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SERVICING VIDEO SATELLITE DEVELOPMENTS

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Pace's MSS100 Technology Servicing the Mitsubishi 8F CTV chassis At the Las Vegas CES The NVQ Nightmare Toshiba Service Briefs

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BC159 BC160	8p 30p	BD534 8D535	38p 38p	BU207 BU208	150p 70p	BUW12 BUW12A	125p 150p	MJ15016 MJ15022		BY184	32p	AN262	250p 140p	AN6359 AN6360	500p 320p	BA516 BA518	150p 150p	BA7751L BA7752	S 150p 250p
BC171 BC172	10p 10p	8D536 8D537	38p 40p	BU208A	75p	8UW12F	250p	MJ 15023	400p	BY206 BY207	11p 20p	AN271 AN274	230p 250p	AN6362	400p	BA521	100p	BA7755	150p
BC177	14p	BD538	40p	BU208AT BU208B	200p 200p	BUW13A BUW32A	200p 500p	MJ15024 MJ15025	700p	BY227 BY228	19p 28p	AN277B AN278	400p	AN6363 AN6357NI	375p K 400p	BA524 BA526	240p 180p	BA7767A BA8504	350p
BC178 BC179	14p 14p	BD643 8D645	50p	BU208D BU209	130p 90p	BUW48 BUW49	550p 550p	MJE340 MJE350	25p 80p	BY298	15p 18p	AN301	60p 330p	AN6368 AN6371	275p 350p	BA527 BA532	95p 100p	BA15218 CA31408	
BC182 BC182L	7p	BD647 BD649	50p 50p	BU225 BU226	120p 120p	BUW50 BUW81A	400p 150p	MJE520 MJE2955	30p	BY299 BY329-1200	150p	AN302 AN303	650p 250p	AN6387 AN6550	480p	BA534	220p 150p	CNX62A	80p
BC183	7p 7p 7p	BD675	40p	BU312	90p	BUW84	75p	MJE3055	T 65p	BY448 BYT11	20p 25p	AN304 AN315	360p 210p	AN6551	100p 50p	BA536 BA546	160p	CNX82A CNX83A	80p 80p
BC183L BC184	7p 7p	BD676 BD677	40p 38p	BU325 BU326A	55p 75p	BUW95 BUX10	85p 150p	MJE1300 MJE1300	5 600	BYT13-1000 BYV96E	30p 26p	AN316	350p	AN6552 AN6554	45p 80p	BA612 BA614	120p 70p	CX136 CX139A	600p 750p
BC184L BC212	7p 7p	BD678 BD679	40p 40p	BU406 BU406D	60p 85p	BUX11 BUX12	200p 150p	MJE1300 MJE1300	7 100p	BYW96E	36p	AN337 AN360	600p 100p	AN6555 AN6605	50p	BA618 BA631	55p 280p	CX141 CX145	750p 725p
BC212L	7p	BD630	400	BU407	65p	BUX20	3500	MJE1502	8 200p	BYX10 BYX55/600	15p 25p	AN362 AN363	140p 150p	AN6612	35p 60p	BA656	110p	CX150B	325p
BC213 BC213L	7p 7p	BD681 BD682	45p 45p	BU407D BU408	75p 60p	BUX21 BUX22	450p 450p	MJE1502 MJE1503		IN4001 IN4002	3p 3p	AN366	150p	AN6650 AN6651	45p	BA658 BA681A	350p 350p	CX175 CX187	325p 825p
BC214 BC214L	7p 7p	80705 80707	50p 50p	BU408D BU409	75p 85p	BUX23 BUX37	900p 220p	MJE1503 MJE1800	1 400p	1N4003	3p	AN610 AN3211K	160p 375p	AN6652 AN5671K	45p 425p	BA682A BA683A	300p 300p	CX804A CX867	775p 575p
BC237	7p	BD709	50p	BU412	175p	BUX39	450p	MJF1800	4 175p	IN4004 IN4005	3p 3p	AN3215K AN3231K	350p 300p	AN6676	600p	BA684	400p	CX868	525p
BC238 BC239	7p 7p	BD711 BD736	50p 50p	BU413 BU414B	175p 250p	BUX40 BUX41	210p 200p	MJF1820 OC28	350p	IN4006 IN4007	3p 4p	AN3236K AN3310K	450p 325p	AN67805 AN6870	80p 450p	BA685 BA715	400p 45p	CX877 CX79258	300p 550p
BC300 BC301	20p 20p	BD826 BD828	50p 50p	BU415A BU426A	170p 70p	BUX42 BUX47A	200p 220p	OC29 OC35	250p 350p	IN4148 IN5400	2p 9p	AN3312	350p	AN6875 AN6878	150p 65p	BA718 8A728	46p 55p	CX20015 CX20106	A 600p A 75p
BC301 BC302 BC302	20p	BD839	55p	BU433	120p	BUX48A	150p	OC36	250p	IN5401	8p	AN3313 AN3320K	300p 450p	AN6879	225p	BA806	220p	CX20109	140p
BC303 BC304 BC327	20p 25p	BD897 BD899	50p 50p	BU500 BU500D	100p 225p	BUX55 BUX80	800p 180p	S2000A3 S2000AF	175p 175p	IN5402 IN5403	8p 8p	AN3331K AN3792	450p 300p	AN6880 AN6882	75p 300p	BA843 BA1310	130p 160p	CX20187 CXA1001	AP 1600p
BC328	7p 7p	BD977 BDX33	50p	BU505 BU505D	90p 90p	BUX81 BUX84	160p 50p	S2055A S2055AF	175p 200p	IN5404 IN5405	8p	AN3794	325p	AN6884 AN6888	200p 150p	BA1320 BA1330	75p 120p	CXA1019 CXA1019	S 225p
BC337 BC338	7p 7p	BDX37 BDX44	100p	BUS05DF BU506	90p 100p	BUX85 BUX86	50p 30p	S2530A TIP29	100p 15p	IN5406	11p 12p	AN3814K AN3821K	450p 600p	AN6889 AN6913	100p	BA1332	60p	CXA1044	1P 550p
BC441 BC446	28p	BDX47	60p	BU506D	70p	8UX87	50p	TIP29A	22p	IN5407 IN5408	12p 12p	AN3822K AN3830K	600p 800p	AN700	60p 650p	BA1350 BA1355	130p 125p	CXA108	275p
BC477	8p 18p	BDX54C BDX62C	75p 150p	BU506DF BU508A	120p 70p	BUX98A BUZ71	350p 75p	TIP29C TIP29E	25p 40p	RGP10 RGP15	25p 25p	AN3990K AN3991K	300p 400p	AN7010K AN7025K	250p 90p	BA1356 BA1360	100p 160p	CXA108	IS 300p
BC516 BC537	22p 25p	BDX63C BDX64C	175p	BU508AF BU508AP	95p	BUZ71AF BUZ72A	100p 100p	TIP30 TIP30C	25p 25p	RGP30	16p	AN5010	250p	AN7060 AN7062	175p 300p	BA1404 BA1604	120p 125p	CXA1082 CXA119	AS 1000p
BC546 BC547	8p	BDX65	80p	BU508D	90p	BUZ72AF	100p	TIP31A	22p	SR2M	60p	AN5011 AN2020	225p 80p	AN7072	260p	BA2266A	250p	CSA1209	P 400p
BC548	Sp Sp	BDX66C BDX67C	175p 275p	BU508DF BU508DR	115p 130p	BUZ73A BUZ73AF	150p 60p	TIP31C TIP32	27p 24p	I.C. SOCKE	TS	AN5025 AN5033	250p 400p	AN7081K AN7105	200p 170p	BA3306 BA3308	60p 70p	F15754N F15764N	1 250p
BC549 BC550	8p 8p	BDX71 BDX77	70p 175p	BU508V BU508VF	110p 100p	BUZ76A BUZ80	110p 200p	TIP32A TIP32C	21p 28p	8 PIN	4p	AN5034	400p	AN7106K AN7110	135p 75p	BA3312 BA3402	60p 90p	HA1124 HA1125	125p 120p
BC556 BC557	8p 8p	BDX87C BDX88C	175p 150p	BU526 BU536	75p 100p	BUZ80AF	200p 200p	TIP33 TIP33C	50p 60p	14 PIN 16 PIN	5p 6p	AN5070 AN5071	125p 100p	AN7111	100p	BA3406A BA3416B	L 120p	HA1137V	N 150p
BC558	8p	BDW24	55p	BU546	125p	BUZ83 BUZ90A	180p	TIP34	65p	18 PIN 20 PIN	9p 10p	AN5111 AN5132	450p 250p	AN7112 AN7114	45p 120p	BA3422	350p	HA1151 HA1197	176p 130p
BC559 BC560	8p 8p	BDW93 BDW94	50p 50p	BU603 BU606D	125p 225p	BUZ91A BY448	400p 20p	TIP34C TIP35C	60p 65p	22 PIN	12p	AN5135N	K 400p	AN7115 AN7116	110p 90p	BA3505F BA3506A	140p 70p	HA1199 HA1201	130p 225p
BC637 BC639	20p 20p	BDY29 BDY56	225p 225p	BU608D BU626	120p 120p	BYT11 IRF120	25p 225p	TIP36C TIP41A	65p 20p	24 PIN 28 PIN	13p 13p	AN5138N AN5150	400p	AN7117 AN7120	65p 100p	BA3516 BA3520	120p 130p	HA1202 HA1319	125p 200p
BC640	20p	BDY58	500p	BU705	130p	IRF130	475p	TIP41C	22p	40 PIN	159	AN5151 AJ 5210	200p 675p	AN7130	75p	BA3521	225p	HA1338	300p
BCY33 BCY34	200p 200p	BDY90 BDY92	125p 100p	BU706DF BU706F	175p 150p	IRF140 IRF230	550p 550p	TIP42A TIP42C	20p 22p	ZENER DIO	DES	AN5215 AN5222	100p 200p	AN7131 AN7133N	90p 325p	BA3704 BA3706	200p 75p	HA1339/ HA1367	300p
BCY70 BCY71	16p	BF137 BF167	35p 30p	BU724A BU801	100p 70p	IRF240 IRF250	425p 375p	TIP47 TIP48	40p 40p	400 mWatt	1	AN5250	160p	AN7134 AN7140	300p 170p	BA3812L BA3822L	80p S 80p	HA1377 HA1384	120p 600p
BCY72 BD115	16p 30p	BF181 BF183	18p 20p	BU806 BU807	70p 60p	IRF330 IRF340	600p 325p	TIP50 TIP51	60p 80p	2V7 to 39V 1.3 Watts	5p	AN5256 AN5260	150p 300p	AN7141 AN7142	70p	BA3824L	5 75p 300p	HA1388 HA1389	320p 210p
8D124P	50p	BF195	7p	8U807F	75p	IRF350	750p	TIP52	80p	2V7 to 39V	9p	AN5262 AN5265	175p 80p	AN7145	80p 195p	BA4110	75p	HA1392	120p
BD131 BD132	25p 25p	BF199 BF200	8p 16p	BU808DF BU810	300p 110p	IRF450 IRF510 IRF520	650p	TIP54 TIP102	85p 70p	VOLTAGE		AN5315 AN5352	600p 600p	AN7146 AN7147	210p 180p	BA4210 BA4220	85p 60p	HA1394 HA1396	170p 650p
8D133 8D135	50p 20p	8F225 BF240	30p 16p	BU824 BU826	450p 120p	IRF520 IRF530	300p	TIP105 TIP106	65p 65p	REGULATO	RS	AN5411 AN5421	450p	AN7148 AN7149	140p 160p	BA4234L BA4236L	70p 110p	HA1397 HA1398	200p 175p
BD136 BD137	20p 20p	BF245 BF254	25p	BU826A BU902	160p	IRF540	300p	TIP107 TIP110	65p	7805	25p	AN5429	150p 420p	AN7154	180p	BA4402 BA4403	45p	HA1406	120p
BD138	20p	BF255	15p 12p	BU903	110p 110p	IRF610 IRF611	150p 150p	TIP111	40p 40p	7806 7808	25p 25p	AN5431 AN5435	275p 125p	AN7156 AN7158	240p 310p	BA4405	220p 80p	HA11123 HA11211	1700
BD139 BD140	20p 20p	BF256 BF257	18p 18p	BU910 BU912	80p 100p	IRF620 IRF630	200p 150p	TIP112 TIP112H	35p 50p	7812 7815	25p 25p	AN5436N	160p 100p	AN7160 AN7161N	350p 375p	BA4412 BA5101	50p 350p	HA11215 HA11219	
BD144 BD157	90p 38p	BF259 BF262	18p 25p	BU920 BU922	100p	IRF640 IRF642	400p 200p	TIP115 TIP116	30p 30p	7818 7824	25p 25p	AN5512 AN5515	160p	AN7163 AN7166	175p 350p	BA5102 BA5115	140p 75p	HA11221 HA11225	180p
BD166	30p	BF270	18p	BU930	130p	IRF650	200p	TIP117	30p	7905	25p	AN5520 AN5521	550p 100p	AN7168	200p	BA5115L	75p	HA11235	100p
BD175 BD177	30p 30p	BF273 BF311	15p 21p	8U932 BU941	175p 250p	IRF710 IRF720	150p 150p	TIP120 TIP121	37p 35p	7906 7908	30p 30p	AN5560 AN5601K	350p 750p	AN7169 AN7170	225p 260p	BA5204 BA5208A	200p F 110p	HA11244 HA11247	
BD179 BD181	32p 45p	BF336 BF337	20p 20p	BU2508A BU2508AF	130p 130p	IRF730 IRF740	175p 160p	TIP122 TIP125	30p 30p	7912 7915	30p 30p	AN5612	200p	AN7171K AN7172K	400p 325p	BA5402 BA5406	180p	HA11251 HA11412	120p 600p
BD182 BD184	60p	BF338	20p	BU2508D	130p	IRF820	150p	TIP126	40p	7918	30p	AN5513 AN5615	200p 300p	AN7173K	450p	-BA5408	180p	HA11414	300p
8D187	60p 30p	BF362 BF367	30p 13p	BU2508DF BU2520AF	225p	IRF830 IRF840	225p 200p	TIP127 TIP130	35p 30p	7924 78L05	30p 24p	AN5620 AN5622	250p 275p	AN7177 AN7178	375p 180p	BA5413 BA6104	225p 250p	HA11423	250p
BD201 8D202	33p 38p	BF371 BF421	17p 18p	BU2520DF BU2525A	325p	IRF9140 IRF9510	1000p 150p	TIP131 TIP132	30p 30p	78L08 78L12	24p 24p	AN5625	400p	AN7205 AN7213	35p 40p	BA6109 BA6110	110p 225p	HA11702	BN 400p 330p
80203 80204	42p 42p	BF422 BF423	21p 25p	BU2525AF BU2527AF	325p	IRF9511 IRF9520	150p 150p	TIP136 TIP137	40p 65p	78L15 78L18	24p 24p	AN5630 AN5633	375p 350p	AN7216 AN7218	175p 60p	BA6125 BA6137	75p 55p	HA11703 HA11706	400p
B0222	31p	BF455	12p	BUF405A	200p	IRF9530	400p	TIP162	110p	78L24	24p	AN5635N AN5640	330p 500p	AN7220	85p	BA6138	130p	HA11710	500p
BD225 BD232	31p 31p	BF458 BF462	19p 50p	BUH315 BUH315D	200p 175p	IRF9531 IRF9540	200p 300p	TIP141 TIP142	65p 75p	79L05 79L08	35p 35p	AN5700 AN5701	90p 150p	AN7222 AN7223	76p 105p	BA6146 BA6149L		HA11713 HA11715	250p
BD233 BD234	30p 32p	BF471 BF472	28p 28p	BUH515 BUH515D	200p 250p	IRF9541 IRF9610	200p 200p	TIP145 TIP146	50p 70p	79L12 79L15	35p 35p	AN5710	100p	AN7224 AN7225	76p 175p	BA5154 BA6208	60p 175p	HA11716 HA11718	480p 700p
BD235 BD236	28p 30p	BF479 BF494	30p	BUH517	275p	IRF9620	225p	TIP147 TIP150	80p	LM309K	100p	AN5712 AN5720	180p 70p	AN7254	150p	BA6209	85p	HA11724	650p
BD237	21p	BF495	15p 16p	BUH517D BUH715	175p 425p	IRF9622 IRF9630	200p 325p	TIP151	90p 60p	LM317T LM323K	100p 350p	AN5722 AN5730	140p 160p	AN7256 AN7273	250p 75p	BA6218 BA6220	85p 55p	HA11741 HA11744	330p
BD238 BD239	24p 30p	8F595 8F596	16p 16p	BUT11A BUT11AF	55p 55p	IRF9640 IRFD9220	375p 100p	TIP2955 TIP3055	50p 50p		800p 700p	AN5732 AN5750	120p	AN7310 AN7311	60p 90p	BA6222 BA6227	130p 50p	HA11745 HA11749	350p
BD240 BD241A	40p 40p	BF615 BF617	30p 30p	BUT12 BUT13	80p 310p	IRFBC30 IRFBC40	200p 400p	TIPL760 TIPL762A	100p 200p		800p	AN5753	75p 130p	AN7312 AN7315	70p 40p	BA6229 BA6235	130p 50p	HA11751 HA11752	1500p
BD243A	50p	BF760	400	BUT18	80p	IRFP140 IRFP150	250p	TIPL763A	200p			AN5763 AN5790	250p 240p	AN7330	110p	BA6238A	130p	HA11839	NT 375p
BD244 BD245	50p 50p	BF763 BF870	40p 22p	BUT18AF BUT30V	80p 1700p	IRFP240	300p 300p	TIPL791A 2N2369	80p 15p	LEDs		AN5791 AN5836	225p 450p	AN7362 AN7363	200p 225p	BA6239A BA6247	130p 150p	HA11847 HA12002	220p
BD246A BD265	50p 45p	BF871 BF960	22p 38p	BUT56A BUT76A	100p 80p	IRFP250 IRFP350	400p 325p	2N2646 2N2904	40p 20p	3mm RED	5p	AN5862K	225p	AN7410 AN7411	150p 50p	BA6248 BA6259	140p 170p	HA12003 HA12005	180p
BD267 BD269	45p 45p	BF961 BF964	35p 38p	BUT90 BUT92	1300p 1200p	IRFP450 IRFP460	400p 775p	2N2905 2N2906	20p 18p	GREEN	8p 8p	AN5900 AN608P	130p 125p	AN7414 AN7415	275p 70p	BA6280A	F 300p	HA12010 HA12016	300p
BD278	50p	BFQ232	75p	BUV18	650p	1RFP9140	1450p	2N2907	18p	5mm RED	1	AN620 AN6130	250p 130p	AN7470	100p	BA6294	250p	HA12017	100p
BD311 BD314	100p 100p	BFQ252A BFR90	85p	BUV20 BUV21	650p 400p	IRFP9240 IRFPC50	500p 600p	2N3019 2N3053	28p 18p	YELLOW	5p 8p	AN6135 AN6209	120p 350p	AN8053 AN8275	200p 250p	BA6302A BA6304	120p	HA12026 HA12038	NT 140p
8D315 8D317	150p 150p	BFR91 BR100	99p 14p	BUV23 BUV24	475p 350p	IRFRC20 IRFZ20	250p 65p	2N3054 2N3055	40p 38p	GREEN	8p	AN6250	50p	AN8370 AN8377	1000p 400p	BA6305 BA6321	140p 250p	HA12044 HA12045	350p
BD331	40p	BR103	37p	BUV25	110p	IRFZ42	275p	2N3055H	50p	Contraction of the		AN6247 AN6270	200p 400p	AN8387	350p	BA6328	250p	HA12047	450p
BD332 BD361	40p 60p	BR303 BU105	85p 80p	BUV26 BUV27	150p 125p	IRFZ44 MJ2501	275p 100p	2N3440 2N3441	45p 175p	RECTANGU LEDs	LAR	AN6300 AN6306	600p 380p	BA222 BA225	65p 100p	BA6334 BA6410	75p 220p	HA12058 HA12088	375p
BD362 BD370	60p 30p	BU108 BU109	100p 80p	BUV28 BUV37	110p	MJ2955 MJ3000	55p 100p	2N3442 2N3771	85p	5mm x 2.5r		AN6310	200p	BA314 BA301	40p 55p	BA6411 BA6418N	250p 100p	HA12116 HA12411	175p
8D371 8D410	30p 50p	BU110 BU111	90p 100p	BUV46A BUV47	75p	MJ3001 MJ4032	100p	2N3772 2N3773	90p	RED YELLOW	5p 8p	AN6320 AN6326N	180p 250p	BA311 BA313	80p 60p	BA64355 BA6993	425p 150p	HA12412 HA12413	175p
BD433	28p	BU124	60p	BUV48A	120p 175p	MJ4032	175p 175p	2N3819	100p 29p	GREEN	80	AN6332	320p	BA333	800	BA7001	150p	HA12430	
				1	10000		The same in the second	and the second second			100			A REAL PROPERTY.		The second second		2004ct 2.2	and the second se

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HA13001	Price	Part LA2211	Price 350p	Part LA7054	Price 350p	Part LC7881B	Price 135p	MC1455	Price 45p	Part SAB2022	Price 525p	Part STK2250	Price 650p	Part STK5468	300p	Part STR7001	Price 600p	Part TA72678F	Price
HA13002 HA13006	200p	LA2800 LA3120	350p 200p	LA7060 LA7096	150p 200p	LC7881M LF347	325p 110p	MC1488 MC1489	35p 35p	SAB3012 SAB3013	675p 200p	STK3041 STK3042	370p 375p	STK5471 STK5472	330p 375p	STR9005 STR9012	400p 450p	TA7269	260p 170p
HA13007 HA13108	300p 280p	LA3150 LA3160	200p 120p	LA7113 LA7116	275p 125p	LF353 LF355	48p 60p	MC1496 MC3302	65p 50p	SAB3017 SAB3021	320p 450p	STK3044 STK3062	500p 500p	STK5473 STK5474	480p 500p	STR10006 STR11006	450p 400p	TA7271	220p 260p
HA13117 HA13118	175p 140p	LA3161 LA3210	40p 65p	LA7123 LA7210	1300p 60p	LF357 LF398	70p 300p	MC3401 MC3423P	46p 100p	SAB3029 SAB3035	526p 600p	STK3082 STK3102	550p	STK5476 STK5477	350p 450p	STR12006 STR13006	450p 500p	TA7273 TA7274	300p 210p
HA13115 HA13127	350p	LA3226 LA3246	60p 75p	LA7212 LA7214	150p 150p	LH2426S LM301	600p 26p	MC3488A MC34063	AP 300p	SAB3036 SAB3037	725p 700p	STK3106 STK3122	2500p	STK5478 STK5479	380p 300p	STR15006 STR16006	500p 500p	TA7279P TA7280	326p 190p
HA13128 HA13130	450p	LA3300	140p 110p	LA7220 LA7222	125p 110p 150p	LM311 LM319	35p 165p	MN12201 MN1226	450p	SAB3042 SAB3064	825p 130p	STK3152 STK3156	500p	STK5481 STK5482	520p 285p	STR17006 STR20005	500p 450p	TA7281 TA7282	200p 160p
HA13135 HA13135	600p	LA3361 LA3365	100p 70p	LA7224	250p	LM324 LM3352 LM339	30p 120p 35p	MN1228 MN1276 MN1280	600p 1300p	SAB3209 SAB3210 SAB6456	225p 250p 125p	STK4017 STK4019	400p 480p	STK5483 STK5486	440p 450p	STR20012 STR20015	450p 450p	TA7210 TA7283	200p 200p
HA13150 HA13151 HA13=03	875p	LA3370 LA3373 LA3375	70p 70p 300p	LA7292 LA7294 LA7295	275p 200p 160p	LM348 LM358	50p 45p	MN3004 MN3005	70p 600p 2000p	SAB8048 SAB8051	225p	STK4021 STK4024 STK4025	380p 550p 530p	STK5487 STK5488 STK5490	525p 480p 450p	STR30110 STR30115 STR30120	330p 275p 400p	TA7284P TA7288 TA7291P	400p 220p 200p
HA13406	400p 350p	LA3376 LA3380	80p 300p	LA7297 LA73054	120p 350p	LM380 LM381	80p 150p	MN3011 MN3101	4000p	SDA2003	450p 325p	STK4026	480p 550p	STK5632 STK5720	450p 400p	STR30123 STR30125	450p 650p	TA7292P TA7294P	325p 450p
HA13412	600p	LA3390 LA3400	250p	LA7306 LA7311	.70p 200p	LM382 LM386	130p 60p	MN3102 MN3207	110p 375p	SDA2005 SDA2007	700p 300p	STK4032 STK4034	li 610p	STK5725 STK5730	450p 450p	STR30130 STR40090	250p 350p	TA7299 TA7302P	200p 75p
HA13432 HA13443	450p	LA3401 LA3410	90p 150p	LA7320 LA7323	120p 325p	LM387 LM389N	100p 105p	MN3208 MN60308	950p 350p	SDA2008 SDA2112	400p 450p	STK4036 STK4038	470p 680p	STK6316 STK63248	300p 500p	STR40115 STR41090	600p 400p	TA7303 TA7307	70p 100p
HA17524 KA2302	100p	LA3430 LA3600	135p 60p	LA7390 LA7331	350p 250p	LM393 LM431	45p 50p	MN6163A MTA001N	4 600p	SDA2120 SDA2131	200p 225p	STK4040 STK4042	1 800p	STK6327 STK6328A	1200p 800p	STR43111 STR44115	950p 5 50p	TA7310 TA7312	100p 120p
KA2136 H42131	150p 110p	LA3605 LA3607	100p 125p	LA7332 LA7340	225p 300p	LM710 LM723	45p 40p	NE555 NE556	20p 40p	SDA2208 SDA4212	450p 775p	STK4044 STK4046	800p 950p	STK6431 STK6607	850p 400p	STR45111 STR50020	550p 450p	TA7313 TA7314	70p 175p
KA2296 KA2299 KA2276	150p 125p 230p	LA4030 LA4031 LA4032	180p 140p	LA73/5 LA7391 LA752	150p 550p 200p	LM741DIL LM741ME	T 45p	NE558 NE565 NE567	80p 110p	SDA5241 SDA5243 SDA5343	725p -2 450p	STK4048 STK4050 STK4060		STK6722 STK6732	725p 1000p	STR50092 STR50103	550p A 260p	TA7315 TA7317P	200p 120p
KA2212 KA2213	65p 130p	LA4051 LA4100	140p 160p	LA7530 LA7535	200p 200p 175p	LM747 LM1017 LM1035N	55p 200p 360p	NE571 NE592	115p 290p 85p	SDA5640 SDA5642	1450p 200p 450p	STK4065 STK4101	510p 650p 500p	STK6822 STK6922 STK6932	900p 500p 525p	STR50113 STR50115 STR51041	500p 500p 500p	TA7320P TA7322 TA7323	200p 130p 80p
CAZZYA COZZZA	100p 60p	LA4101 LA4102	85p 80p 100p	LA7545 LA7550	160p 275p	LM1040N	660p 225p	NE5532P SAA 1000	140p 350p	SGSF444 SGFS465	500p 500p	STK4111 STK4112	500p 500p	STK6962 STK6972	275p 490p	STR50213 STR53041	500p 500p	TA7234 TA7325	75p 90p
CATTLE:	75p 100p	LA4110 LA4120	120p 270p	LA7555	150p 500p	LM1203A	N 225p 330p	SAA1004 SAA1005	650p 325p	SLA4031 SLA7020	750p 450p	STK4121 STK4122	480p 560p	STK69818 STK6982	600p 600p	STR54041 STR55041	350p 500p	TA7326 TA7328	200p
CA2253 CA2254	100p 100p	LA4138 LA4140	105p 60p	LA7580 LA7581	675p 650p	LM1581N LM1856	375p 250p	SAA1006 SAA1008	300p 450p	STA301A STA341M		STK4131 STK4132	480p	STK6982H STK7216	420p	STR56041 STR58041	550p 326p	TA7330P TA7331P	80p 80p
CA2254 GA2309 CA2309	76p 175p	LA4142 LA4145	65p 65p	LA7710 LA7800	250p 90p	LM 1889		SAA 1010 SAA 1024	400p 250p	STA401A STA403A	220p 270p	STK4133 STK4141	420p	STK7217 STK7225	400p 500p	STR59041 STR60001	350p 525p	TA7333 TA7335	100p 85p
Carles 2	150p 225p 125p	LA4160 LA4162 LA4178	100p 110p 150p	LA7801 LA7802 LA7806	100p 300p 250p	LM1295N LM2901N LM2902N	275p 35p 40p	SAA1025 SAA1026 SAA1027	250p 400p 400p	STA405A STA431A STA432A	280p 250p	STK4142 STK4147 STK4151	530p 1450p 680p	STK7226 STK7251	600p 500p	STR80145 STR81145	475p 450p	TA7336 TA7337P TA7339P	180p 175p
G2512 G2512 G25134	175p 200p	LA4180 LA4182	150p 180p	LA780E LA 7820	250c 100p	_M2903N	40p 40p	SAA1029 SAA1042	150p 325p	STA434A STA435A	220p 270p 270p	STK4152 STK4161	650p 650p	STK7253 STK7308 STK7309	450p 350p 400p	STR90120 STRD1205 STRD1406		TA7341 TA7342P	175p 250p 70p
U22427 6462135	100n	LA4190	300p 140p	LA7823 LA7824	290a 130e	LM3909	100p 200p	SAA1043 SAA1044	P 675p 400p	STA441C STA451C	220p 280p	STK4162 STK4164	550p	STK7310 STK7348	470p 400p	STRD 1706 STRD 1806	450p	TA7343 TA7347P	120p 120p
G442816	AH 400p	LA4200 LA4201	130p 120p	LA7830 LA7831	230p 175p	_M3914 _M3915	160p	SAA1056 SAA1057	300p 375p	STA456C STA471	240p 210p	STK4171 STK4172	9000	STK7356 STK7358	425p 440p	STRD 1816 STRD 1906	400p 700p	TA7348P	125p 175p
C=5283	150p	LA4260 LA4261	230p 300p	LA7832 LA7835	130p	UM3916 UM8363	270p 320p	SAA1058 SAA1060	225p 375p	STA901M STK0025	280p 420p	STK4181 STK4182	680p	STK7402 STK7404	560p 400p	STRD3035 STRD4412	300p 500p	TA7354P TA7357	65p 340p
CA72270 GA7313	200p 45p	LA4265 LA4270	125p 300p	LA7837 LA7835	150p 200p	LM2550	175p 150p	SAA1061 SAA1062	250p 250p	STK0029 STK0039	360p 600p	STK4191 STK4192	700p 700p	STK7406 STK7408	650p 675p	STRD4420 STRD4512	400p	TA7358 TA7359P	85p 90p
-149V	300p 250p 200p	LA4282 LA4420 LA4422	350p 140p	LA7850 LA7851	225¢ 290¢	12700	125p 500p	SAA1063 SAA1064	250p 275p	STK0040 STK0049	520p 510p	STK4211 STK4211	V 800p	STK7410 STK7458	1500p 1250p	STRD5441 STRD5541	560p 450p	TA7361 TA7362	125p 150p
1290 1272 1272M	200p 200p 110p	LM4425/ LA4430	130p 4 200p 130p	LA7918 LA7913 LA7930	150p 90p 350p	14491531 1445481 145359	600p 700p 200p	SAA1070 SAA1073 SAA1075	550p 325p 350p	STK0050 STK0059 STK0060	440p 620p 820p	STK4221 STK4231 STK4241	1200p 700p 1050p	STK7554 STK7561	600p 650p	STRD6008 STRD6009	E 450p	TA7364P TA7366P	175p 65p
_2908 _2918	225p 300p	LA4440 LA4445	200p 200p	LA7940 LA7953	2000	MSC115P MSD117P	320p 500p	SAA1086 SAA1089	175p 325p	STK0080 STK0080	1100p 580p	STK4241 STK4241 STK4272	V 1250p 500p	STK7562 STK7563 STK7573	1000p 800p 400p	STRD6018 STRD6602 STRD6601	475p	TA7368P TA7373F TA7374	35p 150p 175p
2538	750p 225p	LA4446 LA4460	170p 120p	LA9200 LB1205	300p 300p 170p	M50119P	525p 750p	SAA1101 SAA1124	700p 200p	STK011 STK015	330p 440p	STK4273 STK4301	550p 500p	STK7576 STK7703	1500p 1000p	STRM6545	5 900p	TA7376P TA7378P	100p 60p
_253C _293D	325p 225p	LA4461 LA4466	120p 225p	LB1216 LB1258	150c 100p	M50461	350p 300p	SAA1130 SAA1250	550p 280p	STK016 STK025	760p 650p	STK4311 STK4332	650p 365p	STK8050 STK8250	750p 500p	STRM6549 STRS5741		TA7401 TA7402P	250p 200p
_253E _254	250p 475p	LA4470 LA4475	300p 225p	LB1258 LB1274	739	M50786	500p 600p	SAA1251 SAA1271	380p 400p	STK050 STK077	1600p 520p	STK4352 STK4362	500p 450p	STK8250 STK8280	1200p 1850p	STR\$5941 STR\$6307	750p 600p	TA7403 TA7404	325p
2.295 	460p 525p 400p	LA4476 LA4480 LA4485	225p 225p	LB1290 LB1292	129p 110p	151914.	120p	SAA1274 SAA1290	280p 750p	STK078 STK080	580p 550p	STK4372 STK4392	490p 500p	STK73405 STK73410	350p	STRS6308 STRS6309	600p 600p	TA7405P TA7411AP	
_298 _485A 1,482	525p 400p	LA4495	300p 250p 260p	LB1405 LB1407 LB1409	75p 130p 200p	151751P	300p 250p 250p	SAA1293 SAA1294 SAA1300	550p 800p 200p	STK082 STK084 STK085	540p 600p 900p	STK4412 STK4432 STK4773	450p 600p 820p	STK7340 II STK73605 STK73907	500p 375p 700p	STRS6707 STRS6708 TA7054	1000p 700p 190p	TA7415P TA7417AP TA7521P	360p 225p 350p
L4978 L7028	525p 400p	LA4498 LA4500	275p 200p	LB1412 LB1415	300p	151164A	80p	SAA1310 SAA1350	200p 275p	STK086 STK0100	800p 900p	STK4793 STK4803	800p 640p	STK78617 STR370	2400p 300p	TA7061	115p 200p	TA7607	200p 360p
1.702N	325p 150p	LA4505 LA4508	220p 200p	LB1416 LB1426	1250	M51782	110p 85p	SAA1351 SAA1900	750p	STK01001 STK420	1200p	STK4813 STK4833	800p 700p	STR371 STR350	400p 350p	TA7066 TA7075P	120p 300p	TA7609	170p 210p
1.2722	175p 325p	LA4510 LA4520	100p 170p	LB1450 LB1615	110p 270p	M51231P	200p 550p	SAA3004 SAA3006	400p 225p	STK430 STK433	500p 400p	STK4843 STK4853	720p 730p	STR381 STR383	390p 410p	TA7089 TA7102P	300p 500p	TA7612 TA7613AF	300p 90p
L6203 L6210	600p 250p	LA4550 LA4555	200p 120p	LB1620 LB1622	210p 220p	M513164	300p	SAA3007 SAA3008	P 200p	STK435 STK436	375p 430p	STK4863 STK4873	700p 850p	STR384 STR440	350p 800p	TA7119 TA7120	150p 56p	TA7614 TA7616	170p 300p
L6221AS L6506 LA1130	300p 300p 240p	LA4557 LA4558 LA4570	150p 125p	LB1630 LB1639 LB1640	300p 300p	MS1329 MS1358P	200p 400p	SAA3010 SAA3027 SAA3049	P 376p	STK437 STK439 STK441	460p 500p	STK4893 STK4913	1000p 900p	STR441 STR442	1200p 1600p	TA7124 TA7130P	250p 85p	TA7621 TA7622	300p 420p
A1135	120p	LA4571	130p 175p 175p	LB1641 LB1642	150p 75p 150p	1358F 1365P 1451366P	150p 350p 360p	SAA4700 SAA5000	425p 200p	STK443 STK457	680p 700p 470p	STK5314 STK5315 STK5322	475p 500p 500p	STR450A STR451 STR452	700p 800p 600p	TA7137 TA7140 TA7141	60p 100p 825p	TA7628 TA7629 TA7630	110p 220p 200p
LA1150	150p 90p	LA4597 LA4620	125p 400p	LB1645	106 0 200p	151361P	200p	SAA5010 SAA5012	220p 400p	STK459 STK450	560p 660p	STK5323 STK5324	600p 450p	STR453 STR454	500p 1300p	TA7150P TA7157	250p 100p	TA7632 TA7640	400p 90p
LA1177	130p 75p	LA4630 LA4700	325p 350p	LB1649 1.B3500	190p 125p	M513877 M51392P	600p 300p	SAA5020 SAA5030	350p 440p	STK461 STK463	600p 950p	STK5325 STK5326	3700	STR455 STR456	550p	TA7172P TA7193	150p 320p	TA7641 TA7644BP	140p
LA1185	150p 35p	LA4705 LA5005	400p 90p	LC4968 LC7011	55p	ME1393A	P 350p P 450p	SAA5040. SAA5040	B 400p	STK465 STK501	720p 550p	STK5330 STK5331	850p 300p	STR457 STR470	600p 400p	TA7200 TA7205	200p 150p	TA76545P TA7658	65p 100p
LA1201	75p 75p	LA5112 LA5511	200p 50p	LC7060 LC7120	600p 350p	M51397A	350p	SAA5041 SAA5042	550p 425p	STK561 STK563	450p 415p	STK5332 STK5333	180p 1000p	STR1096 STR1195	275p 350p	TA7207 TA7208	150p 125p	TA7659P TA7660P	400p 325p
LA1207	120p 140p 80p	LA5512 LA5522 LA5523	50p 45p 150p	LC7130 LC7131 LC7132	300p 250p 400p	M51496P M51533 M51544	275p 300p	SAA5050 SAA5051	650p 400p 500p	STK583 STK760	500p 600p 400p	STK5335 STK5336	350p 350p	STR1229 STR2005	325p 400p	TA7210 TA7214	200p 220p	TA7666P TA7668	100p 100p
LA1230	130p	LA5524 LA5527	80p	LC7137 LC7181	450p 350p	W51948 M54523P	150p 150p 200p	SAA5052 SAA5054 SAA5230	500p 500p 850p	STK770 STK772 STK772B	650p 480p	STK5337 STK5338 STK5339	500p 295p 400p	STR2012 STR2013 STR2015	400p 300p 550p	TA7217 TA7220 TA7222	145p 220p 90p	TA7672 TA7676AP	400p 450p 475p
LA1240	80p	LA5530 LA5531	65p 65p	LC7185	350p 300p	M54563P M58484	200p 500p	SAA5231 SAA5240	300p PA 750p	STK780 STK795	576p 450p	STK5340 STK5342	350p 245p	STR2024 STR2105	575p 600p	TA7223 TA7225	210p 300p	TA7680AP	200p
LA1250 LA1251	75p 75p	LA5537 LA5655	45p 175p	LC7287 LC7215	275p 160p	M51515 M51518	260p 200p	SAA5243 SAA5244	PE 800p	STK 1039 STK 1040	460p 640p	STK5343 STK5353	380p 400p	STR2124 STR3105	676p 525p	TA7226 TA7227	290p 170p	TA7687AP TA7688	100p 150p
LA1265	125p 130p	LA5658	225p	LC7217 LC7218	350p	M51995P M51977P	250p 300p	SAA5246 SAA5246	P 750p	STK1049 STK1050	700p 650p	STK5361 STK5362 STK5372	375p 400p	STR3113 STR3115	225p 400p	TA7230 TA7232	100p 95p	7A7698 TA7699	400p 600p
L41267 LA1354 LA1363	150p 225p 90p	LA5667 LA5700	200p 300p	LC7230	700p 550p	M52307P M54646A		SAA5250 SAA5351	375p	STK1060 STK1070	700p 850p	STK5373	260p 375p	STR3123 STR3125	400p 480p	TA7233 TA7237	120p 300p	TA7705	300p 150p
_11364	200p 120p	LA6339 LA6355 LA6510	35p 50p 150p	LC7351 LC7354 LC7432	200p 200p 425p	MB3708 MB3712 MB3713	275p 140p 130p	SAA7000 SAA7020 SAA7210	550p 600p P 1300p	STK1080 STK2025 STK2028	940p 620p 500p	STK5391 STK5392 STK5421	375p 500p 450p	STR3130 STR3135 STR3212	500p 250p 275p	TA7238 TA7240 TA7241	400p 160p 165p	TA7719P TA7727P TA7750	200p 125p 200p
LA 1368	220p 200p	LA6515 LA6520	150p 175p	LC7522 LC7535	425p 350p 300p	MB3713 MB3714 MB3715	225p 250p	SAA7220 SAA7274	PA 550p	STK2028 STK2029 STK2030	480p 875p	STK5422 STK5431	450p 375p 590p	STR3212 STR3214 STR3215	275p 275p 275p	TA7242 TA7243	190p 320p	TA7757 TA7769	200p 200p 130p
1132	170p 120p	LA6531 LA7007	250p	LC7537/10 LC7537/N	400p 450p	MB3722 MB3730	200p 350p	SAA7280 SAA9050	P 1450p 450p	STK2038 STK2048	700p 950p	STK5434	570p	STR3315 STR4090A	275p 650p	TA7245 TA7245BP	225p	TA7772P TA7784	150p 250p
_A-305	175p 130p	LA7011 LA7016	220p 45p	LC7560 LC7565	750p 300p	MB3731 MB3732	220p 240p	SAA9057 SAB0600	475p 600p	STK2058 STK2101	V 1600p 1050p	STK5441 STK5443	400p 575p	STR4142 STR4211	450p 370p	TA7248P TA7250B	575p 325p	TA7792P TA7796P	260p 75p
	300p 150p	LA7018 LA7019	100p 130p	LC7582E	300p 175p	MB3735 MB3756	400p 160p	SAB0601 SAB0602	525p 625p	STK2110 STK2125	550p 580p	STK5446 STK5451	360p 390p	STR4512 STR5015	400p 500p	TA72518P TA7256P	325p 226p	TA8101N TA8105N	230p 140p
	200p 270p	LA7033 LA7042	400p 280p	LC7815H	175p 280p	MB3759 MB3771	200p 110p	SAB1009 SAB1016	600p	STK2129 STK2139	750p 676p	STK5461 STK5462	500p 500p	STR5100 STR5214	650p 475p	TA7259P TA7262P	225p 400p	TA8110AP TA8119P	110p 70p
	150p 190p 150p	LA7046 LA7051	300p 130p	LC7820 LC7821N	325p 250p	MB3773 MB8719	360p	SAB1046 SAB2015	525p	STK2155 STK2230	900p 470p	STK5464 STK5466	300p 500p	STR5315 STR5412	575p 350p	TA7263P TA7265AP	325p 300p	TA8122AN TA8127N	100p
	anb	LA7053	130p	LC7822N	160p	MC1391	120p	SA82016	P 150p	STK2240	740p	STK5467	400p	STR6020	325p	TA7267	220p	TA8132AN	200p

