall I take it to Snoddies then?"

I made a mental note to swot up on the machine as I switched the Fidelity set on again. It surged into power then died. Greeneyes gave it a look. "That set needs a new switch" she said before leaving.

I left it plugged in and checked a few voltages in the power supply. Only there weren't any. Then I moved over to the switch. There was a.c. at the input, nothing at the output. Why hadn't I tried the switch first? Prejudice of course.

McTurdey's TX100

Just as I'd finished it a builder's labourer bowled into the drive with a set in a wheelbarrow.

"Me name's McTurdey and it's driving me mad" he said. "In the first place there's a big bite outa each side of the picture, and even the bit I got left keeps cutin' out for an hour. Then it's o.k. for the evenin', only I'm not, it gets me all wound up."

The set was a Ferguson one fitted with the TX100 chassis, 110° version. As I put it on the bench McTurdey scooped up his wheelbarrow and waltzed off in a cloud of dust.

Sure enough there was no EW correction then, after a few minutes, the set reverted to standby with the channel indicator displaying only a dash. When the back was taken off the set started to work again and stayed on. So I refitted the back and got a repeat performance. After several minutes of this I took the chassis out and scanned the

power supply and line output sections, hoping to see a dryjoint or two. As every joint looked perfect I plugged the set in again, connected the meter across the mains bridge rectifier's reservoir capacitor and discovered that the cause of the trouble was in the power supply. I then tried to locate it by using freezer and the workshop hairdryer. As this didn't do me any good I started to trace through the voltages, starting with the a.c. input. Now and again the set sprang to life, giving me moments to reflect upon the possibility of a different job ... Then suddenly it died again. I'd got as far as R134, a $1.2k\Omega$, 5W resistor that's part of the snubber circuit. There was lots of voltage at one end but nothing at the other. Waggling it not only produced the intermittent fault but allowed me to lift it clean out of the panel, leaving the joints underneath looking good and solid.

Cleaning off the resistor and resoldering it cleared the intermittent power failure fault. I then looked into the lack of EW correction and discovered that the little correction panel by the line output transformer was bathed in a pool of tacky brown liquid. A clean up put that right.

The Philips Saga

The next set, a Philips 21CE1250/05B (CP90 chassis), would provide only a snowy raster. It's owner, Mr Dropins, explained that it had been all right before his fortnight's holiday. This news filled me with pleasure. I smiled in anticipation of a fast buck and told him it would be ready in a couple of hours' time.

I found the orange battery or, since it's a condenser, I'd better call it a capacitor! It was at the front of the set. I then embarked on the problem of extracting the chassis board from its inscrutable plastic grip-runners. I couldn't find the bits to lift or depress, push or pull or squeeze and, try as I might, it wouldn't budge. As time went by my brain kept telling me to remain scientific and rational but my instinct was to yank it out by force. Eventually the panel was freed. I changed the battery and switched on. This time the set was dead. What had I done? Why hadn't I been gentler, and how was I going to get out of the mess I'd got myself into in the time I'd allowed?

I reached for my giant magnifier and scanned the panel at length for wicked breaks or disturbed joints, but found none. There was plenty of h.t., so I checked the line output transistor and several other items in this area. No good. Perhaps Philips Service could help?

I phoned through and a wonderfully relaxed and detached expert advised me to change diode D6665 (1N4148) and resistor R3665 (4.7Ω) then, if still no luck, to replace the CNX63 optocoupler. I had no CNX63 but the other items tested o.k. with both my meter and component tester. As the set remained as dead a doornail I wrote out an order for an optocoupler and wondered how I was going to tell the customer that the live set he'd brought in was now dead.

Handsets Galore

Then Mr. Dropins showed up, reached into his pocket and pulled out a remote control unit which he thrust into my hand. "Forgot to leave this with the set" he said, "see you later." He smiled and left.

I stood at the bench reflecting on how slowly the sets come off it these days compared to twenty-five years ago. Then I noticed the Magic Mirror IR detection card that had recently arrived. I stood it against the mirror at the back of the bench, picked up the remote control unit and

fired it at the Magic Mirror. The set burst into life and frightened me no end. Recovering, I hurriedly plugged in the aerial and, since the set had no proper channel selector knobs, danced my fingers around the dreaded search-tune buttons. Up came a perfect picture with sound. My relief was enormous. Then I noticed that something else was wrong. There was no colour – on any channel.

The set had no colour control, nor much else, and no matter how I pummelled the remote control unit I couldn't get a trace of colour. So it was into the chroma circuitry. Checks here did no good. Time passed, and I was feeling weary. Then Mr. Dropins turned up again.

"I don't know what's the matter with me" he said. "I meant to leave this instruction booklet with you – oh, and you might as well have the right remote control unit. The one I brought in was for my father's old set. We use it

because it's smaller and handier.

After he'd gone I read through the instruction book, hoping to find something under the heading "how to restore colour after giving the chassis a mauling"... No hints of course, so I returned to the house for tea and sympathy. Anyway, there was tea.

Back in the workshop I picked up the set's proper remote control unit, pointed it at the black-and-white picture and pressed colour control. Up came the colour.

Mr. Dropins was soon back on the scene. I tuned his set in, fitted the back, accepted his cheque and waved him and his set towards his car.

"I'm glad it didn't give you any trouble Mr. Bullock" he said. Then he was gone. I returned to my stool drained. How can all these things happen to just one person? And why does it have to be me?

Choosing a Digital Multimeter

Part 1 David Botto

Whether we like it or not, the old analogue multimeter is gradually disappearing from the workshop. This is simply because recent advances have made the digital multimeter today's most effective measuring instrument for TV/video work. In fact it used to take a whole stack of instruments and a lot of bench space to provide the range of tests that can be carried out with a modern DMM. The latest models use microcontroller technology to provide more features and functions than ever before. In addition to the traditional voltage, current and resistance ranges, many of today's DMMs can measure capacitance, frequency, duty cycles, min/max voltages, temperature and digital logic levels, make good/bad checks on diodes and transistors and measure transistor gain. With such a meter you've a portable test bench in your hand. This is especially helpful for the field service engineer.

Before buying a DMM it makes sense to study carefully what's available then decide on which instrument is best suited to your needs. A massive range of DMMs is on offer today, ranging from economy waistcoat pocket models to large bench instruments. The aim of this article is to help you cut your way through the DMM jungle in order to choose an instrument that best fits your particular requirements. Most readers will be familiar with DMM terminology, but Table 1 is included as a handy reference. We'll also be taking a brief look at the basic working principle of a simple DMM.

Why Digital?

Until quite recently there were certain things that an analogue meter could do but a digital meter couldn't. For example, many older DMMs couldn't check diode and semiconductor junctions.

The heart of an analogue multimeter is its delicate moving-coil meter movement. This is easily damaged by an overload. Connect one on one of its resistance ranges to the mains supply or to the 350V h.t. line in a TV set and you'll be rewarded with a cloud of smoke and a wrecked instrument. This is especially so with cheaper meters that don't have a cutout or fuse protection. The moving needle of an analogue meter did have one definite advantage however. This was when making null or peak adjustments with a TV set or VCR. With early DMMs, especially those

that used a neon tube display, it was impossible to make such adjustments – if you tried, you were rewarded with a display resembling that of a fruit machine. Many DMMs now have electronic analogue pointers, known as bar graphs, to overcome this problem. A DMM of this type has the advantages of DMM accuracy and analogue convenience.

Since the circuitry in a DMM is more complex than that in an analogue multimeter there is in theory more to go wrong. In practice however a good-quality DMM is extremely reliable, failure being rare. One reason for this is the fact that the internal circuitry operates at low voltage levels.

An analogue voltmeter's input resistance is stated in ohms per volt – this is the meter's resistance multiplied by the full-scale voltage measurement. Thus a $20k\Omega/V$ analogue meter set to its 1kV d.c. range presents a circuit load of $20M\Omega$ (1,000 \times 20,000). When the meter is switched to its 5V range however the circuit is loaded by only $100k\Omega$ (5 \times 20,000). This is much too heavy a load for much modern CTV and video work. In contrast a DMM normally has a minimum input impedance of $10M\Omega$ on all its voltage ranges. Some special-purpose DMMs have an input impedance of $25M\Omega$.

If an analogue meter is accidentally dropped, or falls over the edge of the bench, its moving-coil meter may well be permanently put out of business. At best it will cost a lot of money to repair. In contrast a quality DMM is not only tough enough mechanically to stand up to rough treatment, it's also not easily damaged by overloads. It's not good policy to abuse your DMM however – good instruments deserve good treatment.

Perhaps the most popular analogue multimeter of all time was the finely engineered Avometer Model 8, which is protected by a safety cutout. Its price today is around £240 plus VAT. Not so long ago nearly every radio/TV workshop possessed one or more of these meters. Their accuracy on the d.c. ranges is ± 1 per cent at full-scale deflection, which is pretty good for an analogue meter. The a.c. tolerance is 2 per cent of f.s.d., with the resistance ranges ± 5 per cent at centre scale. To obtain this level of accuracy you have to peer carefully at the meter needle, making use of the mirror scale. Good as this accuracy is, a top-quality DMM has an accuracy of ± 0.05 per cent or

Table 1: DMM terminology.

Accuracy: Measured as a percentage error (± per cent)

Annunciators: Display symbols that indicate range or function.

Autoranging: Automatic selection of the correct range to match the input being measured.

Bar graph: LCD analogue scale pointer.

Continuity test: Uses a piezo-electric beeper that sounds with resistance values below 100Ω .

Crest factor: The ratio of peak to r.m.s. a.c. waveform value.

Data hold: Function that freezes the measured value on the display.

Digits: DMM display numbers.

Display count: Maximum count readable on a DMM.

Frequency response: Band of a.c. frequencies the DMM will measure.

Functions: The kinds of measurement that can be made.

High ohms: A resistance range where the test voltage is high enough to forward bias diodes and transistor junctions.

Low ohms: A resistance range where the test voltage is too low for diodes and semiconductor junctions to become conductive.

Input impedance: A DMM's combined a.c. and d.c. input resistance.

LCD: Liquid-crystal display.

Min-max: Function that stores the highest and lowest readings.

Peak hold: Function that holds the highest value reached when changing voltages or currents are being measured.

Range hold: Locks an autoranging DMM to one range.

Resolution: The smallest change a DMM can measure.

Sensitivity: The lowest value a DMM will indicate.

Touch hold: Similar to data hold.

better over its entire d.c. ranges. Those intended for servicing work are usually accurate to ± 0.5 per cent or better.

How a DMM Works

The basic elements of a DMM are shown in Fig. 1. It consists of an analogue-to-digital converter (ADC) followed by a decoder and display. AD conversion is carried out by an integrator followed by a counter. The input, on whichever range, must first be converted to a form suitable for integration, i.e. a chopped d.c. waveform that's proportional to the input being measured. Integration produces a ramp which is fed to a counter along with a clock pulse input. The number of clock pulses that occur during the ramp represents the AD converted signal, since ramp duration is proportional to signal input. The AD converted measurement is of no use on its own of course: it has to be decoded so that an appropriate voltage/current/resistance reading is displayed.

Older DMMs such as the Heathkit 2·5-digit Model IM1202 (an excellent instrument whose neon digits could be read at the other end of the workshop!) used a single-slope integration technique – see the waveform in Fig. 2. Today virtually all DMMs use dual-slope integration, in which the waveform is of the shape shown in Fig. 3.

A Basic DMM

A more detailed account of DMM operation will be given in a separate article at a later date. Meanwhile Fig. 4 provides an outline of a basic DMM that measures a.c. and d.c. voltage and current and resistance. Integration is carried out by the operational amplifier IC1, which produces a dual-slope output. This is fed to a quartz-crystal controlled counter/decoder where the duration of the ramp is checked. A 3·5-digit LC display provides the readout. When the user selects different ranges the decimal point in the display is automatically moved to its correct place.

The lowest voltage range with this design is 199.9mV (200mV range). Calibration control VR1 adjusts the reference voltage and is set so that the reading is 199.9mV when the input is the same.

SW1A/B/C is a ganged range selection switch: SW2A/B/C/D is a ganged function selection switch. When SW2 is set to read d.c. voltages, SW1A selects the appropriate range – 200mV, 20V, 200V, and 1kV. It also selects the a.c. voltage ranges, which are the same. In the a.c. positions an a.c.-d.c. converter is switched into circuit.

In the current measuring positions current is converted to voltage by passing the current through a series of precision resistors arranged in decade steps. When the resistance ranges are selected resistance is converted to d.c. voltage by using a constant-current source. For example in the 200Ω range the constant-current generator feeds a constant 1mA through the $1k\Omega$ resistor and Rx. The resistance ranges of a DMM are much nicer to use than the ohms scales of an analogue meter. Unlike the majority of analogue meters, the resistance scales are

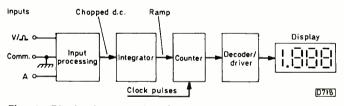


Fig. 1: Block diagram showing the elements of a digital multimeter.

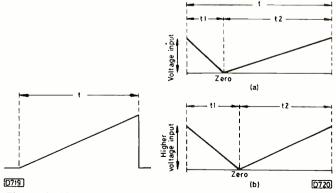


Fig. 2 (left): Single-slope integration waveform. Duration and slope of the ramp vary with the input voltage.

Fig. 3 (right): Waveforms with dual-slope integration; (a) and (b) show how different input voltages affect the slope timing.

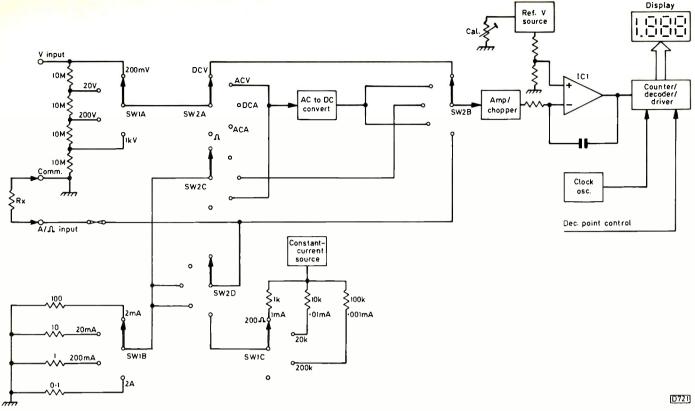


Fig. 4: Showing in simplified form the operation of a basic DMM.

linear. Thus 0.1Ω is just as easy to read accurately as 199.1Ω .

Points to Note

Many DMMs now have capacitance ranges. They use an internal constant-current source, as with the resistance ranges, but the integrating arrangement may not be employed as the counter can simply measure the time taken for the capacitor under test to charge to a given voltage level.

The counter/decoder system is sometimes used, together with input gates, to measure signal frequency.

While many DMMs continue to use manual range switching an increasing number of today's models use microcontroller technology to provide autoranging: the user selects the function then the microcontroller senses the input, decides on the correct range and switches in the appropriate circuitry.

Be warned however. DMMs are not all the same. Don't be tempted to buy the cheapest model. Especially for workshop use it pays to invest in a good-quality instrument. After all, you'll be using it for a good many years.

Types of DMM

Most of today's DMMs come in one of four forms – pocket type, probe type, hand-held or bench models. A brief note on each.

The pocket type is of much the same size and weight as a pocket calculator. Such meters generally have provision for making only a limited range of resistance and a.c. or d.c. voltage measurements. Accuracy on the lowest d.c. voltage range is typically about ± 2 per cent. These meters are handy when installing equipment but are of little use for servicing work.

Probe-type instruments have everything, including

function/range selection and the readout, in a single probe. Ranges and accuracy are similar to the pocket type.

The hand-held type is the most useful for TV/video/computer servicing work. A good-quality instrument will provide a wide range of measurements with a high degree of accuracy. These meters take up very little bench space, which is a big advantage, and are also handy for the outside engineer.

Bench models may be mains or battery operated or both. They are useful where a high degree of accuracy and stability are required – greater than are needed for most TV/video servicing work – but generally don't provide the wide range of functions available with hand-held models.

Switch Quality

Pay careful attention to switch construction when choosing a DMM. Many high-performance DMMs use good-quality push-button switches. It's often claimed that these are more reliable and have lower contact resistance than the rotary switches used in many less expensive models. A rotary switch is perfectly o.k. however provided it's of robust construction. With some cheaper models an economy is made by combining the switch with the meter's PCB, using printed tracks as part of the switch. This arrangement can give rise to trouble in time, especially should high contact resistance develop. You can usually tell a good-quality rotary switch by its nice, positive click feeling.

It's also vital that the DMM has a good-quality case that will stand up to workshop use. Many hand-held meters now have tough ABS plastic cases and protective holsters.

Next Month

In Part 2 next month we'll consider some other aspects of DMM technology and present a table to help in the selection of a suitable model.

The Ferguson Singapore Briefing

Graham Exeter

In late July Ferguson took a party of UK journalists to Singapore to hear about its new video strategy and to to see the Thomson video operations in the country – Thomson recently established a joint venture with Toshiba, called International Video Products. Thomson bought Ferguson from Thorn EMI in 1987 and owns a number of other brands including RCA, GE, Telefunken, Saba and NordMende. It claims to be number two internationally in the video field, after Matsushita (Panasonic).

A brief overview of the world video market in 1990 revealed that some 40 million VCRs and eight million camcorders were sold that year. Japanese companies manufactured 63 per cent of the VCRs and 98 per cent of the camcorders (the other two per cent were produced by Korean companies). It's felt that Europe can close the gap, though the Japanese have a strong grip on the supply and manufacture of i.c.s for video products. A series of major research and development projects have been started in Europe devoted to chip design and production.

UK Strategy

An initial seminar on Ferguson's UK strategy was given by Jay Chinnadorai, director of marketing, and Andrew Duncan, video and camcorder marketing manager. It began with a discussion on the BBC's decision to call Nicam "BBC Stereo", a move that has angered and dismayed manufacturers and retailers alike, since it's likely to add to consumer confusion. It seems that the BBC might now be having second thoughts about this. Incidentally Nicam services have recently started in Singapore, Spain, Hong Kong and the Scandinavian countries.

Except in Japan S-VHS is selling slowly. Ferguson plans to launch wide-screen (16:9) S-VHS software, which will make the wide-screen TV sets more attractive. The company has decided to delay the UK launch of its wide-screen TV sets until early 1992 however.

The company also plans to launch a laser disc player, as a joint venture with Pioneer. Unlike Pioneer's 1450 player it won't have NTSC playback capability. This is because of complaints by film companies about possible piracy. It's a shame as there are hundreds of NTSC titles but very few PAL laser discs. The general feeling amongst those who attended the seminar was that a PAL-only laser disc player stood little chance of being a success in the UK.

According to Ferguson, UK VCR penetration is now around 73 per cent. Sales for the current year are forecast at 2·15 million, giving the market a retail value of around £689 million. About 71 per cent of the VCRs sold in the UK cost less than £350, and 87 per cent are remote-control programmable. Ferguson has decided to concentrate on making its VCRs easy to use and programme. The company is not at present interested in picture enhancement systems like Akai's I-HQ and Nokia's ASO.

Timer Problems

A survey carried out for Ferguson found that 28 per cent of all adults admitted to having problems in setting the VCR timer: 35 per cent of women had problems and 50

per cent of adults over 45. Ferguson made the point that the 45-59 age group in the UK will rise from 6.5 million to 7.5 million by the year 2000. By that year 44 per cent of VCR buyers will be over 45, compared with 36 per cent in 1989. Hence the increasing need for user-friendly VCRs.

Two new Ferguson models, the FV51R and FV52L, feature Instant Help Programming (IHP) which gives onscreen help with timer programming. Both models come with two remote control handsets, a full-function unit and a basic one. The latter controls the VCR's major functions and has just nine large buttons. Sony has an ingenious reversible handset, with all the controls on one side and just the basic ones on the other. Ferguson claims that people still have problems with this complex-looking handset. The basic Ferguson unit can of course be used as a back-up handset, and the company plans to offer it separately for use with other models. The two new VCRs feature a one year/eight event timer, a 40-channel tuner and on-screen tape remaining indication. Model FV52L also features VISS, long play and trick features.

Around 80 per cent of large-screen sets at present on the market in the UK feature teletext, household penetration for teletext now standing at 34 per cent. Ferguson sees teletext becoming a major VCR feature for two reasons. First, there are around 7.5 million people with poor hearing in the UK. Many would like to be able to record subtitled programmes, preferrably in colour. Around ten per cent of UK TV programmes are at present subtitled, and there's pressure for an increase – in the USA legislation may force all programmes to be made with subtitles. The second reason is that teletext can be used for timer programming. As mentioned in Teletopics last month, Channel 4 is to launch Programme Delivery Control (PDC) later this year.

Teletext Timing – PDC

Teletext timing isn't new. A system called VPS (video programming system) has been in use in Germany for some years. It works by assigning to each programme a unique identification that's transmitted as a data signal on a spare teletext line. This enables a teletext-equipped VCR to identify programmes and their start and end times. Thus a recording can be started when the relevant identification is received and the user doesn't lose the end of a programme that starts late. PDC works on the same principle, but instead of using a whole teletext line for identification a hidden packet (26) is included in the advance listing pages. This reduces access time and doesn't waste teletext space.

In use the VCR's timer system stores the PDC codes of wanted programmes. PDC data is transmitted continuously and is constantly scanned by the VCR, which looks for matching codes. The start code occurs thirty seconds before the beginning of a programme. Likewise an end code occurs thirty seconds before the programme ends.

Ferguson has issued a guide that provides answers to some possible problems, such as what happens should a PDC-marked programme end after the start of the next timer event? The answer to this one is that the PDC programme would override the next event, even if this was also PDC marked. If there's a break in transmission whilst

a PDC programme is being recorded the timer will continue. Should PDC signals fail to appear for some reason the VCR will automatically revert to the programmed start and stop times. PDC is robust, using a powerful Hamming Code error correction system. Ferguson pointed out that if the PDC data was so badly corrupted that it couldn't be read the picture quality would be extremely poor as well. Incidentally PDC has no effect on subtitling.

PDC has it weaknesses however. Users have to call up the teletext service, then dial the TV listing pages. Couldn't a user go to these directly? Apparently Ferguson is looking into this. Another question was whether the system could be combined with the VCR Plus system (see elsewhere in this issue)? This appears to be unlikely. Another problem is that teletext programming can be used only with TV programmes to be broadcast several days ahead, though timers are usually set several hours ahead. At present the PDC system can't follow programmes that move to another channel, for example when a sports programme is transferred from BBC-1 to BBC-2: later versions will have this capability however. In theory PDC could be used to record programmes of a particular type, e.g. sport or soap operas. It could even be used to eliminate the advertisements from a recording, though it's doubtful whether the public would ever be offered this feature.

Development of PDC

The basic PDC system was set out by BREMA and the UK broadcasters last February. Channel 4 began test transmissions in April. In the same month the European Broadcasting Union (EBU) finalised the PDC standard, which is known as 8/30 Format 2. Ferguson will be launching its first PDC VCR, Model FV54LX, this autumn. Features will include colour subtitle recording, VISS, long play and a one year/eight event timer. It will sell for about £400. The company points out that the original VPS concept was first patented by Telefunken in 1976. Thomson, which subsequently took over Telefunken, retains this patent in Germany and other countries.

BREMA has decided that PDC should be marketed under the name Startex, which it feels will be more meaningful to the public. According to Ferguson PDC will add around £50 to the price of a VCR. The company adds that although PDC has been standardised the operating software hasn't, so that various makes of PDC VCRs may operate differently.

The IVP Venture

The International Video Products venture is 51 per cent owned by Thomson, 49 per cent by Toshiba. It's Thomson's largest VCR operation and is involved in manufacturing, engineering and R and D work. The plant is massive, covering some 33,000 square metres, with the mechanical deck operation adding a further 6,000 square metres. By the end of the year the workforce is expected to have risen to 3,000. The plant seemed to be more labour-intensive than some Japanese factories I've visited, but there's little doubt that Japanese production standards can be met. Thomson expects IVP to account for 45 per cent of its VCR production by 1992. This year's VCR production figure is targetted at around 1-4 million. The plant produces VCRs, video players and video kits for the European, Far Eastern, US and Canadian markets.

next month in

TELEVISION

FREE CATALOGUE

Greenweld Electronics' new 1992 catalogue, worth £2, comes free with the November issue of *Television*. Includes components, test equipment, accessories, security items, audio and disco equipment, kits, power supplies, etc.

• CHOPPER POWER SUPPLIES

J. LeJeune looks at TV receiver switch-mode power supplies, in particular the type based on the TDA4600 series control chip. Circuit and regulation action are explained and advice given on fault finding.

• SATELLITE SOUND IF ADAPTOR

S. Pearson found that the sound panel used in the GEC C2110 series chassis can be put into service to obtain satellite TV sound where this has a different sound-vision spacing from the standard for which the main receiver is designed.

EW SCAN CORRECTION

Design of the deflection yoke in a TV set has traditionally involved compromise between spot quality and raster geometry. Since the geometry can be corrected by external means, spot quality has been the main aim in yoke design. For many years large-screen, 110° sets have used a modulator circuit to provide EW correction, modulating the line scanning at field frequency. The operation of this type of circuit has been rather an obscure matter in the past. Next month Joe Cieszynski gives a clear explanation of the operation of the commonly used circuits, lists common problems and outlines fault diagnosis techniques.

WHICH DMM?

In Part 2 of his article David Botto explains DMM characteristics and their relevance to servicing and provides details of the models available from the major manufacturers.

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Letters

REPLACING MAINS PLUGS

I've been reading the letters in recent months on whether or not to fit new shielded-pin, three-point plugs to equipment when the old-type plug is still in good condition. While I'm not in the TV trade, my business being portable industrial heaters, your readers may be interested in my experience.

The heaters that come into my workshop for service or repair can be anything from six months to twenty-five or more years old. I find that the plugs on the heaters brought in during the winter season fall into the following three groups. Out of say every hundred about fifty will be of the new type, in various states. If they are good, they stay on. If not, a new one is fitted. Of the remaining fifty, forty will be older-type plugs, again in various states. These I change for the new type regardless of condition, and the owner is charged for the replacement. The way I see it is that if the owner goes back and electrocutes himself on the old-type, unshielded plug the first thing that will be said is "you serviced the heater, why didn't you fit the new-type plug?" It's a situation I don't want to find myself in.

What about the remaining ten plugs? Well, this is the horror department – cracked tops, naked wires, live and negative wired the wrong way round, earth wire disconnected or even cut off.

Needless to say, the plug is the first thing I check before I even think of plugging in.

O. W. Rogers,

Bodmin, Cornwall.

GEC/GRANADA EQUIVALENTS

A correction is required to the equivalents information in my letter last month. The GEC equivalents of the Granada C20AA4 and C22AA4 are Models C2089H and C2289H respectively (Hitachi NP83CQ text chassis). The GEC C2087H and C2287H were fitted with the Hitachi NP81 series chassis.

S. McManus, Technical Dept. (GEC Radio & TV), Hotpoint Ltd., Celta Road, Peterborough PE2 9JB.

With reference to the letter from S. McManus (GEC) last month, the GEC C1657/1658/2295 were sold by Granada as retail sets, quite simply that: they were not modified or customised, just manufacturer's models retailed by Granada. The codes listed are put on by Granada for its own purposes and are sometimes the only identification on the set. The C2295, although based on the Tatung 160/161 chassis, was still a GEC retailed set. The other models Mr. McManus lists are identifiable from the code charts provided.

Roy Baines, Peterborough.

SATELLITE RECEIVER PROBLEM

Keith Cummins' letter (September) confirms my opinion on the Amstrad satellite TV receiver problem and raises the new point of capture effect. This is certainly an intersting thought. With the re-reflected signal delayed by forty feet of cable compared to the original forward signal, a delay of probably 60nsec is introduced. Because of the lag, the forward and re-reflected instantaneous f.m.

spectra will not be identical, but for the spectra to be so different to appear to be two distinct signals (and therefore for the capture effect to apply) seems unlikely.

Mr. Glenton's letters refer to the quality of installations and indicate that the cable may not be a good fit, and therefore not a good match at the LNB. This adds weight to my theory. Perhaps Mr. Baker would like to check his cable at the LNB while the summer weather is with us? It seems that a good installation is essential before all the blame can be put on the receiver, even if it obviously isn't perfect. An important point to note at LNB output frequencies is that the wavelength in the cable is about one foot, which means that the distance between standing wave maxima and minima is about three inches. Discontinuities must be much less that one quarter wavelength in order not to cause impedance changes. Thus a cable flattened for half an inch of its length is possibly useless.

Another way of attempting to increase the Amstrad receiver's input impedance might be to place a small ferrite ring over the cable at the receiver end and slide it along the cable to obtain optimum results.

Ray Porter, M.Sc., C.Eng., M.I.E.E., Stourbridge, W. Midlands.

FILMNET RECEPTION

Most of your readers will probably be aware that Filmnet, the movie channel transmitted via the Astra satellite, has recently adopted digitised encoded sound. This is obviously a disadvantage to users of unauthorised Filmnet decoders. It's difficult to obtain any accurate information on Filmnet's sound encoding method. According to Astra technical information Filmnet is using Nicam sound. Would the use of a Nicam decoder such as the Maplin one, with the correct input filter for Filmnet's primary sound carrier, be successful? Perhaps one of your readers could supply information on this.

Brian Webb,

Havant, Hants.

TESTING IR HANDSETS

Until fairly recently I used to test IR handsets by hanging a scope across the handset's LEDs. There are physical difficulties in doing this however and I discovered that it's not reliable – one handset I tested in this way appeared to have pulses across the LED but still didn't work.

Having recently stripped down an old Rediffusion set I thought it would be a good idea to use the IR detector, which is neatly packaged in a tin box with a built-in preamplifier. So I set to work to add a few components – transistor, resistors and LED – to indicate the presence of IR pulses. Depending on the polarity of the pulse output from the preamplifier, one of the circuits shown in Fig. 1 should work. The additional components were built into the detector box and a 9V PP3 battery was strapped to the side. The results obtained are excellent. At normal handset to TV set distances the LED flashes at the repetition rate of the IR pulses. I now always carry this with me when I suspect a faulty remote control handset.

The other week I was called to check out an IR handset. Four of the channel buttons had stopped working. Guess which? Right, one to four, the most used ones. It was either a new handset (not easy to obtain with this particular make, and expensive too) or try to carry out a repair. The problem was with the carbon impregnated pads beneath the buttons. They seem to "dry up" and become nonconductive. What could be done? I couldn't put new pads

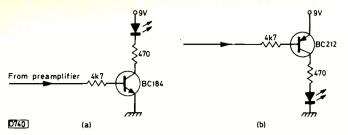


Fig. 1: LED driver circuits, (a) for positive-going pulses, (b) for negative-going pulses.

in as all the buttons are on the same mat.

A few minutes thought and to the kitchen I went to pinch a bit of the wife's cooking foil. Armed with a pair of scissors and a tube of super glue I stuck a button of foil to the underside of the faulty pads and, presto, repaired the unit. I'm not suggesting that all remote control faults are caused by dried-up pads, but armed with an IR tester, foil and super glue a great many handsets can be repaired! Mel Davies.

Skelmersdale, Lancs.

As the manufacturer of the infra-red detector mirrors referred to in a letter in the August issue (page 712) we would like to comment on the suggestion that they are expensive. Electronic workshops today are full of expensive, high-tech test equipment – oscilloscopes, digital meters, frequency counters, the list is long. Our IR detector mirror on the other hand is a low-cost, reliable and extremely useful piece of equipment, costing only £9 including VAT with no post and packing charges. Component suppliers such as SEME Ltd., Willow Vale Electronics and Chas. Hyde and Son Ltd. stock the mirrors. One further point is that the mirrors last a long time and don't use batteries, making them environmentally friendly.

C. R. Dempster, Electronic Consultant Services, 6 Nethersole St., Polesworth, Warcs B78 IEE.

HELP WANTED

Can anyone supply a line output transformer and the four slider knobs used in the Grundig 1500GB/3010GB/717GB hybrid colour sets? New or used, name your price! B. Lawler, 6 Chindit Close,

Formby, Lancs L372JH.

0704 832 625.

Can anyone supply a wire-type remote control or a front panel for the Tatung VRH8300TK VCR, also a front panel for the Ferguson 3V22?

Stephen Davies, Cwrt-y-Gorffwys, Golden Grove, Carmarthen, Dyfed SA32 8NN.

I'm seeking a TV sound only tuner similar to the one that used to be marketed by Radio and TV Components Ltd. of Acton. Can anyone oblige?

A. L. Wragg,

29 Eastern Road, Sutton Coldfield, W. Midlands B73 5PA. 021 354 4265.

Would the two gentlemen from Antrim, N. Ireland who phoned in reply to my earlier letter (July) concerning a Condor Model VHS 8120 VCR please get in touch again -I didn't get your names etc. The manufacturer is Daewoo incidentally, in Co. Antrim. Many thanks for their help.

Can anyone supply a TDA1104 chip, or suggest a modification, for the Panasonic TC2205? Neither SEME nor Panasonic can help.

M.B. Wilson, 1 Playwell Court, Glanton, Alnwick NE66 4BL. 0665 78 437.

Editorial note: There have been a number of calls for help wgith the TDA1104 chip used in the Panasonic U2 chassis. We understand that the NP1106, available from Panasonic or SEME, is a direct replacement. Our thanks to Nick Beer for this information.

Can anyone supply an M193CB1 chip for the Network Model NWC1402? Also I have a Universum FRC27915 TV/Radio/tape combo made by Quelle International. Trouble is that the sound is a.m. Does anyone have a circuit or manual or can suggest a way of converting the TV sound to f.m.?

C. E. Toms,

212 Teignmouth Road, Torquay, Devon TQ1 4RX. 0803 325 177.

Can anyone supply a line output transformer assembly for the Network Model 1402R, new or secondhand? Sight and Sound, 1 Stonewall Cottage, Hill Top Farm, Caythorpe Heath, Caythorpe, Lincs. NG32 3EU. 0400 73448.

Can anyone supply a Woodsdale Components plug-in module to replace the TDA2190, or information on it? Fred Garland, Fernhill, St. Ives Road, Carbis Bay, St. Ives, Cornwall TR26 2JT. 0736 795 620.

Can anyone suggest a source of a service sheet for the NordMende 1201M green-screen computer monitor? I assume that it's about 8-10 years old.

F. B. Greenhall.

24 Trelissick Road, Hayle, Cornwall TR27 4HY.

Can anyone supply a circuit diagram and c.r.t. base adaptor for the Video Circuits type V33 tube tester? E.J. Edwards, 8 Anderson Court, Plymyard Ave., Bromborough, Wirral, Mersevside L62 6EF. 051 334 8733.

FOR DISPOSAL

I have for disposal a prototype dual-standard colour receiver chassis fitted with a round tube. It's free but would have to be collected.

H. H. Journeaux,

7 Blair Avenue, Poole, Dorset BH140DA. 0202 748 072.

IR RADIATION/COMMENTARY-FREE SOUND

Kevin Davies (Letters, August) asks how I discovered that a CCD camcorder sees IR radiation? The answer is simplicity itself: the Sony camcorder comes with a remote control unit that was pressed while it was in the camcorder's shot. I've recently been told that the ability of CCD camcorders to convert IR radiation to the visible spectrum is now being exploited in the security and photographic fields.

While on the subject of IR radiation, the universal, programmable remote control handsets currently being advertised are almost but not quite universal. One I tested copied all available remotes – including Peugeot and Renault car keys! – but failed with a Salora satellite TV receiver.

Back to commentary-free sound. My reason for raising the subject is that it's something about which most people, if they would care to admit it, have at some time or other had cause to complain then dismissed the thought on the grounds that it's just a part of life and can't be changed. But it can be! The technology is there, and while I accept Kevin Davies' findings on motor racing (they must apply to most speed/distance sports) I still feel that a selectable commentary/no commentary option is a very desirable feature that should be made available to viewers. *Gus Cusick*,

Preston, Lancs.

Steve's Camcorner

Steve Beeching, T.Eng.

I'm becoming more reluctant to tackle intermittent faults on camcorders that are still under guarantee. Possibly it's because I'm being sent too many. Anyway, to the point.

Panasonic NV-M7

A Panasonic NV-M7 that came along recently wasn't actually under guarantee, but an estimate was requested. The fault symptom was a vertical blue area on the left-hand side of the picture, merging to red/orange on the right-hand side. This red/orange area covered about two-thirds of the picture. The fault was intermittent but was usually apparent. You can hear the dealer's subcontractor saying "sod that one – send it to Steve". Well thanks fellas!

It's not very easy to explain how I tracked down the cause, starting at the chroma output and working back thorugh the encoder and CCD delay lines to the luminance/chrominance signal processor IC304. I eventually found that the outputs from the B-Y and R-Y matrix had a large triangular waveform superimposed on them – this was the cause of the discolouration.

The main input at pin 41 of IC304 was o.k. So was the Y output at TP2. But pin 17 had this incorrect waveform. It didn't enter the chip with any d.c. supply or the white balance levels. I eventually discovered that its source was at pin 9. C323 which decouples this pin was cracked and was thus intermittently open-circuit.

JVC GRC7

Darren was struggling with a JVC GRC7 the other day. He came to the conclusion that the drum was running slow. I asked him why? His reply was to the effect that if you placed your finger on the drum then slowed it a bit more and let it go you got a momentary picture as the speed increased. The tracking control didn't work either.

When I checked the blank LC display I was able to tell him about changing C6 on the operation panel. That's the third time we've had the fault.

Mystery Cures

So many faults clear up for no apparent good reason while you're carrying out checks. One did on a Panasonic NV-MS1. The symptom was no capstan servo lock on playback.

There were no CTL pulses at IC2002. Nor did any noise come through when pin 11 of IC2001 was touched. C2025 had an effect when it was wiggled – the CTL pulses returned. I changed C2025 without much conviction and

noted that if QR2005 unexpectedly turned on it would shut the CTL amplifier down. So D2013 was checked. But as the fault had now gone away there was not much else I could do.

A similar mystery cure occurred with a Panasonic NV-MC20. The owner complained that the dew light came on intermittently. Darren checked, agreed and sent me off at a tangent. In fact both the dew and the operate indicators flashed under the fault condition when, after a short forward wind in the play mode, the loading system failed to operate and lace up the tape.

No one at Panasonic seems sure what this emergency indication means. The fault had cleared however once the deck and connectors had been dismantled and checked.

A further note should perhaps be added. If the dew sensor is active the camcorder won't work at all and just the dew indicator flashes. It seems that if the dew sensor is activated after play has been selected the operate light also flashes, as an emergency indication. This may indicate a connector problem, or it may yet turn out to be a different software message. Who knows?

Ferguson 3C01

The Ferguson 3C01 strikes me as being a hybrid design consisting of a JVC camera head with a Panasonic deck and VTR circuitry, though the construction suggests NEC manufacture. Be that as it may, the fault report was no viewfinder image. In fact the camera section wasn't producing any signals and investigation showed that the camera tube's high-voltage supplies were absent.