			L	INE	AR	IC	s/J	AP/	AN	ESE	ΞT	RA	NS	IST	OR	S		150	
Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
TA8164P TA8184P TA8189P TA8200A	100p 350p 130p 4 325p	TDA1180 TDA1185 TDA1190 TDA1200	A 190p 80p	TDA2760 TDA2780 TDA2791 TDA2795	600p 275p	TDA465 TDA4670 TDA4680 TDA4689	475p	TDA8391 TDA8395 TDA8405 TDA8415	675p 450p 550p	UPC10040 UPC1009 UPC1018	950p 170p	2SA771 2SA773 2SA777	90p 50p 35p	2SA1177 2SA1179 2SA1182	25p 20p 20p	2SB561 2SB562 2SB564	30p 20p 15p	2SC738 2SC739 2SC761	15p 150p 110p
TA8201A8 TA8205 TA8207K	300p 250p 175p	TDA1220 TDA1235 TDA1236	75p	TDA2822 TDA2824 TDA2840	M 60p 85p	TDA400 TDA4700 TDA4714 TDA4714	A 750p C 350p	TDA8415 TDA8416 TDA8417 TDA8421	650p 625p 550p 500p	UPC1020 UPC1023 UPC1024 UPC1025	200p 60p 12 75p 230p	2SA778 2SA781 2SA786 2SA794	100p 150p 25p 50p	2SA1184 2SA1185 2SA1186 2SA1198	120p 200p 500p 40p	2SB566 2SB596 2SB598 2SB598 2SB600	90p 50p 30p 500p	25C762 25C783 25C790 25C792	150p 85p 50p
TA8210 TA8211AI TA8214K	300p 200p 260p	TDA1251 TDA1270 TDA1327	150p 150p 200p	TDA3047 TDA3048 TDA3082	100p 130p 200p	TDA4718 TDA4729 TDA4800	A 500p 750p 350p	TDA8425 TDA8432 TDA8433	500p 550p 600p	UPC1026 UPC1028 UPC1031	95p 90p	2SA798 2SA812 2SA814	30p 15p 60p	2SA1201 2SA1202 2SA1202 2SA1204	40p 25p 225p	2SB601 2SB605 2SB631	60p 25p 40p	25C805 25C805 25C828 25C829	380p 225p 20p 15p
TA8215 TA8216H TA8217P TA8220AI	300p 300p 120p	TDA1405 TDA1410 TDA1412	35p	TDA3083 TDA3190 TDA3301	200p 100p B 280p	TDA4810 TDA4814 TDA4850	250p A 300p 475p	TDA8440 TDA8442 TDA8443	300p 200p 350p	UPC1032 UPC10350 UPC10430	60p 110p 126p	2SA816 2SA817 2SA825	70p 20p 20p	2SA1206 2SA1207 2SA1208	60p 25p 70p	2SB632 2SB633 2SB641	45p 80p 12p	25C839 25C867 25C870	20p 900p 100p
TA8220A TA8221A TA8225H TA8225L		TDA 1506 TDA 1508 TDA 1510 TDA 1510 TDA 1512	176p 170p	TDA3310 TDA3410 TDA3420 TDA3501	150p	TDA4851 TDA4852 TDA4860 TDA4866	400p 200p	TDA8444 TDA8451 TDA8452 TDA8453	200p 400p 200p 350p	UPC1158 UPC1161 UPC1167 UPC1170	1 70p 110p 125p 150p	2SA836 2SA837 2SA839 2SA841	20p 200p 110p	2SA1209 2SA1210 2SA1215	100p 120p 600p	2SB647 2SB648 2SB649	20p 45p 35p	2SC897 2SC900B 2SC930	175p 30p 15p
TA8227 TA8229K TA8400P	250p 200p 200p	TDA1514 TDA1515 TDA1516	A 450p A 200p	TDA3502 TDA3504 TDA3505	450p 300p 275p	TDA4881 TDA4935 TDA4940	200p 300p	TDA8461 TDA8490 TDA8540	950p 350p 250p	UPC1173 UPC11760 UPC11760	200p 120p	25A841 25A844 25A847 25A854	20p 20p 25p 30p	2SA1216 2SA1217 2SA1220 2SA1221	550p 100p 75p 70p	2SB673 2SB676 2SB688 2SB703	100p 85p 90p 90p	25C936 25C941 25C944 25C945	300p 15p 140p 10p
TA8410K TA8410P TA8432 TA8605N	200p 200p 200p	TDA1517 TDA1519 TDA1519		TDA3506 TDA3507 TDA3510	260p 450p 350p	TDA4942 TDA4944 TDA4950	250p 120p	TDA8702 TDA8703 TDA8708	275p 500p 900p	UPC11800 UPC185H2 UPC1186	200p 400p 80p	2SA861 2SA872 2SA872A	45p 25p 50p	2SA1222 2SA1226 2SA1227	50p 25p 250p	2SB705 2SB707 42SB716	200p 200p 20p	2SC950 2SC959 2SC980	40p 225p 40p
TA8606N TA8607P TA8611A	350p 350p 320p 250p	TDA1520 TDA1521 TDA1522 TDA1522 TDA1524	275p 250p 110p 200p	TDA3520 TDA3530 TDA3540 TDA3541	650p 350p 200p 175p	TDA5030 TDA5140 TDA5330 TDA5331	A 250p T 300p	TDA8730 TDA8732 TDA8735 TDA8740	225p 400p 175p 625p	UPC1187 UPC1188H UPC1191 UPC1197	150p 350p 300p 140p	2SA879 2SA884 2SA885 2SA885	30p 100p 35p 45p	2SA1232 2SA1237 2SA1238 2SA1238	180p 25p 30p 30p	258718 258727 258733 258734	60p 100p 75p 35p	2SC982 2SC983 2SC1000 2SC1001	20p 120p 20p 950p
TA8615N TA8628N TA8631	480p 350p 500p	TDA 1526 TDA 1534 TDA 1540	225p 2000p 420p	TDA3560 TDA3561 TDA3561	260p 300p A 300p	TDA5332 TDA5500 TDA5600	T 150p 400p 450p	TDA8741 TDA8808T TDA8809T	550p 325p 350p	UPC1210 UPC1215	200p 150p	2SA887 2SA893 2SA896	20p 15p 25p	25A1240 25A1242 25A1244	45p 80p 120p	2SB737 2SB739 2SB744	20p 22p 55p	2SC1008 2SC1010 2SC1012	20p 225p 75p
TA8632N TA8644N TA8646 TA8653N	550p 425p 375p 1500p	TDA1541 TDA1542 TDA1543 TDA1552	750p 250p 300p 350p	TDA3562 TDA3562 TDA3563 TDA3564	TF 300p	TDA5660 TDA5700 TDA5701 TDA5708	200p 200p	TDA9045 TDA9080 TDA91020 TDA9403		UPC1222 UPC1225F UPC1227V	225p	2SA899 2SA900 2SA904	40p 45p 20p	2SA1245 2SA1246 2SA1248	55p 80p 35p	258750 258753 258754	60p 100p 80p	2SC1013 2SC1014 2SC1030	170p 140p 160p
TA8659AN TA8690N TA8691N	900p 700p 450p	TDA1553 TDA1555 TDA1557	AQ 375p Q 375p Q 350p	TDA3565 TDA3566 TDA3567	275p 280p 350p	TDA5709 TDA5800 TDA5820	450p 600p	TDA9500 TDA9503 TDA9513	180p 750p 150p 300p	UPC1228F UPC1230 UPC1237F UPC1238	200p	2SA907 2SA909 2SA912 2SA913	550p 500p 70p 100p	2SA1249 2SA1252 2SA1253 2SA1255	100p 20p 30p 30p	2SB764 2SB765 2SB772 2SB774	30p 70p 25p 50p	2SC1046 2SC1047 2SC1050 2SC1051	250p 20p 280p 250p
TA8701A TA8718N TA8720 TA8739P	550p 525p	TDA1558 TDA1560 TDA1571	2 675p 300p	TDA3569 TDA3570 TDA3580	300p 375p 400p	TDA5832 TDA5850 TDA5930		TDA9800 TDA9821 TEA0652	300p 250p 150p	UPC1241F UPC1242F UPC1245V	150p 150p 130p	2SA914 2SA915 2SA916	90p 30p 30p	2SA1257 2SA1258 2SA1261	30p 70p 150p	258775 258776 258788	100p 110p 35p	2SC1061 2SC1069 2SC1070	85p 175p 65p
TA8872N TA8550 TBA120S	450p 450p 25p 40p	TDA 1572 TDA 1574 TDA 1576 TDA 1578	175p 125p 170p 4 210p	TDA3586 TDA3590 TDA3591 TDA3592	750p 300p 360p A 350p	TDA6100 TDA6101 TDA6111 TDA6111	Q 120p Q 225p	TEA0655 TEA0655 TEA0665 TEA1002	80p 300p 300p 650p	UPC1270H UPC1274V UPC1277 UPC1278	250p 250p 240p 240p	2SA921 2SA928A 2SA933 2SA934	40p 25p 30p 30p	2SA1262 2SA1263 2SA1264 2SA1265	110p 280p 280p 200p	2SB791 2SB794 2SB795 2SB810	130p 40p 45p 15p	2SC1079 2SC1080 2SC1096 2SC1098	300p 225p 40p 120p
TBA396 TBA520 TBA530	70p 120p 100p	TDA1579 TDA1589 TDA1591	200p 275p 275p	TDA3601 TDA3602 TDA3611	0 375p 225p 450p	TDA6600 TDA6610 TDA6612	2 700p 2 1100p 2 900p	TEA1007 TEA1009 TEA1015P	120p 100p 110p	UPC1288V UPC12970 UPC1298	230p A 325p 320p	2SA935 2SA937 2SA939	40p 20p 140p	2SA1283 2SA1284 2SA1284	50p 60p 60p	2SB816 2SB817 2SB819	160p 175p 60p	2SC1106 2SC1116 2SC1114 2SC1115	180p 415p 280p
TBA540 TBA560 TBA800 TBA810A3	90p 90p 40p 6 40p	TDA1596 TDA1598 TDA1600 TDA1602	200p 250p 275p 400p	TDA3640 TDA3645 TDA3651 TDA3652	350p 400p 200p 500p	TDA7000 TDA7010 TDA7020 TDA7021	T 120p T 175p	TEA1017 TEA1019 TEA1024 TEA1035	280p 130p 150p 200p	UPC1313H UPC1316C UPC1318 UPC1330H	70p 300p	2SA940 2SA942 2SA949 2SA950	50p 60p 70p	2SA1289 2SA1290 2SA1293	50p 150p 110p	258822 258824 258825	40p 60p 135p	2SC1116 2SC1124 2SC1161	290p 270p 110p
TBA820 TBA820M TBA920	55p 35p 100p	TDA1670/ TDA1675 TDA1701	230p 250p 300p	TDA3652-1 TDA3653 TDA3654	150p 90p	TDA7050 TDA7052 TDA7053	200p 120p 200p	TEA1035 TEA1045 TEA1060	180p 300p 225p	UPC1335V UPC1350 UPC1352C	320p 115p 450p	2SA950 2SA951 2SA952 2SA953	18p 60p 30p 60p	2SA1294 2SA1295 2SA1301 2SA1302	450p 500p 260p 300p	2SB826 2SB827 2SB828 2SB829	75p 200p 200p 200p	2SC1162 2SC1164 2SC1165 2SC1165	30p 600p 760p 100p
TBA950 TBA990 TC5020	100p 60p 200p	TDA1771 TDA1870 TDA1872	250p 200p 275p	TDA3654 TDA3710 TDA3720	2 120p 300p 175p	TDA7056 TDA7057 TDA7072	200p 225p 175p	TEA1061 TEA1062 TEA1064	175p 250p 260p	UPC1360C UPC1362C UPC1363	200p 250p 190p	2SA954 2SA957 2SA958	30p 185p 60p	2SA1303 2SA1304 2SA1306	400p 110p 110p	2SB835 2SB857 2SB861	75p 80p 110p	2SC1170 2SC1172 2SC1173	180p 150p 33p
TC5081AP TC5082P TC5090A TC9125BP	170p 230p	TDA1904 TDA1905 TDA1908/ TDA1908/	80p 80p 90p 225p	TDA3724 TDA3725 TDA3730 TDA3740	500p 500p 400p 480p	TDA7077 TDA7211 TDA7220 TDA7222	175p 150p 100p 200p	TEA1067 TEA1068 TEA1080P TEA1087	150p 350p 170p 40p	UPC1363C UPC1364C UPC1365 UPC1366C	350p 250p	2SA963 2SA965 2SA966 2SA968	120p 30p 25p	2SA1307 2SA1309 2SA1315 2SA1317	100p 50p 100p 30p	2SB863 2SB865 2SB882	220p 25p 180p	2SC1195 2SC1212 2SC1213	210p 35p 10p
TC9130P TC9134 TC9135P	150p 750p 125p	TDA1940 TDA1941 TDA1950	180p 300p 175p	TDA3750 TDA3755 TDA3760	400p 425p 350p	TDA7230 TDA7231 TDA7233	A 225p A 80p	TEA1101 TEA1330 TEA1511	425p 65p 150p	UPC1370C UPC1373 UPC1377C	300p 85p	25A970 25A979 25A984	55p 25p 35p 25p	2SA1319 2SA1319 2SA1320	20p 25p 45p	2S8885 2S8891 2S8892 2S8895	45p 35p 25p 60p	2SC1214 2SC1215 2SC1216 2SC1222	15p 25p 200p 15p
TC9137P TC9138AP TC9142 TC9143	500p 150p 320p 300p	TDA2002 TDA2003 TDA2004 TDA2005	50p 65p 150p 150p	TDA3765 TDA3771 TDA3780 TDA3791	225p 480p 400p 300p	TDA7240 TDA7241 TDA7245 TDA7250	175p 250p 300p 500p	TEA2000 TEA2014A TEA2018A TEA2019	500p 80p 200p 200p	UPC1378 UPC1379C UPC1382	180p 170p 110p	2SA985 2SA988 2SA991 2SA992	60p 25p 30p 30p	2SA1321 2SA1327 2SA1329	80p 13 0p 200p	2SB908 2SB926 2SB941	70p 30p 60p	2SC1226 2SC1237 2SC1247/	75p 250p 35p
TC9145 TC9148 TC9149	150p 200p 225p	TDA2006 TDA2007 TDA2008	70p 120p 100p	TDA3800 TDA3803 TDA3810	350p	TDA7255 TDA7256 TDA7262	500p 600p 425p	TEA20258 TEA2028 TEA20288	75p 325p 376p	UPC1384 UPC1387C UPC1394 UPC1397	425p 250p 120p 350p	2SA992 2SA993 2SA995 2SA995	50p 60p 30p	25A1346 2SA1348 2SA1352 2SA1353	20p 45p 100p 100p	2SB950 2SB951 2SB953 2SB975	180p 190p 90p 100p	2SC1252 2SC1278 2SC1279 2SC1308	850p 110p 30p 350p
TC9150 TC9151P TC9152	425p 425p 425p	TDA2009 TDA2010 TDA2020	160p 150p 120p	TDA3825 TDA3827 TDA3840	226p 200p 300p	TDA7272 TDA7273 TDA7274	170p 80p 60p	TEA2029A TEA2029C TEA2031A	650p 350p 126p	UPC1403C UPC1406H UPC1420C	A 650p A 70p A 450p	2SA1005 2SA1006 2SA1008	25p 90p 125p	2SA1356 2SA1357 2SA1358	100p 65p 130p	2SB985 2SB986 2SB1009	30p 40p 110p	2SC1312 2SC1318 2SC1325	40p 10p 400p
TC9153 TC9154AP TC9156 TC9158P	300p 225p 300p 450p	TDA2030 TDA2030 TDA2040 TDA2048	80p 1 100p 140p 600p	TDA3842 TDA3843 TDA3845 TDA3856	400p 200p 325p 400p	TDA7275 TDA7282 TDA7284 TDA7302	75p 50p 100p 450p	TEA2037 TEA2114 TEA2117 TEA2130	200p 200p 450p 350p	UPC1421C UPC1423C UPC1470 UPC1470	A 550p 200p	2SA1009 2SA1010 2SA1011 2SA1012	200p 225p 80p 85p	2SA1359 2SA1360 2SA1362 2SA1370	45p 45p 25p 50p	2SB1010 2SB1012 2SB1015 2SB1016	25p 55p 60p 130p	2SC1327 2SC1328 2SC1342 2SC1343	20p 15p 15p 200p
TC9162 TC9163 TC9164	276p 375p 400p	TDA2051\ TDA2052\ TDA2054f	450p 525p 110p	TDA3857 TDA3950 TDA4001	350p 225p 325p	TDA7310 TDA7313 TDA7318	800p 650p 550p	TEA2164 TEA2260 TEA2261	175p 225p 226p	UPC1484C UPC1488H UPC1498H	A 300p 150p 200p	2SA1013 2SA1015 2SA1016	100p 10p 30p	2SA1371 2SA1376 2SA1380	100p 30p 75p	2SB1017 2SB1018 2SB1020	40p 130p 120p	2SC1345 2SC1346 2SC1358	15p 100p 270p
TC9167P TC9172P TC9174P TC9176P	100p 300p 325p 500p	TDA2107 TDA2148 TDA2151 TDA2151	250p 350p 375p 260p	TDA4050 TDA4052 TDA4060 TDA4092	150p 500p 500p	TDA7330 TDA7350 TDA7359 TDA7360	A 700p 650p 300p 700p	TEA2262 TEA3717Di TEA3718S TEA5030	175p	UPC1505C UPC1513H UPC1514C UPC1515C	A 200p	2SA1018 2SA1020 2SA1021	100p 30p 35p	25A1381 25A1382 25A1385	100p 120p 180p	2581039 2581066 2581068	65p 40p 160p	2SC1359 2SC1360 2SC1364	16p 70p 25p
TC9177P TCA9940 TCEP100	225p 100p 100p	TDA2220 TDA2270 TDA2320	200p 250p 80p	TDA4100 TDA41734 TDA4180	350p 225p VF 325p 145p	TDA7361 TDA7370 TDA7374	175p 600p	TEA5040 TEA5101A TEA5110	135p 650p 175p 175p	UPC1520C UPC1521H UPC1536C	A 250p	2SA1023 2SA1026 2SA1029 2SA1036	60p 90p 60p 60p	2SA1386 2SA1387 2SA1396 2SA1399	400p 75p 120p 25p	2SB1077 2SB1098 2SB1099 2SB1109	180p 80p 75p 40p	2SC1368 2SC1382 2SC1383 2SC1384	76p 40p 25p 20p
TD62308A TD62382 TD62506 TD62705	P 200p 200p 200p 250p	TDA2501 TDA2502 TDA2503 TDA2504	400p 175p 200p 200p	TDA4190 TDA4200 TDA4210 TDA4260	180p 360p 250p	TDA7770 TDA5114 TDA5115 TDA5116	225p 225p 200p	TEA5114A TEA5115 TEA5116	200p 220p 220p	2SA329 2SA467 2SA473	75p 40p 29p	2SA1037 2SA1038 2SA1048 2SA1048	50p 40p 25p	2SA1400 2SA1423 2SA1428	150p 30p 35p	2581123 2581133 2581134	50p 50p 65p	25C1393 2SC1394 2SC1398	20p 15p 55p
TD6304AP TD6306P TD6350P TD6359P	300p 360p 200p	TDA2505 TDA2506 TDA2507	300p 500p 450p	TDA4280 TDA4282 TDA4283	260p 320p 360p 450p	TDA8120 TDA8124 TDA8134	350p 550p 260p 225p	TEA5170 TEA5500 TEA5501 TEA5550	200p 325p 226p 150p	2SA483 2SA484 2SA489 2SA489	90p 80p 50p 45p	2SA1051 2SA1052 2SA1060 2SA1061	300p 15p 120p 300p	2SA1441 2SA1442 2SA1443 2SA1450	110p 110p 130p 30p	2581135 2581140 2581143 2581151	60p 45p 40p 75p	2SC1399 2SC1400 2SC1403 2SC1407	100p 50p 500p 50p
TDA1001 TDA1002	300p 200p 200p	TDA25071 TDA2510 TDA25144	450p 450p 500p	TDA4290 TDA4400 TDA4420	200p 175p 120p	TDA8135 TDA8136 TDA8137	225p 225p 200p	TEA5560 TEA5570 TEA5580	130p 85p 165p	2SA493 2SA495 2SA496	25p 40p 30p	2SA1069 2SA1073 2SA1076	150p 375p 230p	2SA1459 2SA1462 2SA1469	40p 25p 100p	2S81162 2S81163 2S81168	400p 370p 50p	2SC1413 2SC1419 2SC1426	150p 50p 700p
TDA1003 TDA1005A TDA1010A TDA1011		TDA2515 TDA2530 TDA2532 TDA2540	450p 450p 120p 85p	TDA4421 TDA4426 TDA4427 TDA4431	300p 170p 200p 150p	TDA8138 TDA8138 TDA8138 TDA8138 TDA8139		TEA5581 TEA5591 TEA5620 TEA5630	200p 200p 300p 225p	2SA505 2SA509 2SA537 2SA539	120p 35p 170p 20p	2SA1077 2SA1080 2SA1081 2SA1082	300p 125p 80p 80p	25A1475 25A1488 25A1489 25A1490	95p 150p 300p 225p	2SB1182 2SB1185 2SB1202 2SB1203	40p 50p 45p 45p	2SC1429 2SC1431 2SC1444 2SC1445	50p 400p 275p
TDA1012 TDA1013A TDA1015	120p 110p 85p	TDA2541 TDA2542 TDA2543	120p 110p 210p	TDA4433 TDA4437 TDA4439	150p 300p 220p	TDA8140 TDA8143 TDA8145	200p 160p 120p	TEA5640E TEA5701 TEA6000	760p 650p 400p	2SA544 2SA550 2SA562	650p 150p 30p	2SA1082 2SA1083 2SA1084 2SA1085	20p 100p 75p	2SA1491 2SA1492 2SA1493	300p 260p 500p	2SB1203 2SB1204 2SB1205 2SB1223	45p 45p 40p 60p	2SC1446 2SC1447 2SC1449	350p 55p 70p 120p
TDA1016 TDA1020 TDA1022 TDA1023	140p 110p 330p 130p	TDA2544 TDA2545 TDA25464 TDA2548	200p 120p 200p 200p	TDA4440 TDA4442 TDA4443 TDA4445	180p 240p 250p 220p	TDA8146 TDA8160 TDA8170 TDA8170 TDA8172	200p 125p 170p 250p	TEA6100 TEA6200 TEA6300 TEA6310T	350p 225p 500p	2SA564 2SA571 2SA603	15p 650p 100p	2SA1091 2SA1093 2SA1094	100p 180p 190p	2SA1494 2SA1516 2SA1519	450p 280p 20p	2SB1243 2SB1274 2SB1282	40p 40p 300p	2SC1450 2SC1454 2SC1470	200p 250p 120p
TDA1024 TDA1025 TDA1028	150p 320p 175p	TDA2549 TDA2555 TDA2556	300p 175p 230p	TDA4450 TDA4452 TDA4453	225p 250p 275p	TDA8173 TDA8174 TDA8175	280p 300p 300p	TEA6414A TEA6415B TEA6420	425p 425p 525p 360p	2SA606 2SA608 2SA614 2SA628	200p 15p 150p 20p	2\$A1095 2\$A1096 2\$A1102 2\$A1103	300p 80p 130p 130p	2SA1523 2SA1535 2SA1538 2SA1540	45p 175p 55p 50p	2581318 2581375 2581382 2581468	40p 45p 350p 100p	2SC1472 2SC1473 2SC1474 2SC1501	40p 15p 46p 70p
TDA1029 TDA1035 TDA1038	200p 160p 600p	TDA2557 TDA2558 TDA2574	225p 500p 350p	TDA4480 TDA4481 TDA4482	280p 350p 350p	TDA8178 TDA8179 TDA8185	400p 5 750p 300p	TEA8172 TL431 TL494	125p 45p 100p	2SA634 2SA535 2SA639	50p 50p 60p	2SA1104 2SA1105 2SA1106	140p 250p 160p	2SA1598 2SA1599 2SA1600	220p 220p 250p	2SC182 2SC372 2SC380	75p 25p 10p	2SC1505 2SC1507 2SC1509	56p 45p 35p
TDA1041E TDA1041P TDA1044 TDA1047	250p 180p 110p 200p	TDA25754 TDA25774 TDA25784 TDA25784	200p	TDA4500 TDA4501 TDA4502 TDA4503	300p 400p 550p 300p	TDA8190 TDA8191 TDA8192 TDA8196	200p 425p 275p 150p	TLO61 TLO64 TLO71 TLO74	40p 80p 38p 80p	2SA640 2SA642 2SA643 2SA673	60p 60p 25p 15p	2SA1111 2SA1112 2SA1115 2SA1115	90p 150p 30p 40p	2SA1601 2SA1625 2SA1626 2SA1640	200p 40p 90p 100p	2SC388A 2SC394 2SC403 2SC454	60p 60p 25p 15p	2SC1514 2SC1515 2SC1520 2SC1520	35p 60p 45p 110p
TDA1048 TDA1053 TDA1054	200p 300p 180p	TDA2582 TDA2590 TDA2591	130p 170p 110p	TDA4505/ TDA4505E TDA4505N	300p 300p 450p	TDA8205 TDA8213 TDA82148	1250p 276p 3 225p	TLO83 TLO84 TMP47C-434	55p 70p N 1250p	2SA677 2SA678 2SA683	35p 26p 25p	2SA1123 2SA1124 2SA1127	40p 60p 50p	2SA1652 2SA1667 2SA1668	70p 175p 180p	2SC458 2SC460 2SC461	10p 10p 15p	2SC1545 2SC1567 2SC1568	120p 40p 35p
TDA1057 TDA1059B TDA1060 TDA1062	60p 40p 140p 140p	TDA25910 TDA2593 TDA2594 TDA2595	150p 110p 300p 200p	TDA4505M TDA4510 TDA4532 TDA4555	A 500p 270p 200p 400p	TDA8215 TDA8217 TDA8303 TDA8304	1 300p 225p 350p 600p	TPU2732 TPU2735 UC3524 UC3842N	1200p 900p 100p 125p	2SA684 2SA699 2SA705 2SA706	25p 100p 70p	2SA1133 2SA1135 2SA1141 2SA1142	120p 130p 200p	2SA1671 2SA1673 2SA1680 2SA1706	3100	2SC495 2SC496 2SC497 2SC515	45p 25p 85p	2SC1569 2SC1570 2SC1571 2SC1573	55p 40p 50p
TDA1068 TDA1072 TDA1074	75p 150p 280p	TDA2600 TDA2611A TDA2616	250p 100p 250p	TDA4556 TDA4557 TDA4560	370p 450p 270p	TDA8305 TDA8340 TDA8341	500p 200p 250p	UC3843 UC3844 UPC20C	126p 125p 100p 220p	2SA708 2SA711 2SA715	140p 50p 280p 50p	2SA1143 2SA1145 2SA1146	15p 40p 200p	2SB175 2SB324 2SB337	45p 40p 150p	2SC535 2SC536 2SC605	30p 20p 100p	2SC1576 2SC1580 2SC1583	26p 550p 600p 25p
TDA1077 TDA1082 TDA1083	250p 275p 95p	TDA2630 TDA2640 TDA2653A	300p 220p 225p	TDA4565 TDA4566 TDA4568	200p 326p 225p	TDA8349/ TDA73500 TDA8351	350p 275p 225p	UPC554 UPC555 UPC556H	130p 60p 80p	2SA719 2SA720 2SA725	50p 20p 80p	2SA1151 2SA1152 2SA1153	30p 150p 30p	2SB474 2SB492 2SB511	250p 80p 55p	2SC619 2SC641 2SC644	100p 80p 10p	2SC1586 2SC1617 2SC1619	540p 340p 170p
TDA1085 TDA1087 TDA1092 TDA1097	170p 60p 100p 475p	TDA2654 TDA2658 TDA2670 TDA2690	200p 300p 150p 100p	TDA4570 TDA4580 TDA4600 TDA4600	300p 650p 200p 160p	TDA83601 TDA83611 TDA8362A TDA8362A TDA8362N	3 900p	UPC571 UPC574 UPC575C2 UPC577	220p 60p 90p 64p	2SA726 2SA733 2SA740 2SA742	20p 15p 90p 450p	2SA1154 2SA1156 2SA1162 2SA1163	90p 30p	2SB525 2SB527 2SB531 2SB535	55p 130p 400p 80p	2SC647 2SC681 2SC683 2SC708	250p 35p	2SC1623 2SC1624 2SC1626 2SC1627	50p 60p 55p 15p
TDA1151 TDA1154 TDA1170	40p 50p 85p	TDA2710- TDA2721 TDA2730	400p 200p 200p	TDA4601 TDA4605 TDA4610	120p 220p 370p	TDA8366N TDA8372/ TDA8380	2 1500p 4 450p 200p	UPC592 UPC595 UPC596	95p 190p 190p	2SA747A 2SA748 2SA764	425p 60p 200p	2SA1169 2SA1170 2SA1173	500p 500p 60p	2SB537 2SB544 2SB546	90p 22p 45p	2SC710 2SC711 2SC730	16p 15p 350p	2SC1628 2SC1634 2SC1667	76p 50p 450p
TDA1170N TDA1175	85p 175p	TDA2740 TDA2750	300p 350p	TDA4650 TDA4660	425p 370p	TDA8385 TDA8390/	275p	UPC1001 UPC1004C	220p 130p	25A769 2SA770	80p 200p	2SA1174 2SA1175	25p 30p	2SB549 2SB560	50p 25p	2SC732 2SC735	40p	2SC1669 2SC1674	100p 15p

						J,	AP/	ANI	ESE	E TR	RAI	VSI	ST	OR	S					
Pa	rt l	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part 2SD1756	Price	Part 2SK240	Price
250	1675 1678 1683	90p 80p 100p	2SC2258 2SC2259 2SC2261	30p 60p 700p	2SC2710 2SC2712 2SC2714	50p 20p 20p	2SC3244 2SC3246 2SC3259	45p 50p 350p	2SC3781 2SC3782 2SC3783	150p 75p 300p	2SD287 2SD291 2SD313	250p 250p 25p	2SD879 2SD880 2SD882	60p 40p 25p	2SD1311 2SD1313 2SD1326	65p 1000p 200p	2SD1758 2SD1760	75p 80p	2SK241 2SK246	30p 30p
2SC 2SC	1684 1685	30p 30p	2SC2267 2SC2270	90p 60p	2SC2716 2SC2719	50p 25p 120p	2SC3260 2SC3261 2SC3262	220p 230p 280p	2SC3787 2SC3788 2SC3789	100p 60p 75p	2SD315 2SD325 2SD330	75p 30p 65p	2SD889 2SD892A 2SD894	35p 75p 35p	2SD1327 2SD1328 2SD1330	150p 60p 50p	2SD1761 2SD1762 2SD1763	60p 50p 4 60p	2SK300 2SK301 2SK303	25p 40p 40p
250	1729 1730 1735	900p 10p 70p	25C2271 2SC2274 2SC2275	25p 15p 50p	2SC2721 2SC2724 2SC2738	15p 200p	2SC3263 2SC3264	280p 390p	2SC3790 2SC3795	120p 140p	2SD348 2SD350	300p 320p	2SD895 2SD896	100p 200p	2SD1347 2SD1348	70p 65p 150p	2SD1764 2SD1765 2SD1769	70p 70p 110p	25K304 25K312	25p 750p
250	1740 1741 1755	10p 35p 90p	2SC2278 2SC2283 2SC2290	70p 700p 1800p	2SC2749 2SC2750 2SC2751	350p 300p 270p	2SC3269 2SC3270 2SC3271	50p 50p 75p	25C3798 25C3807 25C3808	220p 120p 70p	2SD357 2SD358 2SD359	40p 40p 50p	2SD898B 2SD900 2SD905	225p 400p 450p	2SD1350 2SD1375 2SD1378	80p 60p	2SD1773 2SD1776	160p 70p	2SK315 2SK320 2SK323	70p 120p 130p
2SC	1756 1758	35p 30p	2SC2291 2SC2298	40p 35p	2SC2752 -2SC2767 2SC2769	76p 300p 400p	2SC3277 2SC3279 2SC3280	280p 30p 200p	2SC3811 2SC3831 2SC3832	80p 250p 135p	2SD361 2SD362 2SD371	100p 100p 240p	2SD916 2SD917 2SD921	130p 300p 320p	2SD1379 2SD1380 2SD1382	100p 100p 60p	2SD1783 2SD1785 2SD1789	100p 160p 210p	25K332 25K359 25K363	175p 40p 50p
250	1760 1775 1781	70p 10p 20p	2SC2307 2SC2308 2SC2312	300p 10p 300p	2SC2773 2SC2774	700p 500p	2SC3281 2SC3284	200p 600p	2SC3833 2SC3851	250p 100p	2SD380 2SD381	650p 60p	2SD923 2SD946 2SD947	360p 120p 100p	2SD1384 2SD1390 2SD1391	50p 350p 250p	2SD1796 2SD1802 2SD1806	180p 75p 75p	25K364 25K367	40p 40p
250	1789 1809 1810	100p 40p 250p	2SC2314 2SC2316 2SC2320	70p 150p 10p	2SC2785 2SC2785 2SC2785	40p 20p 10p	2SC3293 2SC3298 2SC3299	86p 50p 120p	2SC3852 2SC3853 2SC3855	220p 220p	2SD382 2SD386 2SD388	75p 70p 150p	2SD950 2SD951	300p 200p	2SD1392 2SD1395	85p 80p	2SD1812 2SD1815	60p 100p	2SK369 2SK373 2SK374	30p 40p 45p
2SC 2SC	1815 1819 1826	10p 70p 60p	2SC2324 2SC2328 2SC2310	120p A 50p	2SC2791 2SC2792 2SC2793	500p 220p 700p	2SC3300 2SC3303 2SC3306	400p 100p 130p	2SC3857 2SC3858 2SC3866	500p 550p 275p	2SD389 2SD400 2SD401	60p 14p 50p	2SD957A 2SD958 2SD965	520p 60p 35p	2SD1396 2SD1397 2SD1398	120p 100p 120p	2SD1825 2SD1827 2SD1843	60p 120p 100p	2SK386 2SK389	600p 115p
250	1827 1829	60p 500p	25C2315 25C2329	175p 480p	2SC2808 2SC2810	40p 360p	2SC3307 2SC3309	60 0p 150p	2SC3868 2SC3870	100p 200p 210p	2SD402 2SD414 2SD415	120p 45p 55p	2SD970 2SD972 2SD973	170p 40p 60p	2SD1399 2SD1400 2SD1402	300p 280p 120p	2SD1846 2SD1847 2SD1849	350p 350p 280p	25K400 25K405 25K414	700p 450p 550p
250	1833 1834 1841	27p 50p 12p	2SC2230 2SC2331 2SC2333	300p 50p 200p	2SC2812 2SC2814 2SC2824	40p	2SC3310 2SC3316 2SC3317		2SC3883 2SC3884 2SC3885	A 200p 250p	2SD424 2SD426	350p 150p	2SD973A 2SD982	70p 90p	2SD1403 2SD1405	225p 80p	2SD1850 2SD1853	325p 40p	25K415 25K423 25K427	500p 75p 50p
250 250	1844 1845	50p 15p 35p	2SC2334 2SC2335 2SC2336		2SC2825 2SC2825 2SC2827		2SC3326 2SC3327 2SC3328	50p 60p 50p	2SC3885 2SC3886 2SC3890		2SD427 2SD438 2SD467	350p 35p 15p	2SD985 2SD986 2SD998	120p 120p 70p	2SD1406 2SD1407 2SD1408	60p 60p 126p	2SD1856 2SD1857 2SD1858		25K430 25K511	200p 450p
2SC 2SC	1847	45p 85p	2SC2344 2SC2347	150p 35p	2SC2832 2SC2834	300p 280p	2SC3330 2SC3331	20p 25p	2SC3892 2SC3893	A 400p 225p	2SD468 2SD471 2SD476	15p 20p 100p	2SD1010 2SD1012 2SD1020	40p 40p 40p	2SD1409 2SD1411 2SD1412	170p 85p 75p	2SD1863 2SD1864 2SD1877	35p 85p 175p	2SK513 2SK526 2SK531	325p 160p 350p
250	1856 1965 1870	25p 700p 700p	2SC2353 2SC2360 2SC2361		25C293 25C293 25C2953	250p 40p 70p	2SC3333 2SC3345 2SC3346		2SC3895 2SC3896 2SC3897	400p 400p 400p	2SD525 2SD526	50p 70p	2SD1021 2SD1022	120p 250p	2SD1413 2SD1415	60p 190p	2SD1878 2SD1879	160p 275p	2SK534 2SK537	700p 900p
2S0 2S0	1871 1875 1851	425p 220p 70p	2SC2362 2SC2365 2SC2369	280p	2SC2873 2SC2577 2SC2577	120p	2SC3352 2SC3353 2SC3355	280p	2SC3907 2SC3927 2SC3940	250p 250p 40p	2SD545 2SD549 2SD551	18p 120p 300p	2SD1024 2SD1027 2SD1030	850p 850p 75p	2SD1417 2SD1425 2SD1426	125p 260p 135p	2SD1880 2SD1881 2SD1884	350p 300p	2SK538 2SK539 2SK544	350p 1100p 30p
250	1990	15p 500p	2SC2371 2SC2373	25p 210p	2SC28.7	3200p 60p	2SC3356 2SC3358	120p 50p	25C3943 25C3944	75p 80p	2SD554 2SD555 2SD556	225p 500p 225p	2SD1031 2SD1036 2SD1046	70p 600p 200p	2SD1427 2SD1428 2SD1430	160p 180p 280p	2SD1886 2SD1887 2SD1894	300p	2SK552 2SK553	250p 225p 320p
250	7904 7905 7907	125p 15p 20p	2SC2383 2SC2389 2SC2407	45p	25C2983 25C295 25C299	200p	2SC3376 2SC3377 2SC3378	50p	2SC3950 2SC3953 2SC3955	120p 60p 70p	2SD558 2SD560	200p 50p	2SD1047 2SD1051	180p 130p	2SD1431 2SD1432	200p 400p	2SD1895 2SD1910	225p 280p	2SK555 2SK556 2SK557	500p 400p
250	1909 1913 1914	250p 90p 30p	2SC2408 2SC2412 2SC2440	K 50p	2SC2905 2SC2511 2SC2911	ZSp	2SC3379 2SC3381 2SC3383	130p	2SC3964 2SC3972 2SC3973	100p 250p 210p	2SD571 2SD575 2SD592	20p 530p 25p	2SD1055 2SD1060 2SD1062	60p 130p 150p	2SD1433 2SD1438 2SD1439	400p 100p 165p	2SD1911 2SD1913 2SD1929	50p	2SK559 2SK560 2SK566	600p 580p 475p
25	1921	15p 175p	2SC2458 2SC2459	10p 50p	25C2512 25C252	1.29p 650p	2SC3393 2SC3397	80p 20p	2SC3975 2SC3987	210p 220p	2SD596 2SD600 2SD601	25p 30p 40p	2SD1063 2SD1064 2SD1065	200p 250p 160p	2SD1441 2SD1442 2SD1445	220p 80p 200p	2SD1930 2SD1933 2SD1939	75p	25K606 25K612	70p 80p
ZS	7525	10p 180p 110p	2SC2466 2SC2486 2SC2492	275p	2SC252 2SC252 2SC252	75p	2SC3399 2SC3400 2SC3401	35p 50p	2SC3996 2SC3997 2SC3998	1400p 1000p	2SD602 2SD612	60p 50p	2SD1069 2SD1073	150p 350p	2SD1446 2SD1450	300p 60p	2SD1941 2SD1944	500p 50p	2SK684 2SK685 2SK699	950p 1150p 100p
25	541	27p 350p 350p	2SC2470 2SC2481 2SC2482	120p	25C292 2SC253 2SC253		2SC3402 2SC3405 2SC3405	130p	2SC4006 2SC4020 2SC4023	100p 280p 325p	2SD613 2SD617 2SD633	70p 300p 70p	2SD1088 2SD1094 2SD1110		2SD1452	200p 275p 140p	2SD1958 2SD1959 2SD1978	210p	2\$K719 2\$K724	300p 500p
ZS	1945 1945	350p 1500p	2SC2483 2SC2484	120p 185p	25C253	400p	25C3416 25C3417	30p 90p	2SC4029 2SC4043	350p 45p	2SD636 2SD637	10p 15p 15p	2SD1111 2SD1113 2SD1128	20p 225p	2SD1455 2SD1457 2SD1458	250p 165p 50p	2SD1984 2SD1991 2SD1994	50p	2SK725 2SK726 2SK727	550p 425p 475p
254	1953 1953	450p 45p 70p		200p	2SC255 2SC255 2SC257	330p	2503420	80p 45p	2SC4046 2SC4056 2SC4059	350p 550p	2SD638 2SD639 2SD640	20p 350p	2SD1133 2SD1135	65p 75p	2SD1459 2SD1468	80p 40p	2SD1996 2SD2006	45p 75p	25K739 25K758	400p 300p
25	959 962 1 967	10p 175p 1300p	2SC2500 2SC2502 2SC2503	2 140p	2SC298 2SC299	150p		60p	2SC4064 2SC4106 2SC4107	200p	2SD655 2SD661 2SD666	18p 60p 25p	2SD1138 2SD1140 2SD1142	40p	2SD1487 2SD1494 2SD1496	225p 200p 300p	2SD2010 2SD2011 2SD2012	60p	2SK769 2SK786 2SK787	500p 200p 800p
250 250	1969 1970	160p 100p	2SC2512 2SC2517	2 20p 120p	2SC295 2SC30E	50p	25C344 25C344	150p	2SC4124 2SC4125	250p 400p	2SD667 2SD669	20p 35p 350p	2SD1145 2SD1148 2SD1153	25p 175p	2SD1497 2SD1497	230p 02 350p 90p	2SD2018 2SD2033 2SD2061	80p	25K791 25K792 25K793	225p 300p 300p
25	1971 1972 1973	400p 600p 150p	2SC2527	7 300p	2SC302	1450p	250345	125p	2SC4137 2SC4138 2SC4157	200p 400p	2SD673 2SD676 2SD717	250p 180p	2SD1159 2SD1160	6Sp 150p	2SD1506 2SD1508	50p 60p	2SD2066 2SD2125	250p	2SK794 2SK796	315p 600p
25	1975 1980	120p 30p 75p	2SC2538 2SC2538 2SC2540	100p		550p	2SC345	275p		125p	2SD718 2SD722 2SD725	85p 240p 200p	2SD1163 2SD1164 2SD1168	75p	2SD1509 2SD1511 2SD1519	100p 100p 250p	2SD2144		25K809 25K812 25K817	850p 160p 325p
25/ 25/	C1983 C1984 C1985	150p 100p	2SC254	2 300p 5 55p	2SC363. 2SC363	1250	2SC346 2SC348	8 70p 1 300p	2SC4199 2SC4204	700p 60p	2SD726 2SD731	275p 250p	2SD1169 2SD1173	280p 350p	2SD1521 2SD1525 2SD1526	70p 600p 100p	2SD2255 2SD233	250p	25K851 25K872	550p 650p
2\$	C1986 C2001 C2002	100p 15p 15p	2SC2540 2SC2547 2SC2550	7 65p	25C303 25C364 25C364	250p	250348	5 275p		550p	2SD732 2SD734 2SD741	250p 15p 120p	2SD1189	6 400p 55p	2SD1541 2SD1545	350p 275p	2SD2340 2SJ48	225p 425p	2SK875 2SK903 2SK904	475p 500p 500p
254 254	2003 2004 2022	20p 20p 110p	2SC255 2SC255 2SC255	2 60p	2SC305.	7 150p	ZSC350	t 120p	2SC4237 2SC4242 2SC4278	120p	2SD743 2SD757 2SD750	130p 120p 70p	2SD1191 2SD1192 2SD1196	90p		350p 400p 170p	2SJ74	700p 60p 220p	2SK951 2SK952	275p 275p
254 254	2023	180p 30p	2SC255	5 120p 2 90p	2SC307 2SC307	35c Z5c	25C350 25C350	5 250p 7 650p	2SC4288 2SC4300	A 650p 200p	2SD762 2SD763 2SD768	100p 140p 180p	2SD1197 2SD1198 2SD1207	60p	2SD1555 2SD1556 2SD1565	170p 300p 75p	2SJ79	350p 225p 75p	2SK955 2SK956 2SK962	750p 600p 700p
25	2027 2036 22037	200p 50p 50p	2SC256 2SC256 2SC257	B 120p		£ 200p	250351	4 170p 8 120p	2SC4304 2SC4313	225p 1000p	2SD772 2SD773	200p 20p	2SD1210 2SD121	280p	2SD1571 2SD1572	170p 100p	2SJ109 2SJ113	200p 1050p	25K102 25K103 25K105	6 450p
25	C2053 C2055 C2058	120p 150p 20p	2\$C257	7 110p		E 150p	250352	5 45p	2SC438	300p	2SD774 2SD777 2SD784	30p 400p 650p	2SD1213 2SD1218 2SD1223	8 75p	2SD1576	200p 200p 250p	2SJ116 2SJ117	1150p 1200p 550p	2SK105 2SK108	8 800p 1 700p
25 25	C2060 C2061	40p 75p	2SC257 2SC258	9 110p 0 175p	2SC310 2SC311	1 750p 2 35c	25C353 25C354	1 225p 9 200p	2SC4381 2SC4408	425p 50p	2SD786 2SD787 2SD788	100p 20p 30p	2SD122 2SD122	5 70-р 7 40- р	2SD1579 2SD1589	120p 60p 100p	2SJ162	700p 680p 200p		2 375 p
25	2068 2071 2073	60p 140p 40p	2SC258	600p	2SC312	E 75ç	2SC356 2SC357	8 200p 7 275p	2SC443	90p 175p	2SD789 2SD792	20p 400p	2SD123 2SD123	7 300p 3 300p	2SD1591 2SD1593	310p	2SJ182 2SJ200	150p 625p	2SK111 2SK112	8 225p 0 550p
25	C2075 C2078 C2085	60p 95p 100p	2SC259	2 200p	250314	8 9450	250369	1 200p	2SC451	7 250p	2SD794 2SD795 2SD798	33p A 140p 175p	2SD124	5 2 0 p	2SD1608 2SD1609	. 45p	2SK19 2SK33	175p 45p 40p		1 800p 7 700p
X3 K3	C2085	60p 100p	2SC261 2SC261	0 60p 1 30p	25C315 25C315	0 100¢ 1 175¢	2SC359 2SC359	7 75p 9 140p	2SC453 2SC453	450p 1400p	2SD799 2SD809 2SD811	150p 45p 450p	2SD125 2SD125	4 55p	2SD1637		25K55	50p 100p 100p	2SK122 2SK127 2SK129	5 275p
25 25	C2094 C2097 C2099	1200p 2300p 2500p	2SC262	5 190p 6 600p	2SC315 2SC315	3 175p 5 350p	25C360	5 100p 7 150p	2SC474	2 275p 1 350p	2SD819 2SD820	300p 250p	2SD126	4 55p 5 75p	2SD1649 2SD1650	260p	2SK73 2SK97	75p 200p	2SK129 2SK131	9 450p 7 900p
25	C2118 C2120 C21224	1100p 10p 300p	2SC263	1 20p	2SC315	8 2500	2SC361	6 45 p	2SC474	7 375p	2SD821 2SD822 2SD826	550p 290p 30p	2SD126	7 55p 1 55p	2SD1656 2SD1663		25K107 25K109	40p 40p 150p	2SK134 2SK134	1 500p
25 25	C2131 C2141	550p 60p	2SC263	4 10p 6 40p	2\$C315 2\$C316	4 270; 5 150;	2SC354	2 225p 7 400p	2SC476	300p 250p	2SD829 2SD836	375p 50p	2SD127 2SD127	2 200p	2SD1667	120p	25K118	50p 50p 100p	2SK135 2SK135	0 200p 6 225p
25 25	C2153 C2165 C2168	40p 80p 120p	2SC264	0 1800p 3 100p	2SC317 2SC317	3 180g 5 150g	2SC366 2SC367	8 120p 5 100p	2SC482 2SC492	5 70p 4 300p		55p 500p	2SD127	4 80p 5 50p	2SD1669 2SD1677	85s 300p	25K133 25K147	650p 160p	25K135	8 400 p
2S 2S	C2188 C2290 C2209	70p 250p 50p	2SC265	5 75p	2SC317	9 705	250357	9 140p	2SC500	2 450p			2SD127	7 190p	2SD1683 2SD1684	45	25K161 25K163	40p 30p 40p	25K140 25K140	0 250p 4 290p
X	C2216	50p 660p	2SC266	0 100p 5 200p	25C318 25C318	1 200p 2 120p	2SC368	5 450p 7 300p	2SC504 2SC512	4 250p 9 500p	2SD856 2SD858 2SD863	48p 250p	2SD128 2SD128	8 175p 9 250p	2SD1706 2SD1707	325p 400p	2SK168 2SK170	40p 50p 35p	25K146 25K148	2 425p 7 250p
12	C77222 C2223 C2223	4 60p 15p 80p	2SC267	1 100p 1 170p	2SC319	9 40¢ 2 25¢	2SC369 2SC371	2 150p 5 480p	2SD188 2SD198	350p 140p	2SD864	200p	2SD129 2SD129	2 60p 3 70p	2SD1710 2SD1718	2005	2SK192 2SK193	45p 40p	2SK150 2SK152	7 475p 9 700p
M.M		100p 60p 20p	2SC268	2 70p 8 27p	2SC320 2SC321	9 120p 0 550p	2SC371	7 120p 9 450p	2SD200	195p 180p 260p	2SD866 2SD867 2SD868	350	2SD130	2 20p	2SD1730	275	2SK197	150p 140p 35p	2SK154 2SK176	4 900p 7 275p
NA NI		20p 540p 45p 15p	2SC269 2SC270	4 3500p 5 50p	2SC321 2SC322	2 260	2SC374	7 120p 8 100p	2SD213 2SD234	250p 90p 195p	2SD869 2SD870	150p 140p	2SD130 2SD130	8 80p 9 140p	2SD1739	2259	2SK214 2SK216	170	25K203	8 295p 9 750p

NEO LIEA EPI DS

		REPL
Model	Price	Model
AKAI VS105, 112, 115, 116, 120, 1 201, 202, 205, 220, 240, 244, 248, 250, 301, 303, 304, VSP VSP82	25, 126,	VHSAN3 VHSAY3
248, 250, 301, 303, 304, VSP VSP82	8, 1000p	VHSBH1, VHSCH1 VHSBP1 VHSBY3 VHSD52
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VCR9140, VCR9142 VCR9340 VCR9244	2550p 3650p 3450p	VT65 VT130, 135, 138, 145, 250, 420, 425, 426, 428, 430, 43 VT438, 535, 536, VTL30, 30 635, 636
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908, 910, 911, 915, 916, 918, FVHP5000, 5001, 5005, 5050, 5075	906, 907.	VT522, VTM212, 620, 622, 822, 922, 925 VT660E
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FVHP132, 1400, 1440, 320, 440, 445	3550p	J.V.C. & FERGUSON HR2200, 3300, 3320, 3330,
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GHV4400, 4400, GSE-0404P,	1600p	3V00, 8902, 8903, 8909, 891 8922
GSE0121, R02011, R02031, R02051	2350p 1950p	EV31, EV41R EV37 EV43H HRD860
G.E.C. 4000H, 4001H, 4002H V4001H, V4004, V4100	1200p	BR7000E, BR7000S, BR703 BR7030/40H, BR7040 HR7200, 7300, 7350, 2650, BR5200
GRANADA	1500p	HRD455 HRD520 HRD300, 400, 580, 600, 620
CSI, DS2 VHSAH1 VHSAH3	1600p 1100p 2400p	640, 650 HR4100
	-	HRD750, HRD830, HRD860

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	800p 1200p	HR0250, HR0257 3V32, 8942, HR7655 HR0180, 190, 230, 610, FV208, 26, 30, 32, 33, V HR0370, HR0430, HR0-	
HSCH1	2100p 850p 2600p	HRD180, 190, 230, 610, FV208, 26, 30, 32, 33, V HRD370, HRD430, HRD	3V59, F C141L 470 3V
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ISTJ2, VHSTJ3	1300p , VHSWJ3,	641, 660, 670, 720, 730, HRFC100, SR3300MS, F	740, B2 V44L
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5, 510, 518, 600 6190, 700, 900,	901, 902,	FV42L VP160L, VR172L	£10
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20, VS550, 620,		HRJ300, HRJ305, HRJ3 HRJ316EG, HRJ318E	15,
	23000	HRJ615, HRJ715, HRJ81 HRJ400, HRJ405, HRJ40 OEK, HRJ415, HRJ416	15 07MS, H
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20, 25, 35	1000p	HS303, HS304, HS320, H HS306, HS318, HS710 HS307 HS319 HS330	IS700
	1050p 1200p	HS307 HS319	-
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5, VT5 80, VT5 8	5, VT588, 3100p	NV100, NV200. NV370, N NV630	IV380.
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546, 548, VTD6 0, 645, 646, 1, 735, 736, 740 4, 830, 831, 835, 5, 930, 931, 935 , 775, 860, 861,	838, 840, 2600p	NVH77 NVF51 NVGI9	4
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		NV688 NV600	2
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	2400p	NVG7, NVG9, NV230 NV780 NVG 15, NVG400	2 2
8903, 8909, 891;	1000p	NVG 15, NVG400 NVM7, NVMC20 NVF70	35
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BR7040 0, 7350, 2650,		NVF75, NVF77 NVF55 NVFS200, NVFS38, NVSF	4 4
	700p 2000p 1400p	NV8000 NVHD 100, NV	4 HD 101,
, 580, 600, 620,	2000p	NVHE 100 NVSD1	3
0830, HRD860	1000p 3300p	AG7330, AG7350, AG735 AG7450	5, 5
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rice	Model	Price
2300p 2200p FV12L,	NVFS 100 NVFS1	5000p 4850p
2050p 58, 2300p	N.E.C. N9011, 9012, 9013E, 90 9015, 9016, 901A, 9024 9040, 9053, 9054, 9055 9065, 9066, 906, 9077, N9056, DX1000, 1600, N911A, 914C, 915A, 910 9120	014E, 9014G, A. 9033, N9034, 9056, 9063
3100p	9065, 9066, 906, 9077, N9096, DX1000, 1600, N911A, 914C, 915A, 910	PX1200 1150p
1, 637, 20 2100p	9120 PVC600, 740, 744, 754, PV2300, 2400, 760, 794 774	763E, 764, 1, 770,
5000p 0, 5550p	774 N380, N381, N830, N83 N834, N835, N836 82611AH1 (FOR MODE	1650p 31, N832, N833, 700p
1400p 2600p	N895	31500
3800p 4500p 4000a	N9052, N9530, DX2000 VCP1 PVC2300, 2400, 740, 74 764	14, 760,
01.00p 1950p 3300p	DS6000 D5600	1400p 3500p 3500p
5EG, 7100p	VH3, VH555, VH600, VI VH900, VH1000 (ALL MODELS VH1, VH2A) 1100p
3750p 9200p HRJ41	VH1, VH2A D1000, D1100 D1000X, D1500X, D450 D1200, D2000X, D5000 VR6450, VR6520, 64VR VR6420 VR6711 4 HEAD	1600p 0. VPCD100, 1600p
5850p	VR5450, VR6520, 64VR VR6420 VR6711 4 HEAD	60, 725p 1800p
1200p 1450p 1500p	VR0440	2500p
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21500	21DV3, 25601, 02, 11, 1 31DVI, 31DV2, 31DV3, 1 11, 12, 13, 68SB4, 71SE	12, 30DV2, 3SB02, 03, 05, 34, 86SBI,
1900p 2000p 1900p	VR6948 20DV1, 2DDV2, 20RV7, 21DV3, 25B01, 02, 11, 31DV1, 31DV2, 31DV3, 11, 12, 13, 665B4, 715E 915B2, 925B2, DV186, 468, 471, VR201, 202, 2 213, 223, 231, 232, 302, 312, VR313, 3210, 3216 323, 501, 6180, 6182, 6 6291, VR6293, 6362, 6 6470 VR3260, 6349, 6442, 66	03, 2115, 212, 303, 305, 311, 322, 3229
2100p	323, 501, 6180, 6182, 6 6291, VR6293, 6362, 63 6470	185, 6290, 67, 6467, 6468, 4600p
1350p 650p 1400p	6542, 6643 VR601	3, 6448, 6449, 1250p 1800p
G, 18. 2100p 2600p	49586, VR6548, VR6644 VR6843 SAISHO	8. 2750p
2000p 0, 54,	VR100, 605, 705, 805, 9 1200, 1600	05, 1000, 1100, 1200p 13650X,
3250p 4000p	VR3800 VR3200, VR3500 VR2000, VR3300, VR360	1400p
2250p 2850p	VR2500 VR55000X, VX6000A, V SALORA	2650p XLJ2X_1500p
6050p 2000, V7800, 610,	6500, 6600 SV7300, SV8200, SV830 SV8200, SV8200, SV830	
625p 1150p 2800p	SV7400, SV8400 SV8100 SV900, SV9900	1500p 1600p 1200p 3450p
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3200p 4200p 2300p	SV8620 SV9300 SV8830	2100p 2500p 2200p 2250p
3200p 4200p 2300p /L21, 42, 1450p 1700p	SV8720 SV8520 SAMSUNG	2250p 1900p
1700p 4200p 700p	SV6500 SVX301, VB900, 910, VV 5600, VX510, 511, 520.6	1500p VT510, VT320, 16, VX626,
1000p	SVE500 SVX301, VB900, 910, V1 5600, VX510, 511, 520, 6 627, 717, 614, 619, 629, 730, 970, 971, 972, SV7 7VX303, 305, V8510, 52 617, 619, 620, 626, 627, V1520, 616, 621, 626, 627, SVX319, VB770, V1710, 750, 751, 770, VB750, V1 VX7330, VK770, VK8225 1735, XR20	710, 712, 720, 16, 717, 10, 610, 616,
1450p 1850p 2000p 2500p	617, 619, 620, 626, 627, V1520, 616, 621, 626, 90 SVX319, VB770, V1710,	629, 710, 971, 0, 910, 1200p 730, 731, 735,
2400p 2750p 3200p	VX7330, VK770, VK8225 1735, XR20	K8220, VX750, 5, VR1730, 1900p
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2000p 1450p 3600p		
2400p 1050p 2600p	VTC5000, 5400, 600, 600 VPR5000, VTC 1500, VT 21 VTCM25, VTC2000, 5 5300, 5400,	CM 10, 11, 20, 100, 5150,
2600p 1050p 2400p	21 VTCN25, VTC2000, 5 5300, 5400, VTC5500, 5370, VTCNX; 20, 30, VPR5800 VTC5500, 5550, 9100, 93 3355, 9455, 9500 VHR1100, VHR1150, VHI VHR1200, VHR2100, VHI VHR2200 VHR2200 VHR2200	10, VTCNX15, 1800p 300, 9350, 1900p 81200
2600p 3800p 5200p 2000p	9355, 9455, 9500 VHR1110, VHR1150, VHI VHR1700, VHR2300, VHI VHR3200, 2370, 2400, VHI	1900p R1300, R2370 1200p
2250p	VHR3200, 3270, 3300, 3 3300, 3400, 3310, VHRD VHR1500, VHR2500, VHR VHR2700	110, 3150, 500 1500p R3330 2100p 2450p
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3100p 1400p	VHRD4/10 VHR150E, 153, 154, 150 251, 27, 350, 474, 5350E VHR7530, 7540, 8500SP, VHRD5350E, 5450E, 655 TLS1000P, TLS1001P,	1R, 240, 250, . 7500. . 8800.
5000p	VHRD5350E, 5450E, 655 TLS1000P, TLS1001P,	0 385 0p

	Price
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7250, 7300, 8070, 8100, 810 VHR7800, 7810, 8000SP, 880 VHRD4400, 4410, 4500, 4600 VHRD4610, 5700, 4800	1,8200, 11SP,
TL\$2000 VHR5300, VHR6500, VHR744 VHR3500EX	3100p 4250p 00 4500p 2150p
VHRU4610, 6700, 4800 TLS2000 VHR5300, VHR6500, VHR740 VHR3500EX VHR16, 235, 335E, 4150, 416 7250, 7260, 8250 VTC3000 SHARP	0, 4350, 1950p 1400p
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VCT212, 310, 410, VCT510, VCT1314, VCTS313 VC6000, 6200, 6300, 7300,	72, 1100p
7700, 7750, 8000, 8300 VC793 VC473, VC785, VC786	1800p 3000p 2200p
VC595, VC685 VC585, VC685 VC90ET VEH815	2800p 2000p 3900p 2800p
VC800, VCH851, VCH852, VCH882 VCH80, VCH81, VFH815	2700p 2800p
VC800, VCH851, VCH852, VCH892 VCH80, VCH81, VFH815 VCA33, VCA36, VCA43, VCA VCA45, VCA49	44. 1500p 2200p
VCA55, VCA63 VC570	2200p 2800p
DSR-19R FOR SL-T 9ME DSR-21 R FOR SLC 8-C9 DSR-35R FORC20, C30, C40,	3100p 2600p SLF1UB,
SLF1E2 PIN, SLC24PS, 33E, SLF11, 30PF, 35, 60PS, SLK8 SLT20ME, 30ME, SL100	34, 44PS, 35, 1500p
SL5100, SL3000 1 PIN, SLC6 SL36ES, SL37E SL3000, SI 8000, SI 8080, SI 6	515000, E, 1300p
SLT7ME SLV201, SLV202 SLK95, SLT50ME	1600p 2000p 2900p
SONY DSR.19R FOR SLT 9ME DSR.21 R FOR SLC 8-C9 DSR.39R FOR SLC 8-C9 DSR.39R FOR SLC 8-C9 DSR.39R FOR SLC 8-C9 SLT20ME, 30ME SL 00 SLT20ME, 30ME SL 00 SLT20ME, 30ME SL 00 SL300, SL000 SL000, SL0 SL300, SL000, SL000, SL0 SL300, SL000, SL000, SL0 SL300, SL000, SL000, SL0 SL736, SLT50ME SLV275, SLV374WE, SLV410, SLV412, SLV427, SLV410, SLV412, SLV427, SLV410, SLV41000B SLWF500, SLV152, 725, 727, 71	2200p
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CCDF340E, CCDF500E, CCDV CCDV95E, CCDSP5E SLV801, SLV802	/90E, 4800p 3550p
SLV310, SLV315, SLV325, SLV335 SLV210, SLV212, SLV270, SL	1600p V273,
SLV285, SLV300 SLV125, 213, 225, 252, 255, 2 SLVX1, 20, 3 SLV363, SLV416, SLVX50, SLVX55 SLVX75, SLVX90, SLVX95	1150p 62, 280, 1750p
SLVX55 SLVX55 SLVX75, SLVX90, SLVX95 SLV282, SLVX30, SLVX35 SLHF100P, SLHF100UB	2750p 3000p 2025p
SLVE7, SLVE8, SLVE9 SLVE90	5150p 5150p
TOSHIBA	3450p
V63 V9680 V8600, V8650, V8700 V21, V31, V32, V33, V50, V51	1500p 3400p 3000p
¥35,	
V82, V83, V841V85, V86, V87	, V81,
DV90, 96, 97, NM3, V108, 109 199, 200, 202, 205, 207, 209, 1 93, 94	80. 1450p
V5470, V5480 V600 V880MS V700G	1300p 2350p 2600p 3700p
V500G, V509G V9680 V300G, V301, V305, V306,	2500p 2900p
V309G V61, V63 V110, V120, V130, V140, V210 V212,	2550p 1700p), V211,
V220, V221, V222 V711, V880	1500p 3850p
VCP81E, VCP2C2 V65, V66, V6 V312, V322, V412 V91G	1200p 1250p 2600p 4600p
VCF31E, VCF2C2 V65, V66, V6 V312, V322, V312 V916 V609, V610V6108, V610UK, V V659F, V660, V660F V312, V403T, V413G V703W, V813G V95G	611, 3200p
v703W, V813G v95G	5200p 8000p
SEE PAGE 315	10000
MORE GRAND BARGAINS	
BANGAINS	

Kick-start for DTT

pplications for franchises to run digital terrestrial TV (DTT) services in the UK had to be received by the ITC by January 31st. Up to that point the whole idea of DTT had a rather lacklustre air about it. Why start digital broadcasting from terrestrial transmitters with a limitation of about thirty channels when satellite and cable distribution of signals can provide a couple of hundred or more channels? But we were in for a shock. The main applicant (there were only two) was British Digital Broadcasting (BDB), in which Carlton UK Television, Granada Television Ltd. and BSkyB have equal shares. They had, in addition, come to an agreement with the BBC which has promised to contribute up to five subscription channels to the proposed service. So on January 31st we suddenly found that the leading ITV and satellite TV broadcasters were anxious to take up the right to provide us with DTT broadcasting.

All of a sudden, DTT had become a hot proposition, likely to become the main way in which TV is received in the UK within a relatively short time (transmissions are due to start in mid 1998). Why the 'main' way, when satellite and cable can still offer greater scope? Simply because all you need do is to pop into your local dealer to obtain a digital TV decoder. No need to stick up an unsightly dish or get connected to the cable, just plug in your decoder. It will be that simple, and simplicity always pays when it comes to getting the public interested in taking up something new.

The decoder is likely to cost around £400

initially, but once production builds up the price should fall to less than £200. There is of course the extra cost of subscription channels and pay TV programming - but you don't have to have these. One small snag technically is that it might not prove to be quite so simple for many people. Though digital signals have proved to be robust, there is always the prospect of corruption when an inadequate aerial system delivers a poor signal. So many viewers may have to install a proper array instead of relying on a simple set-top aerial. About time too, you might say! The reward for viewers will be not only be extra channels but better quality pictures. The reward for the trade will be in extra aerial work as well as decoder and subscription sales.

Sets with built-in decoders should become available quite quickly - the technology is all there. Suddenly, 16:9 displays and high resolution make sense. It looks as if the days of analogue TV are numbered. This of course was the intention all along, but was unlikely to occur quickly unless someone was prepared to make a go of DTT. The government had, after all, allocated one multiplex to the BBC and one to ITV + Ch. 4 (there are six DTT multiplexes in all. each of which is capable of providing three-six channels depending on the complexity of the transmission - in the digital world, mug-shot displays require less spectrum space than allaction programmes). So it now looks as if the planned move from analogue to digital terrestrial TV will be a smooth one.

Viewers can of course take advantage of DTT and satellite or cable TV as well. Whatever suits. The thing is that thirty or so channels should be ample for most ordinary viewing requirements. Those 200 satellite/cable channels were beginning to look as if they would be used largely for service duplication to provide 'near video on demand'. Those with more specialised viewing interests can rely on cassettes or discs, which are probably better suited to the purpose.

One has to admire the decisive way in which the BDB partners have stepped in and taken advantage of the situation. There is much in it for all of them. Carlton and Granada would get a foothold in digital and subscription TV. The BBC's position would also be enhanced: as a programme provider, it can look forward to an improved income flow. As for Rupert Murdoch, he would plant his feet firmly in the one area of TV from which, in the UK, he has to date been precluded. He has everything to gain and nothing to lose. Those who, like me, looked at the early advertisements for Sky Television and thought the man was off his head have been proved utterly wrong. Murdoch has extended his TV interests world wide to take up just about every opportunity available.

The immediate stock market reaction was to conclude that the cable TV companies will be in for a tough time. This need not be so. They still have the advantage of being able to provide telephony services and links to that growth area, the Internet. In fact we are being spoilt for choice. It seems a long way from 2LO and the girl who made the telephone connections and got all the local gossip!

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REED BUSINESS INFORMATION

TELETOPICS

Interactive TV Services Start

Interactive TV is being launched in the Birmingham area on March 1st. The service is being run by Two Way TV, in conjunction with the BBC, Channel 4 and the ITV broadcasters. It enables users to obtain additional information, such as an actor's biographical details or a horse's form and pedigree, or



Interactive TV has come to the Birmingham area. participate in quiz programmes. Extra information is transmitted, teletext style, during the field blanking period, while viewer's responses are sent via a modem and telephone line, using a freephone number. A set-top decoder box with a built-in modem is required. The viewer uses a special IR remote control handset to move a cursor and operate buttons for various selections/functions.

The Two Way system superim-

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poses text and graphics over the transmitted TV picture. Initially, viewers will be able to choose from around 100 hours of programming a week. There will also be a 24-hour electronic programme guide and a helpline. The broadcasters will supply tapes of programmes in advance, to enable Two Way TV to prepare relevant information for transmission. There is provision for cash prizes with quiz programmes and placing bets up to £10. At the end of a quiz, the set-top decoder will send the score to Two Way TV's operational centre in London for checking.

Two Way TV hopes that its system will become the general standard for interactive TV. The service has been tested in 500 homes in the Birmingham area since late 1995. Broadcasters are pleased since a survey showed that the service boosts some programme ratings by up to thirty per cent. Two Way TV has invested some £20 million on setting up the service, and estimates that break-even point will be reached with 400,000 subscribers. The basic box and handset costs about £100, the charge for a month's subscription being £7. A de luxe package with Nicam stereo sound and four handsets, so that up to four people can play games simultaneously, costs £150. The equipment and subscriptions are being handled by radio/TV dealers. For trade marketing enquiries phone 0171 242 0087.

A somewhat different approach has been adopted by Videotron for cable TV viewers in the London area. Videotron's TVinteractive channel can link TV programmes to the Internet, enabling viewers to visit Web sites that are relevant to the TV programme and watch commentary, via the internet's 'chat' software Internet Relay Chat, on issues raised in a programme. The system's design builds on pioneering work done by TVinteractive to combine WWW technology with TV production.

Interactivity is achieved by using four video channels simultaneously: the different video signals are synchronised with software embedded in the basic transmission. This tells the subscriber's Videoway converter box what he can do at any time. Interactive decisions are carried out by pressing a coloured button on the special remote control unit. There is then seamless switching from one video stream to another, the software keeping track.

TVinteractive is available exclusively via the Videotron Cable TV network, which serves over 110,000 homes in south and west London. There is no extra cost to subscribers. The Videoway box is about the same size as a VCR: it incorporates the memory and software required, as well as the basic cable technology that gives viewers access to the various channels carried by the network.

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Cable TV Goes Digital

Major UK cable television companies are expected to decide within the next two months to commit several hundred million pounds to the development of digital cable TV services. The aim is to expand network capacity to up to 200 channels in order to compete effectively with satellite TV services. The investment is considerable because subscribers would need new set-top boxes - there are now over 2.3m cable TV subscribers in the UK.

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Later this year Time Warner is to start adding digital technology to its cable networks in the USA to provide extra channels and services, with video-on-demand and high-speed Internet access. The company has placed orders approaching \$500m for equipment, including a million digital set-top boxes. Time Warner has been running an experimental network, which it now considers to have been a success, in Orlando, Florida.

Following the completion of successful field trials with Italian cable operator Stream. Pace has started to deliver set-top boxes for what will be the world's first digital cable network. The system is DVB compatible, using MPEG-2 video. Pace has been conducting trials with 2,000 DVC200 units in six Italian cities. Stream hopes to convert a large proportion of its 500,000 subscribers to digital operation by the end of the year.

Transmission News

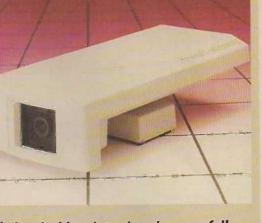
DTT (Digital Terrestrial TV) is now expected to start in the UK in July 1998. The ITC hopes to be able to grant transmission multiplex licences by this summer, but the need for international frequency clearance and agreement on a common standard and conditional access could introduce further delays – an autumn launch was the original aim. Work is understood to have been completed on IC and set-top box development. SGS-Thomson and Motorola both expect to have chip sets available to manufacturers by March/April. Small-scale DTT test transmissions are being carried out across the UK.

NTL has completed a major investment programme that enables ITV, Channel 4 and S4C viewers throughout the UK to receive Nicam digital stereo sound. The engineering work has included modification to or complete replacement of transmitters at over fifty main sites. The final installation was at Skriaig, Isle of Sky on December 6th.

The largest Channel 5 test transmission to date, in London, produced fewer complaints about interference than had been expected. Only 45,000 calls were received from viewers, with 13,000 mentioning interference – up to 175,000 calls were anticipated from homes where retuning had not been carried out.

The BBC has announced that a consortium led by Castle Tower Communications of Houston, Texas is the 'preferred bidder' for its UK transmitter network, which is to be privatised in a deal that should bring in about £250. The consortium came up with a higher bid than NTL, which had been expected to take over the network. The BBC intends to use the money to help fund its transition to digital broadcasting technology.

The FCC has approved the standard for the next generation of TV in the USA – digital HDTV. A second channel is now being assigned to every TV station so that digital transmissions can be run alongside the current analogue transmissions, which are expected to continue for about fifteen years. The first digital TV receivers are expected to go on sale early next year.



Bull Electrical has introduced a new fullcolour security camera at just £119. The Japanese made camera is fully cased and has a 4mm f2.8 lens fitted as standard. Its 500 x 582 element picture makes it well suited to computer-based on-line security systems. The camera provides a standard 1V p-p composite PAL output and requires a 12V DC 200mA supply. For further details phone Bull Electrical on 01273 203 500.

SEME and Willow Vale Electronics have also recently added video security equipment to their stock lines.

TV/Video Equipment

Minsubishi has added a new "flagship" receiver, Model CT32CW1BD. to its TV range. The set offers several viewing modes, including 4:3, 14:9, 16:9, 4:3 (semi-wide), Cinema wide, Panorama 1 and Panorama 2. Other features include a twin-tuner pictureinpicture system, a three- or nine-picture channel scan facility, a superflat tube, Megatext, a 100Hz field and line flicker free display, a full-screen digital memory for quality freeze-frame viewing, the capability to zoom in by up to two times magnification at any part of the picture and Dolby Pro Logic Surround sound. The suggested price is £1.800.

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Sony has launched the first superflat Trinitron widescreen TV receiver in Japan. It's claimed to be the world's first vertically and horizontally flat CRT. The 28in. set uses a number of new techniques to achieve this flat display. including high-level vibration control, a colour differentiation structure and a high-focus gun. Focusing is improved by up to twenty per cent by increasing the beam crossover angle: this gives greater uniformity over the entire screen.

Panasonic is at present handling the

licensing of the DVD scrambling/encryption technology known as CSS. The service includes the delivery of the various coding keys to manufacturers. Panasonic is also developing a DVD Internet Linking system, which is designed to produce MPEG-2 video within an Internet web page using a DVD-ROM drive. Panasonic expects to launch a DVD player. Model DVDA100, in the UK this summer. It will play DVD Video, Video CD and audio CD discs and cost around £600. Hitachi, Akai, Aiwa and Sony have also announced plans to launch DVD players.

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Trade News

Philips has announced that it is to sever its managerial links with and commitments to its lossmaking partner Grundig. Philips will continue as a "passive shareholder", with a 32 per cent stake in Grundig, while Grundig is to seek a new parent company. Philips' aim worldwide is to move production to lower cost countries and concentrate on a single brand.

CPC of Preston continues to increase the range of products it stocks. Over 1,500 items have been added from the H.R. Diemen transformer range, making CPC a single source for virtually all LOPT requirements. Transformers are to be listed in two ways. First by brand and model number, with the relevant H.R. Diemen replacement. The second listing is more comprehensive, with manufacturers' original part numbers cross-referenced to the equivalent H.R. number. CPC's ranges of video spares and accessories and semiconductor devices have also been increased substantially. Over 190 new replacement heads have been added, including drums for carncorders, time-lapse and duplicating machines as well as domestic VCRs. With over 4,500 new semiconductor devices added, CPC's range of such items now exceeds 20,000. Newark Video Services, which is run by Steve Beeching, I.Eng., has been appointed by JVC (UK) Ltd. as an authorised service centre for the DV1 digital carncorder – one of only two or three around the country. Steve remains at the forefront of state of the art video technology.



Reports from David C. Woodnott Simon Bodgett and David Corcoran

Canon UCX1HiE

All functions worked but the customer said that the colour viewfinder picture had 'bits missing'. In fact several areas of the LCD failed to operate correctly, giving the missing pixels effect. Inspection revealed that the mask which surrounds the LCD was pitmarked in several places. This indicated that the problem had been caused by the sun's rays being focused on to the LCD and its mask, probably while the camcorder was being transported. A new LCD was required. We warned the owner to take care when out on sunny days. The rays also affect monochrome CRT viewfinders, but the only damage is usually to the CRT mask, which will show this tell-tale pitting. D.C.W.

Ferguson FC54

The reported fault was no operation. There was a tape stuck in the mechanism, which made removal of the deck section difficult. Fortunately the loading motor's contacts are accessible, and after removing the connections to the drive circuits power could be applied to get the cassette out.

With the deck removed, an inspection revealed that the main cam gear was damaged. We replaced this along with the mode switch, which is usually the cause of such problems with these mechanisms. The switch fails to tell the mechacon to stop driving the

Camcorner

loading motor when the fully laced condition is reached. Hence the damage to the cam gear etc. It's best to check all the plastic gears for damage while you have the unit dismantled. Retiming is straightforward

The deck was still inoperative when we'd reassembled and reconnected it, because CP1 (N20) on the main PCB had failed. Replacing this item restored the unit to active service. **D.C.W.**

Hitachi VME21E

This and other Hitachi models seem to appear, often with various clone badges, on a fairly regular basis. The reported fault with this one was that the AV socket was faulty. In fact the socket was OK, but the pins in the miniconnector were severely bent. Once we'd overcome this problem, a quick check on the camcorder's operation revealed two previously unmentioned faults. There was no autofocus operation, because the lens was completely jammed. And there was a noise band at the bottom of the playback picture.

The lens problem was resolved by dismantling the unit then reassembling it correctly. This is not easy, as the sections are glued together – the unit is not designed to be repaired. Fortunately there was no damage to the unit's parts. The noise band problem was cured by refitting the take-up tape guide assembly to the coaster base. It's common for this guide to become loose, or even detached, with this mechanism. Once refitted the guide needs to be secured with a suitable adhesive. **D.C.W**.

JVC GRC1

This camcorder would record only if the record button was pressed in quick succession. No, I didn't understand the fault report either! The capstan flywheel FG signal was missing, and there was intermittent slow rewind. A dark cloud of gloom spread overhead, as is usual with this sort of fault. Anyway, we discovered that there was a break in the 8V supply to the capstan motor, at connector CN11. Replacing IC4 and C24 in the servo department stabilised the operation of the capstan, restoring order. S.B.

JVC GRAX5

This camcorder's viewfinder had poor focusing. The cause was a defective EHT transformer. Note that if the EVF tube is broken it's cheaper to order the complete viewfinder. The tube tends to be more expensive. S.B.

JVC GRAX40

"Films in black and white" the report said. Checks showed that there was no chroma in the E-E signal. It was a camera head fault of course. The chroma encoder is IC801, whose subcarrier feed was missing. This comes from the EHD-GA1451 hybrid subcarrier oscillator chip, which was faulty. S.B.

JVC GRS505

This camcorder had come from Mastercare, so it was going to be a difficult fault. There was no playback colour, and the Mastercare engineer had noted that there was no E-E colour though the burst was present. A quick vectorscope check showed that the subcarrier frequency was incorrect. The main subcarrier oscillator is in IC110, type MC8181D. Replacing this item restored the colour. An updated IC is now available, type EHD-GA1389A. S.B.

JVC GR45

The cause of intermittent camera pictures is often dry-joints on the bit of flexiprint (horizontal drive pulse circuit) over the CCD imager, particularly at diode D2. S.B.