They are produced by what is almost a mini version of a line output stage. A 2SD975 transistor, Q48, drives the high-voltage transformer. It was damaged, leaky in fact, and the thermal fuse TF1 in its collector circuit was open. Destruction of this transistor is usually caused by failure of the transformer. It's small and produces around 3kV, so it works hard. I replaced the transformer, the transistor and the fuse, ran the thing on the bench for a test recording, then sent it on its way.

To my surprise it came back a few weeks later with no 8V camera section supply. This time IC1, which controls and regulates the 5V and 8V camera supplies, was open-circuit at its 8V output. It's this supply that feeds the previously mentioned transistor Q48.

A new chip was fitted and the unit was left on soak test in the record mode – you can't leave it on in the monitor mode as the battery save circuit switches it to standby. I noticed occasional severe picture break up, and eventually it went off, blowing IC1 again.

An 8V supply link, across IC1, gives operation whilst the drive pulses and power lines are being checked. When the picture broke up there was disruption to the H sync pulses. So attention was turned to the sync generator chip IC31, which was checked for dry-joints. Then the oscillator crystal was replaced. This seemed to restore stability and as no further problems were seen during a soak test IC1 was

replaced once more. The subcarrier control was checked and reset and after that the unit was returned to the dealer. So far so good.

Life being what it is however the camera bounced back almost immediately. A chat with the dealer revealed that, though he'd soak tested it and found it to be stable, when the owner tried it in the shop there was a loud clicking noise from the camera and it went off.

Back on the bench I found that the thermal fuse TF1 was once more open-circuit. When it was replaced the camera worked very well. Then a little light bulb glowed above me. What was the common factor previously overlooked? The battery! When this was connected the camera played up as its power supply fizzled on and off. When it was connected to the charger the battery fizzled for a short period then settled down to charge. It seems, though I don't have proof, that the battery had a poor internal connection that resulted in mistriggering of the camera tube's power supply and overheating of Q48. All this was in addition to the sync generator problem.

Panasonic NV-MS1

This fault was a real pig. A Panasonic NV-MS1 had no record or playback servo operation. Could we provide an estimate? The audio/control head was loose and the guide to the right of it was misadjusted. Not nice, but a fair enough job. The estimate was accepted, so a new head was fitted and aligned along with the guide. Super playback, into its case and away. Except for one small problem. When a record/playback soak test was carried out the original fault, no recording of the control track, became apparent. What's more, once the camcorder was in the record mode it could be stopped only by removing the power. This was the start of a very exasperating experience.

There was no record control pulse output at pin 11 of IC2001. All the other signals were correct except for the CTL duty signal at pin 36, and at that stage I wasn't sure whether this was an input or an output. There was no choice but to change IC2001, which is not an easy job – and proved to be fruitless. Super Gerald at Panasonic said that the main microcomputer chip IC6001 is often the cause of this fault, so it was changed. There were still no control pulses. Attention was then turned to IC2007, a micro chip

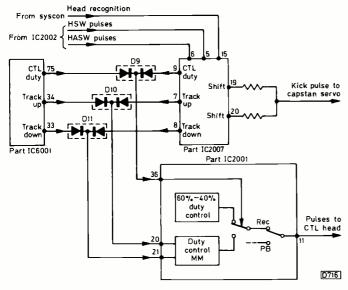


Fig. 1: Block diagram of the CTL pulse generation/head identification arrangement used in various Panasonic models.

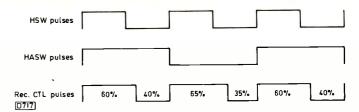


Fig. 2: Waveforms associated with Fig. 1.

with a reset pin and a clock crystal. But what did it do?

Perusal of various Panasonic technical guides brought me to one that provided the answer. It was for the NV-M7 and contained the block diagram shown in Fig. 1. The idea is to vary the duty cycle of the control track signal on alternate frames so that the machine can identify which head recorded a track. This is done to ensure that the head that records a track also plays it back. Thus an error called reverse tracking, when the head drum locks 180° out-of-phase during playback with respect to record, is prevented. Otherwise you can get differential picture wobble – the top and bottom sections wobble in different directions (S distortion).

The NV-M7 is a four-head machine with a small drum. Its video heads are designated A1, B1, A2, B2. Heads A1 and A2 are 180° apart, as are heads B1 and B2. Without a control system the drum could lock 180° out of phase, with head A1 playing back head A2's tracks and vice versa, and similarly with the B heads.

Head/track identification in the NV-M7 is effected by altering the mark/space ratio of the control track signal whilst recording, the sequence being 60/40, 65/35, 60/40, 65/35 etc. (see Fig. 2). During playback the control track pulses are compared with the 40msec head switching signal and the 80msec head amplifier signal. When reverse tracking is identified, the capstan servo is kicked back by 40msec so that correct tracking is restored.

So much for the theory, now back to the fault. With this new information I deduced that what was missing was the output at pin 9 of IC2007. Due to some peculiarity within IC2001 the result was no output at pin 11.

The input timing signals HSW and HASW at pins 5 and 6 of IC2007 were present, the clock was running, the supplies were present and correct and the reset was high. Obviously IC2007 was fault. Wrong again.

At this point desperation set in. I costed a new PCB, drank some more coffee, then phoned Gerald. Anything!! Anyway Gerald and I discussed the pros and cons of the situation and he philosophically mentioned that he didn't trust those little diodes with the boxes around them (D9, 10, 11, see Fig. 1). They are in pairs with a common encapsulation.

First I replaced D9. I then tested it with the Avo, after first mounting it on Blu-Tac to stop it running away. D9 tested o.k., so both D10 and D11 were removed and tested. As they were o.k. they were put back. Dejected and feeling suicidal I switched on to record. Lo and behold, to my surprise I now had control track pulses. My conclusion was that although D9 wasn't itself faulty there must have been leakage or a short between its pins, and that the low at pin 75 of IC6001 was holding pin 9 of IC2007 at chassis potential.

Some questions remain. First, why did the fault condition affect both the record start/stop, normal stop and inhibit power off? Secondly, why did a low at pin 9 of IC2007 completely remove the record control pulse output at pin 11 of IC2001? We may never know, unless some kind Japanese gentleman hears our plea.