Panasonic NVMS4 and NVM40

No power when used with the battery but OK with the AC adaptor seems to be a common fault with these models. The cause is opencircuit print on the AV jack (B) PCB, between pin 1 of P1604 and pin 4 of P1602. **D.C.**

DELT VITO 10 --

	PINCH ROI	LERS/VCR	BELT KITS	
Model Price	Model Price	Model Price	Model Price	Model Price
AKAI /S10, VS9300, VS9500, VS9700, VS9800,	FVHP20 165p FVHD140, 40, 55. FVHP1, 10, 25, 30, 40, 4000,	PINCH ROLLER ASSEMBLY PART NO: 948D020010 HSE11, 12, 18, 17, 21, 22, 27, 31, 32, 41, 51,	VHR2700, 3330, MVR220 165p VTC5000, 5150, 5300, 5350, 5400, 5500, 8000, 8010, 8500, 9100.	SL100, 200, SLC20, 30, 33, 34, 40, 44, 80, 8 9, SLF1, 20, 25, 30, 35, 45, SLF60, 65, 73, 9 SLHF100, 150, 950, SLK85, 95, SLO1700,
/P7100, VP77 186p /S1, VS2, VS3, VS4, VS5, VS6, VS8, VS9,	FVHS10, 30 1350p PINCH ROLLER ASSEMBLY GOLDSTAR	HSE11, 12, 16, 17, 21, 22, 27, 31, 32, 51, 51, 52, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120,	VTC9300, VTCM10, 20, 11, 21, 30, 31, 40, 50, VPR5800 166p	SLS550, SLT0, 30, 50 30 PINCH ROLLER ASSEMBLY
S12, VS15 165p S105, 112, 115, 116, 120, 125, 26, 155, 165, 205, 220, 240, 244, 245,	GHV51, 1221, 1232, 1233, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 165p	150, HSM16, 170, 18, 190, 210, 23, 26, 250, 27, 30, 33, 34, 35, 36, 37, 370, 38, HSM380,	VHR3100.3300, 3310, 3400, 3500, 3700, 3800, VHRD500, 700 166 p	VCR BELT KITS
S247, 248, 250, 512, V\$516, 516, S29 165p	GHV1247, 1248, 1250, 1266, 1290, 1291, 1295, 1296, 1392, 1393,	40, 45, 450, 50, 54, 55, 555, 57, 58, 59, 60, 68, HSMS2, 9, HSMX1, 18, 19, 2, HSS11, 12, 14,	VTC3000 185p VHR120, 130, 14, 141, 143, 14, 150, 151, 153,	VP7100, V\$9300, V\$9500, V\$9700, V\$980 120p
S201, 301, 303, 304, 603, 606, 607, VSP8, SP82, VP58, VP82 165p	GHV1891, 1900. 2145, 3000, 3010, 4400. 4410, 51, 8000, 8200, GHV8210, 8215.	15, 17, 19, 21, 25, 5500, HVF125, HVF150, 303, 85, SV8900, 8930 185p	154, 15, 16, 171, 194, 22 0VHR23, 235, 240, 244, 250, 251, 274, 27, 297, 310, 330, 335, 350, 390, VHR4100, 4105.	VS1, VS2, VS3, VS5, VS12, VS15, VP8810 VS10 6
/S126, VS155, VS165, VS220, VS240, VS250, /S512 165p	8430GHVP1240, 1241, 1247, 1248, 1290, 1291, GHVP1295, 1296, VCP4000, 4100, 4130,	HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330, HS360, HS700 166p	4150, 4200, 430, 4300, 4350, 4400, 474, 4770, 5080, VHR5100, 5200, 5300, 5350, 5600.	VSX9, VS105, 112, 115, 116, 120, 125, 126 155, 165, 205, 220, VS24, 240, 244, 245, 24
/522, 23, 25, 35, 37, 38, 53, 86, 75, 422, 425, 128, 427, 462, 465, 467, /S485, 785, 766, 767, 768, 865, 867, 965, 967,	4200, 4300, 4301, 4305, VCP4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 4350, GSE1290, 1291, 1295, 1296, 1297, 1891,	HS700 166p HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS400, HS410,	5700, 6850, 7100, 7200, 7250, VHR7280, 7300, 7400, 7440, 7500, 7520, 7530, 7540, 7700,	248, 250, 512, 515, 516 30 VS22, VS23, VS25, VS35, VS37, VS38, VS
/5465, 765, 765, 765, 767, 768, 665, 667, 960, 867, /SA77, VSA550, /SF10, 11, 12, 15, 180, 190, 200, 210, 220,	1910, 20005, 2000 185p	HS411, HS412, HS421, HS480, HS710, HS8 10, HS820, 30, H5E 10, 20,	774, 780, 0VHR7810, 8000, 8070, 8100, 8200, 8250, 8500, 8800, VHRD4400, 4410, 4500,	VS55. VS66 8 VS4, VS6, VS8, VS9 12
21, 222, 230, 240, 30, 33 /SF330, 4, 500, 550, VSP88, VSR100,	VT7, 11, 14, 16, 17, 18, 19, 33, 34, 35, 350, 38. 39, 88, 330, 680, 4200,	30, 70 185p NATIONAL PANASONIC	4600, 4610, 4710, 4890, 6700, VHRS700165p VCR100 165p	VSA77 14 VSS99 10
/SX400, 450, 470 165p /SF260, 261, 262, 265, 270, 274, 275, 280,	VT5000, 5030, 5500, 6500, 6800, 7000, 8000. 8300, 8500, 8700, 930, VT9500, 9700, 9900,	NV100, 180, 300, 330PX, 332, 333, 340, 365, 600, 688, 777, 788, 3321,	VHR120, 135, 150, 190, 4150, 4160, 4350, 5200, 5240, 5350, 7200, 7250, 7260, 7700, VHRD4410, 4610, 4710, 4890, 5450,	ALBA VCR40000 13
290, 340, 350, 410, 420, 43C /SF441, 440, 450, 455, 480, 490, 497, 510,	VM600 165p VTB, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100.	AG6010, 5015, 6100, 6200, 6400, 6800, 7450 165p	VHRS700 975p PINCH ROLLER ASSEMBLY	VCR5000, VCR6000 10 VCR161, VCR222 10
60, 580, 590, 599, 600, /SG20, 21, 23, 24, 25, 30, 33, 34, 35, 51, 54, /5, 60, 64, 65, 70, 73, 74, 76,	110, 111, 113, 115, 118, VT120, 122, 125, 128, 130, 135, 138, 145, 150,	NV230, 250, 260, 280, 370, 380, 430, 431, 433, 450, 480, 465, 470, 480 NV630, 550, 730, 770, 780, 810, 830, 850, 870, 770, 780, 810, 830, 850, 870, 100, 100, 100, 100, 100, 100, 100, 1	VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 7000 1350p	VCR3000X, VCR4000, VCR4000X VCR7000, VCR7800, VCR8000, VCR88001 VTV10 1
/SP110, VSX560, VSX580 165p /S17, 20, 22, 23, 24, 25, 26, 27, 35, 37, 38, 53.	168, 170, 175, 220, 225. VT250, 255, 258, 260, 400, 405, 410, 413, 414, 415, 416, 418, 420, 425	890, 2000, 2010, 3000, NV7000, 7206, 7800, 8050, 8150, 8170, 8200,	PINCH ROLLER ASSEMBLY	AMSTRAD TVR123, VCR4500, VCR4700,
5. VSA77 775p PNCH ROLLER ASSEMBLY	VT426, 428, 430, 431, 435, 438, 450, 498, 510, 515, 517, 518, 520, 525,	8300, 8400, 8500, 8800 NV8610, 8620, NVG11, 14, 16, NVG7, 10, 12,	VC200, 381, 383, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000,	VCR5200 1 VCR7000
/\$422, 425, 426, 427, 482, 485, 487, 485, 498, /85, 766, 767, 768, 865,	VT528, \$30, 535, 536, 540, 545, 546, 548, 570, 575, 578, 580, 585, 588	15, 18, 30, 130, 430, AG 1000, 1050, 1200, 1500, 2100, 2200, 6500,	V(6200, 6300, 7300, 7700, 7750, 7600, 8300, 838, 9100, 9300, 9400, V(9500, 9600, 9700, 9800, 166p	VCR1000, 2000, 6000, 6100, 6200, 8800, 1 8603, 8604,
867, 965, 967, VSA650, VSF10, 11, 12, 14, 16, 180, 190, 200, 210, 220, 100, 200, 210, 220, 200, 20	VT640, 830, VTF660, 665, 70, 770, 774, 778, 780, 785, 850, 861, 865.	6810, 7500, 7510, NVH70 165p	VC9500, 9600, 9700, 9800 166p VC300, 387, 402, 471, 473, 477, 431, 482, 483, 486, 488, 496, 500, 571.	VCR8700, 8704, 8714, 8800, 8804, 9000, 9 9244, 9340,
221, 222, 230, 240, 30, 300, 301, 310, 320, 33, 330, 4, 500, 510, 600, VSR110, VSX100, 400, 450, 470 800p	VTL30, 1000, 2000, VTLC50, VTM598, 620, 622, 625, 626, 630, 635 VTM636, 640, 845, 646, 720, 722, 725, 726,	NVG9, NVG120 165p AG6840, 6720, 7150, 7330, 7350, 7355, 7650, NVH65, 75, NVJ30,NVL20, 23, 25,	1 480, 488, 490, 600, 571, 573, 581, 582, 583, 584, 585, 8481, VC5F3, VC5W20E, VCA1031 165p	DD8900, DD8904, TVR4 1 TX3550, UF20, 22 24, VCR3000, 3002, 40
NCH ROLLER ASSEMBLY	727, 728, 730, 731, 735,	28, NVG300, NVF65, NVF70, NVFS1 NVFS 100, NVG 19, 20, 25, 33, 40, 50.	VC108, 205, 405, 408, 550, 600, 651, 671, 674, 681, 682, 684, 685, 693.	9500 V\$1004 1
ALBA /CR300EX_VCR4000 165p	VTM/36, 740, 745, 746, 746, 753, 754, 820, 821, 822, 825, 830, 831, VTM835, 838, 840, 841, 845, 920, 921, 922,	NVV8000 165p NVD48, NVD80, NVG21 NVG45 165p	VC699, 700, 772, 750, 779, 780, 781, 7810. 782, 782MK2, 7822, 783,	BLAUPUNKT ATV100 2 ATV100 BTV224
CR5000, WCR6000 185p CR151, VCR222 180p	925, 930, 931, 935, VTS80, 85, 890, 895VM200, 2300, 2380, 3200,	NVJ700PX 165p NVH0100, NVHD101, NCHD90, NVSD30,	VC795, 786, 787, 793, 800, 7810, 7822, VCT72, VC5F3, VC6V3, VCA 100, 102, 104,	RTV200, RTV222, RTV224 RTV202, RTX200 1 RTV322, RTV248 1
CR750G, VCR7800, VCR8000, 165p	3280, 500, VMS7200 165p VT3000 165p	NVSD40 1125p PINCH ROLLER ASSEMBLY	131, 140, 170, 202, 203, 211, 234, 303, 501, 502, VCA602, 5011, VCD801, 802, 851, 852, 881, 882, VCM73, VCT73, VCT72,	RTV306, 307, 309, 310, 311, 312, 328, 41 434, 444, 707
ANSTRAD	530, VTF770, 780,	AG5150, 5250, 5700, 6024, NVD38, 48, 30, NVF55, 65, 70, 75, 77, NVF51, 100, 200, 88, 90, NVG 19, 20, 21, 22,	VCB361 165p VC220 165p	RTV211, RTV214 1 RTV324, RTV32565p
UCR1000, 2000, 4500, 4600, 4700, 5200, 8000 5130, 5200, 8600,	PINCH ROLLER ASSEMBLY	25, 28, 300, 33, 40, 45, 45, NVG50, NVH65, 75, 77, NVJ30, 33, 35, 37, 40,	VCA10, 30G, 60, 103, 105, 106, 111, 113, 131, 211, 244, 254, 33, 35, 36,	RTV315, RTV316, RTV319, RTV320, RTV317
CHESC2, 9603, 8504, 8700, 8704, 8714, 8800 3854 9000, 9005,	290, 285, 350, 351, 355, VTF360, 365, VTM140, 141, 145, 145, 210,	42, 45, 47, NVL20, 23, 25, 28, NVW 1 350p	VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 51, 52, 53, 54, 55, 57, 58, 505,	RTV301, RTV333, RTV338, RTV404, RTV424
CREAL, 9340, DD9900, 8904. 1659 1659 1659	211, 212, 215, 220, 221,	PINCH ROLLER ASSEMBLY	VCA80, 605, 615, 62, 63, 67, 68, 1033, 11613, VCB311, 320, VCBS97, VCD805, 806, 810,	FERGUSON 3292, 3V00, 3V01, 3V16, 3v22, 8900, 890
DD8900. DD8904, VCR6000, 6100, 6200.	HINARI V20H, V20.5, V20.5, V20.7, 8, 9, 10, 11, 19, 90.	N830, 831, 832, 833, 855 165p PVC2300, 2400, 740, 744, 745, 760, 764,	815. VCH80, 81, 865, 910, VCS 1000, VCT310, VCT410, 610, VCT 1314, 5313, VC790, 185p VC780, 790, VCA10, 103, 1031, 105, 106, 211,	8902, 8903, 8904, 8906, 8909, 8912, 8922 1 3723, 8923, 8924, 8929
CRE700, 8800, 900>9, 9140, 9244, 3340 700p	H13V, VTV100, 208 165p VXL2, VXL3 165p	766 165p DX1000, 1800, 1800, 2000, 3000, NSC12.	244, 254, 255, 30, 35, VCA340, 43, 47, 50, 60, 605, 615, VCD806,	3V23, 8923, 8924, 8929 3V29, 3V30, 8930, 8931, 8933, 8940
THE ROLLER ASSEMBLY PART NO:	VXL4, VXL20, VXL35 165p VTV100, VXL10, VXL11, VLX9.	9013, 9014, 9016, 9033 N9034, 9053, 9054, 9055, 9056, 9066, 9096.	815, VCH80, 81, 83, 85, VCH865, 87, 910, VCS 1000, VCT212, 310,	3V31, 3V32, 8941, 8942 3V35, 3V36, 3V38, 3V39, 3V49, 8943.
TICHESO, UF20, VCR3000, VCR3002, VCR4000 VCR3500 300p 300p	PINCH ROLLER ASSEMBLY	9110, 9120, 9510, 9520, N9530, 9610, PX 1200 165p DS6000G, DX4000, N9077	410, 510, 610, VCTI314. VCTS313 526p	8944 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V
PNCH ROLLER ASSEMBLY PART NO: 254966 209900, 9904, TX3650, UF20, 22, 24,	J.V.C.	NS2000 165p	PINCH ROLLER ASSEMBLY SAISHO	3V55, 3V57, 8945, 8947, 8948
273000, 3002, 9500 166p \$3004 V\$1104 166p		VH1, VH2 165p VC150, 180, VH3, 33, 200, 201, 205, 212, 250,	VHL3, VR1000, 2000, 2500, 3200, 3300, 3500, 3600, 3650, 3650, 3800, VRS4400, VRS5000 165p	3V58, 3V43, 3V44, 3V59, 3V64, 3V65, 89 8951, FV10, FV11, FV12, FV13, FV14, FV
FERGUSON 3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292.	7655 165p HRD110, 111, 120, 121, 140, 141, 142, 143,	254, 288, 300, 303, 312, VH404, 555, 700, 704, 712, 770, 780, 344, 900,	VR3400 180p SAMSUNG	FV21, FV22, FV26, FV32, FV39, VC141L FV31R FV61L, FV62, FV67, FV68, FV70, FV71, F
2900, 8901, 8902, 8903, 8904, 8906, 8909, 3912, 8922, 8923, 8924, 8925, 8929 166p	150, 152, 156, 157, 158, HRD150, 220, 225, 250, 257, 445, 455, 565,	1000, 2948, 3030, 3312 VHF2A, VP2948 165p	SV716, 717, V8510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 900.	FV74, FV77 FV43H, FV44L, FV46T, FV57H
3v29, 3v30, 3v31, 3v32, 3v52, 8930, 8931, 2933, 8940, 8941, 8942 165p	566, 725, 755, HRP50, 2P5000, 8R7000, BRS611, 811 165p	COMB 15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML,	V910, V1510, 520, 611, 616, 621, 626, 900, 910, VX510, 520, 616, VX517, 519, 526, 527, 629, 1650	FV37H 3V52
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56,	HRD520, 540, 550, 560, 580, 600, 610, 620, 637, 640, 641, 550, 660,	TVP230RC, VCP, VH04, 30, 103, 306, 358, 360 362, 400, 416, 512, VH530, 532, 535, 536, 600, 630, 635, 640, 566	SVX301, 303, 305, 307, 319, 322, VB710, 713,	FV41R, FV42L FIDELITY
3457, 3458, 3459, 3465, FV10, FV11, FV12, FV14, 8943, 8944, 8945, 8947, 8948 165 p 3452 165 p		730, 735, 744, 774, 790 VH800, 820, 850, 868, 893, 500, 930, 940, 942	770, 790, 8220, 8225, 970, VX/10, 712,	6100
2950, 8951, FV10B, 11R, 13H, 14T, 20B, 21R, 22L, 26D, 31R, 32L, FV33H, 39S, 41R, 42L,	215, 300, 315, 316, 318 HR.1400, 405, 407, 410, 411, 415, 416, 507,	974, 1012, 1040, 1050, VH1060, 1070, VH1100, 1120, 1204, 1440.	971, 972, 8220, PX980, 981, 982, SE9000, 9001, SX7120, 7121, 7220, 7221, 7230,	VCR100 VTR1000, VTR1001 TX3650, VCR3000, VCR3002.
508, 518, 52L, VC141L 165p FV37H, FV44L, FV46T, FV43H.		1500, 1660, 1800, 2004, VH2151, 2308, 22042400, 2500, 2600, 2700.	SX7301, VK3220, VPX31 165p	VCR9500
FV57H 165r 3V35, 3V36, 3V38, 3V39, 3V49, 8943.	SR3200, 330, 358 165p HRD170, 171, 180, 210, 211, 217, 239, 300,	VH2960, 2970, 3050, VH3060, 4000, 4008, 4010, 4032, 4015, 4015,	VXC9880 165p PX31 R, 32R, PXR30, SV80, SX3230, 3231, 2360, 3361, VX80, SV80, SX3230, 3251, 2360, 3361, VX80, SV80, SX3230, 3561,	FISHER VB\$7000 VB\$9000
8944 1100p PINCH ROLLER ASSEMBLY	HRD370, 400, 430, 440, 441, 470, 530, 530.	4020, 4300, 5020, VP 10, 200, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2957, 2966, 2979, 2980, VTV300,	3250, 3251, VS390, VX30, 31, 32, 3560, 3561, 370, 375, 380, VX6300, 301, 305, 307, 320, VX6321, 375, 330, 331, 336, 337, 350, 351,	FVHP520, FVHP530, FVHP420 FVHP615, 618, 620, 622, 710, 711, 715,
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948 1350; PINCH ROLLER ASSEMBLY	700, 750, 950, HRS5000, 5500, 8000, 9000, BR7030, 70≑0, 9060,	2949, 2959, 2957, 2966, 2979, 2988, V1V300, VXL20, 25, 30 165p		721, 722, 725, 730. FVHP830, 840
PINCH ROLLEH ASSEMBLY FV37, FV57, FV58 350 PINCH ROLLER ASSEMBLY	BRS600, 605, 747, 777, 920, 925 165p HRS10 155p	VR5460 VR6920 165p	503, 504, 600, SX1230, SX1231, 1260, 1261, 1566, V11560, VPK43,	FVHP905, 906, 907, 908, 910, 911, 915, 918
FV31R 165s FV41L FV42L 925s	BP5000, HRD110, 111, 120, 220, 225, 455 1100p	VR2024 165p	1850 165p	VBR330, VBS7500, VBS7600, VBS9900 VBS3500
PINCH ROLLER ASSEMBLY 3V58, 3V59, 3V64, 3V65, FV10, 11, 12, 13, 14	PINCH ROLLER ASSEMBLY HRD140, 141, 142, 143, 150, 152, 157, 158,	VE6540 165p DV856, 586, VR702, 703, 6485, 6585, 6585,	SLC5. 6, 7, SL3000, 8000, 8080, 8200, SLJ 10,	DAUDINO DAIDIO DUIDEE DUIDE
20, 21, 22, 26, 30, 32, 33 PV39, VC141L 875	160, 565, 566, 725, 755,		SLT6ME, SLT7ME 165p SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 35, 60, 100,	FVHD230, 250, 270, 370, FVHP1100, 12 1250, 130, 132,
PINCH ROLLER ASSEMBLY FV43H, FV44L, FV45X, FV46T 700 PINCH ROLLER ASSEMBLY		VR8943, 44589 165p DV464, 662, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, VR2480, 2485, 2436, 2485,		FVHP1340, 1400, 1410, 1440, 1500, 200 210, 250, 3, 300,
FV61, FV62, FV67, FV68, FV70, FV71, FV72, FV74, FV77 775	HRD650, 720, 830, 840, 910, HRJ205, HRS5800 350p	2490, 2496, 2540, 5452, 6463, 6464, 6560.	SLT50ME 165p BMC 100, BMC200, BMC500 165p	310, 320, 2000, 410, 420, 430, 440, 445 475, FVSD2905 FVHP5000, 5005, 5050, 5075, 5100, 975
PINCH ROLLER ASSEMBLY	PINCH ROLLER ASSEMBLY BR7030, BR5600, HRD160, 170, 171, 180,	N-1700, VR2870 165p VR2025, VR5580, VR5581 165p	SLV201, 202, 301, 302, 401, 402, 801. 802 165p	990
FVHP420, 520, 530 165 FVHP615, 618, 620, 622, 710, 711, 715, 716.	HRD230, 271, 300, 310, 320, 321, 330, 337,	49\$86, VR3260, 6349, 5448, 5449, 6548, 6648 165p		G.E.C. 4005 V4004
720. 721, 722, 725, 730, FVHPS10, 830, 840 165	350, 400, 430, 440, 441, HRD470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000 875p	PRESSUPE ROLLER ASSEMBLY PS403- 40205 DV186, 190, VR211, 2115, 212, 213, 223, 286	SLV757, 777 165p SLV255 165p SLV275, 282, 315, 325, 353, 363, 373, 410,	V4007 GOLDSTAR
Put-P305, 906, 907, 908, 918, 918, 915, 916, 528, 970, 975, 980, 990, Put-P 5002, 5005, 5050, 5075, 5100 16-5	PINCH ROLLER ASSEMBLY HRD540, HRD550, HRD580, HRD660,	291, 292, 311, 312, 313, VR3210, 3219, 322, 3229, 323, 535BO, 486,	415, 416, 474, 625, 656, SLV715, 725, 727, 757, 777, 815, 825, SLVX30, 50, 55 165p	GHV1221, 1232, 1233, 1240, 1241, 124
5050, 5075, 5100 165 WBR330, V8S3500, 7000, 7106, 7500, 7500, 5000, 9900 165	HRD860, HRD960 700p PINCH ROLLER ASSEMBLY	471, 562, 562, 571, 761, VR201, 202, VR203, 302, 303, 305, 6180.	SLV125, 213, 225, 252, 255, 262, SLVXI. 20, 3 165p	GHV1245, 1247, 1248, 1250, 1265, 51, 1 8200, 8210, 8215.
FUA-D230, 250, 270, 370, 2000D. FVA-P3, 210 250, 300, 310, 1100.	FL3600, HRJ605, HRJ815, 19755200 875p	6182, 6185, 6285, 6290, VR6291, 6293, 6362, 6367, 6390, 6391, 6393,	SLV215, 216EE, 275, 282, 315, 325, 353. 363EE, 373, 393, 410, 415,	VCP4100, VCP4130 GHV1290, 1291, 1295, 1296, VCP4000,
PHHP1200, 1250, 130, 132, 1340, 1340, 1400 1416, 1440, 1500, 200.	WEBBBB, 730, 735, 750, 755, 765, 800, 850,	6467, 6468, 6470, 6561 VR6570, 6581VR6670, 6676, 6710, 6760,	SLV416EE, 474, 494EE, 555UC, 559, 575UC, 579, 585HF, 595HF, SLV60W, 615, 625, 656,	4300, 4301, VCP4305, 4306, 4310, 4311, 4315, 432
Perfection 10, 420, 430, 440, 445, 470, 475, Perfection 495, 2905 165	VS886 165; VXX3000, VX2500, VX3000,	VR6975, 8681, 63S87, 68SE4, 71S84, 71S85	676UC, 686HF, 696HF, 715, 725, 727, 757, SLV767B, 777, 815, 825, SLVE7, 8, 9SLVX30AS,	4325. 4326 GRANADA
PANCT-C, FVHD40, FVHD56, FVHP1, FVHP1	WITSUEISHI	 72588, 72588, 925831, 20DV1, 20DV2, 20RW7, 21DVi, 21DV2, 25801, 25802, 2581 25812, 30DV2, 31DVI, 31DV2, 31DV335802. 	, SLVX35AF, SLVX50AS, SLVX55DH.	VHSH1, VHSAH3 VHSVH4, VHSWH1, VHSXH1 VHSYH2
GRANDATA LTD	HS12, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 33, 32, 41, 51, 52, 82, HS512, 36, 17, 21, 22, 27, 31, 32, 41, 51, 52	3SB03, 3SB05 3SB11 3SB12 3SB13 3005	PINCH ROLLER ASSEMBLY PART NO:	VHSTH2 VHSBH1, VHSCH 1 VHSBP1
Tel: 0181-900 2329	HSE12, 18, 17, 21, 22, 27, 31, 32, 41, 51, 52, 22, -SM3000, 110, 120, 15 6, 26, 172, 190, 210, 23, 25, 250, 27, 33, 34,	VR231, 232, 332, 422, 4229, 512, 5229, 722, 7229, 723 165	SLV210, 212, 270, 273, 275, 285, 300, 310, 335, 425, 427 350p	VHSAN3 VHSDS2
Fax: 0181-903 6126	2 36 36 37 370 380, 45, 450, 5 4 55 555 57, 52, 59, 68, HSMS2, 9, HSS11,	VR501 PR38 165 SANYO	SV6700,8750, 9700, VHR3100, 3200, 3300,	VHSAY3 VHSBY3
TEA. 0101-303 0120	14, 15, 12, 19, 25, 5600, HV F125, 156, 303, 55, 5V8900, 8330 850	VHR1100, 1110, 1150, 1200, 1300, 1500, 2100, 2300, 2370, 2500,	3310, 3400, 3700, 3800, VHRD500, 7001350; PINCH ROLLER ASSEMBLY	VHSEY1, VHSEY2 VHSCC1

VCR BELT KITS/VIDEO LAMPS & SWITCHES

VCR	BELT KITS/	VIDEO LAM	PS &	SWITC	HES	
Model Price	Model Price	Model Price	Model	Price	Model	Price
GRANADA VHSDP1, VHSFV2 80p	323, 535, VR20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 21D, V3, 25B01, 25B02, 11, 12, 302,	Models & Description	Order Price		ON/OFF MAIN	
VHSTJ1. VHSTJ2 150p VHSTJ3 65p VHSWJ1, VHSWJ2 120p	35812, 35813, 72588, VR30DV2, 35802,		Code	GRUNDIG	SWITCHES	
VHSXJ3 85p VHSVJ2 80p	35803, 63587, 71584, 71585, 71588, VR86582, 91592, 92583, VR6180, 6182, 6185, 6285, 6290VR6291, VR6293, 6362, 6367,		VL01 25p	PART NO:	29703, 29102	
VHSFS1, VHSFS2 130p VHSFG1, VHSFG2, VHSFG3,			VL02 30p	USED ON:	C7500,C7500TT,C8 C8712,C8714,C889	the second s
GRUNDIG	92SB3 85p		VL02 30p		M68-190/99,M70-1	195,P40-345,
MVS400, 440, VS400, 410, 415, 435, 440, 441, 450, 456, 460 55p VS180, 200, 220, 226, 262, 265, 267,	VR44589, VR4458920, VR4458922, VR6443, 6843, 6843, VR6943 100p VR3260, 6349, 6448, 6449, 6548, 6648,	HITACHI 5381682 (VT63, VT64)		PRICE:	ST66-1602,T55-34 140p	0, V77 22
2X40800, 0850, 0880, 1600, 2000, 2080, 2200, 2280,	49SB620, 644869S, 49SB6 110p VKR6850, VKR6855 70p	VIDEO LAMPS		MATSUI/SAI		
MVS200RC 90p VS150 160p VS31D, 311, 315, 320, 326, 340, 345, 380, 385,	VR501 110p VKR6800, VKR6810, VKR6820 70p	AIWA, AKAI, ALBA, AMSTRAD	,VL05 100p	USED ON:	MATSUI-2190, SA	ISHO-
445 85p VS150 76p	SE4104, VR231, 2310, 2319, 231, 232, 2329, 237, 23, 241, 2410, 2419, 242, 243, 245, 2469, 247, 2479, 251, 252, 256, 257, 258, 33, 19,	BLAUPUNKT, FERGUSON, FIDELITY FISHER, FUJITSU,		PRICE:	PST21 30TX 140p	
VS 160, BARCELONA, FLORENZ, GV4000, 4000, 4001,	332, 3329, 333, 337, 339, 3419, 342, 343, 3469, 347, 3479, 35, 1, 352, 357, 358, 422,	FUNAI, G.E.C., GOLDSTAR,		PHILIPS		
GV4002, 403, 401, 4010, 402, 403, 404, 405, 406, 407, 4092, 410, GV411, 412, 414, 415, 416, 417, 4192, 4209, 420, 430, 430, 434, 435,	4229, 432, 437, 442, 4229, 432, 437, 442, 44, 5, 4469, 447, 4479, 451, 452, 457, 458, 459,	GRANADA, GRUNDIG, HINARI		USED ON: PRICE:	K30, K35, K40, KT £0.95	3, KT4
GV437, 440 450, 4592, 460, 464, 470, 500, 501, 5050, 5095,	512, 522, 5229, 6379, 642, 647, 722, 7229, 723, 7379, 747, 3389, 948, 9489 70p	HITACHI, ITT, JVC (HRD		SONY	20.55	
GV5105, 511, 530, 5395, 540, 560, 5695, MV4005, 4105, SE4100, 4104, 4120, 5102, 5104, 5106, TVR37001 70p	SAISHO VR2000, VHL3 90p VR3800, 3200, 3300, 3500, 3600, 3650,	SERIES), MATSUI, MITSUBISH NEC, ORION, NATIONAL,	l,	PART NO:	(POWER SWITCH	+ REMOTE
HINARI VXL2 80p	VR3400, 5000 75p VR3400 100p	PHILIPS, SAISHO, SALORA,		USED ON:	SWITCH) KV1612, MK1, KV1	1612. MK2.
VXL7, VXL8, VXL9, VXL10, VXL11, VXL19, VXL90, VCR34, VTV 100, 200 180p	SAMSUNG SV716, 717, V1616, V-621, V1626, VX616,	SAMSUNG, SANYO, SHARP,			KV1614, KV2052, I	KV2056,
VXL4, VXL35, VTV300 70p VXL5, VXL8 160p	VX617, VX619, X626, VX627, VX629, VX714 85p	SIEMEN, SONY, TELEFUNKEN,			KV2062, KV2068, I KV2216, KV2252, I	the state of the s
VXL3, VXL20 90p HITACHI	VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, V1510, 520, V1511, 516, 621, 626, VX510, 511, 520, V7320, 5600 TOOP	THOMSON, TOSHIBA	101 255		KV2704 KV2705,K	V2706,
VT11, 14, 16, 17, 19, 33, 330, 34, 35, 350, 38, 39, 88, 165, 5030 85p VT5000, VT5500, VT18 120p	VB900, VB910, V1900, V1910 110p PX980, 981, 982, SE9001, SV9001, SVX307,	AKAI, GRANADA (VHSTJ2), V HITACHI (VT3000), ITT (VR3912			KV2752PE3, KX20 KX20PS2, KX27PS	Contraction of a second second
VT7000, VT8000, VT8030, VT8040, VT8300, VT8500, 8700 60p	319, 322, VB750, 770, 8220, 8225, V1770, 780, 8220, 8225, VK8220, VPX31, VX750, VX770,	VRP3833), JVC (HR2200, 3300,	, 	PRICE:	1.50p	States and
VT680, VT6500, VT6800, VT9300, VT9500, VT9700, 9900 75p VT52, VT57, VT61, VT62, VT63, 64, 65, 85, 86,	790, 6220, 8225, SE90C0, 9001 90p SVX301, 303, 305, SX7301, VB710, 971, V1710, 730, 750, 970, VX710, 712, 720, 730,	3330, 3660), MITSUBISHI		PART NO:	(POWER SWITCH SWITCH	+ REMOTE
640 90p VT3000 120p	970, 971, 972 100p VX9880 110p	(HS200), TELEFUNKEN (VR510,	*	USED ON:	KV2022, KV2024	1.2
VT100, 110, 111, 113, 115, 118, 120, 125, 128, 130, 135, 138, VT145, 150, 168, i70, 175, 220, 225, 250, 255,	SX7121 95p SANYO	519, 610),THOMSON (VK300, 305, 306, 3301), FERGUSON		PRICE: PART NO:	200p (POWER SWITCH	26mm)
258, 260, VTL30 90p VM500 VM600 90p	VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50 75p	(3V00, 16, 22, 24, 3292, 8900,		USED ON:	KV1400, KV1440, I	and the second
J.V.C. HR3300, HR3330, HR3360, HR3660, HR4100 130p	VTC5300, VTC5350, VTC5400, VPR5800 B0p	8901, 8902, 8903, 8909, 5912,		PRICE:	KV2060 125p	
HR7200, HR7300 70p HR7350, HR7600, HR7610, HR7650,	VTC5500 70p VTC9100, VTC9300 140p VTC1100, 1300, 1500, VHR1100, 1110, 1150.	8922, 8925)		PART NO:	(POWER SWITCH	21 mm +
HR7655 75p HR7700 75p HRD110, 111, 120, 121, 220, 225,	1200, 1300, VHR 1500, 2370, MVR220 90p	BLAUPUNKT, ORION (VH1, 2A),	VL02 30p	USED ON:	REMOTE SWITCH KV2020)
90p HRD140, 141, 143, 150, 162, 157, 158, 160.	VHR2100, VHR2300, VHR2500, VHR2700 100p	NATIONAL (NV200,2010, 3000, 7000, 8150, 8200, 8400, 8600,		PRICE £2.00	R#2020	1. S. S. S.
190, 250, 257, 310, HRD455, 565, 565, 725, 755, HRP50 55p HRD 170, 171, 180, 210, 21 1, 217, 230, 300,	VHR3100, 3110, 3150, 3300, 3310, 3400, 3500, 3700, 3800, VHR0500, 700, TLS1000, TLS1001 80p	8610, 8620), SHARP (VC2300,		PART NO: USED ON:	2 PIN (FUNCTION KV1612, MKK, V16	
320, 321, 330, 337, HRD350, 370, 400, 430, 440, 44 1, 500, 530, 700, 750, 950	VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, VHR194, 220, 23, 235, 240,	6000, 6200, 6300, 7300, 7700,		USED ON.	KV2052, KV2056, H	and the second
HRS5000, 5500, 8000, 9000, 8R9060, BRS600, 605, 920, 925 50p HRD227, 520, 521, 522, 527, 600, 610, 620,	244, 250, 251, 274, 297, 310, 330, VHR335, 390, 4100, 4105, 4150, 4200, 430, 4300, 4350,	8300)			KV2215, KV2216, H KV2256, KV2704, H	the second state of the se
637, 641, 650, 830, HRD840, HRDX20, 22, HRJ200, 205, 300, 305, SR330, HRS10 800	474, VHR4770, 5080, 5100, 5200, 5300, 5350, 5700, 6850, 7100, VHR7200 7250, 7260, 7300, 7400, 7500, 7500, 75700, 7570, 7500, 7570, 7		L06 40p		KV2706, KV275PE	
HRD840, 550, 560, 580, 590, 640, 660, 670, 720, 730, 740, 770, HRD820, 860, 870, 880,	7400, 7500, 7520, 7530, 7530, VHR7540, 7700, 774, 7800, 7810, 8000, 8100, 8200, 8250, 8500, VHR8800, 8801, VHRD4400, 4410,	(VHSXJ3), TT (VR3993,3994), JVC (HR2650, 7600, 7610, 7650			KV2756PE3	
910, 960, 980, HRDX20, 25, HRJ2 10, HRJ215, 315, 316, 318, 400, 405, 407, 410, 411, 415, 413, 507, HRJ6 10, 615, 715, 97,	4500, 4600, VHRD4610, 4710, 4890, 670075p VMD66, VMD68P 80p	7655), TELEFUNKEN (VR530,	'	AKAI M132773	CEMENT IDLER TY M32773	TT01
HR\$4700, 5800, SR3200, SRS368E 80p HRJ600 40p	VTR1000 70p VTC6010 75p	535, 539, 550, 630, 650),			MZ366960J2	IT02
LOGIK VR955 180p	SHARP VC200, 381, 384, 385, 386, 388, 390, 393, 638, 9100, 9300, 9500, VC9700 100p	THOMSON (V309, 316, 357,		GOLDSTAR	VXP0521 6861471	IT17 IT03
MATSUI VX600, 730, 735, 750, 755, 765, 850, 6000, VS888 75p	9100, 9300, 9500, VC9700 100p VC7300, VC7700, VC7750, VC7800, VC8000 110p	VK309, 411,TX8000), FERGUSON (3V31, 8941, 8942)			6861482	IT04
VX1000, VX2000, VX2500, VX3000, VX6000 100p	VC8300 115p VC300, 387, 471, 473, 481, 482, 483, 486, 488,	AUTHENTIC (N850), DECCA VI	L07 40p	JVC/	6886971 PU 48967B	IT05 IT06
VX600 70p MITSUBISHI HS200 200p	496, 8481 80p VC402, 500, 571, 573, 581, 582, 583, 584, 585,	(VR8300), GRANADA (VHSTJ3,	-07 40p	FERGUSON	PU 51380	1707
HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, 480, HS810, 20, 30, HSE10, 20,	VCSF3, VC8581 80p VC108, 405, 408, 550, 600, 651, 674, 581, 682, 682, 684, 685, 693	WJ1, WJ3), ITT (VR3913, 3914,			PU 51402A PU 55373	IT08 IT09
30, 70 110p HS303, HS304, HS306, HS307, HS330, HS400, HS700 110p	VC700, 750, 783, VC6F3, VC6V3 70p VC208, 671, 772, 779, 780, 781, 782, 785, 786,	3963) JVC (HT7200, 7300, 7350,		NATIONAL	PU 55374	IT10
HS318, HS319, HS410 110p HSM1000, 10, HSM23, 25, 33, 34, 35, 37, 54,	787, 793, 800, VC7810, 7822, VCA100, 102, 103, 104, 131, 140, 170, 202, 03, VCA234,	7700) TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920)	PANASONIC	VXP 0329 VXP 0343	П11 П12
55, 57, 58, 59, 68 55p N.E.C. N830, N831, N832, N833 100p	501, 502, 602, 5011, VCB311, 361, VCD801, 802, VCH851, 852, 882, VCM73, VCT72 75p VCA10, 103, 105, 106, 113, 11613, 211, 234,	1920), THOMSON (V4100,			VXP 0344	IT13
N895 80p PVC2300, PVC2400 180p	244, 254, 30, 33, 35, VCA36, 37, 40, 43, 454, 48, 50, 505, 51, 52, 53, 54, 55, 56, 57, 58,	VK308, 309, 312, 410),			VXP 0401 VXP 0433	IT14 IT15
DX1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, N9033, 9034, 9053, 9054, 9055, 9056, 9066, 9096, 9110, 9120,	VCA60, 605, 615, 67, 68, 1031, VCB320, VCBS97, VCD805, VCO806, 810, 815, VCH80,	FERGUSON (3V23, 29, 30, 8923	,		VXP 0463	IT16
N9510, 9520, 9530, 9610 85p NATIONAL PANASONIC	81, 85, 665, 910, VC51000, VCT212, 310, 410, 610, VCT1314, VCTS312, 313, VC790ET 80p	8924, 8929, 8930, 8931, 8940)			VXP 0521 VXP 0581	IT17 IT18
NV300, NV330PX, NV332, NV333 NV340, NV366 100p	313, VC790ET 80p VCC10 70p SONY	GRANADA (VHSAY3), SHARP VI (VC200, 381, 384, 385, 386, 388,	L08 45p	SANYO	1430662T15620	IT19
NV777, NV788 100p NV2000, NV2010, NV3000 100p NV7000, NV7200, NV7800 95p	SLC8, SLJ10, SLT6ME 140p SLC5, SLC7, SLJ7, SLJ9, SLT7ME 140p	390, 393, 9300, 9500, 9700)		SHARP	NIDL005GEZZ NIDL0006GEZZ	IT20 IT21
NV8600, NV8610, NV862 145p NV230, 250, 280, 430, 431, 433, 450, 460, 465,	SLC9, SL8000, SL8080, SLT50 165p SL6000E, SL8080E, SL8200, SL8600 175p				NPLY0107GEZZ	IT22
470, 650, 730, NV770, 810, 870, 890, 970, AG 1000, 1050 1100 NV370, NV380, NV480, NV630, NV780,	SLV255, 125, 213, 225, 252, SLVX1, 20, 3 95p	PANASONI		20p EACH		200.8
NV830, NV850 70p NV600, NV688, AG6010, AG6015 100p	TOSHIBA V55, V57 85p	MODE SWITCI NV2000, 2010, 7000, 7200, 7800		16p EACH FOR	A PACK OF 5 FOR EAC	THE REPORT OF A
NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130, 400, NVH70 50p NVFV1, NVM10, 3000, 3300, 40, 7, 9000,	V33, V31, V32, V51, V52, V53, V9600, V9680 85p V61, V63, V65, V66, V67 150p	NV230, 260, 430, 810, 870, 2300		13p EACH FOR	A PACK OF 10 FOR EA	CH MODEL
9900, NVMS1, 4 70p NVM 1, NVM3, NVM5 70p	DV80B, DV80D, V71, 73, 74, 75, 77, 81, 83, 85, 86 50p	(VSS0110)	£2.25	C	RANDATA LTD	
PHILIPS VR6460, VR6920 170p VR6540 100p	V108, 109, 110, 120, 130, 140, i99, 209, 210, 211, 220, 221, 411, V421, 509, 610, 611, 659,	NV830 (VSS0091)	£2.10	High Second College 4		
VR6442, VR6542 70p VR2025, VR2580 100p	660, 711, 880 120p V91 G, V95G 115p V212, 213, 22-2, 3i2, 322, 403, 412, 413, 610,	NV300, 333, 340, 366, 688, 777, (VSS0060	778 £3.75	ALL REAL PROPERTY AND		
DV186. 190, 286. 291, 292, 468, 471, 562, 571, 761, VR201, 202, 203, 211, 2115, 212, 213, 223, 311, 312, 313, 3210, 3219, 322, 32, 29,	VCPB1E 110p	NVG21, 25, NVH65, NVD80 (VS		Fa	x: 0181-903 612	40
						-

VIDEO SERVICE KITS

VIDEO SE	RVICE KITS
AMSTRAD VCR700	
Contents BELT SET, PINCH ROLLER. REEL IG Order Code: SK41	ILER. VIDEO LAMP £5.50
FERGUSON & JVC	
3V42/43 HRD455/HR0725	
Contents	Economy Kit Contents
BELT SET. PINCH ROLLER, CLUTCH MECHANISM, TENSION	BELT SET, PINCH ROLLER SUPPLY CLUTCH, TAKE UP
BAND Order Code: SK37 £16.0	CLUTCH
1023	
3V58/59/64/65 HRD170/180/210/230/300/320/370/4	00/430/530/700/750
HRS5000 Contents	
BELT SET, PINCH ROLLER, IDLER J Order Code: SK44	ARM, TENSION BAND
3V29/3V30 HR7200/7300/7350	
Contents BELT SET, PINCH ROLLER, TENSIO	
Order Code: SK05	£5.00
3V35/36, 38/39/49 HRD118/111/120/225	
Contents BELT SET, PINCH ROLLER, TENSIO	N BAND IDI ER TYPESS
Order Code: SK04	£5.00
3/31.3442	
SHE7506 7610/7650/7655 Contents	Economy Kit Contexts
SELT SET. T/U REEL TABLE	BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL
THE TU CLUTCH. T/U IDLER.	IDLER TYRE. T/U IDLER TYRE. T/U CLUTCH
Genter Code: SK33 £11.	NO ORDER CODE: SK34 £5.00
3475535/38/39/49	
-FC 12/111/120/121/225	Economy Kit Contests
SET SET. T/U REEL TABLE	BELT SET. T/U REEL TABLE TYRE, SUPPLY REEL TABLE
THE PINCH ROLLER. T/U	TYRE, PINCH ROLLER, TAU CLUTCH, TAU KILER, TAU
ELER TENSION BAND	IDLER TYRE
Order Code: SK35 £10.	00 ORDER CODE SIGE 61.50
3v29/3V30 #E£7200/7300/7350	
Cantents SELT SET. T/U REEL TABLE	Economy Kit Contents BELT SEL TJU REEL EXERT
TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL	TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER MIRE
TENSION BAND, VIDED LAMP	IDLE TYRE THU KUER TYRE.
Order Code: SK31 £10.0	
3/44/45/48/53/54/55/57	
HRP50/HR0140/150/158/160 HRD250/257/565/566/755	
Contents BELT SET. PINCH ROLLER.	BELT SET. PINCH ROLLER
CLUTCH MECHANISM. TENSION BAND	
Order Code: SK39 £15.0	00 ORDER CODE: SK45 £9.50
FISHER PVHP905/906/907/908/910/911/916	1018
Contents	Economy Kit Casceses
BELT SET. PINCH ROLLER. DLER. GEAR IDLER UNIT.	BELT SET. PINCH ROLLER. IDLER TYRE
TENSION BAND Order Code: SK57 £13.	O ORDER CODE: SKSE ES.00
FVHP615/618/620/622/710/711/715	716/720/721/722/725
130/830/840 Contents	Economy Kit Costers
BELT SET. PINCH ROLLER.	BELT SET. PINCH BOLLER.
TENSION BAND	
	00 ORDER CODE SKER E300
HITACHI WTT1///T33	
Bell' SET. PINCH ROLLER. TENSI	ON BAND, IOLER TYPES
Ornier Code: SK08	£5.00
	AL TRIPLER 5.00 each
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VIDEO SERVICE KITS (Cont.)

VIDEO SERVI	CE KITS (Cont.)
VT11/VT33	
Contents	Economy Kit Contents
BELT SET. T/UP REEL TABLE TYRE, SUPPLY REEL TABLE	BELT SET. PINCH ROLLER. FF/REW IDLER TYRE. T/UP REEL
TYRE, PINCH ROLLER, FF/REW	TABLE TYRE. SUPPLY REEL
IDLER. CLUTCH PLATE	TABLE TYRE
TENSIDN BAND	
Drder Code: SK45 £13.00	ORDER CODE: SK46 £3.75
VT52/61/62/63/64/55/85/86/640	
Contents	Economy Kit Contents BELT SET, PINCH ROLLER
BELT SET, PINCH RDLLER, FF/REW ARM, CLUTCH PLATE.	FF/REW IDLER
TENSION BANO	
Order Code: SK49 £14.00	ORDER CODE: SK50 £3.00
VT400/405/410/13/14/15/18/420/25/26	
510/520/25/26/530/35/36/540/545/46/4 Contents	48/570/75/576/580/85/88
TIMING BELT, PINCH ROLLER, FF/RI	EW ARM. CLUTCH BASE
TENSION BAND	
Order Cade: SK52	19.75
VT180/110/111/113/115/118/120/125/	128/130/135/138/145/150/
175/220/225/250/255/258/260A/TL30 Contents	
BELT SET. PINCH ROLLER. FF/REW	ARM. CLUTCH PLATE
TENSION BAND	
Order Code: SK51	£14.00
PANASONIC	
NV2000/NV2010	NV7000/NV7200/NV7800
Contents	Contents
BELT SET. PINCH ROLLER. TENSION BAND, IDLER TYRES	BELT SET. PINCH ROLLER. TENSION BAND, IDLER TYRES
	OROER COOE: SKO2 E5.00
NV300/NV330/NV333/NV340/NV366 Contents	
BELT SET. PINCH ROLLER. TENSION	
Order Code: SK01	£5.00
NV2000/NV2010	
Contents	Economy Kit Contents
BELT SET. PINCH ROLLER. FF IDLER. PLAY IDLER. TENSION	BELT SET PINCH ROLLER. IOLER TYRE, PULLEY TYRE
BAND. VIOED LAMP	in the second second
Order Code: SK13 £6.00	ORDER CODE: SK14 £3.50
NV7000/NV7200/NV7800	
Contents	Economy Kit Contents
BELT SET, PINCH ROLLER,	BELT SET, PINCH ROLLER IDLER TYRE, CLUTCH TYRE
IDLER UNIT. PLAY IOLER. TENSION BAND	IDLER I THE GLOTOR I THE
	ORDER CODE: SK12 £3.25
NV300/NV330/NV333/NV340/NV366	
Contents	Economy Kit Contents
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IOLER.	BELT SET, PINCH ROLLER IDLER TYRE, PLAY IDLER
TENSION BAND	IDLER TIRE FLAT SPIER
	ORDER CODE SK16 £3.25
NVG7/NVG9/NVG10/NVG11/NVG12	NVG14/NVG15/NVG16/
NVG18/NVG30/NVG120/NVG130/NV	
AG1810 (P/K) Contents	Economy Kit Contents
LOADING BELT. CAPSTAN	LOADING BELT. CAPSTAN
BELT. PINCH ROLLER. IDLER	BELT. PINCH ROLLER. IDLER.
TENSION BAND Order Code: SK27 £6.00	TYRE ORDER CODE: SK28 E3.90
Urger code. 3127 10.00	CUDEN CODE SKED ESTOR
NV332	Same Kata
Contents BELT SET, PINCH ROLLER,	Economy Kit Contents BELT SET, PINCH ROLLER
PLAY IDLER, FF/REW IDLER.	PLAY IDLER TYRE. FF/REW
TENSION BAND. FF/REW TYRE	IOLER TYRE
Order Code: SK29 £12.00	ORDER CODE: SK30 £5.10
NV230/250/260/280/430/450/460/470	650/810/890/
AG1200PK/AG1500PK	Economy Kit Pantante
Contents BELT SET, PINCH ROLLER,	Economy Kit Contents BELT SET, PINCH ROLLER
IDLER. TENSION BAND	IDLER TYRE
Order Code: SK23 £6.00	ORDER CODE: SK24 £3(25
NV600/NV688	
Contents	Economy Kit Contents
BELT SET, PINCH ROLLER. PLAY IDLER. FF/REW IOLER.	BELT SET, PINCH ROLLER PLAY IOLER TYRE, FF/REW
TENSION BAND	IDLER TYRE
Order Code: SK25 £12.00	ORDER CODE: SK26 £6.00
NV730/NV770	
Contents	Economy Kit Contents
SLOT IN BELT, LOADING BELT PINCH ROLLER, IDLER UNIT.	SLOT IN BELT, LOADING BELT. PINCH ROLLER, IDLER TYRE
TENSION BAND	
	ORDER CODE: SK20 E3.00
NV370/NV380/480/630/780/830/850//	AG2100PK/AG2200PK
Contents	Economy Kit Contents
BELT SET, PINCH ROLLER,	BELT SET, PINCH ROLLER
IDLER. TENSION BAND Order Code: SK21 £5.00	IOLER TYRE ORDER CODE: SK22 £2.75
NV777/NV788	
Contents BELT SET, PINCH ROLLER.	Economy Kit Contents BELT SET, PINCH ROLLER
IDLER UNIT. TENSION BAND	IDLER TYRE
Order Code: SK17 £6.00	ORDER CODE: SK18 £4.00

VIDEO SERVICE KITS (Cont.)

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VC781/VC7822/VC785/VC785/VC785/VC783/VC800/ VCA100/VCA102/VCA104/VCA202 Contents Economy Kit Contents BELT SET. PINCH ROLLER. BELT SET. PINCH ROLLER. BAND Order Code: SK64 £13.50 Order Code: SK64 £13.50 DRDER CODE: SK65 VC681/VC582/VC584/VC583/VC593/VC593/VC592/VC5	FOR MORE D	ETA	ILS OF OVER 500	
Order Code: SK47 £8.00 DRDER CODE: SK48 £3.2 VC500/VC571/VC581/VC582/VC583/VC594/VC573 Economy Kit Contents BELT SET. PINCH ROLLER Contents Status Status Contents Economy Kit Contents ES.00 VC781/VC781/VC782/VC785/VC786/VC786/VC783/VC800/ VC781/VC781/VC782/VC782/VC786/VC786/VC786/VC783/VC800/ VCA10/VCA102/VCA102/VCA102/VCA102/VCA102/VCA102/VCA102/VCA102/VCA104/VCA202 Contents Economy Kit Contents BELT SET. PINCH ROLLER #E3.30 ORDER CODE: SK65 #E3.31 VC581/VC582/VC584/VC583/VC593/VC563/VC700 Contents Economy Kit Contents #E3.31 #E3.31 VC581/VC582/VC584/VC583/VC593/VC593/VC593/VC593/VC593/VC593/VC700 Contents Economy Kit Contents #E3.33 BELT SET. PINCH ROLLER BELT SET. PINCH ROLLER BELT SET. PINCH ROLLER #E3.31 REL DRIVE UNIT. TENSION REL DRIVE UNIT TYRE BELT SET. PINCH ROLLER BELT SET. PINCH ROLLER	Order Code; SK62	£13.50	ORDER CODE: SK63	£5.00
Order Code: SK47 £8.00 DRDER CODE: SK48 £3.3 VC500/VC571/VC581/VC582/VC583/VC594/VC5F3 Economy Kil Contents BELT SET.			necessive only this	
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	VC500/VC571/VC581/VC582/V	C583/V0	C584/VC5F3	
	Urder Code: SK4/	20.00	DRUCH CODE: 5846	1323
			DRDCR CODE: CK/0	67.75
REEL IDLER. TENSION BAND. REEL IDLER TYRE		.	REEL IDLER TARE	
BELT SET. PINCH ROLLER. BELT SET. PINCH ROLLER				
Contents Economy Kit Contents				

BACKUP BATTERIES

REPLACEMENT PHILIPS NI-CAD BACKUP BA	TTERIES
Replaces Ferguson Part No:	
00E6-067-001, used on TX10, L2V	90p
Replaces Philips Part Nos:	
138-10138, 138-10313, 1.2V - 90mAh	75p
Replaces Philips Part Nos:	
138-1229, 2.4V - 90mAh	£1.35
REPLACEMENT FERGUSON NI-CAD BACKUP	ATTERIES
Replaces Ferguson Part Nos:00E6-066-001, 2.4V	
Used on: 3V35, 3V56, 3V58, 3V65	150p

REPLACEMENT LINE OUTPUT TRANSFORMERS

Description	Price	Order
		Code
HITACHI 2433752	1500p	LOT01
ORION 3714002	1500p	LOT02
FIDELITY ZX300	1500p	LOT03
FE TX 100 90 DEG	1500p	LOT04
SABA 490007182	1500p	LOT05
FE TX90 WHITE	1650p	LOT06
ITT D307/37 EQ	1600p	LOT07
BLAUPUNKT 210	1600p	LOT08
GRUNDIG 2922010	1600p	LOT09
ITT CVC800/1/3	1500p	LOT10
ITTD218/37 EQ	1600p	LOT11
NORMENDE 5255	1600p	LOT12
SABA 81000 200	1600p	LOT13
SALORA T236 EQ	1650p	LOT14
SABA 811-50-24	1600p	LOT15
SABA 770223500	1600p	LOT16
TELEFUNKEN AT1	1450p	LOT17
TELEFUNKEN EQ	1400p	LOT18
SALORA FM0218B	1600p	LOT19
NORMENDE 5255	1600p	LOT20
TT CVC 1150/1	1500p	LOT21
ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1400p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT B1	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
		LOT29
ITT D066/37 EQ	1600p	
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1200p	LOT33
FE TX100 110 D	1500p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1300p	LOT37
FERGUSON 00D3-508-002	1650p	LOT38
Fits Chassis TX99 41cm + 51cm		
Used On: 51K2, 51J8, 51J7, 41H3.		
41H3, 41H2, 51K3		
PANASONIC TLF14567F	1850p	LOT39
	1000h	20133
Used On: TC2043, TC2243, TX300		
PANASONIC TLF14568F	£15.00	LOT40
Used On: TX2231, TX2244		
PANASONIC TLF14584	2000p	LOT41
Used On: TC2210, TC2160,		
TX1752, TX2112		
TX2112, TX2162, TXC22		
PANASONIC TLF14586F	£18.00	LOT42
TC1651, TC2051, TC2061,		
TC2253, TC2263, TX5500		
HINARI	1600p	LOT43
Used On: CT15	(000p	10143
	1000	LOT44
HITACHI 2434274	1250p	LUI44
CPT2174, CPT2176, CPT2178, 2434274		
We stock line output transformers for		
models. Please nng 0181-900 2329 for	more infor	nation.

Satellite PSU Repair Kits

Experience shows that 50% of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all recommended parts is supplied for the most popular models, which when fitted should over-come this.

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	550p
PACE \$\$9000, 9200, 9010, 9210, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SR0500	SATPSU4	650p
AMSTRAD SRX340, SRX345, SRX350	SATSPU5	650p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE M\$S100	SATPSU8	730p
PACE MSS200/300 APPOLL	SATPSU9	650p
PACE MSS500/1000	SATPSUIO	1230p
FERGUSON SRD4	SATPSUII	8350
ECHOSTAR SR5500	SATPSUIZ	1735p
ECHOSTAR 6500/7700/8700	SATPSU13	3125p
AMSTRAD SRD600	SATPSU14	3125p
MIMTEC (Surensen)	SATPSUI5	775p
AMSTRAD SR0700/SR950/SRX100/30 SRX501/1002/2003/SR02000 SAT250	SATPSU16	7300

PACE 9000 SWITCH MODE TRANSFORMER ORDER CODE: PACE9000 PRICE 800p

SATELLITE TUNERS PACE PRD800/MSS200 2Ghz Order Code: TUNER 01 Price: 1650p + VAT PACE PRD900/MSS1000 2Ghz

Order Code: TUNER 02 Price: 1650p + VAT



Audio Control Head

AMSTRAD ORIGINAL NO: 150751 Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MK/I, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000 Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO: 153134

Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244 Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLD-HAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 erc	875p
VBR0050	NV300, NV340 etc	875p
VSR0081	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
VBR0125		625p

8 way Preprogrammed Universal Remote Control A single remote control to operate Televisions, Videos and Sat Receivers. Plus Auxiliary Options!

- Replaces up to 8 remotes with one Simple 4 digit setup routine
 Controls 1000s of models Teletext functions with Fastext
- Clear (large key) layout Code Search Facility
 Stylish and casy to operate Replace broken or lost remotes

Original remote not required
 Order Code: 8 WAY
 PRICE: 14.50p + VAT

Cassette DC Motors

PRICE
1700
170p
170p
1700
2900

NAME	ideo Cassette Housir	CODE	PRIC
AKAI	V\$35, V\$53, V\$55,		
	V\$56, V\$75	CH18	3200
GRANADA	VHSDPI	CHOS	1100
	VHSYJZ	CHOT	2800
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400. 73401, GSE1295P, GSE1891P, 20001D, 20051D, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000;
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV9000,	UNLU	20001
with other survey and	8200	CH26	2900
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 160, 250,		
	HRD257, 455, 565, 565, 725, 755	CH02	2800p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230,		
	430, 530	CH03	2800p
	3V58, 3V59, 3V64, 3V55, FV11R, 8950, 8951, HRD170, HRD180,		
	HRD370	CH04	29000
	FV31R HRD515, 520, 527, 540, 550, 580.	CH19	_4300r
	600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H HRD540, 580, 830, 860, 910, 960,	CH20	2200p
	HR0970, HRDX20, SEBGUSON EVETH	CH27	2400-
LTT.	FERGUSÓN FV57H VR3605, VR3905	CHOI	2400p
	VR3916, 3926, 3946, 3948, 3976, 3965, 3995, 3997, 6948	CHO2	28000
	VR3916, 3926, 3946, 3948, 3976, 3966, 3995, 3997, 6948	CHO2	28000
NATIONAL PANASONIC	NV730	CHOS	43000
N.E.C.	N830EG, N831EG, N831EG, N832 N833EG	Сназ	2900ç
	N895	CHC2	29000
PHILIPS	CASSETTE LIFT ASSEMBLY (9912 DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VMc290, 6291, 6293, 6362, 6367, 5383, 5467, 5488, 5470, VR6561, 5670, 6760, 6761, 5670, 5970		11000
	VREAKS	CH22	29000
	VRS448	CH22	
	a second se		25000
	49SB5	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 1036V, 106, 1066VM, 2546VM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 210G, VCT212, 310, 410G, 610	CH24	25000
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CHOI	2800p
TILDINI JUN	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500,	CHUI	28000
	6000, 8540	CH02	2800p
TOSHIBA	V55, V57	CHOI	2800p
	V65, V66		or

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SPOI	160p
SWITCH CLEANER	176ML	SPOZ	170p
SILICONE GREASE	200ML	SP03	2100
FREEZELT	170ML	SP04	3100
FREEZEIT	400ML	SP16	600p
FOAM CLEANER	480ML	SP05	1800
ANTI-STATIC	150ML	SP06	1900
AEROKLEANE	135ML	SP07	2200
AERO DUSTER	150ML	\$P08	3100
AERO DUSTER	400ML	SP17	550g
PLASTIC SEAL	200ML	\$P09	2500
GLASS CLEANER	250ML	SPIB	160
COLDKLENE	250ML	SP13	230p
EXCEL POLISH 80	250ML	SP18	1500
ADHESIVE 120	400 MIL	SP19	1905
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400MfL	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SPIN	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75Mt	SPZ3	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
ORIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	-	SP28	2100p

If you purchase more than one Servisol Product, postage & pack-age will be charged as follows: 300p tor 5 cans 450p for more than 5 cans

CD Pick Ups

Service Aide

SONY OPTICAL PICK UP PART NO: KSS210A SONY CDPC 301M, CDPC 305M 220 Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems 2200p

PART NO: KSS210B USED ON MODELS: CF0100, 105, 120, 300, 440, 454, 455, 60, 500, 55, 58, 60 CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S

2200p

Cassette Tape Heads HED TYPEs MONO HEAD STEREO HEAD MINITHEAD Soldering Accessories DESCRIPTION ATTEX SOLDERING IRONS 25 WAT 240 VAC (XSISW 240V) 25 WAT 240 VAC (XSISW 240V) 25 WAT 25 PARE ELEMENT 15 WATT 240 VAC (XSISW 240V) 25 WAT SPARE ELEMENT 15 WATT 240 VAC (XSISW 240V) 25 WAT SPARE ELEMENT 15 WATT SPARE ELEMENT 15 WATT SPARE ELEMENT 16 WWS 500 BRAMMES 22 SWG 500 BRAMMES 23 SWG 500 BRAMMES 24 SWG 500 BRAMMES 25 SUDERING PUMP SPARE NOZZE FAULT FINDING BAUGE 12MM X 15M SOLDERING PUMP STANDAR AND BAUGE 12MM X 15M SOLDERING PUMP STANDAR BAUGE 12MM X 10M DESOLDERING PUMP SPARE NOZZE FAULT FINDING BAUGE 12MM X 15M SOLDERING PUMP STANDAR AND AND BAUGE 12MM X 15M SOLDERING PUMP STANDAR AND	ssue over ds. tion for : BOO	1. a 4 K01
MONO HEAD STEREO HEAD MINI HEAD AUTO REVERSE HEAD Soldering Accessories DESCRIPTION ANTEX SOLDERING IRONS SOUTH AVEX SOLVACION SERVICE SOUTH AND ACCOMPARENT SWATT 240 VAC IX SERVICE SWATT 240 VAC IX SERVICE SWATT 240 VAC IX SERVICE SWATT 240 VAC IX SERVICE SOUTH AND ACCOMPARENT SOLDERING STAND & SPONGES SOLDERING STAND & SPONGES SOLDERING STAND & SPONGES SOLDER MOP STANDARD EAUGE 1.20M X 1.5M SOLDER MOP STANDARD EAUGE 1.20M	S101 S102 S103 S104 S104 S104 S106 S107 S107 S107 S107 S105 S106 S106 S106 S106 S106 S106 S106 S106	900 1100 1100 2000 2000 PRICE 9000 9000 3500 3500 3500 3500 3500 7000 3500 550 5500 900 3500 7000 3500 550 5500 900 3500 7000 800 300 550 500 7000 700 700 700 700 700 700
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The Pace Prima

I had my first look at a Prima when a local installer brought one in for repair. "It's dead" he announced, then scarpered. I did wonder why he hadn't simply returned it to Pace under warranty, but it was too late to ask. I soon found out why: several cracks radiated outwards from the PCB mounting pillar, close to the power supply.

Fortunately none of the cracks had reached the live side of the circuit. So I decided that a safe repair was feasible. I didn't attempt to solder fine wire directly to the damaged

Jack Armstrong is willing to try to sort our readers' satellite TV receiver problems via email. You can reach him via the Internet at:

jackarm@netcentral.co.uk

One model per message – state make/model and fault symptoms. If you have no e-mail facilities you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two stamped envelopes.

Satellite WORKSHOP

tracks, but instead soldered Kynar wire (Teflon-insulated, singlestrand) across the solder pads nearest to the breaks. I used blobs of glue to secure the wires to the board (Tak-Pack is best). This is essential from the safety aspect, because a loose wire might conceivably touch part of the live circuit.

When the installer returned he seemed to be surprised that the receiver was now working. "Spaghetti junction beneath" he commented, "wires everywhere. Will it be reliable?"

Since I had reinforced the board with epoxy resin, cured with the aid of a hairdryer, and I was happy with my neatly soldered "spaghetti" I assured him that it would be perfect.» I spoke too soon however.

Within half an hour he burst into the workshop angrily and slapped the receiver down on the bench. "Won't respond to the remote!" he shouted.

I connected the receiver and tested it with my own handset. No problem. When I questioned him he admitted that he was using an MSS200 handset. Though this is similar in appearance it uses a different code set. The Prima's handset (see photo) can be distinguished by the designation 'RC-10' at the bottom right corner of the keypad.

Handset Repair

Remote control handsets have many uses: apart from dislodging the cat, stirring tea and throwing at the spouse, they are often used for channel changing. The small, uncomfortable-looking man who trailed into the workshop after a large and domineering lady clearly fell into the 'spouse' category.

"'E 'it it wi' 'is 'ead" the lady said, demonstrating the point by clunking the unit on the poor fellow's head. "It's now gone dead. We'll be back for it in an hour, shall we?' She gave the impression that this was an order rather than a question.

l decided that the job was urgent and pushed aside a FilmNet decoder to make room on the bench. It was a handset for the Pace PRD range. A check on the batteries. in series, produced a reading of a little over 3V, but there was no infra-red output when the buttons were pressed.

Now Pace handsets are not the easiest to take apart, and many people either wreck them or give up. My method is to warm the unit with a hairdryer, which makes the plastic less brittle. After that I twist the casing with both hands until I can see the split line start to open. Then I insert a blunt penknife blade and ease it along gently, unclipping the two plastic shells as I move it. Don't be afraid to twist the handset hard: the PCB won't suffer, and the plastic won't break if you have made it nice and hot. This method also works with Amstrad handsets.

The usual problem is that the 455kHz ceramic resonator's legs have snapped. Simply solder two wires into the board and solder the legs of a new resonator to the wires. Glue the resonator down – unless you like repeat business! Occasionally the LED fails instead. I test the LED by connecting 12V across it via a 1k Ω resistor. An IR sensitive key fob is all that is required to see whether it's working.

The lady returned after 59 minutes, snatched the handset from the counter and demanded a fiver from the small man. "Ow much?" she demanded.

"Er. . a f fiver will do nicely" I stammered. Not too appear too downtrodden, I added "special discount, of course".

Another One

No sooner had she gone than the milkman appeared, with another handset. It was for an Amstrad SRD510 and was extremely sticky to touch.

"Dropped it in the milk, did you?" I asked.

"Coke, actually" he replied, waving a bottle of the well-known fizzy drink in front of my face. "Spilt half the bottle, low-sugar too."

I dismantled the handset, using my hairdryer to soften the plastic. The inside was full of brown goo. I used a toothbrush and isopropanol to clean the silicone rubber keypad and the conductive contacts on the PCB. Then I scrubbed the plastic housing shells with warm water and detergent. The hairdryer quickly removed the moisture from all parts, and when I reassembled the handset it worked perfectly.

"Just a tenner" I told the milkman when he returned. He's smaller than I am - and he got some of it back at Christmas.

UPGRADES

A lot of my e-mail comes from people asking about upgrades. Here's a brief list of what is possible and what isn't.

Pace Receivers

500 channels with an MSS500 or MSS1000 (as in the latest versions with an internal positioner): Such a kit is not available and is unlikely to become available because of the large number of model. variants. Pace may however be able to upgrade your receiver at the factory if it's a very recent model. If you enquire, be sure to be able to quote the complete serial number and model number.

Internal positioner for an MSS500 or MSS1000: Not available as a kit, but you can send your receiver to Pace for an upgrade. The cost should be less than f 100.

Internal polariser board for MSS models: Not available. Internal 22kHz tone generator: Not available.

VideoCrypt and Eurocrypt/D2 MAC decoders inside one receiver: Not available.

199 channels and a favourite channel menu: A kit is available from SatCure (01270 753 311) to upgrade the PRD800. It is not Pace approved.

J17 de-emphasis with wideband audio: A kit, not Pace approved, is available from SarCure (01270 753 311) to reduce audio distortion with foreign channels. It comes with comprehensive instructions, but the J17 kit is not easy to fit – because of the number of fiddly surface-mounted components involved.

Enhanced menu options: This SatCure (01270 753 311) kit is Pace approved. It includes a new microcontroller chip to provide a choice of LNB local oscillator frequencies. Most tuners will cope, but you might need to buy a 2GHz tuner if you want the maximum tuning range.

External switch controlled by satellite number: A unit that apparently works with any Pace model from the SS9000 onwards is available from SFM Engineering (01407 742 436). You select a satellite position number in each channel menu and the switch selects one of five outputs. Some or all outputs can be used to control an LNB switch, a 22kHz tone generator, Christmas tree lights or whatever!

Computer interface to control Pace receivers: Not possible. An interface with Windows software is available from Kesh Electronics (01365 631 449) however. It enables you to download the channel information to your PC, rearrange it as required, then upload it back to the receiver. This could be useful to a dealer who wants customised programming for a batch of receivers, but at £199 it's rather expensive for the home user.

Amstrad Receivers

Internal ADX frequency converter for the SRD510/520: Contact Mildenhall Satellites (01638 711 220),

199 channels with SIS menu for the SRD510/520: A low-cost kit is available from SatCure (01270 753 311)?

199 channels, enhanced, twin input, 22kHz for the SRD510/520: This kit from SatCure (01270 753 311) virtually converts to an SRD550, but at £60 its price might put you off! The cost reflects the need for a new tuner, microcontroller chip, EEPROM and transformer.

Test Case 411

Spasmodic and intermittent faults are the bane of workshop life. At any one time it's not unusual to find five or six assorted VCRs and TV sets on the go in the Test Case workshop, being run continuously in the hope that the faults of which they are accused will eventually show up. Some really do have intermittent faults; some never fail because the trouble lies with domestic circumstances (dodgy aerials, duff tapes or whatever); and some have absolutely nothing wrong with them!

Typical of these soak-testers was an Hitachi VTM410 VCR we had in recently. It was accused of shutting down after about half an hour's playing time – it could not be ascertained from the user whether this also happened in the record mode. To test this machine we played a prerecorded tape for a little over an hour at a time, with ten-minute rests between playings. After five days of this the machine had not once stopped or shown any signs of doing so.

The take-up torque was checked and found to be OK. The machine was shaken, tapped, bashed, heated and cooled, all to no effect. The possibility of extrancous light falling on one of the end sensors was eliminated. The drive electronics and the wiring to the drum and capstan motors were checked carefully and pronounced to be OK, likewise the power supply. What do you do in this situation? Run the machine for ever? Return it to the customer and risk a bounce or (in this case) termination of a rental contract? We were assured that the loan VCR was working satisfactorily. It was an earlier Hitachi model.

In fact there was nothing wrong with the VCR, the cause of the problem being a combination of quirky design and an understandable 'pilot error'. We discovered this during a conversation with another dealer, who rents out Hitachi products in large numbers. The machine has now, with no repair or modification, been reunited with its user. He now, most of the time anyway, gets to see the whole of his programme without the machine shutting down. So what was the trouble?

The Hitachi VCR's place on the test bench was taken over by a JVC HRD660, whose very obscure and elusive fault was described as erratic counter operation. After several attempts to reach the owner by phone we eventually discovered the real symptom: during fast wind the counter would sometimes fail to decrement all the way to zero, the point where playback had begun.

Again the machine was tested with a prerecorded tape. This time the VCR was set to play and left to hit the end then auto-rewind. For several days and dozens of playings the counter returned to zero when auto-stop was instigated at the end of rewind. Then we found that plus 37 minutes and 20 seconds was still showing at the fully rewound position. So there was a fault, but how to find its cause?

We used the video monitoring jig featured in the May 1993 issue of *Television*. This showed us, during the next failure two days later, that the decrementing count would 'freeze' intermittently when the fault was present. Because it's a real-time counter, whose operation is based on the control track pulses, this sort of thing can occur when there are breaks in the recording on the tape. The recording was a continuous one however, so the count should have stopped only between the end of the recording and the end of the tape, in both the play and fast rewind modes.

Careful observation of the VCR in the fast-rewind mode produced the answer to this puzzle. It was not too difficult to find and cure. For the solution to this and the Hitachi conundrum, see page 367.

NVQS A Nightmare

What should have been a relatively simple matter of laying down and assessing technical competence standards could end up being a nightmare of paperwork. Those involved in putting NVQs in the consumer electronics industry into practice have a difficult task ahead. Steve Beeching sums up – as best he can

n the early days those entering the radio servicing trade didn't need to have a technical background. They all had enthusiasm, and a few had passed a theoretical exam. Either enabled them to make a start in the corner of a workshop, repairing radio receivers, record players and TV sets. From their early trials and tribulations they learnt how to apply theoretical knowledge to practical diagnosis. More importantly, they learnt by experience which resistor in which TV chassis caused a particular fault, and could build up a knowledge of common failures that produced various common symptoms.

Servicing is today no longer this simple. A fault symptom may be produced by a defect in what seems to

To establish an industry standard of competence for all service engineers, as a sort of industrial benchmark, is a good idea - but not at the expense of proper technical training. be a totally unrelated section of the equipment. For example, while a TV set that fails to turn on could have a faulty switch, the cause could also be a Nicam stereo decoder chip that is corrupting a data line and thus preventing the main microcontroller chip from enabling the power supply.

To learn the basics of modern, state-ofthe-art domestic technology, from radio reception to satellite TV and digital camcorders, takes years. Without the first three years plus a further optional year of video offered by the City and Guilds

course 224, the odds on becoming a competent service engineer are very long indeed.

Enter the NVQ

A case for change can always be made, and is valid if the change is for the better. To establish an industry standard of competence for all service engineers, as a sort of industrial benchmark, is a good idea – but not at the expense of proper technical training.

At last, after nearly three years, the Electrical and Electronic Servicing Lead Body has produced National Vocational Qualifications (NVQs) and Standards for the servicing industry. The NVQs lay down standards of competence for servicing white and brown goods. They are basic servicing qualifications that can be applied to a wide range of consumer products. In the introduction to the NVQs, a section called Sources of Evidence lists the product ranges in which candidates can specialise – from gas to camcorders.

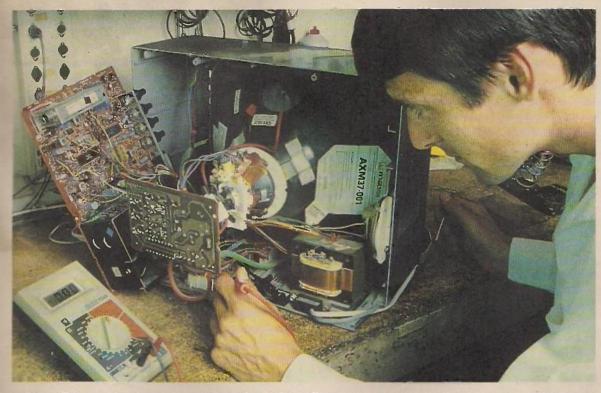
These NVQs do not however take into consideration the many years of learning about basic electronics and technical theory required for knowledgeable, skilled fault diagnosis to be possible. Nor do they pay attention to how this learning can be attained. What they do is to enable candidates to accumulate a portfolio of evidence to show that they are competent in carrying out various servicing operations at specified levels. They are aimed at those currently in the industry, particularly those who can operate as service technicians but do not have paper qualifications.

NVQs can be gained by experience – there is no set time period to achieve a certain standard of competence. They have been designed to meet our industry's occupational requirements at two levels. Level 2 is for service engineers who can carry out moderately difficult repairs, mainly related to replacing parts (modules). Level 3 is for field or workshop engineers who can diagnose and repair faults down to component level. There is no Level 1.

Courses

Training courses teach the student basic electronics, starting with Ohm's Law, resistor colour codes, safety components etc. A training course is where the student learns about the technology and how it's used in consumer electronic equipment. City and Guilds 224 provides such training, though it's a little out of date with the latest technology.

If a student is to learn how to repair modern domestic electronic equipment, he/she has to be taught radio and TV theory, VCR theory, audio and CD theory and camcorder theory. This will take at least three years at day release, so the student is likely to be working as a trainee (modern apprentice) in a workshop that deals with domestic consumer electronics products. The student can thus gain experience under the guidance of practicing service engineers while learning the technical theory at



college. This can be regarded as the 'underpinning knowledge' required for the NVQ. Such knowledge can also be gained by experience, learning as you go.

What an NVQ Represents

It's important to appreciate that an NVQ is not a training course. It is a standard of achievement which tells prospective employers or, indeed, customers "I may not have had formal training or passed relevant exams, but I can do the job".

Who does it suit? Mainly people who have worked in the industry for many years and have learnt their trade by hard work. Also those who have learnt their trade in the services or abroad. It's a transitory qualification that enables someone to go to an employer with a portfolio of written and assessed evidence to confirm that he/she can meet trade requirements. It gives the NVQ holder evidence of competence to do the job. This includes ability to communicate with customers, to carry out installations and repairs and to collect payments.

The intention is that NVQs are obtained at the workplace, the candidates being assessed by competent industry personnel. As a result, an NVQ will give an employer confidence that a prospective employee has attained a certain practical competence level. It is laid down that "evidence must be collected from a real working environment, whether it be the workshop or customers' premises".

To be a candidate, the NVQ applicant must have a working knowledge of the specified products. This implies that the person is already in the industry and seeks proof of his/her ability. Younger students who have passed the City and Guilds exams in recent years should take the NVQ to obtain practical evidence of their competence to repair equipment.

Colleges

In practice the educational establishments could endemine the intended validity of NVQs by allowing atome who can wave a soldering iron in the air to take an AQ, thus churning out cowboys with NVQs. How could happen? Because City and Guilds, the Electronic Examination Board and colleges will treat an NVQ as the equivalent of a training course and simply teach candidates how to pass with the minimum of technical theory. Put another way, only the amount of knowledge required to complete an 'element' (see later) will be imparted.

Thus we have to ask whether employers will have confidence in educational NVQs (college-based NVQs are usually called GNVQs)? Those manufacturers who have expressed an opinion have said "no" in a loud voice.

The NVQ Structure

The Electrical and Electronics Service National Vocation Qualification has 59 'elements'. These elements are assembled into 'units of competence', some of which are

mandatory while others are optional. Units are specified as Level 2 or Level 3. Some units occur at both levels – in this case success at one level counts at the other. Each element is based on performance criteria, range statements, knowledge specifications and recommended evidence. Typical "sources of evidence" are audio and hi-fi systems; cooking appliances; gas appliances; home laundry appliances; microwave ovens; refrigerators. TV/VCR/satellite systems; and camcorders. One or more of these can be chosen by the candidate as his/her specialism.

We'll look in turn at the components of an element.

Performance criteria: These describe the main outcomes of an activity or task but do not describe how the outcome is to be achieved. Performance criteria indicate the standard used to judge that an activity has been carried out

correctly. In other words, the criteria describe what a candidate should achieve when carrying out a specific activity or task. This section of the element specification lays down the activites that comprise an element.

Element 1.1 for example lays down that a candidate must be able to "establish working relationships with customers". The performance criteria used to judge this

In practice the educational establishments could undermine the intended validity of NVQs by allowing anyone who can wave a soldering iron in the air to take an NVQ, thus churning out cowboys with NVQs. are given as: "relating to the customer in the domestic situation, offering advice, giving technical information at a suitably understandable level, dealing with disagreements, informing the customer how to contact the company for service, gathering information from the customer and recognising potential difficulties with customers". We all know the familiar "you repaired it a year ago and it's not been right since then!"

Examples of performance criteria in other elements are: identify the location of faults in products and services; prepare products for installation; replace parts in products; implement preventative servicing procedures.

At Level 2 the performance criteria are more more complex. Examples: "exchange information on work activities with colleagues"; and "evaluate the effectiveness of servicing options".

Range statements: These describe the scope of an activity. Candidates must prove that they are competent across an entire range. They consist of specifying the type of customer, the domestic situation, methods of making contact and information on appointments, location and customer requirements. For example, the ability to assess whether a customer is technically aware or not and

describe the type of repair – replacement of components, addition of components, re-routing connections etc.

Knowledge specification: This section of each element lists the things that a candidate must know to complete the element. Listed examples are: "health and safety legislation and regulations; technical information to support a servicing activity; principles of customer service; diagnostic techniques and procedures for products".

Recommended evidence: This is the type of evidence a candidate has to accumulate for his NVQ, including customer contact records, customer correspondence and

servicing records. It is the specified evidence that a candidate must accumulate in his/her collection of evidence to prove ability, competence and experience.

An Example

The official NVQ document

13 on product repair.

2 on transportation. 6 on installation and

relations.

waste removal.

4 on relationships with

11 on developing work

organisation. 2 on obtaining payment.

lists 59 elements as

21 on customer

colleagues.

activites and

follows:

To give you an example of what a complete NVQ element involves, the following example is for the repair of a product.

Performance criteria: A part is identified as requiring repair and the type of repair needed to restore operation to approved quality standards is understood. The repair is then carried out in accordance with agreed time scales, resources, techniques and equipment. Any variations from normal repair procedures should be approved by the appropriate authorities. Other parts should not be adversely affected by the repair, and Health and Safety legislation should be complied with.

Range Statements: Parts required are mechanical/ electrical/electronic; the repair consists of replacement of components or fitting additional components. Faults may relate to safety, performance or appearance, and may be intermittent, permanent, electrical or mechanical. Resources are people, time, equipment, parts, cost involved.

Knowledge specification: Must know about relevant Health and Safety legislation, about handling parts/components, about appropriate diagnostic and repair techniques, and be able to understand technical information required for servicing. Must know how to confirm that a part needs repair, what types of repair are suitable for various types of fault, and which quality standards are relevant to the repair. Must know what resources are required for carrying out repairs, and how to check whether other parts or components have been affected.

Recommended evidence: Parts repaired, products restored to correct operation, servicing records kept, waste materials removed.

What Does It All Mean?

To cut through all the tangled jargon and unnecessarily complex ways of specifying requirements is not easy. The whole thing looks as though it was put together by a huge committee that couldn't agree on anything and ended up with a long series of compromises aimed at achieving some sort of consensus. Be that as it may, we have to live with it. Let's try to see what it will involve in practice.

A lot of evidence on ancillary tasks such as consumer relations and talking to others has to be collected, but evidence on actual repairs is a bit thin. An element that specifies "diagnostic techniques" aims to sum up at least four years of learning about domestic product technology and a further couple of years of experience with it. Rather a lot to be taken into account by a simple knowledge specification!

Parts of the NVQ evidence required are of a purely trade nature: customer, servicing and stock control records, site plans and drawings, sale agreements and so on. A full-time candidate-at a college would have no access to such data, and thus cannot produce such material as evidence. Except that certain parts of an NVQ can be simulated, provided the assessor is satisfied that the simulation is realistic. Thus a college running an NVQ "course" can simulate customer relations by using college staff and students as customers. It is less clear how such simulations can be put into effect for "requisitions of spares", "site visits and site installation", "stock control records" etc., or the evidence of the internal workings of a busy service department.

The original standard in the consumer electronics servicing industry is the City and Guilds 224 Radio and Television Servicing course. After three-four years of 224 candidates will be ready to embark on the Electrical and Electronics Servicing NVQ, taking as long as necessary to complete the performance criteria and collect the evidence required. Unfortunately it seems that the Department of Further Education is to withdraw funding for City and Guilds 224 once the NVQ is in place. So where will that leave us?

Who is going to teach newcomers Ohm's Law and basic electronic theory? Manufacturing industry perhaps, or busy service organisations? That seems to be unrealistic. But courses to provide this basic knowledge will surely have to be set up to meet the demand once the NVQs are in place.

Meanwhile the NVQ is the answer to the problem many service people ask: "I know that I can do the job, but how can I prove it?" The answer is to go for the NVQ and get assessed.

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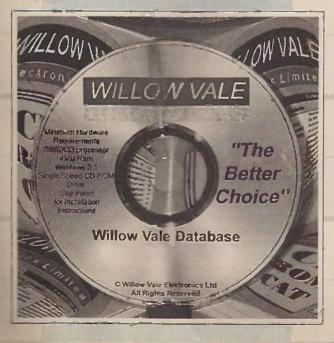
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CES Las Vegas is one of the world's leading consumer electronics exhibitions, where new products and ideas are often first presented. George Cole reports on the winter '97 show

At CES Las Vegas

his year's winter US Consumer Electronics Show (CES) was held at Las Vegas on January 9-12th. It was dominated by DVD and the Internet, with the first DVD players to be seen in the USA on show along with a number of TV models and set-top boxes designed for exploring the Internet.

DVD Players

After a series of false starts, the DVD finally appeared. Virtually all the major consumer electronics companies had DVD players on display. Last year the US consumer electronics industry was in the doldrums: the hope is that the DVD will revive its fortunes. The first players conform to the DVD Video standard, i.e. they are designed for playing movies and music videos in disc form. Several companies, including Sony and Toshiba, also showed DVD-ROM drives for PC applications. These are expected to become available later in the year.

The range of players and prices was interesting. At the higher end of the range, the Sony DVP-S7000 was priced at the equivalent of £670. It has a ten-bit digital-to-analogue converter, a 32-bit RISC processor and a system called Smooth Scan. This is claimed to offer improved picture quality in both the forward and reverse directions. According to Sony the feature is particularly useful when operating in the high-speed, slow-motion or frame-by-frame modes. The player has a dual discrete optical pickup, with a 650nm red laser for DVD discs and a 780nm infra-red laser for CDs. Video output is in component form.

Sony's player is to be released in the USA this April. Most of the other players were priced at the equivalent of about £400. Sony is starting off at the top end of the market because the company feels that DVD will be bought initially by 'early adopters' who are prepared to pay a premium price. Many at CES felt that the 'street price' will turn out to be somewhat lower.

The Philips Magnavox DVD400AT is to be launched during the second quarter at around £400. It should arrive

in Europe during the IFA Electronics Show, which is to be held in Berlin this August.

Panasonic showed two players, Models DVD-A100 and DVD-A300. The former has a Dolby Digital output that enables it to be linked to an external decoder for Surroundsound effects. It also has composite and S-video outputs. The DVD-A300 incorporates a Dolby Digital decoder and a karaoke feature. No launch date or prices were suggested.

RCA, which is part of Thomson, also showed two DVD players, Models RC5200P and RC5500P. The main difference is in the connections provided: both have composite and S-video outputs, but the RC5500P also has an optical audio output socket and a Dolby Digital output socket. Again there were no price details.

Pioneer's dual LaserDisc/DVD player, Model DVD700, was priced at the equivalent of £670. The company says that retailers have been demanding a dual-format player, not least because DVD software will be in relatively short supply during the initial launch phase. The company points out that around 10,000 LaserDisc titles are available in the USA, 125 of them with Dolby Digital sound tracks. The DVD700 has a holographic lens that can read LaserDiscs and CD and DVD discs, a nine-bit video digital-toanalogue converter and a 20-bit, 96kHz audio DAC. It offers both-sides play and a digital field memory to enable CLV LaserDiscs to be played in the trick-play mode.

Pioneer also demonstrated some of the features that DVD discs can provide. For example there's an eightlevel parental control system that can be used to block certain scenes or discs. There was a movie disc that could be switched between English and French sound tracks and between three different language subtitles. Pioneer mentioned a pop music video disc that enables the viewer-listener to select four different camera angles: this is available only in Japan so far.

DVD can certainly offer some clever features, but the feeling was that the first batch of offerings would consist of movies with little by way of such extras.

Toshiba had a massive DVD stand, with both players and DVD-ROM drives on show. The company plans to launch two players in the USA initially, Models SD2006 and SD3006. The former will be priced at the equivalent of some £400 while the latter, with component video output, will cost an additional £60.

Other companies with DVD players on show included Samsung, Akai, Zenith, JVC, Denon and Kenwood.

DVD Prospects

Everyone agrees that the success of DVD will depend on the support provided by the Hollywood studios. Film companies that are to release titles include PolyGram, Columbia Tristar, MGM, Sony Pictures and Warner Home Video. Some fifty titles will be available at DVD's launch, ranging from oldies such as Gone with the Wind to the latest blockbusters like Twister. Some films will have simultaneous VHS and DVD releases. But the DVD packaging doesn't inspire confidence: it looks like an old games software box. long and thin with a colour picture on the front. In fact quite drab. Hopefully, European releases will use a CD jewel box or something similar. DVD disc prices will range from about £13 to £20 a time.

There was a very interesting debate on DVD, entitled "DVD: the new Messiah?" Representatives from Sony, Philips, Toshiba, Thomson and Warner were present. Warren Lieberfarb, president of Warner Home Video, was bullish about the prospects. He predicted that if all conditions (such as Hollywood support) were met DVD player sales could reach 2.8m in the first year. But many felt that this was over optimistic.

Doug Dunn, chairman of Philips Consumer Electronics, stated at a press conference that DVD would be a great but slow-growing market. This view has many supporters. Warren Lieberfarb didn't consider that a record facility would be necessary for the success of DVD. In support of this view, he pointed to the vast quantities of prerecorded tapes that were bought.

But if DVD is to challenge VHS as the standard home video system it will eventually have to offer recordability as well as playback. The PC industry is also pressing for DVD recordability.

The DVD demonstrations were certainly very impressive, with great MPEG-2 pictures and amazing Dolby Digital Surround sound. Time will tell whether the system becomes another VHS or a LaserDisc.

The Internet

There was plenty of evidence at CES that the computer and consumer electronics worlds are on a convergence course. The Internet service WebTV is specially designed for TV viewers. Sony and Philips both launched WebTV set-top boxes to sell at around £220. In addition it costs £13 a month to subscribe to WebTV. The boxes are small and contain a 33-6kbit/sec modern. They plug into the TV set and telephone socket, and are operated by a remote control handset or an optional wireless keyboard. Philips also showed a prototype TV receiver with a built-in WebTV decoder.