15-80H 3.72 2SC1583 15-658 3.72 2SC16137 17053 4.50 2SC16741 17053 5.6 2SC1741 17053 5.6 2SC1741 17053 3.45 2SC1815 171727 2.50 2SC1825 17176 1.58 2SC1825 17177 2.50 2SC1825 17177 1.55 2SC1825 17177 1.55 2SC1825 17177 1.55 2SC2256 17177 1.55 2SC2216 171777 1.55 2SC2216 1717777 1.55 2SC2216 1717777 1.55 2SC2216 1717777 1.55 2SC2216 17177777 1.55 2SC2216 17177777777777777777777777777777777	0.34 AN2140 2.40 BCC 3.89 AN225 4.55 BCC 0.20 AN2401 1.71 BCC 0.20 AN2402 3.35 BCC 0.21 AN2402 3.35 BCC 0.20 AN2403 3.35 BCC 0.21 AN2403 3.35 BCC 0.20 AN2405 5.48 BCC 0.30 AN2405 3.35 BCC 0.30 AN2405 3.35 BCC 0.30 AN2407 3.35 BCC 0.30 AN2407 3.35 BCC 0.30 AN3407 3.35 BCC 0.31 AN320 3.35 BCC 0.31 AN320 3.35 BCC 0.31 AN320 3.35 BCC 0.32 AN351 3.35 BCC 0.34 AN355 1.55 BCC 0.35 AN355 1.55 BCC 0.34 AN355 1.55 BCC 0.35 AN355 1.55 BCC 0.36 AN3407 3.35 BCC 0.37 AN351 3.43 BCC 0.38 AN351 1.55 BCC 0.39 AN351 1.55 BCC 0.31 AN352 1.50 BCC 0.31 AN352 1.50 BCC 0.31 AN352 1.50 BCC 0.32 AN351 1.50 BCC 0.34 AN351 1.55 BCC 0.35 AN355 1.55 BCC 0.36 AN355 1.55 BCC 0.37 AN351 2.5 BCC 0.38 AN351 1.55 BCC 0.39 AN351 1.55 BCC 0.48 AN353 1.55 BCC 0.52 AN3551 1.55 BCC 0.52 AN3561 1.55 BCC 0.	130	1266 1.100 HA1196 2044 1.588 HA13001 2055 1.15 HA13001 2050 1.27 HA13001 2070 1.65 HA13403 2080 1.12 HA13403 2080 1.12 HA13403 2080 1.12 HA13403 2080 1.12 HA1367 2080 1.12 HA1368 2099 1.75 HA1368 2099 HA1377 2060 1.49 HA1388 2060 1.24 HA1388 2060 1.24 HA1389 2070 1.24 HA1389 2070 1.24 HA1389 2070 1.25 HA1392 2070 1.53 HA1397 2080 1.53 HA1397 2080 1.53 HA1397 2080 1.53 HA1457 2080 1.55 HA1457 20	7.43 MC1330P 1.9 1.63 MC1350P 1.5 1.63 MC1350P 1.5 1.63 MC1350P 1.2 2.76 MC1350P 1.2 2.76 MC1350P 1.2 2.76 MC1350P 2.4 1.88 MC1350P 2.4 1.89 MC1350P 2.4 1.89 MC1350P 2.4 1.89 MC1350P 2.4 1.99 MC1350P 2.4 1.90 M	8 SASS60T 5.42 6 SASS70T 5.42 6 SASS70T 5.195 6 SASS70T 5.195 7 SASS60 1.95 7 SASS60 2.85 8 SASS60 1.95 8 SASS60 1.95 8 SASS60 2.97 9 SASS670 3.96 8 SASS60 2.97 9 SASS70 3.96 8 SASS70 1.33 8 SASS70 1.221 8 SASS70 1.221 8 SASS70 1.221 8 SASS70 1.25 8 SESS70 1.25 8 SESS	\$\text{STR1096}\$ 4.78 \$ \text{TBA970}\$\$ \$\text{STR4090}\$ 12.55 \$ \text{TBA990}\$\$ \$\text{STR4490}\$ 1.818 \$ \text{TCA270S}\$\$ \$\text{STR4440}\$ 1.818 \$ \text{TCA270S}\$\$ \$\text{STR4541}\$ 5.77 \$ \text{TCA270S}\$\$ \$\text{STR4544}\$ 4.95 \$ \text{TCA290A}\$\$ \$\text{STR4545}\$ 4.95 \$ \text{TCA290A}\$\$ \$\text{STR4540}\$ 4.195 \$ \text{TCA290A}\$\$ \$\text{STR450103A}\$ 4.12 \$ \text{TCA420A}\$\$ \$\text{STR450103A}\$ 4.12 \$ \text{TCA420A}\$\$ \$\text{TCA420A}\$ 6.16 \$ \text{TCA440}\$\$ \$\text{TCA420A}\$ 0.40 \$ \text{TCA650}\$\$ \$\text{TCA650}\$ 1.60 \$ \text{TCA730}\$\$ \$\text{TCA730}\$ 1.60 \$ \text{TCA350}\$\$ \$\text{TCA900}\$ 1.45 \$ \text{TCA900}\$\$ \$\text{TCA900}\$ 1.25 \$ \text{TCA900}\$\$ \$\text{TCA900}\$ 1.25 \$ \text{TCA900}\$\$ \$\text{TCA900}\$ 1.26 \$ \text{TCA900}\$\$ \$\text{T9014V}\$ 2.42 \$ \text{TCA4500}\$\$ \$\text{TOA910}\$ 1.90 \$ \text{TD636N-DS}\$\$ \$\text{T9014V}\$ 2.42 \$ \text{TCA4500}\$\$ \$\text{TOA1005A}\$ 1.90 \$ \text{TD636N-DS}\$\$ \$\text{T9014V}\$ 2.42 \$ \text{TCA4500}\$\$ \$\text{T9014V}\$ 2.42 \$ \text{TCA4500}\$\$ \$\text{T9014V}\$ 2.42 \$ \text{TCA4500}\$\$ \$\text{T9014V}\$ 2.42 \$ \text{TCA4500}\$\$ \$\text{T0A1005A}\$ 1.90 \$ \text{T0A1005A}\$\$ \$\text{T9015V}\$ 2.30 \$ \text{T0A1005A}\$\$ \$\text{T9015V}\$ 2.30 \$ \text{T0A1005A}\$\$ \$\text{T905V}\$ 2.30 \$ \text{T0A1005A}\$\$ \$\text{T0A1005A}\$ 1.90 \$ \text{T0A1005A}\$\$ \$\text{TA705A}\$ 2.55 \$ \text{T0A10104}\$\$ \$\text{TA705A}\$ 2.57 \$ \text{T0A1037}\$\$ \$\text{TA705A}\$ 2.57 \$ \text{T0A10958}\$\$ \$\text{TA705A}\$ 2.	3.86 TDA4440 1.98 TDA4442 1.98 TDA44612 2.39 TDA4610 2.16 TDA4602 2.16 TDA4602 2.25 TDA5700 2.26 TDA5700 2.27 TDA5700 2.28 TDA5700 2.29 TEA1002 2.29 TEA1002 2.30 TEA1002 2.31 TEA1021 2.32 TEA1021 2.33 TEA2018A 6.37 TIC44 2.31 TCA7 1.71 TIP17 2.02 TIP110 2.02 TIP120 2.02 TIP120 2.03 TIP120 2.04 TIP132 2.05 TIP290 2.06 TIP290 2.07 TIP290 2.08 TIP290 2.09 TI
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AV-66 Video Head Princh Roller Belt Kit foler Replacement Set foler Capstan Motor Tension Band Reel Table Rubber Tyre	Part No. Price VID 2546	3-V-36 Video Head Pinch Roller Belt Kit Take Up Clutch Take Up Idler Reel Idler Brake Pad Capstan Motor Loading Motor Front Loading Motor Cassette LED	Parl No. Price VID 2647 C12.95 VID 1813 C2.95 VID 1031 C3.00 VID 1038 C1.50 VID 1038 C3.07 VID 1039 C3.07 VID 1361 C0.36 VID 2165 C22.87 VID 2165 C92.30 VID 2168 C9.30 VID 1981 C1.35	FVH-P722/725 Video Head Pinch Roller Bell Kit Gear lider Idler Loading Gear Set Cassette LED Tension Band Take Up Reel Table Supply Reel Table FVH-P980K/KV	Part No. Price VID 2500 521.95 VID 1810 53.30 VID 7813 51.95 VID 1013 54.65 VID 1014 54.05 VID 1295 51.35 VID 1981 51.35 VID 1295 77.12 VID 1294 55.77	VT-16 S Video Head Pinch Roller Belt Kit FF/REW Idler Arm Clutch Plate Capstan Motor Cassette LED Tension Band Repair Kit VT-33/330	Part No. Price VID 2505 £23.18 VID 1788 £2.95 VID 7538 £1.58 VID 1020 £1.65 VID 1211 £8.05 VID 2121 £8.05 VID 1379 £3.38 VID 7922 £15.62	HR-D110/111/120/1 Video Head Pinch Roller Bell Kit Take Up Glutch Take Up Glutch Take Up Glutch Take Up Glutch Take Pad Capstan Motor Loading Motor Front Loading Motor Cassette LED	VIO 2647 £12.95 VIO 1813 £2.95 VIO 7543 £1.05 VIO 1031 £3.00 VIO 1038 £1.55 VIO 1038 £3.07 VIO 1361 £0.36 VIO 2165 £25.43 VIO 2168 £9.30	NV-300/333 Video Head Princh Roller Beet Kil Play Idler Idler Idler Arm Cam Gear Intermediate Gear Driving Gear Reel Motor Capstan Motor	Part No. Price VID 2520 £12.36 VID 1787 £3.53 VID 1048 £2.34 VID 1057 £0.85 VID 1220 £3.82 VID 1215 £0.99 VID 1216 £1.12 VID 1217 £0.99 VID 2158 £18.95 VID 2421 £39.43
Princh Roller Belt Kit Idler Replacement Set FWD Limiter Idler Idler	VID 2546 \$16.95 VID 1755 \$23.76 VID 7509 \$1.95 VID 1000 \$5.62 VID 1002 \$3.37 VID 1004 \$1.27 VID 1005 \$1.65 VID 2118 \$28.50 VID 1423 \$6.22 VID 257 \$246.43	Tension Band Remote Control Repair Kit Mains Transformer Take Up Reel Table Rubber Tyre Supply Reel Table Rubber Tyre Cassette Housing 3-V-57 Video Head	VID 1389 £1.42 IR 9100 £11.92 VID 7918 £18.09 VID 2223 £20.38 VID 1080 £0.50 VID 1080 £0.50 VID 1099 £21.33 VID 2573 £16.50	Video Head Princh Roller Belt Kit idler Clutch Casse le LED Tension Band Supply Reel Table FUNAI VCR-4600 Video Head	VID 2501 £24.43 VID 1818 £3.05 VID 7568 £2.40 VID 1093 £4.20 VID 1094 £13.52 VID 1981 £1.35 VID 1377 £2.10 VID 1296 £9.97 VID 2676 £19.68	Video Head Pinch Roller Belt Kit FF REW Idler Arm Clutch Plate Capstan Motor Cassette LED Tension Band Repair Kit	VID 2504 C18.84 VID 1788 C2-95 VID 7538 C1.58 VID 1020 C1.65 VID 1211 C8.92 VID 2148 C35.56 VID 1381 C1.35 VID 1379 C2.10 VID 7922 C15.62	Cassette LED Tension Band Repair Kit Maims Transformer Take Up Reel Table Rubber Tyre Supply Reel Table Rubber Tyre Cassette Housing MATSUI VX-850	VID 1389 C1.42 VID 1389 C1.42 VID 7918 C18.09 VID 2223 C20.38 VID 1080 C0.60 VID 1080 C0.60 VID 1099 C21.33	Cassette LED Tension Band Repair Kit Take Up Reet Table PHILIPS Video Head Pinch Roffer Belt Kit Idler Loading Gear Idler	VID 1982 C1.47 VID 1399 E2.46 VIO 7903 C10.42 VID 1312 C10.12 VID 2526 C13.86 VID 1757 C3.00 VID 1052 C1.95 VID 1052 C1.92 VID 1222 C2.25 VID 1222 C2.25 VID 1370 C1.98
AKAI VS-9800 Video Head Pinch Roller Belt Kri Take Up Idfer	VID 2511 £12.36 VID 1756 £2.85 VID 7506 £1.65 VID 1025 £4.65	Pinch Roller Belt Xit Clutch Mechanism Capstan Motor Loading Motor Front Loading Motor Cassette LED	VID 1813	Princh Roller Belt Kit Clutch Gear Holder RF Clutch Cassette LED VCR-5843	VID 1758 C2.95 VID 7593 C1.95 VID 1226 C4.32 VID 1227 C11.70 VID 1231 C6.52 VID 1981 C1.35	Video Head Pinch Roller Belt Kit FF/REW Idler Arm Clutch Plate Capstan Motor Cassette LED	VID 2628 C24.25 VID 1818 C3.05 VID 7583 C7.20 VID 1020 C1.65 VID 1211 C8.92 VID 2154 C27.81 VID 1981 £1.35	Pinch Roller Belt Kit Clutch idler Cassette LED MITSUBISHI	VIO 1815	Idler Limiter Roller Cassette LED Tension Band Repair Kit VR-6540	VID 1371
REW Idier Unloading Idier FF Rubber Tyre FF Rubber Tyre Unloading Idier Rutiber Tyre Capstan Motor Drum Motor	VID 1026 £5.92 VID 1027 £9.30 VID 1029 £0.74 VID 1030 £0.75 VID 1207 £0.82 VID 2119 £42.31 VID 2120 £18.73	Tension Band Repair Kit Cassette Housing FV-10B Video Head Pinch Roller Belt Kit Idler Arm	VID 1388	Video Head Pinch Roller Bett Kit Idler Cassette LED GEC V-4004 Video Head Pinch Roller	VID 2708 £24.31 VID 1758 £2.95 VID 7615 £3.67 VID 1364 £2.25 VID 1981 £1.35 VID 2506 £14.28 VID 1788 £2.95	Tension Band Repair Kit VT-8000/8500 Video Head Pinch Roller Belt Kit Take Up Idler	VID 1379 £2.10 VID 7924 £15.81 VID 2509 £15.96 VID 1788 £2.95 VID 7803 £0.99 VID 1015 £4.87	HS-307 Video Head Pinch Roller Belt Kit Reel idler Unit FF Idler Rubber Tyre Capstan Rubber Tyre Cam Gear A	VID 2606 £71.56 VID 1808 £2.77 VID 7542 £1.50 VID 1040 £8.48 VID 1081 £0.67 VID 1264 £1.20 VID 1274 £1.20	Video Head Pinch Roller Bett Kit Idler Master Cam Reel Motor Loading Motor Cassette LED Tension Band	VID 2537 £18.73 VID 1815 £4.72 VID 7547 £0.90 VID 1060 £1.81 VID 1265 £1.95 VID 2127 £26.06 VID 2142 £14.35 VID 1981 £1.35 VID 1981 £1.35 VID 1420 £5.10
ALBA VCR-4000 Video Head	VID 1943	Reel Motor Capstan Motor Loading Motor Front Loading Motor Cassette LED Tension Band Repair Kit	VID 2193 \$25.53 VID 2190 \$15.04 VID 2412 \$5.62 VID 2412 \$5.62 VID 1981 \$1.35 VID 1386 \$1.65 VID 7921 \$14.16	Belt Kit FF REW Arm Clutch Plate Capstan Motor Cassette LED Tension Band Repair Kit GOLDSTAR	VIO 7538 C1.15 VID 1020 C1.65 VID 1211 C8.92 VID 2148 C35.56 VIO 1981 C1.35 VID 1379 C2.10 VID 7922 C15.62	Wind Roller FF/REW Idler Capstan Motor Tension Band Remote Control Repair Kit Take up Reel Table Supply Reel Rubber Tyre	VID 1016 CD.78 VID 1023 C2.90 VID 1355 C50.50 VID 1381 C1.80 IR 9097 C12.63 VID 7928 C14.79 VID 1302 C11.47 VID 1300 CD.67	Gear 2 Cam Gear B Gear 1 Cassette LEO Tension Band Take Up Reel Table Supply Reel Table	VID 1275 C1.20 VID 1276 C1.27 VID 1277 C1.27 VID 1981 C1.35 VID 1393 C2.55 VID 1307 C2.55 VID 1299 C2.70	PYE DV-761 Video Head Pinch Roller Belt Kit Idler Loading Gear Modification Set	VID 2621 E82.18 VID 1827 E10.35 VID 7588 E1.42 VID 1252 E3.97 VID 1253 E6.37 VID 1254 E10.35
Pinch Roller Belt Kit Idder Cassette LED Tension Band AMSTRAD VCR-4600 Video Head	VID 7596 £3.99 VID 1049 £3.75 VID 1981 £1.35 VID 1399 £2.40	Video Head Pinch Roller Belt Kit Idler Arm Reel Motor Capstan Motor Loading Motor Front Loading Motor Cassette LED	VID 2581 \$37.81 VID 1817 \$11.25 VID 7564 £2.50 VID 1901 £2.88 VID 2193 £15.04 VID 2190 £25.53 VID 2412 £5.62 VID 2412 £5.62 VID 1981 £1.35	GHV-8000/8200/82 Pinch Roller Belt Kit Idler Bracket Centre Clutch Gear Limiter Roller Cassette LED Tension Band	210:8215 VID 1815	VT-9300/9500/9700 Video Head Pinch Roller Belt Kit FF. REW Idler Arm Play Idler FS Brake	VID 2509 £15.96 VID 1788 £2.95 VID 7802 £1.10 VID 1019 £2.62 VID 1075 £4.20 VID 1212 £2.25	Video Head Princh Roller Belt Kit Reel Idder Unit FF Idler Rubber Tyre Capstan Rubber Tyre Cam Gear A Gear 2	VID 2607 £42.37 VID 1898 £22.77 VID 7559 £2.85 VID 1040 £8.48 VID 1081 £0.67 VID 1264 £1.20 VID 1274 £1.20 VID 1275 £1.20	Tension Band SAISHO VH-2000/3800 Pinch Roller Belt Kit Idler Reel Motor Cassette LED	VID 1431 £4.27 VID 1815 £4.72 VID 7565 £0.97 VID 1060 £1.81 VID 2121 £16.31 VID 1981 £1.35
Pinch Roller Belt Kit Clutch Gear Holder RF Clutch Cassette LED VCR-9000	VID 1758 \$22.95 VID 7593 \$1.95 VID 1226 \$4.32 VID 1227 \$11.70 VID 1231 \$6.52 VID 1981 \$1.35	Tension Band Repair Kit FIDELITY VCR-100 Video Head Pinch Roller Bell Kit Clutch	VID 1386 £1.65 VID 7921 £14.16 VID 2502 £14.72 VID 1758 £2.95 VID 7593 £1.95 VID 1226 £4.32	VCP-4100/4130 Video Head Pinch Roller Belt Kit Idler Brackel Centre Clutch Gear Limiter Roller	VID 2645 £63 81 VID 1815 £4.72 VID 7585 £2.39 VID 1052 £1.92 VID 1223 £25.81 VID 1228 £2.02 VID 12440 £1.20	Capstan Motor Cassette Lamp Tension Band Remote Control Repair Kit Take Up Reel Table	VID 2156	Cam Gear B Gear 1 Cassette LEO Tension Band Take Up Reel Table Supply Reel Table NEC N-830 EG/831/832	VID 1276 £1.27 VID 1277 £1.27 VID 1981 £1.35 VID 1393 £2.55 VID 1307 £2.92 VID 1299 £2.70	SALORA SV-8620 Pinch Roller Belt Kit FF REW Idler Arm FF REW Idler Arm FF REW Idler	VID 1808 \$2.77 VID 7600 \$2.85 VID 1233 \$2.70 VID 1234 \$2.85 VID 1235 \$1.12
Video Head Pinch Roller Belt Kit RF Clutch Clutch Gear Holder Cassette LED	VID 2502 £14.72 VID 1758 £2.95 VID 7592 £1.05 VID 1225 £3.82 VID 1226 £4.32 VID 1227 £11.70 VID 1981 £1.35	Gear Holder RF Clutch Casserte LED FINLUX VR-1030 Video Head Pinch Roller idler	VID 1227 £11.70 VID 1231 £6.52 VID 1981 £1.35 VID 2558 £39.81 VID 1803 £4.12 VID 1006 £2.88	Cassette LED Tension Band VCP-4200/4326 Video Head Pinch Roller REW Belt Cassette LED GRANADA	VID 1981 C1.35 VID 1399 C2.40 VID 2645 C63.81 VID 1815 C4.72 VID 7234 C0.37 VID 1981 C1.35	VR-3913 Video Head Pinch Roller Belt Kit Reel Idler Take Up Clutch Take Up Idler Brake Pad	VID 2511 \$12.36 VID 1814 \$3.13 VID 7812 \$1.22 VID 1036 \$2.70 VID 1037 \$2.86 VID 1038 \$1.55 VID 1361 \$0.36	N-630 EG/63 1/632 Video Head Pinch Roller Belt Kit Take Up Clutch Take Up Idler Reel Idler Brake Pad Capstan Motor	VID 2647 E12.95 VID 1813 E2.95 VID 7543 E1.05 VID 1031 E3.00 VID 1038 E1.55 VID 1039 E3.07 VID 1361 E0.36 VID 2165 E22.87	Cassette LED Tension Band Take Up Reel Table Supply Reel Table SAMSUNG VI-510/520/611/61 Video Head Pinch Roller	VID 2648 £24.62 VID 1815 £4.72
BANG & OLUFSEP VHS-65 Video Head Prich Roller Beit Kit FF REW Idler Arm Clutch Plate Capstan Motor	VID 2506	Tension Band Remote Control Repair Kil VR-2010 Video Head Pinch Roller Belt Kit Idter	VID 1432 £5.17 IR 9034 £13.46 VID 7930 £12.76 VID 2578 £56.31 VID 1827 £10.35 VID 7588 £1.42 VID 7588 £1.42 VID 1522 £3.97	VHS-EY1/EY2 Video Head Pinch Roller Belt Kit Reel Drive Unit Loading Gear A Loading Gear B Capstan Motor	VID 2539 £16.50 VID 1822 £7.20 VID 7605 £2.25 VID 1255 £6.45 VID 1268 £1.72 VID 1271 £1.20 VID 2404 £39.37	Reel Motor Capstan Motor Laading Motor Casserie Lamp Tension Band Repair Kit Take Up Reel Table Rubber Tyre	VID 2169 £28.12 VID 2164 £37.18 VID 2168 £9.30 VID 1947 £0.50 VID 1389 £1.42 VID 7913 £18.52 VID 1080 £0.60	Loading Motor Front Loading Motor Cassette LED Tension Band Repair Kit Mains Transformer Take Up Reel Table Rubber Tyre	VID 2168	Belt Kit Idler Idler Reel Motor Capstan Motor Loading Motor Cassette LED VX-710/720/730	VID 7598 C1.57 VID 1232 C1.35 VID 1346 C3.37 VID 2407 C13.04 VID 2409 C25.06 VID 2142 C14.35 VID 1981 C1.35
Cassette LED DECCA VRH-8300 Video Head Pinch Roller Bell Kit	VID 1981 £1.35 VID 2511 £12.36 VID 1814 £3.13 VID 7812 £1.22	Loading Gear Modification Set Tension Band Remote Control FISHER FVH-P520	VID 1253 £6.37 VID 1254 £10.35 VID 1431 £4.27 IR 9034 £13.46 VID 2500 £21.95	Cassette LED Tension Band GRUNDIG MVS-400 Video Head Pinch Roller Belt Kil	VID 1981	Supply Reel Table Rubber Tyre VR-3993 Video Head Pinch Roller Bell Kil	VID 1080	Supply Reel Table Rubber Tyre Cassette Housing N-895 Video Head Pinch Roller	VID 1080 £0.60 VID 1099 £21.33 VID 2514 £49.68 VID 1813 £2.95	Video Head Pinch Roller Belt Kit Cassette LED SANYO VHR-1100 EX/EE	VID 2648 £24.62 VID 1759 £3.50 VID 7608 £4.12 VID 1981 £1.35
Reel Idler Take Up Clutch Take Up Idler Brake Pad Reel Motor Capstan Motor Loading Motor Cassette Lamp	VID 1036 C2.70 VID 1037 C2.86 VID 1038 C1.55 VID 1361 C0.36 VID 2169 C28.12 VID 2168 C9.30 VID 1947 C0.50	Video Head Pinch Roller Belt Kil Take Up Idler FF/REW Pulley Idler Tension Band Take Up Reel Table	VID 1788	Idler Loading Gear Clutch Gear Limiter Roller Cassetre LED Tension Band Remote Control VS-520 GB	VID 1052 C1.92 VID 1222 C2.25 VID 1228 C2.02 VID 1440 C1.20 VID 1981 C1.35 VID 1400 C2.32 IR 8965 C20.56	Reel Idler Take Up Clutch Take Up Idler Roller Bar Brake Pad Reel Motor Capstan Motor Loading Motor	VID 1036 52.70 VID 1037 52.86 VID 1038 51.55 VID 1363 53.61 VID 1361 50.36 VID 2169 528.12 VID 2169 545.18 VID 2168 59.30 VID 2168 59.30	Belt Kit Clurch Mechanism Capstan Motor Loading Motor Front Loading Motor Cassette LED Tension Band Remote Control	VID 7540 0.80 VID 1082 013.01 VID 2166 550.43 VID 2167 011.40 VID 2168 09.30 VID 1981 01.35 VID 1981 01.35 VID 1987 02.25 IR 8947 020.37	Video Head Pinch Roller Belt Kit Reel Drive Roller Reel Motor Cassette LED Tension Band VHR-1100 SP/120	VID 2583 £25.68 VID 1787 23.50 VID 7558 £2.49 VID 1076 £5.70 VID 2198 £13.04 VID 1981 £1,35 VID 1411 £2.40
Tension Band Repair Kit Take Up Reel Table Rubber Tyre Supply Reel Table Rubber Tyre	VID 1389 £1.42 VID 7913 £18.52 VID 1080 £0.60 VID 1080 £0.60	Rubber Tyre Supply Reel Table Rubber Tyre FVH-P530 Video Head Pinch Roller Bell Kit Take Up Idler	VID 1293 £1.35 VID 2500 £21.95 VID 1788 £2.95 VID 7532 £1.99 VID 1015 £4.87	Video Head Pinch Roller Timing Belt Centre Pulley Cassette LED Tension Band HINARI VXL-30/35/4	VID 2595 £29.00 VID 1821 £12.12 VID 1482 £7.20 VID 1482 £7.20 VID 1981 £1.35 VID 1401 £3.37	Front Loading Motor Cassette Lamp Tension Band Repair Kit Take Up Reel Table Rubber Tyre Supply Reel Table Rubber Tyre	VID 1946 E0.49 VID 1389 E1.42 VID 7914 E19.12 VID 1080 E0.60 VID 1080 E0.60	Repair Kit Cassette Housing N-9013/9014/9033 9053/9054/9055 Video Head Pinch Roller Belt Kit	VID 2695 £39.50 VID 1828 £7.27 VID 7601 £2.85	Video Head Princh Roller Belt Kit Reel Drive Roller Reel Motor Cassette LED Tension Band	VID 2583 £23.43 VID 1787 £3.50 VID 7558 £2.49 VID 1076 £5.70 VID 2198 £13.04 VID 1981 £1.35 VID 1411 £2.40
3-V-30 Video Head Pinch Roller Belt Kit Reel Idler Take Up Clutch Take Up idler Brake Pad	VID 2647	FF/REW Pulley Idler Tension Band Take Up Reel Table Rubber Tyre Supply Reel Table Rubber Tyre FVH-P720/720K/72	VID 1016 C0.78 VID 1023 C2.70 VID 1378 C2.10 VID 1293 C1.35 VID 1293 C1.35	Video Head Pinch Roller Belf Kit Clutch Idler Loading Motor Cassette LED HITACHI	VID 2518 £21.00 VID 1815 £4.72 VID 7566 £2.10 VID 1316 £5.47 VID 1317 £3.22 VID 2167 £11.40 VID 1981 £1.35	JVC HR-3300 Video Head Pinch Roller Bell Kit Take Up Idler Large REW Idler	VID 2511 £12.36 VID 1756 £2.85 VID 7506 £1.65 VID 1025 £4.65 VID 1025 £4.65	Reel Drive Pulley Cassette LED PANASONIC NV-2000/2010 Video Head Pinch Roller Belt Kit	VID 1265 \$8.52 VID 1981 \$1.25 VID 2520 \$12.36 VID 1757 \$3.00 VID 7800 \$1.75	VTC-M10/11/20/2 Video Head Princh Roller Belt Kit Reel Drive Pulley Idler Reel Motor Tension Band	VIO 2530 £23.75 VIO 1758 £2.95 VIO 7809 £0.45 VID 1079 £6.95 VID 1219 £1.73 VIO 2179 £17.39 VID 1408 £1.87
Reef Motor Capstan Motor Loading Motor Cassette Lamp Tension Band Repair Kit Take Up Reel Table Rubber Tyre Supply Reel Table Rubber Tyre	VID 2169	Video Head Pinch Roller Bell Kil Gear Idler Idler Loading Gear Set Cassette LED Tension Band Take Up Reel Table Supply Reel Table	VID 2500	VT-11 Video Head Pinch Roller Belt Kit FFIREW Idler Arm Clutch Ptate Capstan Motor Cassette LED Tension Band Repair Kit	VID 2504 £18.84 VID 1788 £2.95 VID 7538 £1.58 VID 1020 £1.65 VID 12111 £8.92 VID 2147 £28.05 VID 1981 £1.05 VID 1379 £2.10 VID 7922 £15.62	Unloading Idler FF Rubber Tyre Unloading Idler Rubber Tyre Capstan Motor Orum Motor Cassette Lamp Tension Band Repair Kit Take Up Rubber Tyre	VID 1027	idler idler cam Gear intermediate Gear Driving Gear Cassette Lamp Tension Band Repair Kit Take Up Reel Table Supply Reel Table	VID 1054 00.85 VID 1055 00.80 VID 10216 01.12 VID 1216 01.12 VID 1948 00.22 VID 1997 03.38 VID 7901 018.47 VID 1312 01.12 VID 1310 08.62	Supply Reel Table SENTRA VX-5000/8000 Video Head Pinch Roller Bett Kit Idler Cassette LED Tension Band	VID 1319 £8.62 VID 2713 £22.31 VID 1787 £3.50 VID 7596 £3.75 VID 1981 £1.35 VID 1399 £2.40

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Servicing the Saisho VR1200/Matsui VX820

Ed Rowland

The Saisho VR1200 and its Matsui equivalent, Model VX820, were released during the latter part of 1986. The Saisho VCR was sold through Dixons outlets and the Matsui version through Currys stores. They are identical units and the following notes therefore apply to both.

Although these machines were manufactured down to a price they have proved to be reasonably reliable apart from a few problems that can by now be classified as stock faults and some others that, though not as common, will no doubt be encountered by engineers who deal with these VCRs fairly regularly.

The power supply, see Fig. 1, is straightforward and in general doesn't give much trouble. There are a couple of fairly common faults however, not least of which is failure of the 2SD1207 12V regulator transistor Q2502. It lives

directly in front of the STK5332 regulator chip. Note that this transistor is a safety component: although other types will work in this position, it's important that the correct replacement is used in order to comply with safety requirements. When Q2502 fails the result is no functions, often with the red "operate" LED lighting momentarily when the function button is pressed. A new transistor is usually all that's required to restore normal operation.

Another cause of no functions is failure of the STK5332 chip IC2501, in which case the display will usually be o.k. and the machine will accept a cassette, though no other functions are possible.

Failure of the machine to power up, with the display strobing, should lead to a check on diodes D501 and D502. Replace them both.

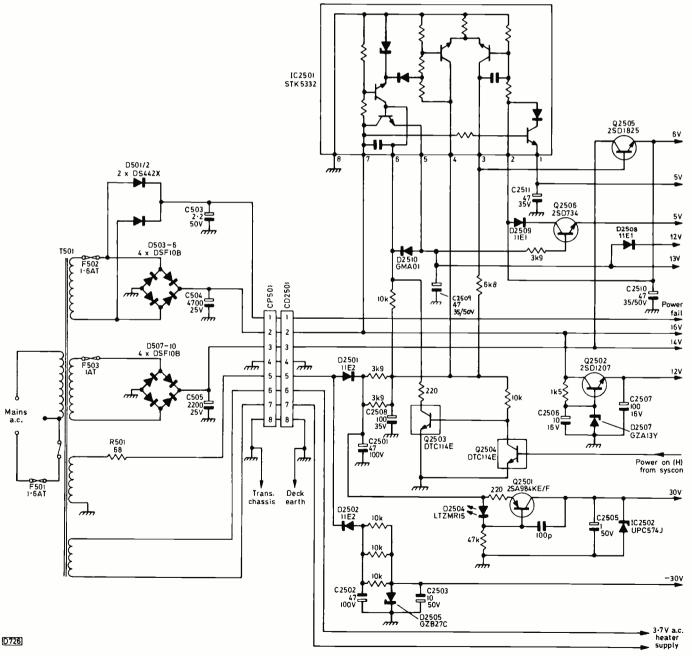


Fig. 1: Power supply circuit used in the Saisho VR1200/Matsui VX820.