The system has been designed to appeal to noncomputer users. When you click on the relevant icon, the set-top box automatically calls up the nearest Internet connection and presents a home page. E-mail can be sent and received, and you can explore the Internet and build p a list of favorrite Web sites. Computer graphics and text can look pretty ropey on a TV screen: WebTV mages on the other hand look crisp and clear.

WebTV is to introduce a technology called VideoFlash her this year. It enables full-motion MPEG-1 video to be invalceded from the Internet in real time. Anyone who

has tried to download images of any sort from the Internet using current technology knows how painfully slow the process is.

WebTV is certainly user-friendly. There are, however, conflicting reports on how well it's doing. While Philips claims to be pleased with the response, some retailers have complained about a limited demand for the set-top boxes. It's certainly nicer to net surf with a TV set rather than a PC, but consumers are notoriously unpredictable when they are presented with a new concept.

Akai and Zenith had Network Computers (NCs) on display. These plug into a TV set and a telephone line, giving viewers access to the Internet. The difference between using an NC and Web TV is that the latter is run by a single service provider – you can buy an NC and choose your Internet service provider.

The NC contains a 33.6kbit/sec modem and 8Mbytes of RAM. Unlike a PC it has no hard disc: all programmes are downloaded from networks such as the Internet. Its advantage is low cost – around £250.

Sharp and Mitsubishi showed TV sets with built-in modems and Web browsers. Sharp's 32-PC1 has a 32in. 16:9 screen on which the user can view TV and Internet images side-by-side. Mitsubishi's DiamondWeb TV is available in 32, 36 and 40in. screen sizes. Prices start at around $\pounds1,500$.

Digital Satellite TV

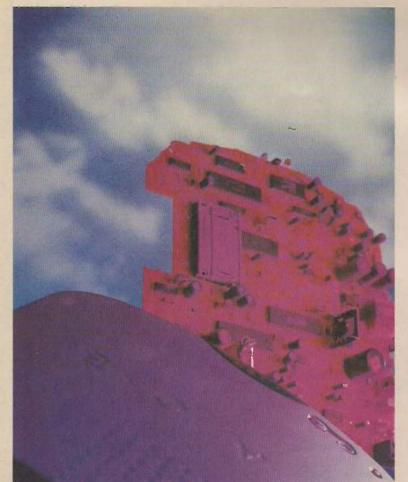
US viewers already have three digital satellite TV services, including Echostar which has around 450,000 subscribers and Primestar with around 1.7m. Primestar offers up to 95 channels which are transmitted via fourteen transponders aboard a medium-power satellite at $85^{\circ}W$. It rents the hardware required. Installation costs £100-£150, and the monthly subscription is £20-£36 depending on the package selected.

The largest digital satellite operator however is DirecTV, whose DSS (Digital Satellite System) offers viewers a choice of up to 175 channels. It has been one of the most successful consumer offerings since its start in 1994 – DirecTV claims to have over 2.3m subscribers. Programme packages range from £4 to £30 a month. Companies that market the equipment include Thomson, Sony, Toshiba, Samsung, Philips, Sanyo, Hitachi and Matsushita. A basic system, with 18in. dish, costs around

Turn to page 332



Zenith's NetVision network computer will, via a built-in 33.6kbit/sec modem, give TV viewers access to the Internet, enable them to send and receive e-mail, and provide various interactive services. It's due for release in mid-1997. The Zenith NetVision boxes and TV sets will incorporate a printer port and a smart-card slot for transactional services (banking, home shopping etc.). In addition an Ethernet port will enable a high-speed cable modem to be connected.



The Pace MSS100 sets high standards for a budget-price satellite receiver. J. LeJeune starts a two-part examination of the technology it uses

Pace's MSS100 Technology

R evolutionary is the best word to describe Pace's budget-price MSS100 series analogue satellite TV receiver. Much of the signal processing is carried out by a single LSI chip, and even the cabinet design is unusual, departing from the traditional rectangular box – one either loves or hates it! Fig. 2 on page 330 shows a simplified block diagram of the electronics used in the receiver. In this look at the technology involved, we'll stick to convention and start off with the power supply.

The Power Supply

A lot of flak was created by the power supply in PRD series receivers. The power supply used in the initial MSS series receivers has performed much more impressively. The MSS100 uses an entirely new type of power supply called TOPS – and the tops it is! Surprisingly simple and very rugged.

It's based on a new range of ICs dedicated to switchmode power supply use, the TOP200 series. We have all become used to the STR series of chopper chips used in TV receiver power supplies. The TOPs chips go one better in having just three pins – one for the connection to the primary winding of the chopper transformer, one for regulation feedback and one for the chassis return path. The output device within the chip is a power MOSFET. Fig. 1 shows the power supply circuit. All the capacitors used are rated to work up to 105° C.

Filtering in the mains input circuit prevents switchfrequency hash being fed into the domestic electricity supply. A conventional bridge circuit then rectifies the mains input, the reservoir capacitor being C3 (47μ F, 400V). It created some problems in early receivers by going low in value.

A supply of some 330V is generated across C3 for

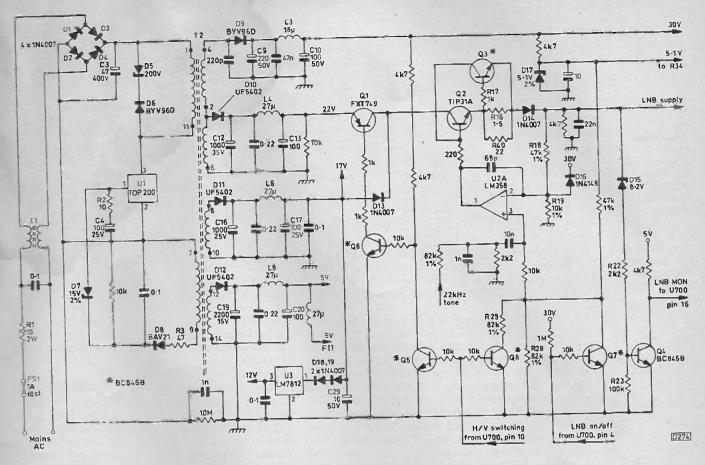
application to pin 1 of the chopper transformer T2. Diodes D5 and D6 are incorporated to limit the back-EMF overswing when the power device in U1 switches off – they form a very simple snubber circuit.

When this 330V appears at pin 3 of U1 a small current is bled away internally to start up the chip. This current charges C4 via R2 and pin 1 of U1. When the voltage across C4 reaches 5.7V, an oscillator within U1 starts up, generating a waveform with a 65:35 duty cycle and a frequency of approximately 100kHz to drive the power device within the chip. The chopper action commences, and the voltages on the secondary side of the transformer rise rapidly.

The feedback winding on the transformer, connected between pins 7 and 9, supplies rectifier diode D8 which generates a low-current DC supply of about 20V. This is applied to pin 1 of U1 via the 15V zener diode D7. The feedback arrangement has been designed for optimum sensitivity. As the feedback winding delivers 20V, there will be a higher voltage change for a given percentage error than with a winding that delivers only about 6V, which is all that pin 1 of U1 requires. What D7 does is to provide a fixed voltage drop of 15V, so that almost the whole of any voltage variation is passed on to U1. The result is tighter control of the output voltages provided by the power supply.

Should the voltages at the secondary side of the circuit rise, there will also be an increase in the DC feedback at pin 1 of U1. This will adjust the mark-space ratio of the output device's drive waveform, reducing the on time for current flow in the transformer's primary winding. Thus the outputs will be reduced and the voltages stabilised. A fall in the voltages in the secondary side of the circuit will be accompanied by a corresponding fall in the feedback

SATELLITE



voltage. This will increase the mark-space ratio of the drive waveform. The switching device's on time will thus be longer. The outputs will rise, providing the required stabilisation. C4 also adds inertia to the feedback, to prevent hunting and overshoot.

U1 incorporates effective safety features to prevent damage to itself and the power supply as a whole. Excess current protection is achieved by sensing the voltage developed across the output device's drain resistance. Should the voltage across this resistance exceed 10V, an internal trip circuit will be activated. This shuts the output device down and puts it through the start-up sequence every 1-2secs. The drain resistance of the MOSFET output device is very closely controlled during manufacture.

Another safety feature looks for voltage spikes on the mains supply. Should one occur, it will affect the voltages at pins 1 and 3 of U1 simultaneously. This will trigger an inhibit circuit within U1: drive to the output device is removed and the power supply shuts down. To restore normal operation you have to switch off the mains supply for a few seconds, allowing C3 to discharge.

The safety features are very effective and cater for all common fault conditions and more. Even a broken switchmode transformer limb will not result in the destruction of U1 - the power supply simply goes into the trip mode.

The Achilles heel was C3. In early receivers it would fall in value. As a result, a negative voltage could be fed to U1! This is the only condition against which U1 is not protected. Later receivers are fitted with a different capacitor, which seems to have solved the problem.

There is no adjustment for the outputs provided by the power supply. The four outputs are:

(1) 30V, produced by D9, C9, L3 and C10.

22V, produced by D10, C12, L4 and C13.

(3) 17V, produced by D11, C16, L6 and C17.

(4) 5V, produced by D12, C19, L8 and C20.

The 30V supply is used primarily for the varicap tuner. It also provides a constant-current bias for the zener diode (D17) in the reset generator circuit, the H/V switching and the LNB on/off switching transistor.

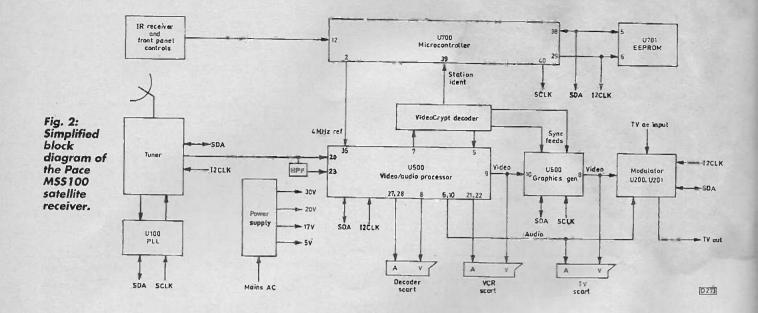
The 22V line is used exclusively to supply the LNB: for vertical polarisation the 17V supply takes over. This supply is used extensively in the receiver and also feeds the LM7812 regulator U3 to provide the 12V line.

The LNB Supply

The UK version of the receiver has a single LNB input. There are dual LNB types for export markets, and the following description of the LNB supply switching takes this into account. With single LNB receivers the LNB supply is fed to pin 5 of the tuner, an 'LNB select' voltage being applied to pin 6. With dual LNB models the LNB supply can be switched, under software control, using the LNB select line from pin 21 of the microcontroller chip U700.

The H/V line from pin 10 of U700 provides two control actions. First, when it goes high the 22V supply is disconnected: this is done by switching Q5 on, with the result that Q6 and Q1 switch off. D13 is then forward biased, and the 17V supply arrives at the collector of Q2. Secondly, by switching Q8 on or off the bias applied to pin 3 of U2A is altered, thus altering the output from the LNB supply series voltage regulator transistor Q2.

This arrangement prevents excessive dissipation with a high LNB current load. Theoretically the chopper circuit could be used to provide the LNB with a regulated supply directly. But under a fault condition the operation of the microcontroller chip could be affected. Adding the series Fig. 1: The power supply section of the Pace Model MSS100.



regulator also improves the regulation characteristics, with foldback current limiting, 22kHz tone injection and high ripple rejection.

The TIP31A series regulator transistor Q2 is controlled by the operational amplifier U2A. Resistors R18 and R19 sample the LNB supply from Q2, providing feedback to pin 2 of U2A. Pin 3 is fed with a reference voltage derived from the 5-1V zener diode D17. To cater for the two different voltage levels required by the LNB (for horizontal or vertical polarisation), this reference voltage is adjusted by adding R29 in parallel with R28 or open-circuiting R29. When Q8 is switched on R29 is in circuit: with Q8 off, R29 is open-circuit. As we have seen, Q8 is controlled by the H/V line from pin 10 of U700.

Transistor Q7 can be switched on and off by the LNB on/off line from pin 4 of U700. With Q7 switched on, pin 3 of U2A is shorted to chassis and Q2 switches off, removing the LNB supply.

A 22kHz tone from pin 29 of the LSI chip U500 can be applied to pin 3 of U2A. This modulates the LNB supply, at 400-800mV peak-to-peak, to switch bands with a universal type LNB. The tone switching is under the control of the receiver software.

D15, R22, R23 and Q4 monitor the LNB supply. In the event of a short-circuit along the LNB cable or in the LNB itself, the supply will fall to a very low voltage because of the action of the foldback current-limiting circuit - Q3. R16, R17 and R40. R16 and R40 monitor the supply current. If this is excessive, the voltage developed across these resistors switches Q3 on, altering the drive to Q2. With the LNB voltage at a low level, D15 will cease to conduct and Q4 will switch off. This raises the level of the LNB MON line, which is connected to pin 16 of the microcontroller chip U700, to 5V. U700 then tells the graphics generator chip U600 to display a red screen with the flashing message "LNB SHORT" on it. Coincidentally, U700 attempts to reapply power to the LNB, testing for the short-circuit condition approximately once every half second.

The Tuner

The MSS100 is fitted with a Pace tuner – Fig. 3 shows the circuitry in this area. A single-input, 27MHz bandwidth version is used in UK receivers. The tuner's local oscillator runs at 479.5MHz above the required channel frequency. It's is controlled by a phase-locked loop which is based on

a Sanyo LM7001 dedicated PLL tuning system chip (U100).

The local oscillator frequency is divided by 128 by a prescaler within the body of the tuner. This provides, at pin 18, a sample signal within the range 9-20MHz. The sample signal is fed via C106 and R101 to pin 11 of U100, where it's further divided down by a programmable divider whose division ratio is set, via the SDA serial data line, by U700. The final sample signal has a frequency in the low kHz region.

The 5.625MHz crystal X100 generates a reference frequency for the PLL system. U100 also divides this down. The programmable divider for the sample frequency is set by U700 to produce a final output at the same frequency as the reference frequency. the comparison between the sample and reference frequencies being made at this low kHz frequency. Any difference between the two frequencies produces an error signal that moves the tuner's local oscillator to the correct frequency and holds it there. Basically, the tuner's local oscillator becomes crystal controlled.

The tuning output at pin 14 of U100 is a pulse-width modulated signal with a peak-to-peak amplitude of 5V. This is insufficient to cover the required tuning range. So the PWM signal is fed to the MOSFET transistor Q100, which is connected as a Miller integrator operated from the 30V supply. This stage inverts and amplifies the tuning voltage, providing an output that's suited to the tuner's voltage/frequency characteristic. The output from Q100 is in the range 0-30V. It's fed to pin 15 of the tuner.

A further oscillator within another phase-locked loop runs at 479-5MHz, the second IF. This is used for demodulation. The signal FM, when applied to this phase-locked loop, generates an error signal which is a replica of the original modulating signal. This type of demodulator is not new – it has many similarities to the locked-oscillator discriminators used in many early FM receivers and valved 625-line TV sets.

An AFC signal from the demodulator PLL leaves the tuner at pin 10. It's fed to pin 35 of the microcontroller chip U700, which monitors the position of the signal within the IF passband and initiates any adjustment required to the tuning voltage to maintain the correct carrier position within the passband. U700 signals U100 via the serial data line (SDA), the latter chip carrying out any correction required to the local oscillator frequency. This system caters For reasonable amounts of LNB local oscillator drift. The tuner's video output, at pin 13, is a baseband signal, that is a video signal with energy dispersal still applied, plus several audio subcarriers. It's filtered to remove HF out-ofband noise and is then buffered by the emitter-follower Q101. From there is passes directly to pin 20 of the STV0056 LSI chip U500.

The STV0056 Chip

The STV0056 is a Thomson device dedicated to satellite TV signal processing. It uses BICMOS construction and is divided into three main sections, audio, video and supervisory. The supervisory section includes generation of the 22kHz switching tone, I2C bus control and a low-power consumption mode. The STV0056 is designed for receivers with three or even four scart sockets.

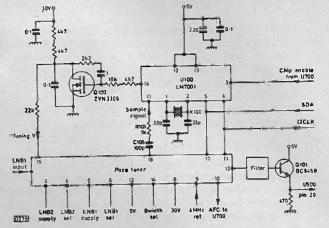
The video section of U500 includes the de-emphasis, clamping and energy-dispersal removal circuits required plus a switching matrix. The audio section has twin independent demodulators that can be used for stereo pairs or individual subcarriers with monophonic operation. Wegener Panda noise reduction is incorporated, and another switch matrix for source selection. The STV0056 eliminates much of the discrete component circuitry and the many smaller switching chips used in other models in the Pace range and the ranges from other manufacturers.

Video Processing

To clarify what goes on in the STV0056 chip we'll look at the video and audio sections separately. Fig. 4 shows, in simplified block diagram form, the video section.

Baseband video enters at pin 20, where it's fed to a programmed, gain-controlled amplifier. The software enables the gain of this stage to be set between 0-12.7dB in 63 steps. This is followed by inverted or non-inverted output selection. For C band operation the amplifier should be set to invert the video signal – C band satellites use video modulation of opposite sense to Ku band satellites.

The output from this amplifier is fed directly to the switching matrix as an unclamped baseband signal with all the audio subcarriers present. It's also passed to the PAL de-emphasis network. An active de-emphasis system is used, based on feedback around an operational amplifier connected between pins 15 and 18 of the chip. De-emphasised but still unclamped PAL is available to the internal switch matrix. The output at pin 15 is also filtered to remove signal components above 5.5MHz, the highest



video frequency, buffered, filtered to remove any residual amounts of audio subcarrier, and then again buffered by compound emitter-followers connected as a super-alpha pair before returning to U500 at pin 13 as a 1V peak-topeak video signal.

Energy dispersal removal is then performed. This is done by a clamp which sets the sync tips at 1.2V DC. The deemphasised and clamped PAL video at this point is a positive-going signal that's passed to the matrix. Other video inputs to the matrix are unscrambled video from the internal VideoCrypt decoder, entering at pin 5; video from a VCR at pin 11: and video from an external decoder at pin 4. As these last three inputs are AC coupled, DC restoration is applied before they reach the matrix.

The switch matrix enables six inputs to be switched between three outputs. These are video to the internal VideoCrypt decoder at pin 7, to an external decoder at pin 8, and to a VCR and/or TV set at pin 9. The software incorporated prevents any invalid connections being made, for example VideoCrypt decoder input to VideoCrypt decoder output.

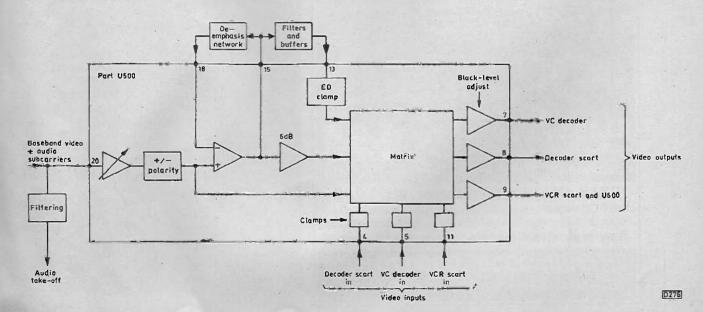
Although pin 9 carries the common feed to a VCR and TV set, further processing (in U600) adds on-screen messages and set-up menus to the TV feed only, leaving the VCR feed clean.

Next Month

In Part 2 next month we'll look at the audio processing, the colour graphics chip U600, the modulator and the microcontroller system.

Fig. 3: The tuner and tuning control system.

Fig. 4: The video processing section of the STV0056 chip.



continued from page 327

£130, though some are available for as little as £66.

DirecTV plans to start an interactive service later this year. It will include Internet access, multimedia magazines, data-enhanced TV (text and graphics relating to a programme), games and software. The service will be available using a multimedia PC equipped with a special board. IBM, Microsoft and several PC board manufacturers are understood to be involved.

Electronic Delivery

The Amsterdam-based company EMC3 announced plans to launch an electronic digital delivery (EDD) service next year. The idea is to deliver videos, music and games at high speed to specially adapted VCRs, PCs and NCs. A two-hour video programme could be downloaded in about ten minutes. EDD uses a powerful compression system and is designed to operate via cable, satellite, wireless and broadband systems. Companies that support EMC3 include JVC, Mitsubishi, Sharp, Sanyo, Sony, Hitachi, Pioneer and Samsung.

Video Developments

Philips demonstrated a digital HDTV set that produced excellent pictures. Its release is to be in late 1997/early 1998.

Flat-screen TVs of various types were on show, including Sharp's 40in. LCD set. Its pictures looked good. So too did those produced by Philips' 42in. wall-hanging set, which uses plasma-gas technology. It goes on sale in the second half of the year and is expected to cost the equivalent of around £6,700. Pioneer was also showing a 42in. plasma TV. JVC demonstrated a number of products including its D-VHS recorder, which is to go on sale in the USA later this year, DVC camcorders and a 'video docking station' with a video capture board that puts shots straight into a PC. It will cost around £1,900. JVC also demonstrated a video printer priced at about £530.

Sharp showed an amazing carncorder that records up to 2,000 digital still images on a 140Mbyte MiniDisc. It can also record 365 images with 40 minutes of stereo sound (double this time with mono sound). Sharp's VC-LX3 hi-fi VCR has a built-in 3in. colour TFT LCD screen. This enables you to be sure that you are recording the required channel while you are watching something else on the TV set.

SoundView Technologies was demonstrating a V-chip converter box. To recap, the V-chip enables parents to censor TV programmes. A recent US law lays down that all new TV sets with screen sizes of 13in. or more must incorporate a V chip from February 1998 onwards. Programmes will have to be transmitted with electronic tags that provide ratings for language, violence and sexual content.

The V-chip converter is designed for use with the 200 million TV sets already in use in US homes. It measures 6×9 in. and connects to the aerial socket and power line. Parents use a keypad to enter a PIN code and set the rating level. The converter then monitors the incoming TV signal: when an unwelcome broadcast is detected, the screen is blanked until an acceptable channel is selected. If a child tries to tamper with the box, the TV set's power supply is shut off. The converter is expected to sell for about £27. To date, the system has been rejected in Europe.



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Channel 5 and VideoPlus

As we have now had our first test transmission for Channel 5 in London, I set up my VCRs and TV sets to receive the new channel. I set the VCR to tuner position 5 to receive Channel 5 and, as seemed to be a logical thing to do, moved the satellite channel (Sky) from position 5 to position 6. Imagine my horror later that night when, having programmed the X Files with VideoPlus using the VCR's remote control unit, I noticed that as the VCR switched on it was recording tuner position 5. Speedy manual action saved the recording.

A check on the instructions for my Aiwa HVGX150K showed that the VideoPlus setting can be moved from 5 to 6.

I have seen nothing about this problem anywhere. What will happen when viewers set their VCRs as I did? Just how many complaints will there be that "VideoPlus isn't working"?

Francis Beach,

Cricklewood, London.

Editorial note: We understand that Channel 5 and Gemstar (which created the VideoPlus system) are, rather late in the day, having talks about the problem.

Samsung VIK310 Series

With reference to Mike Leach's micle (February issue) on the Sumsung VIK310 and associated

Letters

models I would, as a Samsung dealer who has sold and serviced many of these machines, like to add the following comments.

As Mike pointed out, the biggest problem with these machines is in the power supply, where C110 (100µF, 25V, 105°C) dries up with disastrous consequences. As it dries up, the power supply thinks that its output voltages are falling and attempts to push them back up again. Depending on how long this has been going on, you may have to replace the capstan motor, the drum motor, C113-C120 inclusive, IC101, R101, R107 ZD101, R113, D606, D701, D702, D157, D158, D604, 1C602, R630, R631, IC601, R638 and R644. That's if you are lucky! In some cases D606 may have overheated so badly that the main PCB has burnt beyond repair and the machine has to be scrapped.

Samsung is well aware of the problem, and has produced a modification kit that contains most of the above components – but, sadly, not the drum or capstan motor. The modification kit is available to Samsung dealers free of charge on receipt of the model and serial number. Part no. of the kit is 6WINNER1MODKIT.

In an attempt to avoid further problems once the kit has been fitted, Samsung recommends adding a 27V zener diode across the 21V rail. The idea is that the diode will go shortcircuit should its breakdown voltage be exceeded, presumably shutting down the power supply. However neither ZD101 nor ZD702, which are both connected across supply rails, seem to provide any protection. ZD702 simply burns up the PCB.

The course we adopt is to replace C110 with a special Philips type rated at 125°C. This is available from Farnell Electronic Components of Leeds (01132 636 311) as part no. 286-709. If a machine comes into the workshop with even a totally unrelated fault, replace C110 before you so much as plug it into the mains supply! Michael Dranfield, Buxton, Derbyshire. I have just read Mike Leach's article on servicing the Samsung VIK310/320/350 series VCRs. As an authorised Samsung service centre, we would like to say that while Mike Leach's advice is sound the best and cheapest way to repair this power supply is to order the correct repair kit from Samsung or one of the company's parts suppliers – it includes detailed information on repair.

After repair the power supply should on no account be connected to the main panel before testing. Otherwise the result can be severe damage to the main panel and even the capstan motor. The correct procedure is to connect it to the mains supply first, then listen for any noise from the power supply. If everything seems to be normal, measure the voltage between pins 1 and 3 of CN101, using a digital voltmeter. The reading obtained should be between 15-17V. If so, the power supply can be refitted to the VCR. If the power supply fails either test, it should be discarded and a replacement fitted. The cost of not following this procedure can be high. Dennis Cass, A-Z Radio, Hull, North Humberside.

Can You Help?

I am researching the Onwa TV chassis used in Models C14ET and C21ET from JVC, with a view to preparing a service manual. It was also used in a number of other models under various different brand names, but there is very little information about this. If anyone can provide any information, will they please get in touch with me? Steve Beeching, Newark, Notts, Phone 01636 626 327, fax 01636 626 767.

Price Differences

When I needed a new drum for a Matsui VX6000 a supplier quoted \pounds 86.40 + VAT. Then I recalled seeing an advertisement for Matsui VX3000 decks at £16 each on the back page of *Television*. I ordered one and received a brand new deck with heads and cassette housing. The

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drum assembly enabled me to sort out the VX6000 problem, while the rest of the deck came in useful for repairing a Matsui VX1000 that had been brought in because of sluggish playback. I still have a spare new cassette housing should I need one. This must be one of the best deals around.

Incidentally, why do they design VCRs that wear themselves out by keeping the rotating heads in contact with the tape in all modes?

I've recently gone on the net and am looking for people who, like myself, are interested in helping each other with hints and advice on repairing VCRs and TV sets. You can reach me at:

BranchTV@aol.com Edward Branch, Northallerton, N. Yorkshire.

PCBs

Although I agree with many of the points mentioned by Pete Roberts in his letter (January issue) concerning the advantages of fibreglass over phenolic (SRPB) PCBs, there is one major reason why fibreglass panels are seldom used in mass-produced TV or satellite receivers.

A typical TV chassis will have a main

PCB with 600 to 1,000 holes in it, together with several slots for heatsinks and screening cans. The only way to form all these holes and slots quickly is to use a specially made die and a power press to punch through the board in one pass.

Phenolic paper boards are made with various 'punching' properties. Unfortunately fibreglass boards are too tough and abrasive to be punched successfully: they can only be drilled.

Prototype and low-volume production PCBs are usually made with NC controlled drilling machines, but it still takes between five and fifteen minutes to drill all the holes in an average size PCB. Further time is wasted if there are many different hole sizes, or if there are slots or irregularly shaped holes that have to be milled. Compare this with the die punching method, which can produce a completed board in a few seconds.

With modern auto-insertion machines and automated test equipment it makes sense to combine all the PCBs used in a receiver into one large biscuit, which is broken apart after component insertion and soldering. It's cheaper to throw away any unused areas of the biscuit, such as a SECAM decoder or Zweiton sound board, than to set up separate production lines for each small board. A biscuit made from fibreglass is very difficult to break into individual boards, and leaves a ragged edge. The tendency of a phenolic board to crack easily is an advantage in producing clean edges.

In some cases a phenolic board does not have sufficient strength or adequate electrical properties but production requirements are such that punching is the only method that can be used. In these cases an epoxy-paper or epoxycellulose board is used: they can be punched easily after heating to soften the board (hot punching). This type of board is often used in UHF tuners or semiprofessional equipment. It has a matt white or pale amber appearance.

Multilayer PCBs, such as those used for computer motherboards, are in effect several thin PCBs glued together to form one complete board. Fibreglass is the only material that can be used for this purpose, because the epoxy resin used to make each layer must be compatible with the epoxy used to glue the layers together – the whole board is cured to form one solid mass. J.R. Allison,

Bradford, W. Yorks

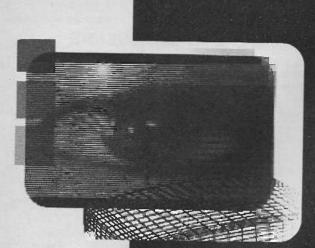


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TELEVISION March1997

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Reports from Philip Blundell, AMIEEIE Richard Newman Michael Dranfield Chris Watton Ian Rees and Stephen Leatherbarrow

ITT Digi 3 110° Chassis

There was no sound or picture, with the standby light flashing on and off. Another faulty line output transformer? Not this time. Our Konig LOPT tester gave it a green light. But the set had all the symptoms of a short-circuit somewhere in the line output stage.

Tests on the supplies derived from the LOPT showed that the diodes were all OK and that there were no short-circuits to chassis. It was a different matter when I checked the resistance across the field output chip, which was short-circuit. Beware of chips that operate with split supplies!

I had a TDA2170 in stock, but Chas Hyde can supply an alternative. Replace the field flyback boost capacitor C402 as well. **P.B.**

Ferguson ICC7 Chassis

This set kcpt blowing its mains fuse. Four had blown at about six monthly intervals. The set was brought to us to see if we could cure the problem, as its fuse had blown again. When we checked the fuse's end caps, spark erosion could be seen. The fuse holder wasn't gripping the fuse tightly. To ensure a sound repair we futed a new fusc holder. P.B.

TV Fault Finding

Philips K35 Chassis

I've always liked these sets. This one had a really superb picture despite being some fourteen years old. It also had faint flyback lines that wouldn't go away however. In addition there seemed to be a strange shading effect at one side of the screen. I went straight for the 155V supply reservoir capacitor C583 (4.7µF, 250V) which can cause similar troubles, but not this time. A lot of time was spent replacing decoupling capacitors, all to no avail. Eventually, while carrying out scope checks in the line output stage, I found that the waveform at the anode of D586 (BY406A) was quite low and crushed. D586 is a clamp diode. It was leaky, a replacement curing the fault. R.N.

GoldStar CI20A50

Field collapse was the problem with this set. Although there were some dry-joints around the field chip, resoldering them didn't cure the fault. The cause turned out to be FR718 $(3\cdot 3\Omega)$ which was opencircuit. A replacement restored the field scan, but the height and linearity were all wrong. This wasn't another fault – someone had had a twiddle. R.N.

Sony KV2000

This old-timer had given sterling service over the years but was now driving its owner mad because of a loud, high-pitched whistle. I noticed that there was considerable cogging on the picture, and that the noise and the cogging both decreased when the set had been on for about ten minutes. A squirt of freezer on a rather sad-looking capacitor (C612) made the fault appear. A replacement cleared the fault. R.N.

Philips Anubis Chassis

We've had loads of these sets in with dud line output transformers.

The new type LOPTs are black and shouldn't cause any more problems. R.N.

Philips G110 Chassis

Choke L5619 (3-9 μ H) in this chassis is now tending to fail, with the result that the power supply self-destructs when put into standby. It's in the BUT18AF chopper transistor's base drive circuit. The parallel 10 Ω chip resistor R3619 is also worth checking, as it can be damaged. The coil is not included in the basic power supply repair kit, though it is in the extra kit ES7059. As L5619 can also become intermittent, it makes sense to replace it as part of a power supply rebuild. R.N.

Sharp C2095

This set's owner complained that he couldn't tune in the signal from his VCR. When we tested the set on the bench we found that the tuning voltage rose to only 8V, then dropped to zero and started again. Fortunately we had the circuit diagram - there are ten ICs on the tuning panel. Extensive checks led us to the TC4081 quad two-input nand gate chip IC11012, which controls the on-screen display tuning bar. The fault cleared when this was removed, but there was no on-screen display of course. We found a replacement on a scrap panel. When this was fitted the tuning bar travelled right across the screen - it had previously moved only about two inches. This had been part of the clue. M.Dr.

Ferguson TX90 Chassis

This set was dead though the HT was OK. The cause of the problem was no line drive. In this chassis over-voltage protection is carried out by a couple of transistors that short out the line drive. One of them, TR110, was short-circuit collector-to-emitter. M.Dr.

Grundig CUC720 Chassis

Intermittently dead was the complaint with one of these sets. We tested it for several days before the fault showed up. Then, at switch on, the LED display flashed "88" briefly. After that it went off and the set remained dead. On investigation we found that in the fault condition the power supply was running but its outputs were all very low – the HT was only 75V instead of 152V.

Replacing several components seemed to cure the fault, but the set came bouncing back. Eventually we found that the culprit was the HT preset control R647. When we touched it with a screwdriver the HT rose to 200V. Its wiper was clearly making intermittent contact. M.Dr.

Orion 14ARX

This 14in. colour portable was dead with the standby light on. We didn't have a manual unfortunately. On investigation we found that there wasn't a standby transformer. Instead, the standby supply is derived directly from the mains, the circuit consisting of a half-wave rectifier, a reservoir capacitor and a couple of resistors. At the end of the resistor chain we obtained a reading of exactly 5V, which we assumed to be correct. Big mistake!

When we obtained a copy of the circuit diagram we found that the standby supply should be 13V. The $3\cdot3\mu$ F, 250V reservoir capacitor had dried up. A replacement restored the correct voltage and the set came back to life. M.Dr.

Akura CX30

Although the EHT was present there was no sound or picture. When we connected the collector of one of the RGB output transistors to chassis via a $1k\Omega$ resistor we obtained screen illumination and found that the cause of the problem was field collapse. This method of obtaining a display is better than disturbing the first anode control's setting. Further tests showed that the 12V supply was missing, because the 3·3 Ω resistor R418 was open-circuit. It's in series with the feed from the LOPT. M.Dr.

Amstrad TVR3

There was an odd fault with this set. Everything worked all right until it was switched off. When the operate button was pressed, the set switched to the VCR channel and stayed on. After some careful study we found that the contacts of the standby we have remained closed. They

remained closed with the voltage across its coil down to 1V. We assumed that the relay was magnetised, as a 24V relay shouldn't hold its contacts closed with only 1V across the coil. The collector of the transistor that controls the relay switching is also connected to the sound mute pin of the AN5265 chip. via a $22k\Omega$ resistor (R155). We traced the source of the 1V to this chip. When we increased the value of R155 to $47k\Omega$ the voltage across the coil fell to 0.7V and the relay dropped out when asked.

Another dealer we know has had this problem. A new relay would probably cure the fault, but this simple modification is cheaper. M.Dr.

Matsui 2091

This set would revert to standby about two seconds after being switched on. If the on/off switch was held in, the set would stay on but with a snowy raster and no onscreen display. The culprit turned out to be the microcontroller chip's 10MHz crystal. M.Dr.

Bush 4414

There was no tuning. A check showed that the voltage at the tuner's VT pin was 30V and wouldn't decrease. We found that R642 (22k Ω , 1/8W), which is connected between the microcontroller chip and the tuning voltage integrator, was open-circuit. M.Dr.

ITT Compact B2 Chassis

There was no vision or sound. Checks at pins 5 (UHF) and 14 (12V) of plug TZ showed that the tuner's supplies were OK. A scope check at pin 24 then produced a good composite signal display. In this situation the culprit is usually the TDA2014 video switch chip IC3601. This was no exception. C.W.

Toshiba 145R7B

This set worked all right until it was put into standby. The sound was then muted but the picture remained. We found that the standby switching transistors Q802 and Q803 weren't operating because R833 (120k Ω) was opencircuit. C.W.

Contec KT8135

This colour portable was dead. As there was 320V across the reservoir capacitor C501, the mains input and rectifier circuits were obviously OK. As we didn't have a circuit diagram we carried out cold checks in the power supply and line output stages. The silicon all seemed to be OK, so we made a start on the resistors in the power supply. R501, R502 (both $330k\Omega$) and R503 (1M Ω) were all faulty. Replacing them restored normal operation. C.W.

Sony KVM2151U (BE2A Chassis)

There was no blue in the display. A check at the tube's blue cathode produced a near HT reading, so the blue gun was cut off. Our next check was at pin 1 of CNC72, the blue input to the CRT base panel from the TDA3505 RGB processor chip IC302. There was a low reading here in comparison to the green input at pin 2. A check at the chip's blue output pin 10 produced a reading that was slightly high in comparison to the other outputs. The 100Ω chip resistor R312, which is in series with the feed from 10 of IC302, was open-circuit. A replacement restored the picture's blue content. C.W.

Ferguson TX100B

When this set was cold there was no colour. Once it had warmed up there were only bands of colour. We found that C48 (0.1μ F, 63V), which is connected to pin 24 of the TDA3562A colour decoder chip IC3, was the culprit. C.W.

Sony KV2212

There was no picture. We found that the HT voltage was low at only 83V. C652 and C653 (both 33μ F. 250V) in the power supply were both faulty. Replacements restored the picture. C.W.

Samsung P68 Chassis

This set was stuck in standby. Checks around the 2SC2331Y transistor Q803, which is used to switch the 16V supply, produced some incorrect voltage readings. In addition R819 (270 Ω , 2W) in Q803's collector circuit was cooking. Q803 was found to be leaky. C.W.

Finlux 1000 Series

There was no sound and the set would switch to standby. If there's no sync signal these sets switch to standby after about ten minutes – the main microcontroller chip starts a switch-off routine after nine minutes. When the sync signal is present, the voltage at pin 13 (transmission identification) of the TDA2578A timebase generator chip ICh1 should be high. It was only 0.5V. A replacement chip restored the voltage, curing the faults. C.W.

Sony KV2766

When text was selected there was just a blank raster. When mix was tried a very weak text image was superimposed on the picture. A check at the output from the SAA5050 chip showed that there was a large amount of character data at full amplitude, but there was only a very low input at the video chip. RV3 (100 Ω), which sets the text amplitude, was open-circuit. C.W.

Korting 41525 Orbitter

This set has an early digital tuning system that wouldn't go above channel 32 at the bottom of the band. while any signal we obtained couldn't be stored. Checks at the TRD (Tuning Remote Digital) panel showed that the 50V supply was at only 11.6V while the 30V tuning supply was at 6.8V. These supplies are derived from pin F of the line output transformer. A check at the anode of the relevant rectifier. D1039. showed that a nice 55V waveform was present. At the cathode there was only 11.6V however. The reservoir capacitor C1039 (47µF, 63V) was opencircuit, C.W.

B & O 8800

The power supply made a grunting sound about five times then the set went dead. When I looked at the circuit diagram I too grunted a few times. Fortunately I spotted the cause of the trouble without having to get too involved. The transformer's EHT outlet was illuminated when the set tried to start up. A new transformer and two yards of EHT cable restored the set to as good as new. C.W.

Sony KVX2552U

The cause of intermittent colour was traced to the TDA4510 decoder chip. The reference oscillator has to be set up after fitting a replacement. This is done by shorting pin 11 of the chip to chassis then adjusting C332 for nearly stationary colour. C.W.

ITT CVC1203 Chassis

This set was said to be dead. We found that the power supply was providing low outputs – the HT was just over 100V instead of 145V, and there was only 18V at the 24V output. A check showed that the HT adjustment didn't work. This is usually a sign that the line drive is missing. An 8V start-up supply was present at pin 14 of the TDA 1940F line generator chip IC601, but there was no supply at the collector of the line driver transistor T741. The $1k\Omega$ feed resistor R744 was open-circuit. C.W.

Amstrad CTV12

There was little or no sound. Checks in the audio output stage suggested that there was something amiss with the biasing, though the supply was present. There was audio at the demodulator. After checking the transistors and ceramic capacitors I turned to the supply resistors. R151 ($39k\Omega$) near the left edge of the PCB was open-circuit. I.R.

Bush 2057NTX

This dead set had been subjected to a mains surge. The 2SC2482 line driver transistor Q401 and its feed resistor R416 (2kΩ, 5W) were faulty; the cause of field collapse was simply failure of the TDA3653B field output chip IC401; while the cause of no sound or vision was the 12V, 1W zener diode ZD402 being short-circuit with its supply resistor R422 (3-3Ω, 2W) open-circuit (these components are situated just to the right of the scart socket). Make sure that the HT voltage is 112V at TPB+ or you may loose all the work you've done. I.R.

Finlux 3624P

I look after banks of these scart only monitors (3024V, 3028H, 3029V chassis) at a local rock theme pub. Many of the problems are caused by crystallised joints in the line output stage, the result of poor ventilation. This one looked as if it should work there was plenty of activity from the line output stage. But no raster with low EHT made me wonder about the tripler in the LOPT. A slight bulge on CZ19 (marked 390nF but was 470nF in this chassis) gave me a clue. When removed it was found to be opencircuit. L.R.

ITT Compact D2 FST Chassis

There was poor sync with no or chopped sound and hum bars. Having had similar symptoms in older ITT models I went straight to the screened module that contains the tuner. Sure enough C201 (4.7μ F, 63V) was low in value. I replaced the other electrolytics inside the module for good measure. I.R.

Goodmans 2043T

This set was dead. Checks on the

small electrolytics in the chopper power supply revealed that C805P (100μ F, 16V), which is mounted in front of the chopper transistor, had dried out. I.R.

Huanyu 37C-3

No luminance sent me scurrying for the oscilloscope. After some time spent carrying out checks in the luminance section a casual flip of the service switch on the PCB brought the picture back. Cleaning the switch cured the problem. LR.

Sony KV2762

There was a minor tuning fault with this set: the tuning would alter by a very small amount, usually on a change of scene. The tuning supply was slightly low at 29V, and altered by 0·1V when the fault occurred. Its source is the 40V supply, which is derived from pin 3 of the chopper transformer via D652 and R651. The latter measured 60Ω , which is a bit high for a 1·2 Ω resistor! As a precaution we also replaced the 33μ F, 50V reservoir capacitor C653. S.L.

B & O MX4500W

This set was dead, in the trip mode, with the line output transistor shortcircuit. A replacement failed the following morning, which was a cold one. We eventually found that CL26 ($2\cdot2\mu$ F) was very low in value. This distorted the line drive waveform enough to overheat the 2SD1546 output transistor, hence its early demise. The chassis is actually a Thomson/Ferguson ICC type, though the exact equivalent eludes us. S.L.

Ferguson ICC7 Chassis

Red LED. green LED then the sound of EHT followed by silence and no lights were the symptoms with one of these sets. The cause was traced to transistor TP53 (BC557) which was leaky collectorto-emitter. It's the voltage error sensing transistor in the power supply. S.L.

Hitachi C25-P228 (G8Q Chassis)

This set suffered from what appeared to be intermittent corruption of the data stored in the ST24C02CP chip IC1502. All tuning information and analogue signal levels would be lost, with the set reverting to channel 0.

We found that the 5V supply to the text board, measured at PL1506, disappeared at random. It comes via IC001, whose 8V supply also went missing when the fault occurred. This supply comes via a coil on the back of the print. A poor connection was present here: when the iron touched one end of the coil the solder fell away to reveal a blackened print pad. Cleaning, retinning and resoldering restored reliable operation. S.L.

GoldStar CIT2175X

There was very intermittent loss of the vision and sound. As this was more prevalent when the set was cold, and after several hours' use, we tackled the problem with freezer and a hairdryer. The IF/video section of the set is based on a TDA4502 chip. After checking in this area for an hour or so we traced the cause of the fault to L202, a green coil that's labelled 2K2. It was going opencircuit. S.L.

Toshiba 217D9B2

There was no sync because, we discovered, there was no 12V supply to the text board (at pin 16 of P805). This supply is produced by Q813 (BD945), which is a simple series regulator. Q813 itself was blameless, its very low base voltage being caused by the 13V zener diode D827 (type 04A213X) which was virtually short-circuit. A replacement restored normal operation. S.L.

Goodmans 1410 (Thomson TX805 Chassis)

This portable was dead with a shortcircuit S2000AF line output transistor (TP10). Checks showed that in addition RP28 (2.7Ω , 5W) was open-circuit and DP11 (BA157) short-circuit. Fortunately the set continued to work during a long soak test after fitting the replacements. S.L.

Hinari VTV200

This TV/VCR combination produced normal sound with a blank raster – but only when cold. We've had this before, and wasted no time in replacing C629 (100μ F, 25V), the reservoir capacitor in the supply to the 12V regulator IC604. C629 falls in value, the resultant low, noisy supply causing the symptoms mentioned. Freezer and a hairdryer will confirm its guilt. S.L.

Ferguson ICC7 Chassis

A common fault with this chassis

and similar ones is intermittent loss of signals. The usual effect is a blanked out screen – black, but with very regular white patterning. The cause is dry-joints within the IF unit, particularly at CS32 which is associated with the LA7550 chip IS10. SL.

Akura CX25 and CX26

We've had a number of these sets in the workshop. Field faults, brightness faults, no sound, distorted sound, intermittently dead and clicking (very similar to Nicam noise) have all had one cause. In addition, a sort of RF patterning, no colour and tuning drift can be added to the list. The micro's EEPROM has always been responsible. It can be obtained direct from Akura, Cumbernauld. The part no. for Model CX25 is 13-ONVM30-60P25B/00294AA and for Model CX26 13-ONVM30-60PB/00294A. S.L.

Amstrad TVR3

For severe line corrugation from cold, go straight to C91 (22μ F, 16V). We've recently had a run of these models with this fault. S.L.





the Mitsubishi CT2965STX

The Euro 8F chassis used in this model has an interesting master/slave control system in the power supply. John Coombes on fault finding in this and other sections of the receiver.

This smart 29in. model was released in late 1990. It's fitted with the Mitsubishi Euro 8F chassis. It superseded the CT2964STX, which is similar in appearance and general internal layout. There are however some significant differences between the two models. In particular they have totally different power supply circuits. Model CT2964STX is fitted with the Euro 4Z chassis. A note at the end of this article will mention some faults you can get with the CT2964STX. To start with we'll concentrate on the ST2965STX.

The Power Supply

Fig. 1 shows the power supply circuitry used in the Euro 8F chassis. It's a conventional chopper power supply, but output control is based on a pair of chips. IC901 (TEA2164) on the primary side of the circuit and IC950 (TEA5170) on the secondary side. IC950, which is called the master regulator, senses the HT voltage at pin 5. It contains an oscillator and a pulse-width modulator, whose output at pin 3 is transformer coupled by T902 to pin 6 of IC901. This chip, which is called the slave regulator, generates the drive for the 2SD1887 chopper transistor Q901 at pin 14. It contains excess voltage and current and low voltage protection circuitry, and an oscillator for start-up and standby operation.

Standby switching is controlled by the M50439-564SP microcontroller chip IC701 and switching transistors Q951 and Q950. When pin 10 of IC701 goes low Q951 and Q950 switch off, removing the supply to pin 2 of IC950. IC901 then has to rely on its internal oscillator. IC701 also switches off the 12V regulator chip IC953 – the control is at pin 2. Note that there are two 5V regulators. The main one, which provides the supply for IC701, is IC952. IC951 provides the 5V supply for the text panel. Both regulators are type μ PC78M05H.

If you are presented with a dead set, the first thing to do is to check the 2AT mains fuse F991. If it has simply gone open-circuit, the cause may be ageing or a power supply transient and a replacement should hold. If the fuse has blown, the cause could be an intermittent shortcircuit in the on/off switch S991. Alternatively check the BYW56 bridge rectifier diodes D901-4, their 2.2nF, 1kV protection capacitors C901-3 and the 2SD1887 chopper transistor Q901 for shorts. If these items are all OK, the TEA5170 master regulator chip IC950 could be faulty. Incorrect operation of this chip can result in high voltages and a blown mains fuse. If F991 has blown, Q901 is short-circuit, the 4-7 Ω , 10W surge limiter resistor R901 is open-circuit and zener diode D909 (type RD3.0FB2) is short-circuit, Mitsubishi advises fitting a 390k Ω , 0-25W resistor across pins 1 and 4 of IC950, on the copper side of the board, before replacing these components. Use hot-melt bonding material to secure the resistor.

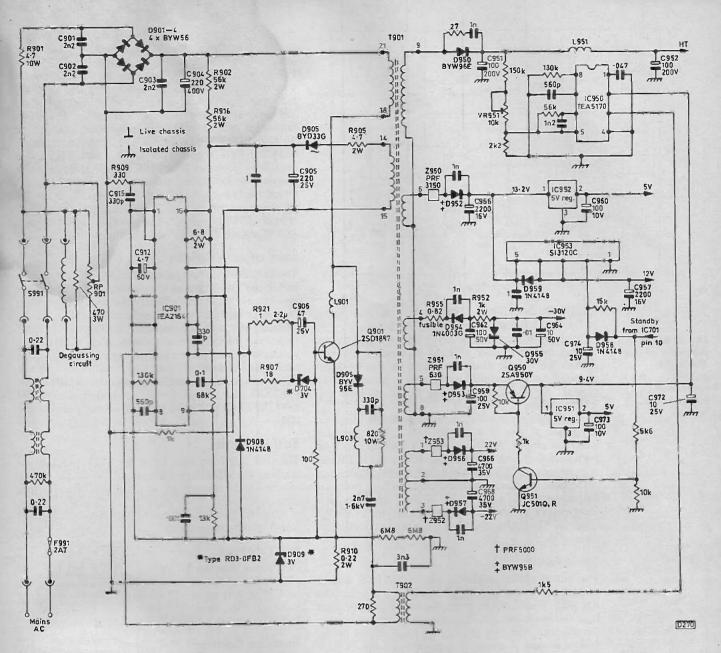
If the above checks have failed to reveal anything amiss, check whether the 3-15A circuit protector Z950 (type PRF3150) is open-circuit. If so and there appears to be no reason for the failure, Mitsubishi advises uprating the protector to type PRF5000 (5A) – part no. 299P132010.

With Z950 open-circuit there will be no 13V input at pin 1 of the 5V regulator IC952 and pin 5 of the SI3120C 12V regulator chip IC953. Thus the microcontroller chip IC701 and the TDA2579A timebase generator chip IC501 will have no supplies. It's worth remembering that IC953 is turned on at pin 2 by a 5V feed from IC701.

If there is any problem with IC950, the master and slave regulator chips IC950 and IC901 should be replaced as a pair.

The Line Timebase

A short-circuit line output transistor (Q552, type 2SD1879) is the most common fault in the line output stage. This will load down the power supply. The usual reasons for the failure of Q552 are dry-joints at coil L553 in its emitter circuit or at the driver transformer T551, or shorted turns in the line output transformer T553. This item may have to be checked by replacement.



Dry-joints around T553 can cause intermittent or permanent loss of the picture and sound.

If there is no picture, check whether the **CRT**'s heaters are alight. If not, check for dry-joints at pins 9 and 10 of T553 and at pins 9 and 10 of the tube's base socket – also ensure that the tube's pins are clean and not bent.

Loss of the line drive may be the cause of the no picture symptom. Check the BF419 line driver transistor Q551, which could be short- or open-circuit. Then check its feed resistor R551 ($6.8k\Omega$, 5W) which may be opencircuit. If the line driver stage is OK, check whether there is a line drive output at pin 11 of the TDA2579A timebase generator chip IC501. If this waveform is missing, check whether IC501's supply (11.6V) is present at pin 10. Check back to source – IC953 via L557, with C507 (100µF, 25V) for smoothing – should this supply be missing. If the supply is present, replace IC501.

T553 can be the cause of no picture, intermittent flashing on the screen or even focus variation. Excess humidity can result in breakdown of its insulation, with arcing. Watch out for damp homes!

If there is just a loud squeal from the power supply,

T553 probably has shorted turns. Other possible causes are the EW modulator diodes D551 (BY228) and D552 (BYW96E), and their parallel tuning capacitors C576 and C578 (both 0.01μ F, 1-6kV). Check them for shorts.

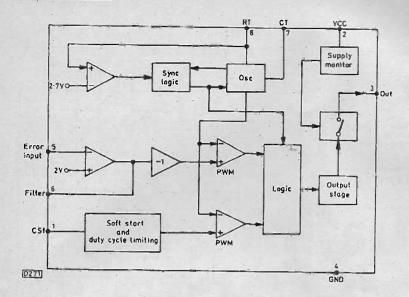
Dry-joints at the plug/socket for the line scan coils can be the cause of line collapse. Also check for dry-joints at plug/socket EA on the pincushion correction (PCC) PCB.

If there is sound but just a bright raster with flyback lines, check whether the tube's first anode (screen) control is faulty – it's on the LOPT. If this item is OK, the cause could be loss of the HT supply to the RGB output stages: check whether the fusible, $2 \cdot 2\Omega$ resistor R559 is open-circuit or the 47μ F, 250V reservoir capacitor C565 is short-circuit.

The Field Timebase

The obvious item to check in the event of field collapse is the μ PC1498H field output chip IC401. Before replacing it, check carefully for dry-joints at its pins then check that its 28.7V supply is present at pin 6. If this supply is missing, check whether C412 (470 μ F, 35V) or C567 (1,000 μ F, 35V) is short-circuit, whether Fig. 1: The chopper power supply circuit used in the Mitsubishi Model CT2965**STX** (Euro &F chassis). **TELEVISION**

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R563/R570 (both 0.82Ω , 0.5W fusible) are open-circuit, or D553 (BYW95B) is open- or short-circuit.

Dry-joints at the scan coil plug/socket connections are another possible cause of field collapse in the scan circuit. We've also known the scan coils to be opencircuit. Another possibility in this area is failure of C408 (330pF, 500V). This fault can be intermittent and difficult to trace.

If the output stage and scan circuitry are OK, check for dry-joints at pins 1-4 of the TDA2579A timebase generator chip IC501. Note that if a receiver is left on for a long time with field collapse IC401 and IC501 can both be ruined. This can make fault finding difficult.

The field amplitude control VR402 (500k Ω) can cause height variations when faulty. If the field linearity is incorrect or intermittently incorrect, check VR401 (500k Ω). The carbon tracks of these preset controls can deteriorate.

Sync Faults

The brown sealant which is across the PCB can be responsible for loss of sync, no colour, line jitter or false line hold. What happens is that the sealant can introduce high-resistance leakage – thus the symptoms can be very intermittent. The cure is simple: scrape all the brown sealant around suspected components off the PCB. A common fault is loss of sync because of the sealant around pins 5, 6 and 7 of the TDA2579A timebase generator chip IC501.

The Signals Side

An intermittently blank raster and ghosting or ringing are problems you sometimes get. They can be very intermittent, and are not necessarily related to heat or a cold start. To overcome the problem, resolder coils L4 and L5 in the IF unit IP1A1 then retune all channels to the correct setting and ensure that the AFC switch is in the on position. In most cases this will solve these problems. Otherwise it may be necessary to replace the tuner and IF unit

If there is no picture or sound, or the picture reappears intermittently, suspect the IF unit.

If there is a raster with no picture content, replace the tuner.

The tuner can also be responsible for tuning drift. But first check that the 33V supply is stable. The μ PC574J-K 33V stabiliser IC704 could be faulty – check it by replacement if necessary. If this item is OK, suspect the 2SC1740S-E transistor in the tuning supply integrator circuit. Check it by replacement. If still in trouble, replace the three 0.47μ F capacitors C721/2/3 in the integrator network.

If the drift is apparent only on channel change, there's a modification that can be used to improve the AFT pull-in range. It comes as a kit, part no. AFT1.

If the various channels can be tuned in but are not retained in memory when the set is switched off, check the M58630P EAROM chip IC702. First ensure that its ~31V supply is present at pin 2. If this is missing, check the RD30FB3 zener diode D955 which could be shortcircuit and the fusible resistor R955 (0.82Ω , 0.5W) which could be open-circuit. Then ensure that its 5V supply is present at pin 1. If this voltage is low, C960 (100μ F, 10V) is probably open-circuit. If the supplies are OK, check IC702 by replacement.

Loss of one Colour

The 2SC2688-M,N output transistors Q651 (red), Q652 (blue) and Q653 (green) are suspect when the fault is loss of one colour. If the fault is intermittent, you can swap over transistors to prove the point.

Check the $5k\Omega$ bias presets VR651 (red), VR652 (blue) and VR653 (green) if the problem is grey-scale variation with loss of or increase in one colour – their tracks can deteriorate.

Loss of one colour can also be caused by a fault on the AV/RGB PCB. Check the DC conditions around the AN5352 chip IC2T0. If they are correct, suspect the chip.

Sound Faults

The first step is to ensure that the $\pm 21V$ supplies are reaching the STK4132II audio output chip IC3S1. Check at pins 3 and 1 respectively of plug/socket PA. If either is missing, check back to its source in the power supply. If necessary check the 100Ω fusible resistors R3T8 and R3U3 which can go open-circuit.

No Teletext

First check that the 5V supply is present at pin 4 of plug/socket TX3. If this is missing, check IC951 (μ PC78M05H) and C973 (100 μ F, 10V) in the power supply. Other items to check if necessary are the 13-8MHz crystal X7701 and the SAA5231 chip IC7705.

Remote Control

If there's no remote control operation, check whether the handset or the infra-red receiver is at fault. In the event of a suspect receiver, check that its 5V supply is present at pin 1 of plug/socket RH. Check this plug/socket for dry-joints or poor connections. If a scope check at pin 5 of the microcontroller chip IC701 produces a pulse waveform, check IC701 by replacement.

If the handset is at fault, check its batteries and the battery connections first, also that the TV/VCR switch is in the TV position. Other things to check if necessary are the SE1003 LED, which could be dry-jointed, and the KBR393 crystal X1 which could be dry-jointed or defective. The M50462P chip IC1 is suspect if the other things mentioned are all OK. If there is intermittent operation or only one button doesn't function it may be necessary to replace the remote control handset.

Model CT2964STX

This model has a lot in common with the CT2965STX, including the line timebase and several of the subpanels, but there are different field (AN5521) and audio (LA4270) output chips and the chopper power supply is totally different. Some of the information above also

Fig. 2: Block diagram of the TEA5170 master regulator control chip.

applies to the CT2964STX therefore.

The power supply circuitry in Model CT2964STX is a modified version of the arrangement used in the Euro 4 chassis. There are two chopper circuits, the main one which is based on an STR59041 chopper chip IC901 and a standby supply that produces -30V and 5V outputs. The basic arrangement was dealt with in my article on the Euro 4 chassis in the July 1991 issue of *Television*.

A fault with the STR59041 chopper chip in Model ST2964STX can cause high voltages with the failure of many components on the main PCB and the pincushion control (PCC) PCB. If the PCC PCB is badly damaged it may be necessary to fit a replacement. Ensure that IC901 and the 2SD1879 line output transistor Q552 have been replaced. I have never had PCC PCB burn-ups with Model CT2965STX.

Another problem you can get with Model CT2964STX is a pattern that looks like co-channel interference. It usually occurs only at switch on, lasting for a few minutes. The cause of the fault seems to be ripple on the 12V line, the usual culprit being C920 (470μ F, 25V, 105°C). If replacing this doesn't solve the problem, check C925 (10μ F, 25V) and the connections to the 12V regulator IC902 – if the legs seem to have overheated and are a dull colour, fit a new μ PC7812H IC. On some occasions it may be necessary to replace the equivalent components in the 5V supply: reservoir capacitor C922 (100μ F, 25V), smoothing capacitor C923 (100μ F, 10V) and regulator chip IC903 (μ PC78M05H).

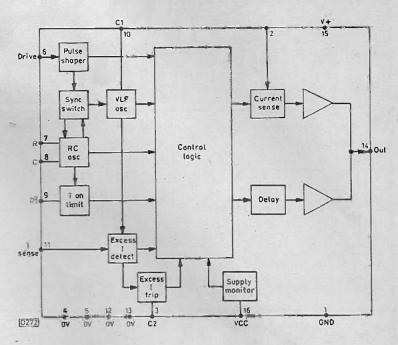
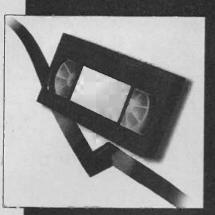


Fig. 3: Block diagram of the TEA2164 slave regulator control chip.

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Reports from Philip Blundell, AMIEEIE John Coombes Graham Thompson Nick Beer Keith Evans Chris Watton and Gerald Smith

Philips VR323 (Charlie Deck)

Tapc damage because it rides up or down the capstan is a routine fault with the older Charlie range of VCRs. The cause is often a defective pinch roller, but lately I've had several cases where this has not been the cause. The take-up torque has been excessive because the coupling (item 214 in the exploded view of the deck) is faulty. This item and the pinch roller are included in service kit 4822 310 31803.

Take care with the back-tension band when fitting a service kit to a Charlie deck. Make sure that it is clipped into its holder. I've come across cases where this has not been done. The resultant low back tension produces spotty playback pictures with the tape running up or down the capstan. P.B.

Ferguson 3V65

This machine thought it had a tape inside and was trying to rewind it, though there was no cassette present. When I've encountered this fault on previous occasions the cause has been loss of the switched

VCR Clinic

outputs from the STK5481 chip. But in this case the supplies were all OK. There was no voltage at the cassette lift however. On inspection the motherboard was found to be suffering from dry-joints at the connectors, especially at CN1. P.B.

Pioneer VR737

This machine worked all right but there was no display. I was able to use the Philips VR6484 manual to find that fuse 1216 in the power supply was open-circuit. P.B.

Mitsubishi HSM57

"Noise on Nicam" was the complaint. Sure enough when stereo was selected in the E-E mode there was a loud rushing noise that swamped the audio signal. Mono E-E sound, also hi-fi record and playback sound, were OK.

A problem in the area of the digital-to-analogue converters seemed likely – otherwise I would have expected the internal muting to have been in operation. Checks around the TD6710AN chip soon bore fruit: the 16.93MHz resonator X7A2 wasn't oscillating. A replacement restored the Nicam sound to normal. P.B.

Logic VR960

If the problem is no operation light and no functions, the STK5332 power regulator chip is probably faulty. J.C.

Toshiba V215B

If there's no fast-forward movement because the main brake has not released, being in the on position, reset its mechanical position. J.C.

Panasonic NVL20

There was no display or operation. C1109 (1 μ F) in the power supply is the usual cause of this – it goes open-circuit. But this time the mains input fuse had blown because the bridge rectifier D1102 (S1WBAGO) was short-circuit. Note that the STRD1816 auto voltage-selector chip IC1101 can go short-circuit between pins 2, 3 and 4. J.C.

GoldStar RQ2931

It's becoming quite common to get a dead machine, the cause being failure of the KIA7806 6V regulator chip lC101 in the power supply. G.T.

Toshiba V404B

There were no results. Power supply checks showed that the outputs were all low by about 50 per cent. The U4614B control chip IP001 in the primary side of the power supply was faulty. G.T.

Ferguson FV26D

A check in the power supply of this dead machine revealed that R1 was open-circuit. It's a safety resistor which is mounted near the mains transformer. G.T.

Panasonic NVJ45

There was no E-E tuning, though loopthrough and playback were fine. The tuner used in these VCRs is known for problems, but not of this sort. Checks showed that its 12V BU supply was missing. This comes from the adjacent bandswitching chip, which is largely redundant in the UK version. Pin 12 of this chip produced a low reading of 0-2V, though its supplies and controls were all fine. A resistance check here produced a reading of $1k\Omega$ to chassis. So I tried, to no avail, a replacement chip from a scrap unit.

I then noticed that the tuner had been replaced, and that one lug of its case is soldered very close to the print to the BU pin. There are a couple of surface-mounted links on this print. One was touching the rather bulbous joint on the tuner's lug – or was it? The resistance check had produced a reading of $lk\Omega$: it now read short-circuit! Tidying up the joint restored the $lk\Omega$ reading and the tuning. But I didn't trust the original chip. N.B.

Samsung VIK316

This machine produced a very dim display. It was invisible in standby, and barely visible when powered up: Otherwise the unit worked fine. The filament supply was at 2-5V, with 6V peak-to-peak of hash on it. This pointed to capacitor trouble, and we duly found that C38 (100μ F, 10V) was open-circuit. The correct filament supply voltage is not quoted in the manual: with the machine working correctly I found that the reading was 5-72V. N.B.

Panasonic NVG10

This elderly VCR's playback vision was dull and there was no field sync. When a recording was played back on another machine it was fine. It seemed likely that there was a faulty electrolytic in the playback luminance path, and a search for a suitable candidate brought me to C306 (10μ F). A scope check across this capacitor proved its guilt, while a warm iron on its top cleared the fault. A replacement restored the playback vision. N.B.

Mitsubishi HS337

This machine came in because it had mechanical problems, and did need a good service. On test from cold however it was found to produce very weak playback vision – a check on a recording with another machine proved that the fault was with playback only. We found that a small resistor had been tacked across C2C1 (10μ F) on the print side of the PCB, to which it was glued. This glue was now conductive when cold. Removing it and cleaning up the area cured the fault. N.B.

Panasonic NVL25 Remote

As the remote control handset that goes with this model is expensive to replace I decided to try to repair it. The problem was that the scanner section wouldn't switch off – the red beam stayed on all the time, with the result that battery life was very short. Pin 13 of IC2, the scanner control chip, was stuck at 1-5V – this is the power-on line. The switching signal comes from a microcontroller chip via QR2, which is a UN2211 digital transistor (internal biasing). As the base of

Panasonic NVG40

There was no capstan phase lock in the playback mode though record was OK. Checks around IC2101 on the servo sub-pack produced the following results: the capstan speed duty cycle at pin 16 was correct at 50:50, though the DC voltage was high at 5V instead of 2.5V; the capstan phase duty cycle at pin 17 was wrong at 1:99, with the DC voltage at 0V instead of 2.5V; the DC voltage at pin 2 (tracking MMV) was low at 0.3V. The latter seemed odd, as this is a simple DC control voltage obtained from the 5V supply via the tracking control. Herein lay the simple answer: there was no 5V at the top end of the tracking control as the grey single wire to the control sub-PCB from the timer PCB (pin 4 of P7503) had broken off. It had never been secured by tape or glue. N.B.

Panasonic NVJ35 etc

The dead machine symptom with any model that uses this power supply can be caused by C1119 (680μ F) on the secondary side of the supply being short-circuit. This is unusual however: the usual cause is C1109 (1µF) on the primary side of the supply. The difference is that with C1119 short-circuit you get a slight chirp at switch on. N.B.

Ferguson FV11R/JVC HRD170

There was heavy patterning on the playback picture. One could have been forgiven for suspecting the heads, but this was not the cause. A 4MHz signal was being superimposed on the playback FM.

We scoped every conceivable circuit to try to find the source of the interference. It was only when the short interconnecting lead between the tuner/IF and the mother board was disturbed that there was a noticeable change in the interference signal. When the lead was disconnected, removing the power to the tuner/IF board, there was no interference.

As our scope checks showed that there was a substantial amount of the offending interference signal on the power supply rails, we looked questioningly at the 5V regulator chip on the tuner/IF board. It seemed to be running very hot, and when a quick burst of freezer was applied the patterning disappeared. It seems that as the 7805 regulator's temperature rose it began to behave as an effective signal generator. K.E.

Matsui VX2500

Our customer complained that this machine wouldn't record. On test it soon became apparent that the cause of the fault lay in the receiver section, where it was possible to select stations but the signals were badly broken up. As the problem looked like poor demodulation, we decided to replace the LA7577 chip IC01. This restored normal operation. K.E.

Samsung VI611

This machine's clock display was intermittent. There should be -24V at pin 17 of the power supply's output socket: when the display was out there was only -1V here. The -24V supply is derived from the mains transformer by rectifier DI (1N4002) and its reservoir capacitor C3 (47µF), with stabilisation by Q1 and ZD2. As you often find in Samsung machines, some of the components are glued to the PCB. The trouble is that the glue becomes conductive. This was the cause of the problem - when the fault was present Q1 was bottomed. Removing the glue cured the fault. C.W.

Sharp VCA55

When this machine had been used in the search mode, particularly in the forward search mode, it would sometimes continue to move the tape at search speed after play had been selected – with the play symbol showing in the display. The cause of the fault was traced to the capstan motor. Although its control voltage would change to the play level, the motor would continue to run at the higher speed. C.W.

Sharp VCM20

Even after fitting a heatsink Q901 blew intermittently. In addition the chopper transformer would buzz. The cause of the problem was dryjoints on the optocoupler IC901. G.S.

JVC HRJ565

There were various erratic faults, for example the power light not lighting, the capstan going into the rewind mode by itself, the machine cutting off to standby and failure to accept tapes. The cause was oxidised glue in the power supply. G.S.

HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.

Wanted: Alignment instruction videotape for the Panasonic G deck, also a main TV PCB for the Amstrad TVR3. Service TV, 18 Benfleet Road, Hadleigh, Essex SS7 1QB. 01702 558 444. Wanted: Circuit diagram or any other information on the Princeton

Graphic Systems LM300 monitor. E. L'Amie, 8 Harty Avenue, Wigmore, Gillingham, Kent ME8 ONA. 01634 234 661. Wanted: Deflection yoke for a Matsui Model 2160 (line coils are shorted) and a readable copy of the circuit for the Matsui 1422, also an MAA4032A control panel chip (IC01) for the ITT Model TX3437 (Compact B-110 chassis) or a working scrap panel. Chris Lowe,

Electrotech Services, 10 Buttermerc Road, Redcar, Cleveland TS10 1LL. 01642 486 868.

Wanted: Service manuals for the Toshiba V9600B and Ferguson 3V29 VCRs. B. Ashton, 23 Newcastle Street, Barrow-in-Furness, Cumbria LA13 9TB. 01229 836 769.

Wanted: HVR block and H Stat for the Sony Model KV2060UB. Need not be new as long as working. M. Payne, 294 Whiteleas Way, South Shields, Tyne and Wear NE34 8HW. 01915 192 848 after 4.00 p.m.

Wanted: Power supply/timebase panel for the Fidelity Model CTV14S (ZX2000 chassis), prefera ably working. Keith Patton, 1 Gienvale, Duneaney Road, Glarryford, Ballymena, Co. Antrim BT44 9OB. 01266 685 531. For disposal: Telequipment scopes, Models D32, D61 and S51, and an Advance E2 signal generator, all with manuals. Zenith 100L variac. Television magazines from 1971 to date. Minimal cost to collector. Also an EMI L2A tape recorder: offers please for this rare, unused item. A Ferguson 25in. colour set with 4000 chassis, working and free to collector. Harry Mellor, Gatesgarth, Back Lane, Airton,

Skipton, North Yorks BD23 4AL. 01729 830 417.

Wanted: LOPT (part no. 02-463003123) for the Seleco Model 16ZB312GB. M. Tapscott, 2 Oaktree Cottage, Royal Oak Road, The Pludds, Glos GL17 9UG. 01594 861 169.

Wanted: Ciruit diagrams for the B&K Precision Model 1500 oscilloscope, made by the Dynascan Corporation. Good photocopies OK. Also details of any UK source of spares. Nigel K. Goodman, 24 Greenacres, Westfield, Nr. Hastings, East Sussex TN35 4QT. 01424 756 221.

Wanted: Service data for the Panasonic NV7000EM multi-standard VCR, the JVC HR7200/ Ferguson 3V29 and the Toshiba V9600B. Also looking for a Mazda CRM173 or equivalent 17in. CRT. Terry Martini. 122B Cannon Street Road, London E1 2LH. 0171 702 8774, fax 0171 702 8216. Wanted: New or used. Tuner/IF unit and cassette carriage for the Fisher FVH-P905: video deck for the Akai VSF440; head preamplifier screening can top lid (item 501a in the exploded view) for the Philips VR6760. Colin McCormick, 23 Shaplevs Gardens, Staddiscombe, Plymouth, Devon PL9 9TY. 01752 693 615 or 01752 405 201 (home). Wanted: Circuit diagram or service manual (photocopy OK) for the HCM 1421B monitor (made by Hyundai). W.J. Alderman, Outspan, **Ouethiock**, Liskeard, Cornwall PL14 3SQ.

Wanted: Service manual for the CM335 14in. monitor or can anyone tell me who made/distributed it – there's no make shown on the monitor. Also an MN15245SAY-1 IC and a service manual for the Datsura CDR9009 14in. CTV. K. Howells, 81 Wye Court, Thornhill, Cwmbran, Gwent NP44 5UL. 01633 838 464. Wanted: Service manual or circuit diagram for the Philips PM3110 oscilloscope. Geoff Salt, 133 Cromwell Road, St. Andrews Bristol BS6 5EX. 01179 425 649. For disposal: Twenty different valve types for TV sets, new and boxed. Must cover postage. J. Harris, 44 Rymond Road, Birmingham B34 6BT. 01217 487 240.

Wanted: Viewfinder CRT (NEC 0.5in. type C1M40P45 5H51) for the Hitachi VK-C1600E camera. Peter J. Wills, 2 Gard Close, Barton, Torquay TQ2 8QU. 01803 327 725. Wanted: B&O Beogram 2000/3000 turntable/CDX CD player; also an RC handset for the Ferguson FV12L VCR. Tim Jarman, 203 Lynchford Road, Farnborough, Hants GU14 6HF. 01252 511 299. Wanted: Service manual or infor-

mation on the Sharp VCT72H and Bush VCR3501 (photocopy OK). C. Raynor, 39 Northway, Lymm. Cheshire WA13 9AT. 01925 822 673.

Wanted: Working lower drum assembly for the Sony SLV373UB (secondhand will do) and a capstan motor assembly for the Hitachi VT428E. David Paines, 2 Sycamore Crescent, Bawtry, Doncaster DN10 6LE, 01302 710 797.

Wanted: IF transformers or a complete chassis for the Bush VTR103 portable radio. Roger White, 47 Bosvean Road, Shortlanesend, Truro, Cornwall TR4 9DX. 0187 276 186.

Wanted: Function select switch and service manual/data for the NEC TV5500 TV/radio/cassette combination. Stephen Hall, 9 Reayrt Aalin, Ramsey Road, Peel, Isle of Man IM5 1US.

Wanted: Circuit diagram and any other information on the Harvard 14in. monitor, also supplier for the SGST444 line output transistor. George Watson, 30 Bradwell Close, Mickleover, Derby DE3 5DY. 01332 722 781.

Wanted: Scan coil type 89-2389-00 to fit CRT type 510VSB22. R.M. Dowling, 393 Blackfen Road, Sidcup, Kent DA15 9NJ. 0181 303 1721.

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What a Life!

A mixed batch of TV problems and customers of various sorts. Donald Bullock's workshop scene

While we were in Spain last week our neighbour, the Widow Twerpy, called us over. Her Sky News channel had suddenly deteriorated – it was just possible to see and hear what was going on through the snowy screen and hissing sound. We weren't all that surprised, as there had been a spell of winter storms with strong gales (those who only visit Spain for summer holidays have no idea!). But the other channels were all OK. In fact apart from Sky News her reception was excellent.

We tried another receiver-decoder, but it made no difference. So we connected a new downlead from her LNB to the receiver-decoder. This made no difference either. Time to take the LNB to the workshop for investigation.

It's an older type, with an openended horn. As I was wondering whether the damp had got into it, out bounced a huge jumping spider. They are common in these parts. I have seen one pounce from nowhere on to a bluebottle, then grip and eat it in a trice. I was frightened to death.

But the spider cleared off. I studied the LNB carefully and decided to open it. Then I saw a pair of powerful arms protruding from behind the Avo. All further work was swiftly delegated to son James.

He connected the LNB to our workshop dish, and found that the fault was still present. Sky News was virtually unviewable. So he shone the bench light into the horn, picked up a pair of tweezers, and in no time had removed a huge ball of cobwebby stuff from deep inside the horn.

Then he reached for a screwdriver and hesitated. He looked worried. "I hope there isn't one of those jumping spiders inside" he said.

"Don't worry" I replied. "It's gone. Jumped out and disappeared somewhere behind the Avo. James got up and fled.

After a while I managed to coax him back. He opened the LNB, removed the rest of the debris, and reassembled it. Then he tested it again. Sky News was now perfect. The reception I mean, not the programme.

More LNB Trouble

As the boys took the LNB back to the Widow Twerpy I returned to the house to find Greeneyes peering at a mass of snow on the screen of our 27in. Sanyo set, which is run from a separate LNB feed.

"Look what's just happened to Sky News" she said. "It was all right a minute ago."

I looked at the picture. It was as bad as the Widow Twerpy's had been. And the other channels were all perfect. More spiders?

As the LNB is a dual-output type, I decided to swap over the downleads. What with the rain and the winds, one of them might have become waterlogged. But this made no difference. It was going to be another workshop job.

When I opened it I found that rainwater had got in at the cable exit points – there was a small area of green corrosion. I cleaned this off, carefully valeted the unit with a justwarm hairdryer, then reassembled it. It worked perfectly after that. When I refitted it I sealed it up like Fort Knox.

More Sound

A man who looked like a ransacked ferret approached the workshop the other day. He was nursing an Hitachi colour portable, Model C14 P216. There's a stock sound fault with these sets, and I sniffed easy money to be made.

"Come in, er. . . Sir" I smiled. "Wollitis Mr Block, is this" he said, holding up the set. "Wollitis is the sound."

"Good, good" I said with great sincerity. "Tell me what it really is, what it really is."

"Wollitis, Mr Block, is I wanted the sound louder. So wollidid, Mr Block, is I opened it up and connected my big hi-fi speakers."

"You stupid twi – er – oh, I see. Ha ha. And why not, eh?" I reached for a pen. "And what name is it?"

"Stoat" he said, "Mr Stoat."

I opened Mr Stoat's set. The original small 8Ω , 2W speaker was both disconnected and ravaged. The wires that had previously connected it lay over the panel.

In this chassis the 10V supply that powers the audio output chip is derived from the line output transformer, via R402 (4.7Ω) which is a safety resistor.

R402 had departed. For reasons that I applaud, the TBA820M audio output chip has been superseded by a KA2201. A new chip, a new speaker and a new safety resistor put the set right.

Mr Stoat came back the next day. "Wollitis, Mr Block, is I've come for the set" he announced.

I hoisted it on to the counter. "Wollitis, Mr Stoat, is twenty quid" I said, "and wollit'll be if you do it again is forty."

Pffh etc

As he left a large lady barged in carrying a big, clumsy looking set. "He goes 'pffh', Mr Bloop, then the tube goes" she said, throwing her arms apart. "Funny, innit. 'Pffh' an' the tube goes!"

The set was a Pioneer SV2102. I longed for the old days, then faced up to the present. The "tube going" was in fact intermittent field collapse. And when I opened the set I found that it wasn't too frightening – the cabinet contained a Ferguson/

COMMENTARY

Thomson chassis. I soon saw that the cause of the trouble was a dry-joint at one side of CL54, a 250V, 0.56µF capacitor in the field scan circuit. Resoldering the joint cured the problem.

Davey Ruggles

Our next caller was Davey Ruggles. A decent loser, Davey makes a meagre living from collecting scrap in his battered little lorry. He'd be better off on the dole, but he's not the type. He and his wife have two children and live in a converted bus. They are the most contented family I know.

"I've got some decent customers, Don" he said. "One of 'em gave me this set. If it's worth mending 1 might make a bob or two. It's the wife's birthday next week, and trade ain't been so good lately."

The set was a Matsui 2086. There was no brightness, and when I advanced the setting of the tube's first anode preset control, after marking it carefully (easier than searching for references later), I found that field collapse was the cause of the trouble. Then I noticed that R419, a safety resistor, was glowing red hot.

We didn't have the circuit diagram, and I didn't feel rich enough to buy one nor well enough to face up to trying to read one obtained from the boys who, to me, are still Mastercare. So it was a matter of attempting a bit of logical diagnosis.

The supplies involved in generating the field scan would probably be derived from the line output transformer. R419 provided a clue. When I traced its wiring, I came to the line output transformer via rectifier diode D406 and safety resistor R421. The associated reservoir capacitor is C423. What was cooking R419?

On the other side of R419 I found a 12V, 1W zener diode (ZD401) that seemed to be short-circuit. But when the set was switched off it read OK. So I switched on again. The field scan jumped up for a second or two then collapsed as R419 began to get hot under the collar. Was it the zener diode or something else? There's a 220µF, 16V smoothing capacitor (C422) in parallel with ZD401. I removed and tested it, but it seemed to be OK. Because I've an inborn prejudice about and suspicion of electrolytic capacitors however I decided to replace it. This time the field scan came up and stayed up. All was well.

Curious, if not paranoid, about this

When Davey returned we got him to join us over a cup of tea and told him that the set was a write off. He went a bit quiet, but soon brightened up. "Oh well, it didn't do any harm trying" he said, "what do l owe you?"

We waved this question aside and topped up his tea. Steven went out. When Davey had finished his tea he went back to his lorry – then returned almost immediately.

"Hey" he said, "that set's on my passenger seat with a sticker on it saying 'Mended, no charge'. What's it all about?"

"Compliments of the house, Davey" I said, "give your wife and family our regards."

Card Trouble

Jim Sawney is a keen pike angler. He was wearing his waders when he came through the door and put an Amstrad SRD400 satellite receiverdecoder on the bench.

"I've had this blasted thing in my fishing bag for over a week" he said. "Forgot all about it. Now the wife wants to record 'The Princess and the Grinning Prat' tonight. Any chance of saving my life? The Sky card is with it. Can I pop in tonight, on my way home from fishing, to see if it's done?"

I noticed that it was raining hard. "Are you going fishing in this?" I asked.

"It'll soon blow over" he replied as he plodded out.

When he'd gone Steven tried in out. It seemed to be all right. Then he put the card in and a message came up on the monitor – "your card is invalid".

Steven checked that the 5V supply was correct at the test point just above the ten-pin connector CN01. It was. Then I saw him blow into the slot before reinserting the card. This time it worked. I looked at him.

"What sort of magic was that?" I asked.

"It's the card contacts" he replied. Then he dismantled the receiver and cleaned them. "Third this weck" he commented.

Fidelity ZX4000 Chassis

I picked up a Fidelity CTV1405R (ZX4000 chassis) which was dead, and started to look for the circuit. "Are the fuses intact?" Steven asked.



A commotion outside. . .

They were.

"Then replace D21" he continued. "It's a BY299 diode and you'll find that it's short-circuit."

I took out the diode and checked it. Steven was right. A replacement got the set working again. I looked at Steven.

"What does it do?" I asked, "and how did you know?"

"Dunno what it does" hc replied, "but when the set's dead and the fuses are OK it's always that diode." Actually it's the HT rectifier.

Jim's Return

Somewhat later Jim Sawney loomed up outside. He looked drowned and worn out, but he'd had a successful day – there were two fifteen pounders tied to the handlebars of his bicycle. He propped the bike up carefully and came in.

"Hi chaps" he said, "I don't think I've ever felt so knackered. I've walked through twenty miles of river bank mud spinning for them pike. Any luck with the Amstrad? Dare I go home?"

"It's ready" Steve told him, "only a matter of some tarnished contacts."

"Magic!" said Jim. "I can look forward to an evening of peace. I can do with it, I'll tell you."

Just then there was a terrific crash outside. A passing dog had spotted a cat sniffing round Jim's bike and had leapt at it, tripping the owner.

We ran out to confront a general mêlée. Tripped dog owner, barking dog, spinning bicycle wheels and a cat up a lamppost. Then Jim came out.

"You did say you wanted a bit of peace, didn't you?" I asked him. "Not just yet awhile though!"

Satellite Notebook

Reports from Hugh Cocks, Nick Beer and Michael Maurice

Reverts to Standby

The owner of a Pace MSS100 receiver that was almost a year old phoned to say that it would sometimes revert to standby while he was viewing. If it was left for a few minutes it would sometimes come out of standby and resume normal service.

When I called the receiver was of course behaving impeccably. But tapping the case produced a pink screen with the "LNB short-circuit" message, then within a couple of seconds the standby mode.

Fortunately 1'd had a previous encounter with the section of the power supply involved. Obviously the voltage reaching transistor Q4, which monitors the LNB voltage, was low or non-existent when the board was tapped. It comes via Q2. a TIP31A transistor that's fixed to a heatsink near the mains transformer. When I removed the board from the case I could see the minimal amounts of solder that connected Q2's legs to the PCB. Resoldering them cured the problem. How it took nearly a year to show up is another odd one! H.C.

Poor Mains Connection

The owner of another Pace MSS100 got in touch with us because his three-month old receiver wouldn't come back on after redecorating the living room. The mains fuse (FS1) was lightly blown, though the TOP202 chopper device U1 in the power supply was OK. D2 in the mains bridge rectifier circuit had gone short-circuit instead, and the 47µF, 400V reservoir capacitor C3 didn't look too healthy. After replacing these two items and the fuse the receiver chirped back into life. TOP202 power supplies do chirp when power is applied, while PRD and SS series BUTIIA power supplies ping, but I digress. .

I called round to install the

receiver, as I wanted check on the condition of the mains lead – it hadn't been brought in with the receiver. Just as well I did. The lead was plugged into a very poor extension socket that made intermittent contact. This had undoubtedly caused the trouble. H.C.

Pace SS9000/Ferguson SRV1

There were hum-like bars on the picture, as though C416 in the tuner was in trouble. Having replaced C416 and the various capacitors that give trouble in the power supply I was still left with hum-like noise. Scope checks showed that there was, at worst, 2V peak-to-peak of noise on the 12V supply. When the set had warmed up the amplitude of this noise fell to about 0.5V p-p. Replacing the 12V supply's reservoir capacitor C21 (2,200µF) cleared the fault, with the noise down to an insignificant level. **N.B.**

Amstrad SRD500

This receiver wouldn't even produce an accurate test signal, let alone pictures and sound. I replaced all the electrolytics in the secondary side of the power supply, and the start-up resistors in the primary side, but there was still no picture or sound. The test signal worked however.