We've never known the 6V regulator transistor Q2505 to fail. In general, as previously mentioned, we've found that the power supply is pretty reliable.

Fault Round-up

No functions can be the result of things other than the power supply going wrong. We've had trouble with the mode switch for example. It's located beneath the right-side of the carriage and can give rise to several symptoms, some of which are quite perplexing. They include switching off after the machine has ejected a cassette, intermittent stopping in the record or play mode, and no functions after accepting a cassette. The only sure way of providing a cure is to replace the switch – cleaning it usually doesn't produce any improvement.

Loss of functions can also occur when the BU2176S chip IC2001 fails. It's located on the main PCB and is fairly easy to replace. We've had this fault only once however, though we have had drum speed problems due to this i.c. on a few occasions.

We've had a number of these machine come into the workshop with a cracked front operations PCB, though goodness knows how users manage to do it! Depending on the severity of the damage the job can be a more or a less arduous undertaking, as there are literally dozens of fine tracks. These require very delicate microsurgery to effect a repair. In situations like this we find that the fibre pencils sold by SEME can be extremely useful for removing the etch-resist from the damaged print in order to expose the copper track.

One of the faults most frequently encountered is loss of the steel activating pin from the limiter post lever assembly, which is situated next to the pinch roller. What happens is that the nylon bush that holds the pin splits, with the result that it falls into the machine. The outcome is that when play is selected the machine laces up and then, after displaying for a few seconds a picture that looks as though the machine is in the pause mode, it unlaces. The pin can be refitted using Superglue, but a replacement lever is a better option.

To remove the old lever assembly simply ease back the nylon clip that holds it in place and, using long-nosed pliers, raise it above the clip. Then rotate the lever assembly anticlockwise and the limiter post arm clockwise until the pin on the arm disengages from the slot in the lever assembly, which can now be lifted clear. Don't forget to recover the old pin from within the machine: it could cause problems, though it quite often drops out through the ventilation holes when the machine is being transported.

Other faults that you could meet are as follows: failure to accept a cassette due to faulty end sensors or alternatively the BA6329A chip IC1003; no drum rotation because circuit protector CP209 is open-circuit; no E-E signals because C6017 (1,000pF) between pin 5 of IC6001 and chassis is leaky; and varying capstan speed accompanied by wide noise bars on the screen because of failure of the BA6305 chip IC2004.

In the event of there being no clock display, with everything else o.k., remove the back-up battery BT601 from the main PCB and refit it after 20-30 seconds.

Tape edge damage is usually caused by a faulty clutch and/or pinch roller. If in doubt replace them both.

If you find that it's necessary to replace the loading belt it is advisable to obtain the service manual before undertaking the operation. Its replacement involves dismantling the loading gear mechanism, a rather complex



undertaking that's not too easy even with the manufacturer's instructions to hand. Fortunately very little trouble is experienced in this section of the machine.

Two tuners have been used in these machines, types TEEB1X032A and UE30-B03. They are interchangeable.

Spares for the Matsui/Saisho range are available from CPC, Chas. Hyde, HRS Electronics and Mastercare.

A Video Nasty

Nick Beer

A VCR fault I had recently could contend with some of Steve Beeching's and no doubt many others' for the video fault of the year title. The machine involved was a Panasonic NV-FS1B. It's a first-generation S-VHS VCR that uses the G mechanism, not that the mechanism had anything to do with the fault.

Symptoms

As the customer was an AV technician at a local school he had enough technical background to be able to give a fairly accurate description of the symptoms. The main symptom was a vertical bar about a inch wide at each side of the playback picture, approximately one and a quarter inches in from the side of the screen. When the playback picture had dark areas, falling to black level, at the edge the bars took the form of a blue cast. As the video level in these areas increased, the colour of the bars changed, becoming orange/yellow at white level. In addition, at or near black level a third bar could be seen about an inch from the left-hand one. This bar had no chroma content — it looked more like a parasitic oscillation. The fault was present on playback only: recordings made on the machine and played back via another one were perfect.

But this was only one of the symptoms! When a tape with high chroma content was played chroma phase inversion occurred, e.g. highly saturated reds/oranges became green. The saturation had to be high for this to happen: when the colour-bar section of the Panasonic test tape was played only slight errors were present — the chroma was smeary, shifted and weak but no inversion occurred. I used a known good machine to record the colour bars, with a high level of chroma, from our colour-bar generator. When these were played back there was chroma inversion.

The symptoms were worse when the machine was in the LP mode and worse still in S-VHS.

Fault Tracing

The cause of the fault was likely to lie in a common playback area, so large chunks of the circuitry could be ruled out as being unlikely to be involved. This done, there was still a large area for investigation. I decided that the symptoms probably had a common cause, and also that I would find it much more easily by concentrating on the first symptom. The luminance/chrominance signal processing circuitry in this model is extremely complex in block diagram form, let alone by reference to the circuit diagram. As a start, I played back a blank raster and scoped the chroma output from the head amplifier. The output was as expected: pretty inert and, most significantly, flat across the line period. The signal is

buffered on the main PCB and is then fed to pin 32 of the YC module, where it goes to pin 13 of the hybrid chip IC801. Scope checks showed that the signal was o.k. up to this point.

The chroma signal output from the hybrid chip is at pin 11. At this point spikes could be seen on the line-frequency chroma display, corresponding with the bars on the picture. The circuit here becomes common to the record and playback signals – the record chroma passes through a $1k\Omega$ resistor on the hybrid chip, leaving at pin 9. I disconnected pin 9 to eliminate any possible problems here. Now an optimist would check for such things as a noisy supply to the chip, then try a new chip. Being one I did just this, and of course it didn't make the slightest difference.

Checks around the hybrid chip failed to reveal anything new, so I came to the conclusion that a fault upstream was introducing an incorrect impedance in the chroma signal's path. One interesting factor I discovered, purely by chance, was that very slight pressure just behind the exit guide, effectively increasing the tape wrap length, removed the symptoms from the screen. This was presumably due to altered chroma signal level.

I was left pondering theoretical possibilities, and was also considering the second symptom – the phase problem. Before I wasted too many more hours I decided that consultation with Panasonic was a sensible step. The local branch hadn't experienced such a problem, but the engineer I spoke to was intrigued by the symptoms and offered to take the machine off my hands. That would have meant that I couldn't write about the fault when I did find its cause, so I declined the offer, at least temporarily!

Further thought led me to suspect delay line trouble, or a capacitor or inductor fault. Bridging or checking suspects proved only that they weren't at fault. A call was then made to Bracknell to enquire whether this fault had been experienced. The answer was no, but the engineer went away for ten minutes to consult with his colleagues. When he got back he confirmed my first suspicion, that the 2H delay line DL802 could be responsible.

Panasonic viewdata said that there was no such part number (EFDHR124A13S). Our storeman consulted Panasonic spares who consulted Japan. A delivery time in weeks was being talked about. While all this was going on I discovered that the same device is used in the Panasonic NV-G25. One was swiftly removed from a stock machine and fitted in the faulty one. Lo and behold, a complete cure! When the cover was removed from the faulty delay line a quarter inch crack could be seen in the glass. Very strange, as the device is mounted in a fairly central position and there was no suggestion that any shock had been applied.

Panasonic Comment

Shortly after this incident I attended a Panasonic seminar on camcorders. A point made was that one of two nasty problems with video equipment had been traced to damaged delay lines . . .

Salora J Chassis

On a different subject, Steve Cannon in his article "Gremlins and Gurus" in the July issue mentioned DB712 in the Salora J series chassis' power supply. In a previous article I mentioned that it can go short-circuit, which is the usual thing that happens. But like Steve I too have had it go open-circuit on occasion.

Long-distance Television

Roger Bunney

The 1991 Sporadic E season has turned out to be rather quiet. There have been numerous openings for those able to monitor Band I during the day, but for those of us whose time is limited reception has been infrequent. Tropospheric activity has been present but reception has been limited mainly to the south and east coast areas. The following SpE log looks respectable enough, but remember that it's a collated log based on a number of reports.

5/7/91 TSS (USSR) chs. R1, 2; SVT (Sweden) E2; NRK (Norway) E4; TVP (Poland) R1; RAI (Italy) IA; TVE (Spain) E2, 3, 4.

6/7/91 RAITA; TVE E2, 3; NRK E2; TVP R1; DR (Denmark) E3; CST (Czechoslovakia) R2.

7/7/91 RAI IA; TVE E2, 3; TVE-2 E2; DR E3; C+ (France) L2.

8/7/91 SVT E2; RAHA.

9/7/91 TVE E4.

11/7/91 SVT E2.

12/7/91 RAI IA, B; TVA (Italy) IA; TVE E2, 3, 4; TVE-2 E2; MTV (Hungary) R1; NRK E3; JRT/RTV (Yugoslavia) E3, 4.

14/7/91 TSS R1, 2; RAI IA; TVE E2, 3, 4; MTV R1, CST R1.

15/7/91 RAI IA, B; RTP (Portugal) E3; TVE E2, 3, 4; TVE-2 E2.

16/7/91 RAI IA, B; TVE E3; YLE (Finland) E3, 4; NRK E3; SVT E2, 3, 4; RUV (Iceland) E4; TSS R1, 2.

17/7/91 TVE E2.

18/7/91 RAHA, B; EPT (Greece) E3; C+ L3.

19/7/91 RAHA, B; TVE E2; MTV R1; JRT/HTV E3.

20/7/91 TVP R1; TSS R1, 2; TVE E3, 4; RAI IA.

21/7/91 TVP R1; TSS R1, 2, 3; SVT E2; NRK E2; CST Ŕ1; RAI IA; TVE E2, 3, 4; ORF (Austria) E2a.

22/7/91 ORF E2a; JRT/HTV E4; TSS R1; TVE E2, 3, 4; +PTT (Switzerland) E3; ARD (W. Germany) E2, 3.

23/7/91 RALIA; TVE E2, 3, 4; C+ L3; TSS R1, 2, 3; CST R1.

25/7/91 TVE E2, 3, 4; +PTT E2; SVT E2.

26/7/91 TSS R1-5; YLE E3, 4; SVT E2; NRK E2, 3, 4; RUV E3; +PTT E2; TVP R1, 2, 3; MTV R1, 2; ORF E2a; RTSH (Albania) IC; TVE E2, 3, 4; ARD E2, 3; JRT E4.

27/7/91 ŘAI IA, B; +PTT E2; C+ L2, 4; TVE E2, 3, 4; ARD E2; CST R1: MTV R1; SVT E2; DR E4; RTP E3; TVE E2, 4; TSS R2.

28/7/91 RATIA, B; TVE E2, 3, 4; C+ L2; TSS R1, 2; NRK E2, 3; SVT E2.

29/7/91 TVE E3; JRT/HTV E3.

30/7/91 RAHA.

1/8/91 JRT/HTV E3, 4; TVE E2; RAI IA; CST R1.

Tropospheric lifts occurred on July 4/5th, with reception from Norway, Denmark and W. Germany; on July 10/11th with reception from W. Germany in the north east; on July 13-16th with reception from Denmark, Sweden, Norway and Germany along the east and south east coasts; on July 23rd with reception from the Benelux countries; and on the 28/29th with reception from Denmark, Germany the Benelux countries in the east and south east.

Thanks to Simon Hamer (Powys), Peter Schubert (Rainham), Roger Fussell (Torpoint), David Glenday (Arbroath) and Brian Williams (Penarth) for sending in reports to supplement my own log.

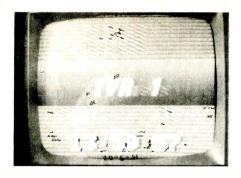
Veteran TV-DXer Nick Brown (Rugby) recently moved and has installed a new aerial system. At u.h.f. he is using two stacked Wolsey Colour King aerials with the outputs combined and fed to a Labgear CM7271 head amplifier. For Band III a wideband, eight-element Jaybeam ABM8 feeds a Fringe Electronics v.h.f. 1220-3 head amplifier with a gain of 20dB and a 1-8dB noise figure. Beneath this there's a combined Band I/II aerial for SpE reception. Indoors an HS Publications D100 unit converts the v.h.f. signals to u.h.f., feeding a Toshiba colour receiver. The aerials are four metres above the roof. Initial results indicate that the system is working well: with just a slight tropospheric lift low-level Band III/u.h.f. signals are received from Germany, France, Ireland and the Benelux countries.

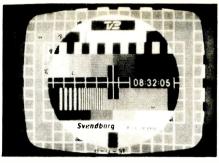
The mystery 525-line ch. R1 signal that's been received several times in the UK during periods of intense F2 propagation and is thought to originate in the Far East has, it seems, now been received by Robert Copeman in Australia. He recorded a 525-line ch. R1 signal on May 5th and reports that its strength was such that it overrode other, simultaneous Chinese transmissions on ch. C1. Unfortunately only pictures were seen, with some writing in the lower right-hand corner. Clearly the signal is coming from somewhere in S.E. Asia. Does anyone have any suggestions as to its source?

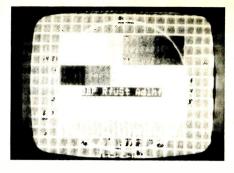
News Items

Ireland: The 1990 Broadcast Act may be amended shortly. It was intended to redistribute advertising by imposing restrictions but simply seems to have led to losses by RTE and could affect the viability of the proposed TV3 commercial network. RTE is considering the possibility of distributing a programme consisting of RTE1/2 material to









Left: SpE reception of TVR 1 (Rumania) in Holland. Centre: New Danish TV2 network test pattern identification, received on ch. E32. Right: German test pattern, generally used by ex-DDR1 transmitters. Photos courtesy Ryn Muntijewerff.

cable systems in the UK via satellite. There could also be a dedicated Irish sports channel.

Denmark: The TV2 network has run into financial difficulties and might be forced to close this December. The government has refused to provide more funds.

Lithuania: A new independent TV service is called Nepriklausomos Lietuvos Televizija (NLTV), which translates as Independent Lithuanian Television. Satellite derived material from SAT-1, Tele 5, Childrens' Channel etc. plus a one-hour (1700-1800) CNN news programme is used. Currently the Vilnius service is on ch. R10. The USSR-based service continues on ch. R2 from 1800. Technical problems are common: the test card is type UT0167, rarely with any identification.

Ukraine: The CT-2 network transmitters are now broadcasting locally produced programmes with CT-2 infilling.

Czechoslovakia: A new high-power transmitter is in operation at Chomutov, on ch. R52, near the German border. The Slovakian region now receives a service called TA3 via the former OK3 transmitters. Programme content is part satellite, part local with a CNN programme at night. The unlicensed indepedent NTV service has closed down but has applied for a licence to restart.

Hungary: The NAP-TV breakfast show (0600-0900) has moved to MTV-2.

Korea: An expansion of the TV services over the next nine years is planned. Another three channels are to be made available via satellite by 1994 while the US Forces' AFKN-2 service is to be taken over in 1993. By the end of the year six nation-wide TV networks will be in operation, including Seoul TV which opens this autumn.

New EBU Listing: Berlin Schaeferberg ch. E56, 100kW horizontal, carrying ARD-4 with directional aerial aimed at 70° into the eastern part of Germany.

50MHz Amateur Band

The following reports come by courtesy of *Six News*. At 1536GMT on April 29th, during an intense auroral event, Scottish amateur GM3WOJ contacted Jorge DeCastro, CX8BE, in Uruguay using s.s.b. The distance of 7,063 miles is a new world record for auroral operation. Actual frequency was 50·14MHz. It's possible that propagation was partially by TE/F2 into the auroral curtain, but anyway it was a very fine achievement.

Solar cycle 22 continues, but with the peak now passed and a slow decline. F2 and auroral activity should remain high during the rest of the year however. The sunspot minimum with this cycle will occur in 1996: the peak count was a smoothed 158·1 in July 1989.

Yugoslavia now allows amateur operation in the 50-50-9MHz band on a secondary user basis. Maximum

output levels are 10dBW urban, 20dBW rural. Turkey also allows limited operation within the area 40°E to 40°N. Limited operation is to be allowed in Poland from next year, in areas where there are no Band I TV transmissions.

Satellite TV

New regulations for satellite TV aerials have been issued by the Department of the Environment (see Teletopics last month, page 799). The larger size of dish (90cm) can be used to the west and north of a line that runs approximately from Devon through West Glamorgan and Manchester to Humberside. If you are on the east/south side of this line planning permission will be required for a tracking dish of say 1m diameter mounted on a house. Provided a garden sited dish is not too obtrusive and isn't of over 2m height it should fall within permitted development under the terms of the Town and Country Planning Act, since sheds and fencing are permitted provided they don't exceed 2m.

The French company Clinvest has provided Super Channel with financial assistance worth over £20m to enable the services and presentation to be revamped.

Satellite Japan Corporation intends to launch two satellites by 1994 and offer carriage of domestic communications and TV services. It will be the third Japanese telecommunications company to enter this field. Each satellite will have 24 transponders operating at up to 50W output. The Japanese BS3a satellite has lost power due to solar panel faults. As a result only two of its three transponders, carrying NHK and JSB TV, are in operation – there will be no back-up until BS3b comes into operation.

A press statement has been issued by SES following rumours about possible solar panel problems with the Astra 1B satellite. It states that 1B has not lost a solar array and that no transponders have been switched off to save power – neither has Astra 1A lost the use of any of its back-up transponders.

Russia is to place a fourteen tonne space platform in orbit next year, carrying telecommunications equipment for TV relay. Another two platforms, each weighing eighteen tonnes, are to be placed in orbit by 1997, giving a total downlink capacity of thirty TV channels.

Telecom Eireann has opened an earth station at Elfordstown near Cork. More earth stations are coming into operation to work with the Eutelsat system, the latest being at Lario near Milan. Stations in Yugoslavia and Rumania are due to open during the coming year.

The Eutelsat II F5 craft will be launched in October 1992. The 13°E II series craft has been carrying HD-TV test transmissions between Thomson's Paris plant, Philips at Eindhoven and ITT Nokia in Finland.

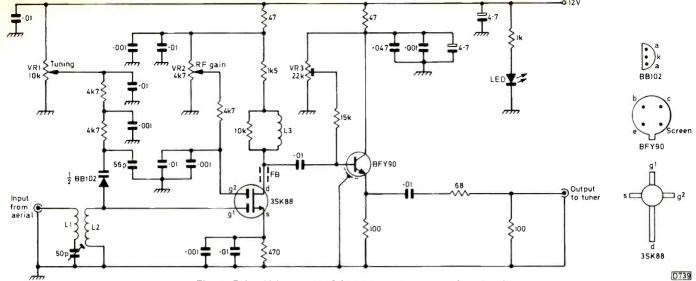


Fig. 1: Brian Williams' MOSFET Band I preamplifier circuit.

The European Commission is backing the Euronews project which will provide a centralised TV news service for the EBU region.

It's hoped that the Telecom 2A satellite, to replace the seven-year old 1A craft, will be launched by the end of the year in time for the winter Olympics. Funding is shared between France Telecom (60 per cent) and the French Defence Ministry (40 per cent).