A scope check at the scart socket produced an unrecognisable signal where there should have been composite video. So I heated various components on the main board, which quickly brought me to C514 (100μ F, 25V). It's part of the filter in the LNB supply. A replacement restored normal operation. M.M.

Pace MSS200

The picture was OK but there was no sound, just noise. On looking inside I noticed that the MSP3400

digital sound processing chip U14 was discoloured (burnt) on top. A new chip restored the sound. M.M.

Pace VC100 VideoCrypt Decoder

We see quite a few of these standalone decoders. They are sometimes branded NordMende. The power supply PCB, which sits alongside a video in/out PCB, is almost identical to that in Pace SS9000/9200 series receivers. The case is also similar to a Pace SS9200IRD, but has only an authorise button, a card slot and a power-on LED. It was superseded by the VC200.

This particular VC100 decoder had been connected to a motorised Grundig system and had worked well for several years. Then, according to its owner, the picture suddenly started to look "grey" intermittently with a coded signal, though the decoded picture could be seen weakly in the background. A substitute decoder worked well, so I returned to the workshop with the offending one. It so enjoyed the trip that it worked faultlessly for the next 24 hours on soak test.

Eventually the fault did appear. Decoding still took place, but the video level dropped dramatically. There was also a small ghost on the decoded picture. Although decoded video came out of the decoder PCB correctly, it became attenuated in the de-emphasis network L4/L5 which feeds the emitter-follower transistor Q22. The cause of the problem turned out to be at the junction of L4 and L5: resoldering this restored normal operation.

Unlike the Thomson SVA1, this decoder passes the incoming baseband signal straight through to the scart socket unless it detects a VideoCrypt signal. This is useful if you have a MAC decoder, but a nuisance if a clamped output is required. The decoder can be modified as follows to overcome the problem: bypass the 4053 CMOS switch U1 by linking Q22's output (which would normally go to pin 1 of U1) to the base of Q14 (which is normally fed from pin 4 of U1). This gives a clamped output irrespective of the video input. **H.C**.

A Reception Problem

Mr Pugh has been a customer of ours for over ten years. He started out with 2-8m steerable dish and a Connexions 2450 receiver in the early days, watching the film channels before there was any encryption and when the future Astra satellite project was still called Coronet! About four years ago he decided to retire the 2450, and we updated the system with a Pace PRD800 receiver and a 13/17V polarisation-switching LNB. The dish is now much larger than required, but does give a cracking picture – even in monsoon rain conditions!

A few months ago the picture deteriorated, with an odd effect: better pictures were obtained when the dish was moved away from the peak signal position. Not wanting to be distracted and confused by this odd symptom, I ran a new length of cable out of the window and along the ground to where the monster dish lives, then looked again. Everything was now as it should be. Why should the old cable have produced the odd effect of improved pictures away from the dish's peak signal point?

Then I remembered. At the time of the original installation I had to include a line amplifier, as the cable run was fairly long and the 2450's tuner (actually it had two, low- and high-band) needed a fair IF level at 1,700MHz to receive Music Box (which turned into Superchannel in 1987) via Eutelsat I F1!

I found the line amplifier – it was dry as a bone, having been mounted in a plastic box – and replaced it with a back-to-back F socket. The original cable then gave excellent results across the band. In time the cable may need to be changed, but since the results were OK and the run is awkward I left it alone.

Why had the line amplifier gone funny? As the signals improved when the large dish was moved away from its optimum position, the amplifier must have been overloading. This is not surprising in view of the size of the dish. The problem started when Astra 1E came into operation, with signals above 11.7GHz. No doubt the LNB produced some output at the higher IF, the extra signal being more than the amplifier could handle. Astra IF operates above 12.1GHz and shouldn't have caused much trouble to the system. H.C.

A Noisy PRD800

The owner of this Pace receiver complained about a "strong whistling noise". While he could hear it at a moderate level, his children said that it was very loud. When-I arrived I could hear the whistle outside the front door – the owner clearly had hearing with a greatly attenuated HF response.

As the receiver was an early production model, I replaced C5 $(22\mu F)$, C7 and C8 (both $10\mu F$) in the power supply as a matter of course. This immediately cured the problem. Since the power supply runs at something over 25kHz, we were possibly hearing a half-frequency signal. It's unusual for one of the electrolytics to radiate such a loud sound – certainly it's the first time I've had this with a Pace receiver. H.C.

Pace **SS6000**

This elderly receiver continues to give good service. It is used mainly for reception of the BBC radio stations via Astra. Fortunately it's kept as cool as possible, which has no doubt contributed to its longevity. The local power supply can be described as "pretty rough" at best, the customer living out in the sticks far from the distribution transformer. Anything that draws a heavy load produces a severe voltage fluctuation.

The owner keeps his SS6000 because of its non-chopper power supply as much as anything else. Certainly we'd have seen more of him had he used a switch-mode power supply receiver. He has a small stock of spare mains fuses and, being technically minded, is not bothered about having to remove the top occasionally to replace the fuse. On this occasion however he was stumped.

The receiver came on with channel 1 and wouldn't budge. This happened after a particularly violent supply voltage variation. We cleared the problem by pressing setup 987 on the remote control unit. This is the unlock code for the SS6000: the feature ensures that accidental channel change can't occur whilst taping, and was discontinued in later models. To lock the receiver you enter the same code – or, failing that, local power supply variations will do the trick! H.C.

A Pace SS9200

This receiver was stuck in standby pressing the standby button on the

front panel made no difference.

When I removed the top I found that PCB discoloration around the power supply was minimal for the receiver's age, which was a good sign. So I removed the decoder PCB and tried again. After a longer than normal time the receiver came on, but with horrible liney pictures on the non-coded channels. Removal of the decoder board lowers the load on the power supply, and is a good initial check to see if the receiver will stagger into life, albeit reluctantly!

At this point I replaced all the large DC electrolytics, also the chopper transistor's base drive coupling capacitor C9 $(1\mu F)$ and C416 in the tuner (the small green electrolytic above IC401). The receiver then produced good results.

The channels had returned to their 'factory default' settings however, so most of them had to be retuned. The normal cause of this is C9 drying up (the next step is failure of the chopper transistor). Retuning these receivers is unfortunately a boring and time-consuming task! H.C.

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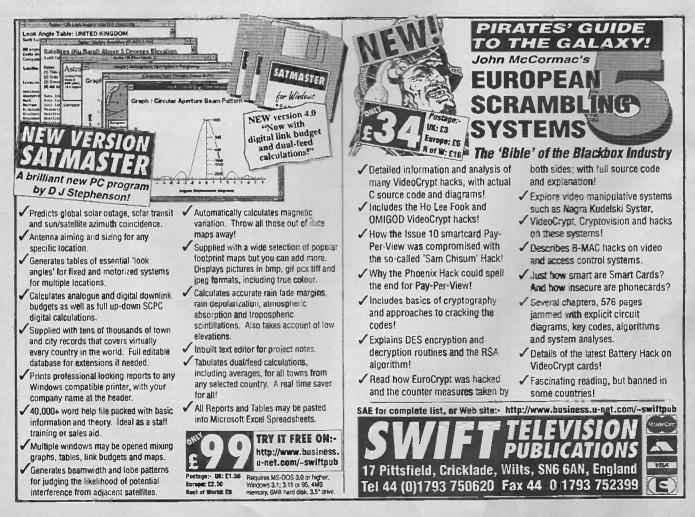
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TELEVISION March 1997

Free irreversible temperature strips

This month's cover-mounted gift* is an evaluation pack comprising three irreversible temperature indication strips.

Called Thermostrips, these light, thin indicators consist of one or more heat-sensitive squares or dots. The centre of the indicator dot turns black once the temperature rating shown next to the dot is reached. The change to black is irreversible, so the strips become a permanent record of an upper temperature threshold of a component or piece of equipment.

To aid in maintaining of a piece of equipment, for example, Thermostrips applied for the usage period can be removed during servicing and attached to the service report as evidence of correct functioning. They can also be used to help detect whether goods returned under warranty have been subjected to overheating. Performance of the strips is not affected by contact with solvents, gases, steam, etc. Because of their size and the way they operate, Thermostrips can be the only practicable way of measuring peak temperature in situations where equipment cannot be watched round the clock, or on moving parts, etc. Accuracy of the strips is ±1°C for ratings to 100°C and ±2°C for ratings above. *UK readers only

To obtain details of the range of temperature strips that ATP instrumentation supplies, write to Tournament Way, Ivanhoe Industrial Estate, Ashby-de-la-Zouch, Leicestershire LE65 2UU, or telephone 01530 416876, fax 01530 560373.

In addition to temperature strips covering the range 40 to 200°C, ATP also supplies a vast range of instrumentation, including:

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Send your request for a free catalogue on company letterhead to ATP's address above.



Chemical Aids from Manzan

Where would we be without freezer and the other chemical aids to fault diagnosis and servicing? They have become indispensible for quick and effective repair work with consumer electronics products.

A new range, manufactured by the Belgian company Kontakt Chemie, has recently become available in the UK from Manzan Electronics. There are 29 products in the range at present, grouped in four categories: cleaners; maintenance and quality control; longterm protection; and special products for PCBs. They are supplied in attractive 200ml cans (other sizes are avialable) at competitive prices.

There seems to be a product for just about every need you might have. Basic items include contact cleaners, contact lubricants and a freezer that reduces the temperature to -42°C. There's a special magnetic head cleaner, a degreaser, a label remover, a moisture dispersant, an anti-static preparation and a coating that provides EMI shielding.

For further details and a leaflet contact Manzan Electronics, 107 Duke Street, Birkenhead, Merseyside L41 8BN. The telephone/fax number is 01516 451 575.



The following notes are based on issues CDH62 and CDH63 of the Toshiba Service Bulletin

TELEVISION

Model 219T9B

HT rises slowly and reaches only 90V: Replace C814 (100µF, 50V) in the chopper drive circuit. C814 goes low in value.

Model 258T7B

AN7171NK audio output chip IC606 damaged: The 12V supply may be high. If so C866 and C869 (both 10μ F, 50V) may be low in value or open-circuit. Replace IC606 (part no. 23318195), C866 and C869.

Models 2112DB, 2512DB, 2812DB

No channel ident, teletext dark, OSD in black: The TA8775N RGB switching chip ICY50 is faulty. Part no. is B0383933.

Model 2152DB

White interference lines in the background on chs. 39-51: The Sony UF811B tuner H001 is faulty. Part no. is 23321181.

Models 2535DB, 2835DB

No sound, distortion only as volume setting is increased: The TA8776N audio processor chip IC601 is faulty. Part no. is B0383935.

Models 2552DB, 2555DB, 2852DB, 2855DB

Faint horizontal lines across the screen, similar to a 50Hz hum bar: Posistor R890 is passing RF – disconnect the degaussing coil to prove. Part no. for the posistor is 24000875.

Models 2857DB, 3357DB

No colour at switch on: Replace the 4-43MHz crystal X503, part no. 23153979.

Hissing or ticking noise from the back of the set: Check the LOPT (T461) chimney for internal corona discharge. Unclip the EHT lead and clean the chimney and lead or replace T461 (part no. 23236447).

Low and distorted Surround and centre audio

channels: TA1217N audio processor chip QG01 faulty, Part no. is B0385645.

Model C2225

No sound: C614 (0.01µF) could be faulty.

VCRs

Models V204B, V254B, V404B, V454B

Failure to record sound, bias oscillator not working: The BC847B oscillator transistor TS030 is faulty. Part no. is 70010331.

No colour: The TA8892N YC processing chip IV001 is faulty. Part no. is 70011884.

Dead, power supply ticking: CP007 ($10\mu F$, 50V) is low in value. Replace.

Models V205B, V215B, V255B, V425B, V705B

Intermittent failure to load tape fully, ejects tape; horizontal patterning on playback picture; all power supply secondary voltages low, even with no load: The 5.6V zener diode DP094 is leaky. Part no. is 70011286.

No playback sound; low voltages at pins 12 and 22 of the BA7795LS chip IS001; AF signal OK at pin 12 but no AF at pin 22: Replace the 220nF chip capacitor CS012, part no. 70041009.

No record audio, E-E low, playback OK; no AF at pin 16 of the BA7795LS chip IS001: Replace the 220nF chip capacitor CS016, part no. 70041009.

Dead, power supply ticking: CP007 (10µF, 50V) is low in value. Replace.

Models V205B, V215B, V255B, V425B, V825B, V855B

Failure of the auto tape speed function to operate with a timer recording: Replace the microcontroller chip IT001.

In Models V205B and V215B the microcontroller is

type TMP90CR74DF-7482, part no. 70012601. In Models V255B and V425B IT001 is type TMP90PR74ADF-7525, part no. 70012600. In Models V825B and V855B IT001 is type TMP90CR74ADF-7485, part no. 70012596.

Models V212B, V213B, V312B, V412B, V423B, V513B

Poor fast forward/rewind and a noise bar on frame change in slow motion: The MPS750 transistors TP81 and TP83 both faulty. Part no. is 70010939. They may check OK out of circuit. There should be 13V at pin 3 of BP03 in slow motion.

No playback colour, no colour signal at test point BW14 (next to socket BF03 on the main PCB): Head preamplifier module 0800 faulty. Part no. is 70090231 in Models V212B and V213B, 70090185 in the other models.

Will not accept a tape, the loading motor runs continuously: The servo/logic chip IT01 is faulty. In Models V212B and V213B it's type ST9030PQ1, part no. 70011687 (this is a new part no.). In the other models it's type ST9030BQ1, part no. 70011398.

Intermittent rewind and fast forward. Play, cue, review OK: Check for wear at the nylon post on the main brake charge lever K156, where it touches the clutch housing. Replace K156, part no. 70030994.

E-E OK, playback of prerecorded tapes OK, own recordings have no sound and the picture is ragged and jumps: The 220nF chip capacitor CN13 is leaky. It's between pins 21 and 22 of the AN3248NK luminance processor chip IN01. Part no. is 70041000_e

Model V215B

Video head switching line visible on screen, cannot be correctly adjusted. Also unable to enter VTR SET-UP, PROG or CH PRESET menus on OSP: Replace the ST24C04 EEPROM chip 1T003, part no. 70011892.

Models V215B, V855B

No playback chroma: Replace the TL8843P comb filter chip IV001, part no. 70011891.

Models V226B, V255B, V425B, V426B, V513B, V726B, V813B, V825B, V854B, V855B, V856B

Timer doesn't cancel PDC recordings after they have been made, leading to a FULL (CLEAR PROG?) message on the screen: This is not really a fault. The timer clears all PDC recordings at 4.00 a.m. the morning after the recordings were completed, provided the VCR is still in the timer mode. If the customer has used the VCR between the recording finish time and this 4.00 a.m. clear down, it will leave the event in memory. Use the Cancel button to clear the event required manually.

Models V255B, V425B, V825B, V855B

Clock setting wrong by exactly half an hour: Cause is error in reading data from the customer's BBC-1 teletext signal (see note later). If it's not possible to improve reception, replace the main microcontroller chip (IT001 or IC501) with a version that has revised software. Part no. is 70012714 for Models V255B and V425B; 70012713 for Models V825B and V855B. The original microcontroller software looks for the date and time (co-ordinated universal time) on a 'hidden' row of teletext data (packet 8/30, format 1) as well as a 'time-offset code' (byte 15) that's used to change automatically from GMT to British Summer Time (in half-hour increments). The original software writes this data in memory, writes it again one second later, then compares the two: if the data is the same the VCR assumes that the time is correct and starts the clock. The VCR checks this data on position 1 (BBC-1) every morning at 8.00 a.m. – unless the VCR is in use at the time.

If the received data is corrupted because of poor reception conditions, the 'time offset' (byte 15) may be read incorrectly. When this is checked at one-second intervals it is confirmed as the same data though it may not be correct.

The new software version doesn't start the clock until it receives and confirms the data three times in successive seconds, thus eliminating clock errors. But as the cause of the problem is poor reception, which will not have been improved, the VCR may not set the clock automatically. The user will have to set it manually. The daily check at 8.00 a.m. will ignore the incoming data unless it is correct for the three successive checks and not reset the clock. The later software version of the chip was fitted in production to models produced from late 1996.

Model V705B

Dead with 5V supply to the main microcontroller chip IT001 low at only 2V: Resistor RT089 (1 Ω safety) is open-circuit. Part no. is 70040122

Models V804B, V854B

No power, ever 14V supply missing: The PRF3150 circuit protector Z811 is open-circuit. Part no. is 70011864.

NEW FROM ALBAN

The Promax GV241 Monitor Pattern Generato

The GV241 has been designed to assist in adjusting and repairing analogue computer monitors. Its connector configuration provides quick links to most popular monitors without the need to prepare temporary cable assemblies.

The signals available can be used with confidence, as they are identical to those produced by the computer's own graphics card. There are eight test patterns: colour bars, grey scale, crosshatch, multiburst and R, G, B plus white rasters.

The GV241 can generate twenty nine different standards, from CGA to the sophisticated Sun 1,600 x 1,280, with selection by scrolling through memory.

There are D9, D15 and miniature D15 connectors on the front panel, also seven BNC connectors that provide R, G, B, composite video without sync, line sync, field sync and composite sync outputs.



The GV241 is available at £355 plus VAT from Alban Electronics Ltd., 6 Caxton Centre, Porters Wood, St, Albans, Herts AL3 6XT. Phone 01727 832 266, fax 01727 810 546.

Test Report

Vann Draper SL30 Soldering Station

Donald Bullock finds this the ideal soldering station for a busy workshop

y salad days in this trade were spent in the company of a Henley Solon 25W soldering liron, whose sleek ebony finish imparted a much-needed touch of professionalism to my clumsy efforts at being a TV engineer. But time moved on. The bulky components of an earlier generation gave way to miniaturisation, with printed panels that became progressively more dainty. Those of us who were slow to change with the times discovered that many hitherto rugged components now had melting points, also that printed printed tracks could curl from their panels. The Henley Solon is no more in today's technological world. Such soldering irons, once cheap and simple, have given way to instruments of much greater sophistication, many of which sell for very large sums indeed. Many have become miniaturised themselves, and most now work at far lower temperatures than was once the case. These developments have met with general approval, but there are times when an iron's inability to get really hot can be a nuisance - when removing a chassis-mounted heatsink for example. Vann Draper electronics took full account of such points, and many more, when designing the SL30 soldering station. We've had one in daily use in our busy workshop for seleveral months now: the following report is based on our experience of using it for a wide range of jobs.

Description

The unit (see photograph) consists of a tastefullysculptured, high-impact plastic plinth which is about seven inches deep and five inches wide. Height without the solder gun holder is about three and a half inches. This falls to about an inch at the front, because almost half the depth is used for a large display panel. Colour is matt light grey. A 2×3 in. waterproof, flush-mounted metal tray is set into the top to accommodate a piece_sof natural sponge.

The solder iron sink consists of a secured metal funnel enclosed within a heavy chromium-plated spiral,

with a hard plastic collar. It can be fitted at the left or right rear corner. The on/off switch is flush-mounted at the front left of the plinth. There's a three foot connecting lead that's made of a soft 'dead' material. This plugs into a five-pin DIN socket at front left-hand side. The mains lead is at the back of the unit, where there's a central air vent, a recessed 1A fuscholder and a substantial earthing point with both a socket and a screwed button.

The control panel matches the plinth. It houses a fullwidth, two-colour digital display, a graduated temperature-control knob and a two-position slider display switch.

The iron itself is rated at 24V, 48W. The shaft is a hot, hollow tube into which the bit slides as far as its collar will allow. A retaining tube slips over the lot and is screwed on to a thread at the base of the shaft. This arrangement makes bit changing a simple job and precludes the corrosion that can occur with some other, designs. The iron's tapered black handle has a substantial integral finger guard and is fitted with a comfortable soft plastic collar that's indented with stipples. This makes it easy to achieve precision, a welcome feature.

On Test

The two positions of the slider switch are marked set and read: a pair of green indicators within the digital display area indicate which has been selected. To start with we switched to set and advanced the temperature control knob until the bright red digital display read 250°C. Then we switched to read and allowed the iron to cool before switching it on again. When we did so the display rose from room temperature to 260°C within a minute, then quickly settled at the correct level. This was maintained whether the iron was being used intensively or was at rest.

The set/read facility is an extremely accurate way of monitoring the soldering station's temperature control. We used it extensively during our assessment of the review model. It proved to be stable and reliable. The temperature range is from 160°C to 470°C, which is hot enough for any job likely to be encountered during normal bench work. Even when the need was to solder to chassis there was more than enough heat speedily available

The iron is a joy to work with. Being controllable and reliable, it enabled us to concentrate on the job in hand without distraction.

As to bad points, it's difficult to think of any. It is very heavy indeed for its small size, but unlike our telephone it stays where put! On seeing it for the first time we felt that for right-handed people the power lead was inconveniently placed on the left-hand side of the plinth. But this wasn't a problem in use - we placed the plinth to the right of the job in hand.

The iron is fitted with a standard 0.8mm 45° angled bit. There's a range of seven different bits. It includes conical- and flat-bladed types in sizes 0-4, 0-8, 1-2, 1-6 and 3.2mm. There is also a cylindrical bit in size 1.2mm. They are available at £1.30 each.

Verdict

The SL soldering station is ruggedly made, well designed and good looking. It works very well. After a practical test which lasted for several months I have no hesitation in recommending it. The smooth running and efficiency of any workshop that obtains one will be enhanced.



Availability

Cost is £69.00 delivered, plus VAT. You can obtain the station from Vann Draper Electronics Ltd., Unit 5, Premier Works, Canal Street, South Wigston, Leicester LE18 2PL (01162 771 400, fax 01162 773 945).

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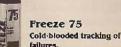


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TELEVISION March 1997

Long-distance Television

DX conditions and reception. Satellite sightings and news. Planning a DX installation to meet today's needs. Roger Bunney on the DX scene

From the DX-TV point of view 1996 was a very poor year. As it drew to an end, we were treated to chilly north easterly winds, ice, snow and temperatures below freezing – an apt counterpart to the DX conditions. During this cold period I removed the aerials and dismantled my lattice mast in preparation for a house move in early 1997.

The mast had been in service for over twenty five years. During that time all sorts of experimental aerials had been tried out on it, for different types of reception and for various TV standards, ranging from 405 to 819 lines. Part of my life came down with that mast. With digital transmissions from terrestrial and satellite sources about to increase rapidly, the next twenty five years are likely to see much more dramatic technical changes. Hopefully I will be able to keep up with them. But for a period, while the move takes place, I'll be off the air. I intend to be up and running before the start of the next

Sporadic E season.

There was very little DX-TV reception during December. Cyril Willis (King's Lynn) and Peter Schubert (Rainham) both reported improved tropospheric activity between December 7-10th. The best days were the 8-9th, with reception of DR (Denmark) in Band III and at UHF (DR2) and, as usual, many German Band III and UHF channels. The 10th produced a rare sighting of RTL (Luxembourg) ch. E7.

The mid-December Geminids meteor shower produced some strong signal pings in Band I, but always on programme! There was sufficient activity to be seen in the sky for comment to be forthcoming from our local station Radio Solent. I saw several classic burn-ups as well as the usual white-line streaks.

There have been reports of TE (transequatorial skip) reception of south African 50MHz (6 metre) beacons in the southern UK and northern France. If you have a scanner, check the following CW beacons in the late afternoon: 7Q7SIX at 50-003MHs ZS2SIX at 50.005MHz V51VHF at 50.018MHz FR5SIX at 50-0215MHz ZD8VHF at 50-0325MHz ZS6DN at 50.05MHz Z21SIX at 50.052MHz ZSISIX at 50-08MHz. ZD8VHF is on Ascension island

and FR5SIX on Reunion island (east of Madagascar): the rest are across southern Africa.

On the subject of technical change, several Dutch broadcasting groups have agreed to develop a "wireless alternative to cable". Reception would be via a decoder with a pencilsize aerial, placed on top of the TV set. The idea is actually to complement cable systems. Experimental transmissions are due to start in January 1998, initially in Amsterdam with about twenty channels.

Satellite Sightings

Our French satellite expert Tim McClelland (Christchurch, Dorset) passed on the word that France 3 was to appear on December 18th via Telecom 2B (5°W). Sure enough programming in the clear appeared, at 12-732GHz. Check the text for programme schedules. Paulo Raymundo reports from Brazil that DirectTV is now running 32 digital channels (18 PPV) via Galaxy IIIR at 95°W. His pictures are good - he is using RCA hardware that cost him \$1,000, almost double what he was quoted in 1995! You can reach him via e-mail at:

raymundo @ svn.com.br John Locker (Wirral) has closed his satellite receiving system down pending a house move, but reports that his Kirch (German) 'D box' has been reprogrammed and will pick up news feeds provided the bit and FEC rates are known.

Bob French (West Midlands) has installed a 3-1m IRTE dish. Unfortunately within days the high winds snapped a casting on the H-H mount. So the system is at present motionless. Inclined orbit tracking has been incorporated, in conjunction with the Chaparral M140 receiver. Bob intends to monitor the NASA space feeds from Spacenet-2 at 69°W.

Bandula Gunasekera has set up the first digital satellite receiver in Colombo, Sri Lanka, for a local dealer/importer. It's a C band Panasat receiver that came from South Africa. Channels receivable include

A 2.5GHz

downlink from

a helicopter to

ground then

uplinked via

Eutelsat | F5 at

25.5°E back to

the studio for

programme.

the GMTV

DX-TV

Deutche Welle, RAI and MCM.

Hot Bird 2 at 13°E has been carrying out tests across its frequency capability. Transmissions received include ART-Europe at 12.02GHz and RTP-I at 11.73GHz horizontal, also signals below 10.95GHz.

A live outside broadcast to the **BBC** Plymouth evening magazine programme on December 12th brought back memories of the summer, when the Corporation's UKI-231 SNG truck visited Brewer's Key at Weymouth. The feed was via Orion-1 at 37.5°W (12.674GHz vertical). Orion was busy that evening, with basketball down just a little at 12.652GHz horizontal, the link being provided by BT's UKI-100 truck. The same truck was active on December 17th in Paris, with a live late afternoon report from the financial establishment - the Bank of France had that day decided not to cut the Franc exchange rate.

A much stronger signal has recently been available from AMOS-1 at 4°W. It carries a cable programme for ATV Poland. With my 1.5m dish and 0.7dB Chaparral LNB the signal is almost noise free. Check at 11.64GHz horizontal.

At this time of year the EBU's leases via Eutelsat II F4 at 7°E normally carry various skiing and other Alpine snow antics. My recently purchased, Dutch sourced EBU 'descrambler' (sound-in-syncs stabiliser and audio recovery) provides excellent entertainment value when compared with last year's wobbly pictures and silence!

Eddystone Query

A recent Eddystone User Group newsletter suggested that the company, famous for its comma unications receivers, produced TV sets for the domestic UK market in the mid-Fifties, though no information can be found in the Eddystone factory files. Can anyone throw any light on this? Please write in via the magazine.

News Items (Terrestrial)

Portugal: Hugh Cocks reports that RTP-1 and -2 are now testing teletext. To reduce costs RTP-2 is at present off air in the mornings. Accurate programme timing has apparently gone by the board: films often start up to ninety minutes late! Brazilian soaps proliferate on both channels.

Gibraltar: The ch. E6 and E12 allocations have been swapped following complaints from the Spanish government to the UK Radio Communications Agency that the GBC has been in breach of the ITU's 1961 Stockholm plan. Signal Hill now uses ch. E6 at 1kW, while North Mole uses ch. E12 at a much lower power. This has caused reception problems in the Costa del Sol (Marbella, Algeciras) and in parts of Gibraltar itself.

Sweden: SVT is to start ferrestrial digital TV transmission tests later this year.

Poland: Channel TVN, which at present operates in nine local transmission areas, is to join with Nasza Telewizja to create a national commercial network in competition with Polsat and TVP.

Israel: The government wants to privatise Channel One following losses of \$18m in 1996. The second channel is also under fire in the Knesset. Two cable channels (one Jewish and one Arabic) financed by advertising have been approved. UK: To supplement their coverage Vodafone and Cellnet are seeking a 5MHz allocation in the 1,800MHz band. Microcells in town centres, large buildings etc. would use dualband handsets. The aim is to start operating in late 1998. Note that this allocation is within the normal IF bandwidth of a domestic satellite receiver

Satellite News

Hot Bird 2 is now up and running. Over half of its twenty transponders were booked prior to the launch. The Polish RTL-7 DTH/cable channel appeared in early December, in the clear, having moved from Hot Bird 1 – frequency is 11.489GHz (vertical).

Intelsat is engaged in final contract discussions on two new satellites to be suffixed FOS-II (Follow On Spacecraft). Proposed launch will be mid-2000. They will be positioned above the Indian Ocean with a complement of 44 C band and ten Ku band transponders. Another contract of importance in the Asian/Pacific region is for a high-power K series TV satellite to be positioned at 95°E in late 1998, with 30 Ku band transponders intended for DTH and VSAT services. On December 12th Intelsat welcomed its 140th full member, Equatorial Guinea.

German broadcaster ZDF is planning to start a free-to-air digital service, ZDF-Infobox, this coming August, with programming from ORF (Austria), SRG (Switzerland) and the ARTE channel (Germany). The German network ARD plans to open a digital TV service in June/ July. Earlier still, Spain's Telefonica digital satellite package is scheduled for a March opening, just two months



after the start of Canal Plus Espagne's digital programme package. Telefonica's partners include RTVE, Antena 3 and the Mexican Televisa service.

Canal Plus and Kirch DF1 are to provide a joint digital package for the German market. RTL-5 has relaunched the Dutch channel.

The tight regulations that govern Indian broadcasting have been partially relaxed to enable private companies to uplink news and OBs via the INSAT craft, in conjunction The 16:9 aspect ratio Belgian test pattern received via Eutelsat II F4 at 7°E with the use of a Dutch EBU decoder to provide SIS stabilisation.



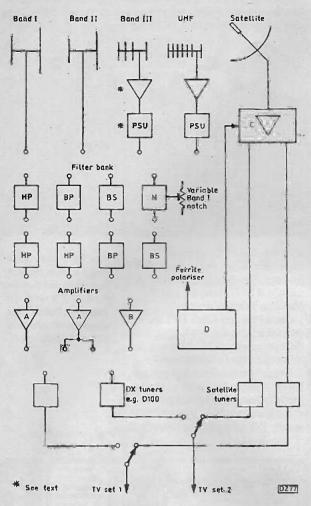


Fig. 1: Suggested layout for a terrestrial/satel lite DX-TV installation, assuming two **TV** receivers and two satellite tuners. The filter bank includes bandpass, notch, bandstop and high-pass filters. All cabling 75 Ω coaxial with common earthing. Sockets Belling-Lee type mounted on diecast boxes. A 40 230MHz amplifiers with 10dB gain; B 400-900MHz amplifier, 20dB gain; C 900-2,200MHz amplifier; D LNB and polariser power supply and control.

with the Indian national broadcaster Dordarshan.

PowerVu digital TV test transmissions are being run by the US AFRTS: the end of B-MAC transmissions has been postponed to mid-1997.

A new Arabic satellite, NILESAT-1, should be in operation over Europe by this winter with twelve 100W Ku band transponders. Orbital position is 7°W.

Avoid special offers of digital receivers intended for the Kirch Dbox package is the general advice from several people with experience of digital TV reception. The response to the service in Germany has been negligible - only a few thousand subscribers have signed up. As a result nearly 100,000 decoders have been left in stock. Most of those tried out to date have been difficult to alter from their designed-in parameters. More flexible third generation chips are now appearing in Thomson equipment. It's wise to wait a little bit longer.

Robert Cooper (SatFACTS NZ, December issue) reports that the Taiwanese manufacturer Sun Moon Star has satellite receiver sales of over \$500m a year. The company is at present producing the Skandia SK888 digital receiver, which was designed by Asia Digital Broadcasting with the help of SGS/ Thomson MPEG engineers. It looks good.

Planning a DX Installation

Unfortunately TV-DXing isn't what it used to be! Twenty five years ago the only problem, in Bands I and III. consisted of interference from adjacent- or co-channel transmitters. These bands were the preserve of TV broadcasters. In the UK Band I has now become the home for mobile radio, baby alarms and other items a sort of RF dustbin. Mobile radio is also taking over Band III. All this despite the fact that our European neighbours still use both bands for TV broadcasting. DXing at UHF is now a challenge of seeking weak signals amongst the mass of local megawatt transmitters and relay stations on every village hill.

During the past decade satellite services have expanded and cheap receiving equipment has become available. A growing number of TV-DXers have turned their attention from terrestrial to space reception. MPEG digital satellite TV will be the next difficulty, especially as equipment is likely to be expensive at the start. No doubt we'll get round this as well!

A TV-DXing installation today needs to be planned to include satellite reception, while more than ever the VHF coverage has to take into account local interference problems, Fig. 1 shows a basic plan.

The feeds from the Band I and II (TV) aerials come direct, without head amplifiers. This enables bandpass, band-stop or notch filters to be added prior to any weak signal amplification. Why? Consider for example a local PMR base station operating at 55-9MHz. This will completely obliterate ch. E3 and spread into ch. R2 (nominal vision carriers at 55.25 and 56-75MHz respectively). A notch filter with a 25kHz bandwidth and -40dB attenuation should reduce the interference to a manageable level before a weak ch. E3 signal is amplified - imagine trying to attenuate the local PMR base signals after amplification! Similarly a Band I filter will avoid overloading caused by out-of-band interference from a local VHF radio station - provided the filter is inserted in the aerial feed prior to the amplifier. Attenuation of at least -35dB is required. The same principle applies in Band III. Suitable filters are available from specialist

suppliers – Aerial Techniques stocks a wide range. I recall an excellent band-pass/combining filter made by Labgear, type 9032/BF if I remember correctly. This is no longer made but stocks may still be available. It had aerial input sockets for Bands I, II, III and UHF with a single output.

The UHF aerial feed comes via a head amplifier – there should be no local problems with mobile radio stations here. A medium-gain head amplifier can be used in the Band III feed. This depends on local interference conditions. Hard wire the power supplies.

The aerial feeder cables should all be terminated with coaxial plugs. Coaxial connections should also be used for the indoor preamplifiers, filters, inputs to tuners/receivers and TV receiver(s). This will provide maximum flexibility in dealing with interference problems.

If a good selection of filters is available it's safe to use wideband amplifiers indoors, providing gains of say 10 and 20dB. I suggest using separate wideband VHF (45-230MHz) and UHF (430-860MHz) amplifiers, not a wideband 40-860MHz unit. Bear in mind the growing number of cellphone masts. These transmit at around 920-950MHz and may break through if an ultra-wideband amplifier is used. As mentioned above under news items, part of the 1,800MHz band may be offered for cellphone use: this could result in IF breakthrough with satellite TV systems.

The DXing system should incorporate satellite reception facilities. The signals here are, in the UK, at 11GHz plus. Local interference is unknown, though IF breakthrough can happen (the first IF is typically 950-2.010MHz). Use double-screened cable. I suggest that the IF input from the LNB is fed to a small active RF splitter/amplifier with say one input and four outputs. Two of the outputs would feed satellite tuners, a third would be available as a spare and the fourth would be used to provide the DC feeds to the LNB and polariser.

I use an outboard LNB/polariser/ splitter amplifier power unit rather than relying on feeds from my receivers. I've fitted LNB supply on/off switches to my two remotecontrolled satellite receivers, which are programmmed for 13V maximum to the LNB. This ensures that one receiver doesn't supply 18V to switch the triple-band LNB to the telecom band when the other receiver is being used for the FSS band. Fig. 1 sums it all up.



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Answer to Test Case 411 - see page 321 -

The Hitachi VTM410 might have staved on test in the workshop for ever had we not twigged that it's fitted with a wonderful feature called ITT: Instant Touch Timer. We are used to this in the record mode, where one touch of the key sets the machine to record and subsequent key strokes limit the recording time to multiples of thirty minutes, clearly shown on the display panel. But this innovative Hitachi machine does the same in the playback mode, and keeps it a secret - there is no indication that we could see, though there is a bit about it on pages 19-20 of the user's instruction manual! It is very easy to stroke the play key twice by mistake, and of course inserting a tape initiates play when the cassette's safety tab has been broken out. Our customer now takes greater care when using the play button.

The JVC HRD660 really did have a fault: it was one of those borderline things, hence the irregularity of the symptom. In the fast rewind mode the tape path across the audio/control head is maintained by a half-load system. This holds out a loop so that the control pulses can be read off the tape and counted, to indicate the tape position and trigger an index system if required. The half-load guide pole beside the audio/control head was slightly bent, leaning towards the cassette. As a result the tape path was diverted, with the tape a little high as it passed the heads. Thus control pulse transfer was not reliable.

We were able to cure the fault by carefully bending back the guide pole so that the tape passed centrally between the audio and control heads in the fast-transport mode.

NEXT MONTH IN TELEVISION

Servicing the Ferguson ICC7 Chassis

John Coombes on how to tackle the faults you could encounter with these sets.

Simple Video Security System The idea is to use a triggered VCR to record the presence of an intruder. In designing the system Denis Mott's aims were simplicity, low cost and reliability.

Amstrad SRD400 Channel Expander

The only drawback with the otherwise excellent SRD400 satellite receiver is its limited tuning range. You can overcome this by using the Global Connections ADX-plus channel expander unit. Martin Pickering on how it can be added with automatic switching.

Repairs the Accountants' Way

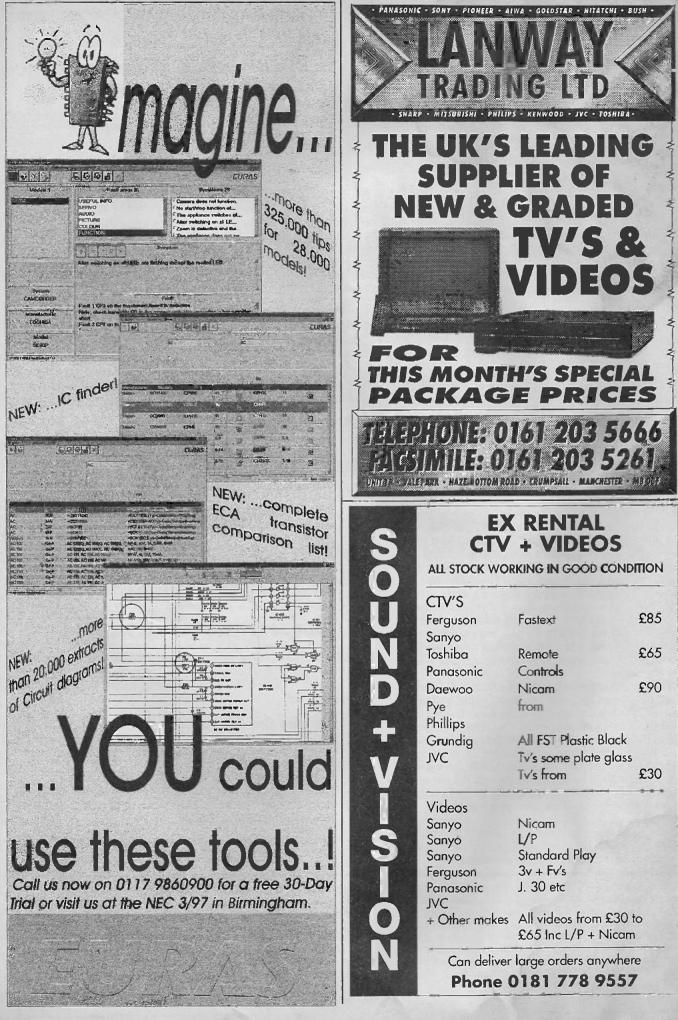
Michael Maurice argues that the influence of accountants on servicing procedures in large organisations can be horrifying.

Renovating the Panasonic NVG21/25

These now elderly VCRs provide exceptional picture quality and are well worth renovating. Brian Storm on what to look for and the action required.

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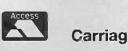
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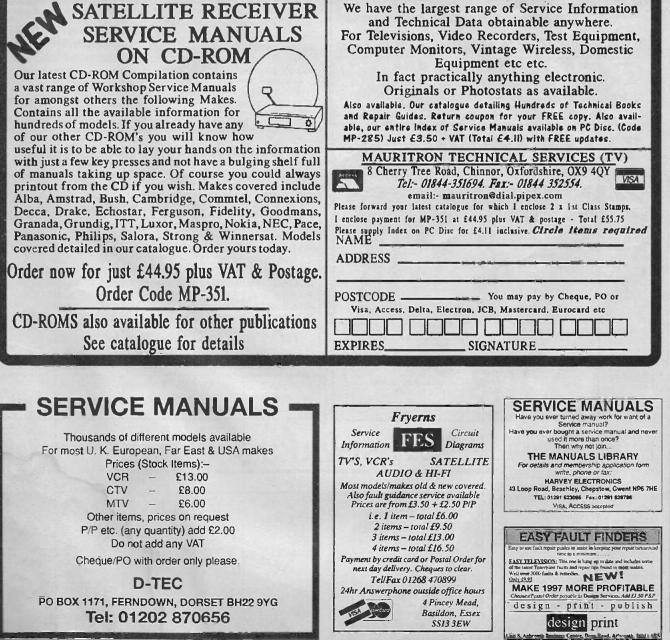
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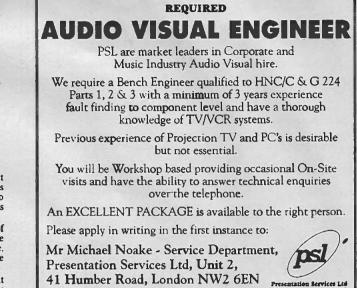
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80680 30p BU180A 65p 1 501264 50p BU204 60p 1 501266 £1.00 BU205 75p 1	BUTHAF	50p BYW29/50 L5p HCF4520BE 50p BYW95 L0p HD61404251	50p 50p	(TEXT) £2.00 TDA1543 £1.00 TEA1908A 90p	IDA3592A IDA3650	£3.00 TDA9403 £1.50	VIDEC	0
120 120	BUT13 BUT18AF	£1.00 BYW95C 10p HD0140815 £1.00 BYW562A HE4528BP	1.00	SAA5240A/P £4.00 TDA2460 £2.00 SAA5241A/E £4.00 TDA2541 £1.00	TDA 3651	£3.00 TDR2033 £1.00	PANEL	S
D1398 11:00 BU206 £1:00 1 D1415 £1:00 BU207 £1:00 1	BUTTION		15p	SAA5241A/E £4.00 TDA2541 £1.00	IDA3651AQ	£3.50 TDD16105 50p CL	SAIN TH	OP
11415 £1.00 BU207 £1.00 B	BUT71/son	15p 100V 8p HEF4029BP 40p BYX10 10p HEF4029B	20p	SAA5243A/P £4.00 TDA2382 £1.00 T SAA5243A/P £4.00 TDA2582 £1.00 T SAA5246A/P £4.00 TDA2600 £2.00 T	TDA3651 TDA3651AQ TDA3652 TDA3653AQ	£3.50 TDD1610S S0p SE £3.50 TEA1009 £2.00 SE £2.00 TEA1039 £2.00 SE	END FO	

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