Band I Preamplifier

Brian Williams has come up with the interesting Band I preamplifier circuit shown in Fig. 1, based on a tuned input MOSFET with a gain control. The advantage of having a tuned input is virtual elimination of cross-modulation (overload) problems from nearby transmissions. I've no performance figures but Brian comments that it's excellent in terms of optimum gain with minimum noise. He says that the absence of noise on the screen when the amplifier is tuned to resonance with the aerial removed is striking,

and that the stability over the band is excellent – with the coil as specified, the coverage is 40-78MHz. The BYF90 transistor provides buffering and improved matching into the 75Ω output. The varicap diode used is one of a matched pair in a common encapsulation. Take the usual care over construction. The prototype was built inside a tobacco tin with an earthed screening strip across the MOSFET to maintain stability – the subminiature ceramic plate capacitors are soldered directly to this strip.

Coil L2 consists of eight and a half turns of 16 s.w.g. copper, air cored with a diameter of half an inch. The coupling coil L1 consists of one and a half turns of thin flex at the end of L2 (not over it). Two 25pF trimmers are used at the input where the circuit shows a single 50pF trimmer. L3 is an r.f. choke consisting of ten turns wound on the associated $10k\Omega$, 0·25W resistor. VR3 should be adjusted for the best signal/noise performance with a stable, weak signal. When correctly set the voltage at the emitter of the BFY90 transistor should be approximately 0·8V.

Service Briefs — Pioneer

The following repair tips and modification notes have been compiled from recent Pioneer service communications.

CDV/Laservision

Model CLD1450: To overcome analogue audio dropouts add a 1μ F, 50V electrolytic capacitor between the 5V rail and the end of R828 nearest to connector CN10. Do this on the component side of panel ASCB, which is the lowest of the three PCBs. A wire link marked +5V will be seen just above and to the right of connector CN10. This is the supply connection point for the capacitor.

CD Players

Models PD4500/4550/5500: If the swing lever (item 105, page 11 in the service manual) is bent or has jumped out of the rack (item 7) the tray won't open. This tends to happen as a result of rough handling while being transported. If the

lever can be reshaped or refitted this can be done, but there's an improved version (part no. PNB1225). When the repair has been completed, disconnect the mains supply with the tray open. Then gently push the tray shut. This leaves the swing lever in its lowest position where it's less liable to damage in transit.

Models PDX303/707/909, PD5010/6010/7010, M6: To cure intermittent skipping add a magnet (part no. PMF1001) adjacent to the shaft of the spindle motor. Glue the magnet in position as close as possible to the shaft without fouling it. If this problem is experienced with discs that last over an hour, add rubber sheets to the clamper holder arm – part nos. PEB336 (large) and PNM054 (small). If the problem is experienced in conjunction with mechanical sensitivity to vibration, fit modified floating mechanism cushions: replace the four existing PEB293 cushions with part no. PEB321 (grey colour) in the rear right-hand corner and part no. PEB320 (black) in the other three corners.

All models: When removing the operating bar or front panel it's important to take care of the mains switch. To remove the bar from the switch shaft, always have the switch in the off position, then lever the bar off gently using a flat bladed screwdriver – otherwise the switch latch will be damaged. Always remove the bar before removing the front of the machine.

TV Fault Finding

Reports from Brian Storm, Paul Hardy, Stephen Leatherbarrow, Michael Dranfield, J. Edwards, J.K. Potts and John C. Priest

Panasonic TC1485 (Z3 Chassis)

"Dead set" the job card said. Well not quite: the main h.t. rail was up and running, but there was not much else. The l.t. supply from the chopper transformer T801 was quite low. This usually indicates that the power supply is running at the wrong speed because of no line drive. A check at pin 15 (X-ray protection) of the M51407SP i.f./colour decoder/timebase generator chip IC101 confirmed that the protection circuit was in operation, as there was a voltage there. After disconnecting various feeds to the sensing circuit transistor Q502 was pronounced guilty. But why? After much voltage checking in the associated circuitry R560 ($270k\Omega$) was found to be open-circuit. B.S.

Panasonic TX28A2 (Alpha 3 Chassis)

The complaint with this set was that it would go off after about three and a half hours. So I left it to run. Just as Graham Gooch came out to bat two and a half hours later the picture went black, the bottom third went white, the top third broke into white lines, the bottom half went green then the whole raster went bright white. The power supply next shut itself down with a scream of agony. I went across and switched the set back on as Graham Gooch watched the first ball of the day sail harmlessly over his head. Atherton went back to the pavillion, closely followed by Graeme Hick and Allan Lamb, then just as Robin Smith walked out to bat the set performed its pyrotechnics again and shut down.

I removed the back and gazed in awe at the congested inside of this monitor-style set. Where to start? The vertical circuit boards were all securely plugged into the main boards. Fortunately my eye was drawn to a large silver heatsink at the bottom of the set. The clip that should have been holding IC891 to its heatsink hung loosely across it. I gratefully refitted the clip, put the back on and left the set to run. It was still working perfectly later that afternoon as Robin Smith completed his century. **B.S.**

Panasonic TX21T1 (Alpha 2 Chassis)

There was no sound from this set. The voltages around IC253 seemed to be within reason but there was no life and the situation didn't feel like a faulty chip. As the voltage at pin 2 seemed to be slightly low I disconnected C269. Up came the sound. C269 (10nF, 50V) read about $3k\Omega$ when checked with my meter.

Grundig C2402 (CUC51KT Chassis)

This set was dead – in fact the 124V line was low. No obvious shorts or leaks could be found. Eventually I discovered that D656 (BYW76) was going high forward resistance under load, though it read o.k. when tested with a meter.

P.H.

NordMende SC7732

Bright flyback/teletext lines were present over the first couple of inches of the field scan. Much time was wasted making checks in the first anode and blanking circuits on the tube's base board, which proved to be blameless. The

cause of the fault was eventually traced to C57 (1μ F, 50V) in the field timebase module. It had gone low in value. Note that this capacitor is present with only certain modules – several different types were used in these sets.

рμ

Philips K35 Chassis

The complaint was that the set wouldn't lock to channels in the search tuning mode. What struck me immediately was that with no signal present the line oscillator sounded way off frequency. Changing the TDA3571BQ oscillator chip provided a cure.

P.H.

Philips K40 Chassis

This set arrived with a blank raster. Advancing the setting of the first anode control showed that the cause was field collapse. The field output chip was short-circuit while its l.t. feed resistor R3186 was open-circuit. When these items were replaced we still had problems however. For the first ten minutes the lines at the top of the screen were expanded. Thereafter normal service was resumed. Freezer and a hairdryer brought us to C2107 (100μ F, 50V) which was partially open-circuit.

Grundig CUC120 Chassis

Very severe patterning that varied with the brightness was soon traced to ripple on the 19V rail. C662 (470 μ F, 25V) was completely open-circuit.

Doric CU36502D

This set seemed to be fitted with a Sharp chassis of a type we've not seen before. The fault was field collapse. Checks showed that the voltages around the field output transistors were incorrect, with little bias applied to Q502. R513 (1·2k Ω , 1W) was found to be open-circuit. As a precaution we also replaced both output transistors (Q501/2). S.L.

Hitachi CPT2176 (G6P Chassis)

This set was dead with just a low-frequency whine from the power supply. We found that the voltage at the collector of the line output transistor Q781 was low. The cause was C909 (220 μ F, 160V) which smooths the output from the chopper power supply.

Hitachi CPT1474

This set greeted me with a very bright raster and no sound when I switched it on. Within three seconds the power supply tripped and screamed. When I next switched the set on I turned down the first anode control. This time the set remained on but still had an over-bright raster and no sound. A check at the collectors of the RGB output transistors showed that the voltages were only 40V, though there was 200V at the line output transformer. It seemed that the RGB output transistors were conducting heavily, so the drives from the TDA3565 colour decoder chip IC501 were disconnected. Up came the collector voltages

and out boomed the sound. A new TDA3565 cured the problem.

J.E.

Saisho CT141X/Matsui 1420A

This set was dead but the usual faulty bits were o.k. This time C508 (4·7 μ F, 50V) in the STR50103A's start circuit was found to be low in value. Replacing it restored normal operation. The fault can also be caused by R502 (100k Ω) or R503 (82k Ω) in the start supply. M.Dr.

Hitachi CPT1474/1646

No picture, no sound and no field scan is a simple fault. Not so when you don't have the manual! With a CPT1646 that came in the 12V supply was found to be missing in places. The cause was an open-circuit 0.47Ω safety resistor, R228. We've had the same problem with Model CPT1474, where the culprit was R222 (same value). M.Dr.

Ferguson ICC5 Chassis

The complaint was of random flashing lines on the screen, but we found that a signal fed in via the scart socket produced a perfect picture. As we've had similar faults caused by the tuner this was our first suspect. We hooked up a rotary tuner from an old monochrome set as a check. This cured the fault, so a new tuner was obtained and fitted only to find that the fault remained as before. A check on the 11.5V supply to the tuner showed that it was stable and ripple-free. The voltage at the tuning pin was also stable but the scope showed that there was a low-frequency noise component at some 10-20mV peak-to-peak. My first thought was that this was audio noise, but decoupling various points in the audio output circuit made no difference. The surface-mounted capacitors CT01, C103, C105 and C109 in the tuning voltage supply were changed but this had no effect on the fault. What next? In desperation I cooled the U6316 PLL chip IT20. This provided a cure. When IT20 was then heated the fault was back again. A new PLL chip restored correct operation.

Saisho CT141X/Matsui 1420A

For no luminance with these sets check and replace as necessary D602, D603 and D613. Type 1N4148 diodes will do. Also check and/or replace the 2SA733 transistor Q601.

If you have to replace the 5.6Ω , 5W surge limiter resistor R501, as you will have to do if the chopper chip IC501 and the over-voltage zener diode D508 have gone short-circuit, use the Amstrad type AM1422138 from CPC of Preston. It's the same but cheaper.

M.Dr.

Philips CTX Chassis

There was a very odd fault with this set, bad patterning on the screen. It was like CB radio interference. It went away when the colour was turned down, so something was affecting the chroma circuits. There was no ripple on the 12V supply to the TDA3560 colour decoder chip, and a replacement chip made no difference. While studying the fault over a cup of tea I noticed that the patterning seemed to change in sympathy as people in the picture talked. Something was amiss with the sound rejector trap. Shorting it out made no difference, proving that 6MHz sound was entering the colour decoder chip. A replacement obtained from a scrap set provided a complete

cure. When the old one was examined the coil's continuity was found to be o.k. so I came to the conclusion that the internal series tuning capacitor was open-circuit.

M.Dr.

Ferguson TX100 Chassis with Teletext

The problem was loss of memory: the set had to be retuned every time it was switched on. Visual inspection of the panel didn't reveal anything amiss and the i.c. voltages all appeared to be correct. The next logical thing to do seemed to be to replace the M293B1 tuning memory and control chip IC7. A new one provided a complete cure.

J.K.P

Some Quickies

Ferguson TX90 chassis: No field output was caused by dryjoints on TR105 (TIP112H) at the rear of the central heatsink.

Philips CTX-E chassis: No sound was caused by absence of the l.t. supply to the audio output chip. R3170 (3·3 Ω) was open-circuit for no apparent reason.

Ferguson TX9 chassis: Intermittent operation was due to dry-joints at the collector of the line output transistor TR68, where the struts enter the PCB. **J.K.P.**

Bush 2114/2020

For fizzing or squealing from the chopper transformer at switch-on, possibly dying away after a few minutes or alternatively continuing for much longer, accompanied by fine tearing of verticals in the picture, replace C818 (1μ F, 50V). It decouples the set-h.t. potentiometer.

If the set seems to be dead but the fuses are o.k. check R422 (1Ω , 1W safety type) in the line output stage. It feeds the 16V rectifier and in turn the LM7812 12V regulator, which supplies the TDA2579 chip where the line oscillator resides. TH801 and R817 ($5.6k\Omega$, 0.5W) in the power supply start-up circuit are other possibilities. J.C.P.

NEC 3022E

Apart from a few cases of dry-joints where the 15-pin decoder input/output socket is soldered to the main PWB(B) these satellite TV receivers have proved to be pretty reliable. This is the first actual fault I've had. The complaint was of "flashing on the picture", and sure enough soon after the set was switched on from standby there was a white flash across the screen – a band about 1mm high, the full width of the screen. At the same instant there was a "tick" from the sound. The symptoms recurred at about two to three second intervals and were present on all channels, the effect being similar to that when an unsuppressed fridge or central heating thermostat switches off. The repetition rate ruled out this possibility of course.

The LNB supply was steady, so a spare receiver was used to check the LNB/dish/cable part of the installation. As expected, the results were perfect with no trace of flashing. We left the spare receiver and took the one that was clearly faulty back to the workshop. When it was connected to our own dish the fault was immediately visible, so after a quick check on the five main outputs from the power supply attention was turned to the tuner unit. We then noticed that on some channels there was a noticeable falling off in picture quality and an increase in picture noise during the half second or so before each flash, when the signal sprang back to normal before

restarting its slow decline.

The tuner's supply voltages were stable and although there was a slight variation at the two a.g.c. terminals it was not until the a.f.c. was monitored that I struck gold: the voltage at this pin was swinging in time with the ticks and flashes. Tracing back from the a.f.c. pin took me via pin 7 of socket VC to the microcomputer chip IC1001 on Main PWB(A). The a.f.c voltage at pin 39 of this chip should be a steady 2·7V. In this case however it was swinging between zero and 3V in time with the flashes. Since the connection between the tuner and IC6001 is a direct path, pin 39 was isolated by disconnecting the link between the two boards (pin 7 of connector VC). The voltage at pin 39 continued to vary so a replacement μ PD1700CU-520 chip was ordered from SEME. Fitting it provided a complete cure.

TEST CASE

346

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.

Most of the equipment that's featured in these Test Case items is middle-aged, simply because that's what we mainly see on the bench. This month's tale relates to a brand new machine however, though the point it illustrates is relevant to most makes and vintages of VCR. To solve this puzzle it's not necessary to have the service manual: the main thing is to know where to look!

The machine involved was a Sony SLV777, which is a VHS home deck with two speeds, hi-fi and editing facilities. It had been delivered to a customer new but had to be retrieved the very next day because of a colour problem. As there wasn't another of these machines in stock the repair had to be done pronto. The symptom showed up with the Eastenders recording that was still in the machine: the colour was very poor and grainy and was strewn with confetti. The underlying black-and-white picture was clean and noise-free however.

As the tape was the machine's own recording a known good tape was played back. The results were the same: luminance fine, colour saturation about correct, but grain and noise speckled the coloured areas of the picture. Head cleaning didn't improve the results obtained. The next step we took was to narrow down the field of search by checking as many modes of operation as possible.

A recording of colour bars was made in the SP and LP modes. The tape was rewound and then played back using another dual-speed machine. At both speeds the colour was bright and clear. Playback via the faulty machine gave noisy chroma in both modes. So the trouble was confined

to playback and was present with both standard and longplay operation. Having established the exact symptom, it was time for diagnosis. It then emerged that almost everyone in the workshop had virtually no knowledge of VHS (or any other for that matter) colour signal processing. They all claimed that they'd never had a real colour fault before, which says much about the reliability of this part of a VCR but not much for the lads... The repair became a joint effort, a sort of community project.

Someone suggested that the heads might be responsible, but that was overruled on the grounds that recordings were o.k. and that separate heads were used for the SP and LP modes. Next it was decided that the quality of the output signal at the scart AV socket should be checked. When this was linked to a Sony set's scart port the results were no better. It was thus concluded that the fault lay in the chrominance processing circuitry. An oscilloscope was brought into use, along with a three-hour tape recorded throughout with a colour-bar signal. If the fault wasn't found in three hours we would get a five-minute break while the tape was rewound!

Investigation began on board YC-65, which is where the colour signal processing takes place. IC801 does most of the work here. The chroma signal goes into it and comes out several times, finally emerging at pin 21 after which it goes to the YC adder department. The waveform at pin 21 of IC801 was of correct amplitude but was ragged and noisy.

In which part of the processing circuitry was the fault most likely to lie, considering the symptom? Should we have gone upstream or downstream from IC801? See next month for the answer and another test case item.

ANSWER TO TEST CASE 345 - page 822 last month -

A surprising amount of fault diagnosis can be carried out successfully in TV sets and VCRs without detailed knowledge of circuit operation and theory. A bit of it would have helped with last month's bench session though! The symptom with the JVC HR-D140 was drum speed runaway, smartly followed by deck shutdown.

The drum servo has two loops, one digital and one analogue – the phase and speed control loops respectively. The relevant one here was the speed control loop, which maintains the motor speed at 1,500 r.p.m. using feedback from the FG (frequency generator) built into the motor. A frequency-to-voltage converter inside the servo chip maintains its input frequency at 1,500Hz, which corresponds with 1,500 r.p.m. If the converter sees no FG signal it drives the motor harder to try to find some.

This was what was happening, but no feedback ever appeared because the FG printed coil leadout had a badly soldered joint. A check with the scope at TP414 or at pin 6 of IC404 would have shown this, and a d.c. continuity check would have provided confirmation. Fortunately with this motor it's easy to remove and repair the FG PCB, which is bolted to the underside of the motor.

The loading mechanism service job would have had to be done sooner or later anyway!

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EL O ELOT I ONDON COMPONENTO	VIDEO SERVICE KITS FROM	£4.99p TA7270 25	Op 2SA-726	25p 2SB-548	40n 2SC-1345	30p 2SC-2238	60p 2SD-523 150p
ELC EAST LONDON COMPONENTS	3V35/3V45 CASSETTE HOUSING		5a 2SA-733	20e 2SB-554	350p 2SC-1359	20p 2SC-2240	25p 2SD-525 70p
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COMPONENTS AT VERY KEEN PRICES	3V35 CAPSTAN MOTOR VT11/VT33 CAPSTAN MOTOR	£22.99p TA7274 20 £24.99p TA7279 44	Op 2SA-769 On 2SA-771	130p 2SB-560 130p 2SB-561	35p 2SC-1383 20p 2SC-1384	35p 2SC-2278 35p 2SC-2320	25e 2SD-571 30e
TEL: 081-472 4871 FAX: 081-503 5926	VITI/VISS CAPSTAN MUTUR	624.99p TA7279 44 686p TA7280 33		50g 2SB-562	35p 2SC-1393	30p 2SC-2335	129s 2SD-592 29p
«IEL. 001-472 40/1 FAX. 001-303 3320»	AN5111 3500 M511021	325e TA7281 21		60u 2SB-564	70u 2SC-1398	78e 2SC-2371	45p 2SD-600 80p
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JVC FERGUSON 3HSSV £8.50p HITACHI	AN5431 2500 MB3705	180g TA7680 44	Op 2SA-841 On 2SA-844	40p 2S8-595 15p 2S8-596	80s 2SC-1413A 75s 2SC-1417	240p 2SC-2458 20p 2SC-2482	40a 2SD-636 25a
BAC CEDCUCON SUCCUA CIO GG VI-SUUU 11.439	AN5435 2500 MB3722		Op 2SA-844 On 2SA-861	50p 2SB-618	325g 2SC-1445	250p 2SC-2500	30e 2SD-637 20e
AKAI VS201/301 £18.999 VT-9300 859	AN5510 275p MB3730		9p 2SA-872	20p 2SB-631	40a 2SC-1446	60p 2SC-2501	85p 2SD-639 25p
PANASONIC 3HSSN £8.50p VT-11/33 P1 30c	AN5620 338p MB3731	300p TDA1515 2	Op 2SA-893	15p 2SB-632	40p 2SC-1447	75p 2SC-2502	90p 2SD-641 310p
PANASONIC NV3/U £12.990 VT-52/63/65 £1,75e	AN5900 150p MB3732 AN6341 3500 NESSS		Op 2SA-896	35p 2SB-633	50p 2SC-1454	320p 2SC-2537	450p 2SD-666 25p 20p 2SD-667 25p
PANASONIC NV366	ANICOAA 445-		Op 2SA-899	60p 2SB-641	28p 2SC-1473 20s 2SC-1474	30p 2SC-2546 45p 2SC-2550	20p 2SD-667 25p 70m 2SD-669 40p
THE ACT OF THE PARTY OF THE PAR	ANGZEO 618m		Op 2SA-900 Ob 2SA-905	35p 2SB-643 20p 2SB-644	20p 2SC-1474 25p 2SC-1475	45a 2SC-2555	150a 2SD-687 60p
HITACHI V18000/9000 £15.99p VC-496 £1.80p HITACHI VT11/33 £15.99p VC-585 £1.00p	AN7145 1950 CTK435		Og 2SA-915	30e 2SB-647	30p 2SC-1507	50a 2SC-2564	236p 2SD-716 120p
HITACHI VT 17/35/39 £29.99p VC-651/800 £1.00p	AN/100 2400 07//400	550n TDA2577 2	Op 2SA-916	30p 2SB-648	55p 2SC-1509	45p 2SC-2565	260p 2SD-718 130p
HITACHI VT120/220 £25.99¢ VC-7300 £1.50c	ANTIOI SEOP	720m TDA2581 2	Bg 2SA-917	35ø 2SB0649	40p 2SC-1514	40p 2SC-2570	50p 2SD-721 150p
FISHER FVHP510/910 \$16.99\(\text{p}\) VC-8300 \$1.50\(\text{p}\) AMSTRAD PSF1/PSF2 \$15.99\(\text{n}\) VC-9300 \$1.50\(\text{p}\)	AN7168 260p STK460 AN7171 425e STK461	720 TDA2593 1	Op 2SA-921	10p 2SB-673	80p 2SC-1520	85p 2SC-2575	25p 2SD-725 350p 125a 2SD-745 250p
AMBITUAL TO THE STATE OF THE ST	AN7172 4250 STK463	1DAZ003A 3	i 0 p 2SA-940 Nn 2SA-950	50g 2SB0681 25g 2SB-686	250p 2SC-1550 120p 2SC-1567	60p 2SC-2577 60p 2SC-2579	125p 2SD-745 250p 130p 2SD-748 150p
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AM5300 12.26					KA 2284	£1.20							TDA3560	£3.90			PANASONIC VEH 0121	£8.50
AM6330N P. 25.50 EX8341 P. 4.50 P. A1135 P. 25.50 L/7806 P. 25.50 STR2230 P. 5.50 STR2230 P. 5			BA//51AL	£1.95	LA1130	C2 50				£8.00	STR454	25.20			2SC1403A	£4.50		
ANGSZÓR C150 HA1388 C2 51 A1250 C150 HA1389 C350 LA1250 C150 HA1389 C2 50 LA1250 C150 HA1389 HA1389 C2 50 LA1250 C150 HA1389 HA1389 HA1389 C	AN6130N		EX8341	£4.50		£2.50				26.50			TDA3502A		2SC1815		PANASONIC VEH 0286	£21.75
ANGSZÓR C150 HA1388 C2 51 A1250 C150 HA1389 C350 LA1250 C150 HA1389 C2 50 LA1250 C150 HA1389 HA1389 C2 50 LA1250 C150 HA1389 HA1389 HA1389 C										€9.50			TDA4501	£4.50	2SC1913	£1.20	PANASONIC VEH 0177	£21.50
ANGSZEN CJ.50 HA1338 CJ.50 LA1231N CJ.80 LA1251N CJ.80 LA1															2SC1969		PANASONIC VEH 0174	£25.00
ANGSZÓN C 25.50 HA1339A C 25.50 LA1230 C 1.50 LA1339A C 25.50 LA1230 C 1.50 LA1339A C 25.50 LA1230 C 1.50 LA1339A C 25.50 LA1339A C 25.50 LA1365 C 1.50 LA13	AN6310		HA1199			£1.75											PANASONIC VEH 01/4 (original)	£32.00
AN6344 74.75 HA1394 (2.59 LA200) C 12.95 C 1.73 LA200 C 15.90 LA200 C 15	AN6326N	£3.50	HA1338	£2.95	LA1230	£1.50	D 00 .		STK3044	€5.75			TDA4600	\$2.75	2SC2335	£1.20	PANASONIC VEH 0267 (original)	£25.00
AN6344 74.75 HA1394 (2.59 LA200) C 12.95 C 1.73 LA200 C 15.90 LA200 C 15			HA1339A				J B1403	C1 50	STK3062				TDA4600-2	€2.50	2SC2570	$\Omega = 0.50$	PANASONIC VEH 0210	£37.00
AN6344 74.75 HA1394 (2.59 LA200) C 12.95 C 1.73 LA200 C 15.90 LA200 C 15	AN6330		HA1372	13.50 C3.50			LB1405				STR4211	€4.50	TDA4600-21				PANASONIC VEH 0252	£29.50
AN6344 74.75 HA1394 (2.59 LA200) C 12.95 C 1.73 LA200 C 15.90 LA200 C 15	AN6332	€4.75	HA1377	£2.20	LA1385	£1.95			STK3152iii				TORTESO	24.33			PANSONIC VEH 0252 (original)	£35.00
AN6344 74.75 HA1394 (2.59 LA200) C 12.95 C 1.73 LA200 C 15.90 LA200 C 15										€5.75	STR6020	£5.20	UPC575C	£1.00	2SC3153	€3.20	SAMSUNG Most Models	£19.50
AN6366 19.35 HA1396 19.75 LA2000 F150 LC7367 19.50 STK41311 19.50 STR541431 19.50 STR541531 19	AN6342N AN6344		HA1392				201043	LE.30			STR50020	26.20	UPC1025H					
ANGSIZ PL 50 HA11215 C 220 LA3201 D 095 LM3914N C 275 STK41611 PL 275 LA3210 D 095 LM3914N C 275 STK41611 PL 275 LA3210 PL 275 L	AN6346N		HA1396				1.07127	C4 E0							2SC3409		SHARP VC 6300/7300 original (BBASS)	632.00
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ANGSIZ PL 50 HA11215 C 220 LA3201 D 095 LM3914N C 275 STK41611 PL 275 LA3210 D 095 LM3914N C 275 STK41611 PL 275 LA3210 PL 275 L							LC7815	£2.95	STK41411		TA7193P	64.00			250358	CO 60	TOSHIBA V31/33/9600	.£18.00
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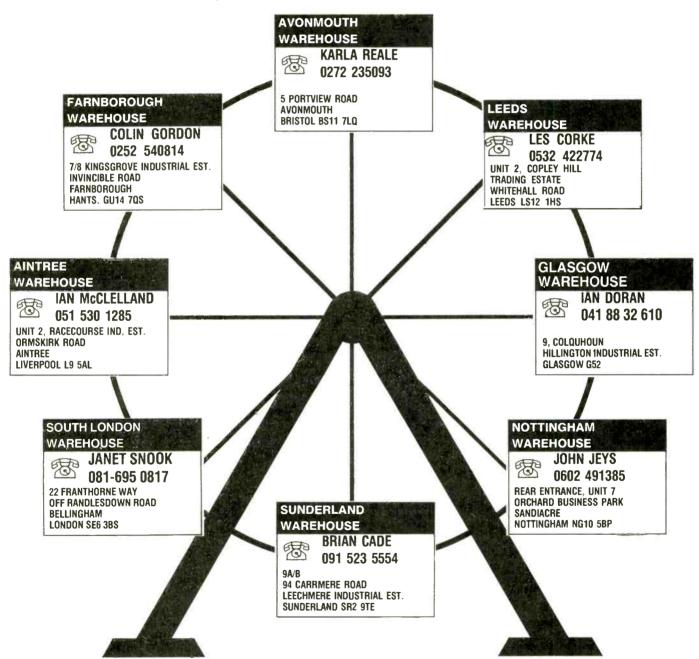
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AN253P £1.8			L7824		MPD4011C	.£2.00	STK441	£10.50	TA7267P	£2.80	TDA1044	£2.50	TDA26400£3.54		£2.00	2SC2979
					MPD4069C	.£1.10	STK459		TA7270P	£2.50	TDA1044U.	£1.50	TDA2653A £2.75		£2.00	2SC3153
			L7912 £0.80	M490881£12.50	MPD4081	£1.10	STK461	£10.50	TA7271P	£3.25	TDA1057	£2.00	TDA2822£2.00		£5.00	2SC3402
		£3.00	L7915 £0.80	M4918/881 £11.50 M50127AP £6.00		£5.00	STK463	£14.50	TA7274	£2.60	TDA1082	£3.50	TDA3190£0.95		£2.50	2SC3519
AN5015 £3.3 AN5033 £5.0		12.40	L7918		MPD5521066 1		STK465	£12.00	TA7280	£3.00	TDA1083	£1.70	TDA3303 £15.00		€2.75	2SC3678
AN5132 £3.0			LA1180 £2.60	M50431-101SP £6.50	MSL9378RS MSM5840H-84	£3.50	STK5315	02.62	TA7280P	£3.00	TDA1151	£1.50	TDA3330£5.50		00.63	2SC3715
AN5265 £1.3			LA1185 £2.60	M50453-012P £6.20			STK5322	£6.50	TA7281	£2.75	TDA1154	£2.70	TDA3540 £4.00		£2.10	2SC458
						E14.50	STK5325	€5.50	TA7281P	£2.75	TDA1170S .	£1.20	TDA3541£2.25		£2.20	2SC789
N5510 £4.5 N5512 £1.9			LA1201	M50560-01P£2.70 M51014L£1.95	SAA1006 SAA1025	.£2.50	STK5331	00.02	TA7299P	£3.00	TDA1180	21.80	TDA3560 £3.40		£2.95	2SD1047
N5521£1.5		\$2.50	LA1260 £1.75	M51164 £1.40	SAA1124	.£5.80 .£3.95	STK5332	£3.50	TA7302	£1.30	TDA1180P .	£3.00	TDA3561£2.50		.63.90	2SD1051
N5730 £3.2			LA1403 £3.75	M51356P£5.00		.25.50	STK5333	£12.00	TA7303	£1.10	TDA1270M.	£1.90	TDA3562A £5.00		£4.50	2SD1128
NS750 £2.5			LA3160 £1.90	M51381P£1.50		.02.60	STK5338	83	TA7310	£1.75	TDA1365	£4.10 £4.90	TDA3565 £3.00		£1.90	2SD1138
N5760 £2.0			LA3210 £1.90	M51393 £4.25		£8.50	STK5361	£6.25	TA7312	£1.75	TDA1412	£1.00	TDA3571BQ £5.50		£3.50	2SD1159
N5900 £1.5		£3.10	LA3220 £1.00	M51513£10.00	SAA1276		STK5421	£6.50	TA7313	20.90	TDA1470		TDA3590£3.00		\$2.20	2SD1207
N6326£4.0			LA3350 £1.50	M51515L £3.10		.£4.50 £10.70	STK5422 STK5434	£5.00	TA7313AP TA7314	£1.40	TDA1501A	£5.00 £3.20	TDA3651 £3.00		\$2.00	2SD1273
N6332 £4.4			LA3361 £1.50	M51516 £4.00	SAA1293	£7.00	STK5434	£6.50 £5.30	TA7323	£3.25	TDA1501A	£8.50	TDA3651AQ £6.50		22.20	2SD1275
N6341 £2.7			LA3600 E3.50	M51903L £3.50		£9.75	STK5471	£5.30	TA7325	£2.00	TDA1510	£3.20	TDA3652		£1.50	2SD1288 2SD138
N6344 £6.5			LA3700 £2.58	M5213L £3.10		26.00	STK5476	£6.00	TA7325P	£1.50	TDA1510A	£3.20			£1.70	2SD138 2SD1391
N6346 £4.5		£2.00	LA4100 £1.90	M52184 £1.00		£3.00	STK5481		TA7328	£1.30	TDA1512	£1.00			27.00	SDC1397
N6346 £4.5			LA4102 £1.20	M52314 £1.10		25.80	STK5482	£5.20	TA7335	£1.50	TDA1515A	£2.50	TDA3810£2.90 TDA3950£3.00		£1.95	2SD1398
N6359 £5.5		£1.70	LA4125 £2.00	M54519P £1.00		26.60	STK5720	£7.00	TA7335P	£4.20	TDA1520	23.95			€2.00	2SD1426
N6360 £3.7		£1.75	LA4140 £0.70	M54543 £1.75		25.80	STK5730	£5.25	TA7342	£2.10	TDA1670A	£2.60	TDA440		€2.48	2SD1426
N6362 £4.2	BA681	00.03	LA4160 £1.25	M54544L £1.85		29.00	STK6962	£3.20	TA7343	£1.75	TDA1701	£3.00	TDA4422 £3.95		£0.70	2SD1455 2SD1
N6387 £5.5		£1.90	LA4182 £2.10	M54548L £4.50		€5.00	STK6972		TA7350	£2.10	TDA1770A	€3.00	TDA4500 £3.80		£1.75	2301433 2301
N6612 £2.2		£1.80	LA4183 £2.75	M58478P £4.75		29.90	STK7216	26.10	TA7358	£1.50	TDA1870A	€2.60	TDA4501 £4.00		£1.95	2SD1496
N6651 £0.6		£1.10	LA4192 £1.70	M58655P £6.50		£9.50	STK7308	£5.75	TA7607	£3.50	TDA1905	£1.40	TDA4503 £4.50	TRANSISTOR 2N3773	£1.90	2SD1497
N6671K £5.5			LA4422 £1.30	M58839 £8.00		14.00	STK7309	£7.00	TA7607AP	12.40	TDA1908A	£1.75	TDA4505 £3.95		£5.50	2SD1497-02
N6677 £5.2	BTT601	8 £3.50	LA4440 £2.70	M708£5.50		29.00	STK7348	25.00	TA7609P	£2.70	TDA1940	£1.80	TDA4510 £4.40		£3.50 £1.90	2SD1497-06
N6884 £2.7	6 HA1121		LA4445 £2.50	M709£4.75	SAB3013	£4.50	STK7356	€6.50	TA7614	€2.50	TDA1950	€2.50	TDA4600 £2.60		20.95	2SD1650
AN6912 £2.0	HA1122	3 £3.75	LA4460 £1.70	MA150-E £2.20		11.00	STK7358	£6.50	TA7628P		TDA2002	£1.40	TDA4600-2 £2.60		£0.35	2SD1877
N7111 £1.50	HA1122	5 £2.10 -	LA4461 £1.80	MB3106 £1.00	SAF1032P	00.02	STK772B	£4.75	TA7629	€4.00	TDA2003	£1,30	TDA4601 £2.10		£0.33	2SD639
W7112 £3.0			LA4500 £2.70	MB3730 £2.75		£2.00	STR1096	£3.60	TA7629P	£2.75	TDA2004	£1.70	TDA4610 £4.50		£4.70	2SD667
₩7116£1.20	HA1123		LA4507 £2.70	MB3731 £3.25	SAS560	£3.50	STR3125	£5.50	TA7630P	£2.00	TDA2005	£1.70	TDA5101 £2.00		£0.40	2SD725
N7143£1.6	HA1124		LA4570 £2.20	MC13002P £5.00		£3.00	STR40090	00.82	TA7640	€2.00	TDA2005S	€2.95	TDA7250 £5.50		£0.20	2SD787E
N7148£1.70			LA5522 £2.20	MC1310 £1.25		£3.50	STR4211	£5.95	TA7658	£2.00	TDA2006V	£1.95	TDA7270 £6.00		£0.35	2SD811
N7158£4.0			LA5527 £1.95	MC1330P£2.95		£3.50	STR440	£5.00	TA7668	£2.00	TDA2020	£3.50	TDA7607AP \$2.40		20.95	2SD836
N7160 £6.0			LA6358 £5.00	MC14001BCP £1.10	SL1430	€2.80	STR441	£5.00	TA7680	£4.80	TDA2030	£1.10	TDA8180 £6.00		£1.50	2SD837
N7169 £3.50			LA7016 £2.50	MC14093B £1.50		£2.80	STR451	£4.95	TA7681AP	£5.75	TDA2030H	£2.00	TDA8190 £3.80		20.40	2SD845
N7171K £8.04			LA7096 £4.00	MC14426P £2.20		£1.10	STR454	£4.85	TA7687	£2.00	TDA2030V	£1.75	TDA8341 £3.00		£1.60	2\$D868
N7205 £1.9			LA7210 £3.10	MC14429P £2.20		£2.20	STR50020 .	£7.90	TA7698A	£6.85	TDA2040	£2.00	TDA9503 £2.55		£0.55	2SD869
N7213 £1.10			LA7305 £6.90	MC14497P £5.50	SL480	£3.30	STR50103A	£5.50	TA7698AP	£7.50	TDA2151	£3.00	TDA9513 £2.95		12.30	2SD870
N7218£1.20			LA7309 £3.75	MC14511BCP £2.00		£3.00	STR5412	£5.95	TA7705P	£1.50	TDA2161	£1.75	TEA1009 £2.00		£2.50	2SD871
N7220 £1.60		5 £3.80	LA7507 £4.00	MC14516BCP \$2.00		£3.00	STR58041	£6.75	TA7709	£2.50	TDA2170		TEA1014 £2.00		£1.80	2SD895
N7222£2.10			LA7520 £3.25	MC1458/UPC1458		€2.50	STR6020	£4.90	TA7738	£2.50	TDA2190	£10.00	TEA1039 £2.00		22.10	2SD898
۲7.60 £7.60			LA7800 £1.50	£1.95		£1.25	STR8050	. £14.15	TA78L010P.	£1.75	TDA2270	£2.20	TEA2018 £2.10		£1.30	2SD898B
17224 £1.40		£1.20	LA7801 £1.25	MC3359 £1.10	SSA1075	£5.90	SVM993C	£2.00	TA8101N	£4.25	TDA2320		TEA2018A £2.10		Ω.25	2SD900B
N7225 £1.90			LA7820 £1.90	MCU2632 £1.90		£3.50	TA4180	£3.00	TA8102P	£4.25	TDA2510	£4.30	TEA5101 £6.00		£4.50	BC107B
V7273			LA7830 £2.50	MDA2061 £7.00		12.00	TA4193	25.00	TA8644	€5.50	TDA2521/3	£9.75	TL011CP £2.00		20.50	BC108
V7310£1.10			LA7913 £1.30	MDA2062 £3.50		£5.50	TA4194	£5.50	TAA310A	£2.00	TDA2522Q	£10.75	TL072CP £2.00		£0.75	BC108B
7311£1.75		00.02	LM1011N£3.00	MEA2050 £4.60	STA401A	£3.75	TA4301	£4.50	TAA550	£2.10	TDA2530	£4.75	TMM 2114AP £5.75	2SC2331	21.00	BC115
7315 £1.7			LM1017/M192B1	MEA2901 £3.00		£3.00	TA4345	£3.40	TBA120S	£0.50	TDA2530Q	£4.25	TMS1944AN2L £2.00		£1.50	BC118
17324 £4.50		£5.00	£2.30	MH27316		£4.30	TA4350	26.00	TBA530	£1.00	TDA2532	£3.00 •	TMS1952 £2.50	2SC25311	0.26	BC147A
7410 £2.10		£2.00	LM1035 £5.75	ML232B £4.50		10.00	TA7120	£1.25	TBA560	£1.00	TDA2532Q	£3.00	TMS1956 £2.30	2SC2564	23.04	BC159
17415 £1.40		00.00	LM1036N£3.70	ML237 (BTT6018)		12.00	TA7137	£1.25	TBA7500	£4.20	TDA2540	£2.75	TMS1965NL£2.00		£0.55	BC171
N7420£3.20		£3.00;	LM1112CN£3.30	£3.50		£8.50	TA7176	£2.50	TBA800	20.85	TDA2541	£2.00	TMS3450 £2.10		C1.50	BC172
17818F£1.60		24.00	LM13600 £5.00	ML238B £7.50	STK2125£	12.00	TA7176AP	£2.40	TBA820M	Ω0.45	TDA2543	£5.25	TMS3615£1.75		20.95	BC172C
1403£1.00	HA1397	£5.40	LM1868N£1.50	M293£4.00		€9.20	TA7193AP	. £4.00	TBA920S	£1.00	TDA2560	£3.75	U410B £1.60		1.25	BC182L
A1320 £1.50		£3.50	LM1894N£5.75	ML923£4.50	STK3041	€5.70	TA7193P	00.02	TCA640	£3.75	TDA2560Q	£1.10				BC183
A1332 £1.00	HA1406		LM317T £1.00	ML923DP £4.50	STK40090	€8.00	TA7205	£1.75	TCA650	£3.95	TDA2576A	. £2.90	1 - Mild	100	ales d	10 10 10
A301B £1.50 A318 £2.50	HA1457		LM324£0.80	ML926£4.20	STK4121 II	£8.75	TA7205AP	£1.25	TCA6608	£3.50	TDA25771	£2.80	NAME OF TAXABLE PARTY.			DIOS
	HA4219	£2.70	LM339	MM314APL £1.75		26.90	TA7222	£2.25	TDA1005	£2.50	TDA2578	£3.00		ELEC		
A328 £1.10	HD1408	1 £0.25	LM339N £0.75	MM53108N £1.25	STK4142 II £	10.00	TA7223	£2.50	TDA1010A	£1.10	TDA2578A	£2.80				

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TDARISO ORIGINAL	ea 50	BELT KITS	VS310/315/320-380/	
TRANSISTORS BD244 £0.30	BU406 £0.90	Belt Kits for most models		Hitachi VT33 Original
BC184 CO.O9 BU244U	BU406D £1.50 BU407 £0.50	are stocked. Some	HITACHI	Hitachi VT64 Original
BC213 Cn 00 BD434 CO 80	BU426A £1.00	examples are:	VT11/14/17/19/33/34/35/	Hitachi VT8000 series Original
BC214A £0.07 BD508 £0.90	BU500 £1.00 BU508A £1.00	AKAI \/\$1.2.5 1.20	38/39/88 1.30	Hitachi VT9000 series Original
BC214B £0.07 BF195 £0.07 BC214L £0.09 BF196 £0.15	BU508AF£1.70	VS4 6 9 15 1.10	38/39/88 1.30 VT8000/8500 1.00 VT9300/9500/9700 1.00	Sharp VC7000 series Original .
BC237 CO.07 BF197	BU508D £1.00	Ask for models not listed.	VT9300/9500/97001.00	MODE CONTROL MOTORS
BC23B C0.07 BF198 C0.07 BC307 C0.12 BF199 C0.14	BU806 £0.75 BU807 £0.75	AMSTRAD	Ask for models not listed.	
BC307	BUT11 £0.95	TVR1.2,3, VCR4600, 4700,5200 1.90	PANASDNIC	Ferguson 3V42,43,44,45,48,4
BC327-25 CO.07 BF259	BUT11AF £1.95	4700,5200 1.90	NV230/250/280/370/380	Ferguson 3V58,59,65,FV10,1
BC328-40 C0.05 BF422 C0.15 BC337 C0.07 BF458 C0.22	BUW84 £1.65 BUX84 £0.60	Ask for models not listed.	430/450/460/465/485/630/ 810/830/850/870/8901.60	20,21,22,26
BC372 £0.95 BF459£0.22	SD12659 £0.75	FERGUSON/JVC		Sharp Reel Motor Pulley only
BC392 £1.50 BF469/BF471 BC441 £0.25 £0.25	T9064V £2.28 TIP110 £0.45	3V00/3V16/3V22 etc 1.60		Replacement of plastic pu
BC461	TIP112 £0.45	3V29/3V30 1.20 3V35/36/38/39 1.10	NV7000 7200 2000	number of Sharp Reel Motor
BC54/ £0.07 BF4/2 £0.25	TIP29	3V42/43/44/45/48/53/54/	2010	above metal pulley gives bette
BC548 C0.07 BF870/BF472 BC549 C0.07 C0.25	TIP30	55/57 1.00	Ask for models not listed.	performance.
BC557 CO 30 BU108 CO.75	TIP32	Ask for models not listed.	PHILIPS	•
BC559B £0.07 BU126 £0.70	TIP41 £0.27	Loading belts on certain	VR6367/6467/6561/6751/	IDLER ASSE
BC639 C0.18 BU208 C1.00 BC640 C0.30 BU208A C1.00	TIP42C £0.40 TIP47 £0.98	models also available.	6760/ 2.25 VR6460/6920/6520 2.40	FERGUSON
BD131 CO.50 BU208D £1.00	TIPL791A£1.20	FISHER		Take up Clutch (Mechanical me
BD132	ZTR604 £0.55 ZTX650 £0.70	FVHP520/530 1.00 FVHP615/620/622/710/711/	SANYO	3V 29/30 Take up idler
BD237 £0.22 (TOSHIBA)	218030 10.10	715/716/720/721/725 830	VTC5000/5150/6500 0.65	3V29 30 Take up Clutch
BD238 £0.22 £1.00		840 1.00	VHR1100 1300 1500 1.00	3V29 30 Reel Idler
BD243B £0.30 BU326A £1.00 BD243C £0.40		FVHP905/906/907/908/910/		3V35 Reel Idler
		911/915/916 1.20	SHARP	3V35,36,38,39 Take up Clutch
DIODES AND THYRISTORS BA157 CO.07 BY206 (BYB96R)	DA91 £0.20	GRUNDIG	VCF3/VC402/500/571/581/ 582/583/584/585 1.10 VC9300/9500/9700 1.95 VC8000/8300 1.95 Ask for models not ifsted.	3V58,59,64,65,FV10,11,12,1
BR100 £0.20 £0.55	D1112 £2.20	VS400/410/440/450/	582/583/584/585 1.10	Clutch Assembly 3V44,45,48
BR101	RGP15G £0.45 RGP15J £0.55	VS180/200/220/262	VC8000/8300 1.95	54,55
BR303 £1.50 BY227 £0.20	RGP15K C0.35	265/267 2.20	Ask for models not ifsted.	Clutch Assembly 3V42,43
	RGP30K £0.70 RHI £1.30			
BT116	RM11C£0.45	Many other belt kits in st	ock. Examples are Alba,	FISHER
BT129P C4.50 BY96D	SG264 £8.50	Funai, GEC, Goldstar, Gi	ranada, Grundig, Hinari,	FVHP615,905,910, Idler Asser
BT151/800R BYV96D £0.55 £1.75 BYW56 £0.50	SG613£12.00 SKB/02£0.60	ITT, Mitsubishl, NEC, O	rion, Saisho, Samsung,	FVHP615 Gear Idler Assembly
BY126 £0.20 BYW96E£0.50	SKB/08 £1.20	Schneider, Son	ıy, Tensai etc.	FVHP905,910 Gear Idler Asser
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BY 164 CO 90 FB2506 C1.50	SKE1/02 £0.60		LINES	FVHP520,530 Pulley
BV164/SKR2/02 IN4001 CO 06	SKE1M15 20.65		er£16.00	HITACHI
£0.90 IN4002 £0.06 BY179 £1.10 IN4004 £0.10	SKE2G2/02 £0.75 SKE2G3/04 £1.30			VT11,33 etc. Original Idler Arn
BY179/SK2/08 IN4005 £0.10	SKE4F1 04 CO.45	Video Washer and E Clip I	(it£5.00	VT11,33 etc. Idler Replacemen
\$1.10 IN4006 \$0.08 BY184 \$0.65 IN4007 \$0.08	SKE4F1 06 CO.45 SKE5F3 10 C2.20			VT9300,9500 etc. Play Idler
BY184 £0.65 IN4007 £0.08 BY189 £2.00 IN4148 £0.10	SR2M 00.75	LINE OUTDUT 3	DANCEODMEDO	VT9300,9500 etc. F/F Idler
BY190 £2.00 IN5408 £0.25	T9053V £1.40		RANSFORMERS	VT9300,9500 etc. Idler
D1130 LE.00 1193400 LU.23		Deces 100	9.50	
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VIDEO HE	ADS	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 110 ITT Compact 80 Series 90 ITT CVC45	12.50 9.50 16.75 19.75 18.00	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull
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AMSTRAD 3HSSR-VCR7000 (Saisho/Orion) PSF1-VCR4500, 5200, 9000	ADS	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 110 ITT Compact 80 Series 90 ITT CVC45 ITT 1109F ITT CVC1204	12.50 9.50) 16.75 19.75 18.00 14.00 11.50	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Origi
ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3HSSR-VCR7000 (Saisho-Orion) PSF1-VCR4500, 5200, 9000 PSF2-VCR4600, 4700	ADS	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 110 ITT Compact 80 Series 90 ITT CVC45 ITT 1109F ITT CVC1204	12.50 9.50 9.50 16.75 19.75 18.00 14.00	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Origi DV464,6462,6463,650 etc. Id
ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3MSSR-VCR7000 (Saishoi/Orion) PSF1-VCR4500,5200,9000 PSF2-VCR4600,4700 PSF3-VCR6000 FFRGUISON	ADS 218.00 215.00 215.00 221.50	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 110 ITT Compact 80 Series 90 ITT CVC45 ITT 1109F ITT CVC1204 ITT CVC800/1/3 ITT CVC1100	12.50 9.50) 16.75 19.75 18.00 14.00 11.50 21.50 16.50	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull VT11,33 etc. Clutch Assembly PHILPS VR6460,6920 Idler Arm (Ongi DV464 6462,6463,650 etc. Id VR6542,6843 Reel Idler
ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3MSSR-VCR7000 (Saishoi/Orion) PSF1-VCR4500,5200,9000 PSF2-VCR4600,4700 PSF3-VCR6000 FFRGUISON	ADS 218.00 215.00 215.00 221.50	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 110 ITT Compact 80 Series 90 ITT CVC45 ITT 1109F ITT CVC1204 ITT CVC800/1/3 ITT CVC1100	12.50 9.50) 16.75 19.75 18.00 14.00 11.50	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. Fl/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Ongi DV464,6462,6463,650 etc. Id VR6542,6843 Reel Idler VR6542 Reel Drive Pulley
ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3HSSR-VCR7000 (Saisho'Orion) PSF1-VCR4500,5200,9000 PSF2-VCR4600,4700 PSF3-VCR6000 EFERGUSON	ADS 218.00 215.00 215.00 221.50	ITT CVC20. ITT CVC25/30/32 ITT Compact 80 Series 11(ITT Compact 80 Series 90 ITT CVC45. ITT 1109F ITT CVC1204. ITT CVC800/1/3 ITT CVC1100. ITT CVC1150/1175	12.50 9.50) 16.75 19.75 18.00 14.00 11.50 21.50 16.50	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. Fl/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Ongi DV464,6462,6463,650 etc. Id VR6542,6843 Reel Idler VR6542 Reel Drive Pulley VR6843 Reel Drive Pulley
ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3HSSR-VCR7000 (Saisho-Orion) PSF1-VCR4500, 2500, 9000 PSF2-VCR4600, 4700 PSF3-VCR6000 FERGUSON 3HSSV-2 Head universal 3HSSVA-3V42, 44, 45, 46 etc 3HSSVA-3V42, 44, 45, 46 etc 3HSSVA-3V32-HR76555	ADS 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 11(ITT Compact 80 Series 90 ITT CVC45 ITT 1109F ITT CVC1204 ITT CVC1204 ITT CVC1100 ITT CVC1150/1175 ITT 6325	12.50 9.50) 16.75 19.75 18.00 11.50 21.50 21.50 20.00	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Origi DV464,6462,6463,650 etc. Id VR6542,6843 Reei Idler VR6542 Reei Drive Pulley VR6843 Reei Drive Pulley PANASONIC (All Original)
ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3HSSR-VCR7000 (Saisho/Orion) PSF1-VCR4500,5200,9000 PSF2-VCR46000,4700 PSF3-VCR6000 FFRGUSON 3HSSV2-Bead universal 3HSSVA-3V42,44,45,46 etc 3HSS4VB-3V32/HR7655 3HSS4VC-3V46/HR0565	ADS 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00 118.00	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 10 ITT Compact 80 Series 90 ITT CVC45 ITT 1109F ITT CVC1204 ITT CVC1204 ITT CVC1100 ITT CVC1100 ITT CVC1150/1175 ITT 6325 ITT 6325	12.50 9.50) 16.75 19.75 18.00 14.00 11.50 21.50 20.00 18.50 18.50	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Ongi DV464,6462,6463,650 etc. Id VR6542,6843 Reel Idler VR6542 Reel Drive Pulley VR6843 Reel Drive Pulley VR6843 Reel Drive Pulley VR6843 Reel Drive Pulley VR690 (All Original) NV370 Idler Arm Unit VXP052
ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3HSSR-VCR7000 (Saisho/Orion) PSF1-VCR4500,5200,9000 PSF3-VCR6000 FFRGUSON 3HSSV2-Head universal 3HSSV2-Head universal 3HSSV4-3V42,44,45,46 etc 3HSS4V8-3V32-HR7655 3V48,58,59,65,FV10,11,	P90-4 L 28 NOT LISTED \$18.00 \$15.00 \$15.00 \$21.50 \$22.00 \$25.00 \$25.00	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 11(ITT Compact 80 Series 90 ITT CVC45 ITT 1109F ITT CVC1204 ITT CVC1204 ITT CVC1100 ITT CVC1150/1175 ITT 6325 ITT 3546 ITT 12011 Other ITT transle	12.50 9.50 16.75 19.75 18.00 14.00 11.50 21.50 06.50 20.00 18.50 18.50 20.00 20.00	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Origi DV464,6462,6463,650 etc. Id VR6542,6843 Reel Idler VR6542,7843 Reel Drive Pulley VR6843 Reel Drive Pulley PANASONIC (All Original) NV370 Idler Arm Unit VXP052 NV8600,8610 Play Idler VXP0
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ASK FOR SEMICONDUCTORS VIDEO HE AMSTRAD 3HSSR-VCR7000 (Saisho/Orion) PSF1-VCR4500, 5200, 9000 PSF2-VCR4600, 4700 PSF3-VCR6000 FFRGUSON 3HSSV-2 Head universal 3HSSVA-3V42, 44, 45, 46 etc 3HSS4VB-3V32/HR7655 3V48, 59, 59, 55, PV10, 11, 12, 13, 14, 20, 21, 26 And most other Fergusons	P90-4 L 28 NOT LISTED \$18.00 \$15.00 \$15.00 \$21.50 \$22.00 \$25.00 \$25.00	ITT CVC20 ITT CVC25/30/32 ITT Compact 80 Series 11(ITT Compact 80 Series 90 ITT CVC45. ITT 1109F ITT CVC1204 ITT CVC1204 ITT CVC1100 ITT CVC1150/1175 ITT 6325 ITT 3546 ITT 120/1 Other ITT transle	12.50 9.50 16.75 19.75 18.00 14.00 11.50 21.50 20.00 18.50 20.00 20.00 20.00 20.00 18.50 20.00 20.00 10.50 20.00 2	VT800,8500 etc. Play Idler Ass VT8000,8500 etc. FF/Rew Pull VT11,33 etc. Clutch Assembly PHILIPS VR6460,6920 Idler Arm (Ongi DV464,6462,6463,650 etc. Id VR6542,6843 Reel Idler VR6542 Reel Drive Pulley VR6842 Reel Drive Pulley VR6843 Reel Drive Pulley VR0542 Reel Drive Pulley VR0542 Reel Drive Pulley VR0540 Idler Arm Unit VXP052 NV8600,8610 Play Idler VXP05 NV332,777,788 Idler Unit VX NV600,688 Idler VXP0515
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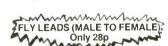
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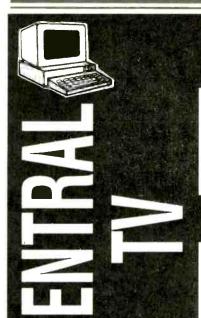
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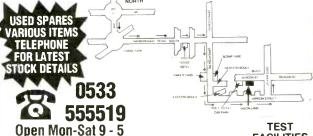
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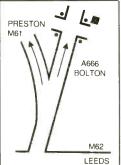
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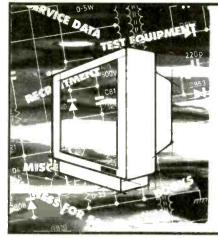
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HEACTH 20 Turn Pot 40,00	Section Sect	SAB3037 \$2.00 SAB3035 \$2.00 SAB3205 \$2.00 SAB3205 \$2.00 SAB3206 \$2.00 SAB3206 \$2.00 SAB3206 \$2.00 SAB3206 \$2.00 SAB3206 \$2.00 SAAS0100 \$2.20 SAAS0102A \$2.00 SAAS012A \$2.00 SAAS013 \$4.00 SAAS013 \$4.00 SAAS014 \$2.00 SAAS015 \$2.00 SAAS015 \$2.00 SAAS016 \$2.00 SAAS017 \$2.00 SAAS018 \$2.00 SASS01 \$	SN/76/22PN C1.00 SN/76/22PN C1.00 SN/76/22PN C1.00 SN/76/23PN C1.00 SN/76/23PN C1.00 SN/76/23PN C1.00 SN/76/23PN C2.00 SN/76/23PN C2.00 SN/76/24PN C2.00 SN/76/20 SN/76/20 SN/76/20 SN/76/20PN C2.00 SN/76/20PN C2.	TDASING \$3.00 TDASING \$1.50 TDASING \$1.50 TDASING \$1.00 TDBS033 \$1.00 TDBS033 \$1.00 TDBS033 \$1.00 TDBS035 \$1.00 TDBS066 \$2.00 TD
BS Y95n	\$\begin{array}{cccccccccccccccccccccccccccccccccccc	\$\frac{1}{3}\frac{1}{4}\frac{1}{4}\frac{1}{3}\frac{1}{3}\frac{1}{4}\frac{1}{3}\frac{1}\frac{1}{3}\f	TCE120CO	Transistors A1222 559 BFINI 249 A1223 559 BFINI 249 ACIGA 259 BFINI 259 ACIGA 259 BFINI 109 ACIGA 259 BFINI 1
2SA 997 110 BC217 2SA 972 100 BC217 2SB 474 300 BC218 2SB 474 100 BC218 2SB 474 100 BC218 2SB 474 100 BC218 2SB 474 100 BC218 2SC 121 200 BC228 2SC 121 100 BC239 2SC 122 100 BC339 2SC 123 100 BC337 2SC 123 100	\$\begin{array}{cccccccccccccccccccccccccccccccccccc	18A 305Q 50p 18A 305Q 1.00 18A 306Q 1.00 18A 306Q 1.00 18A 301Q 1.00 1	TDA2140	BL/ya9 Sup B-91 Sp B-91 Sup B-92 Sup B-93 Sup B-