

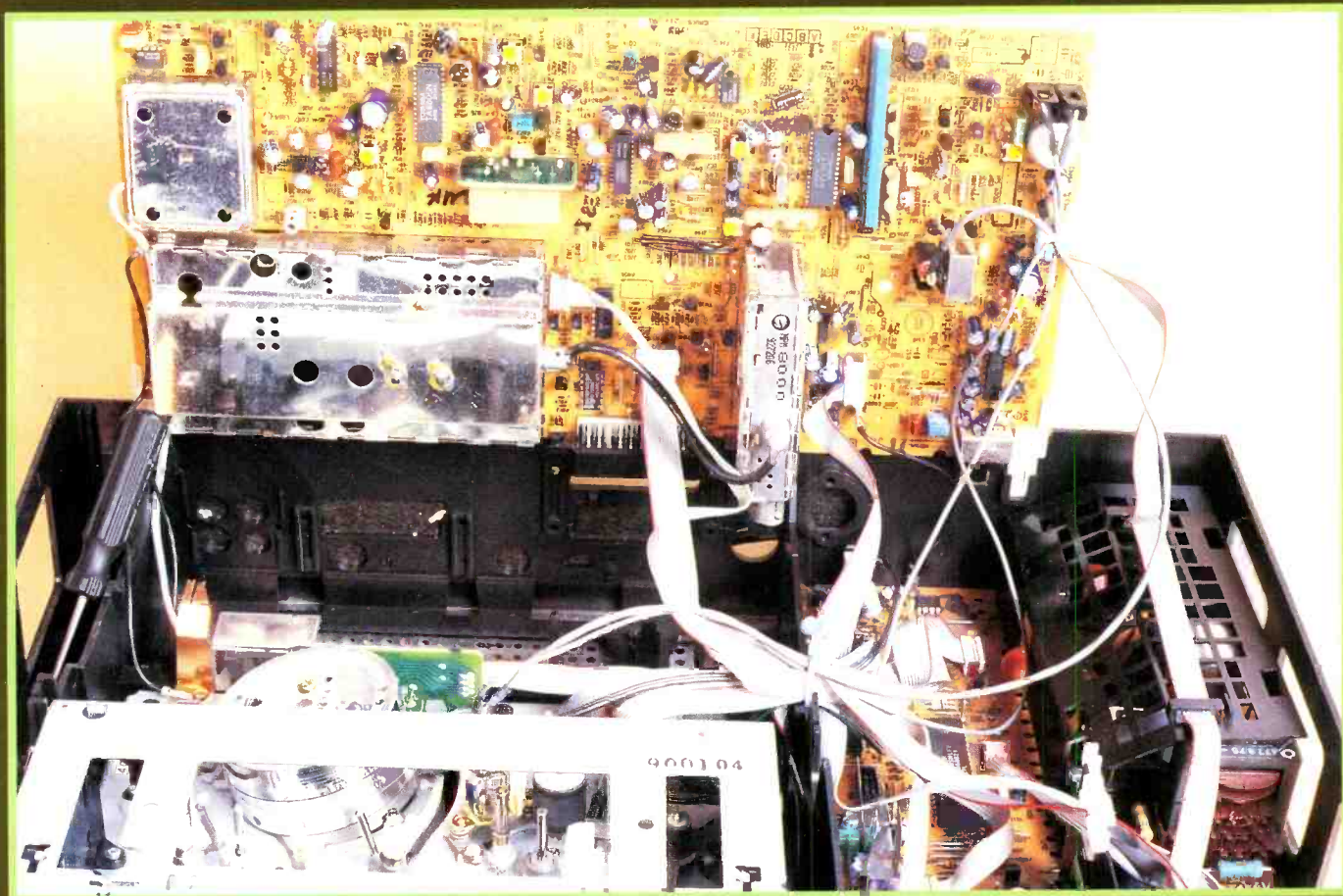
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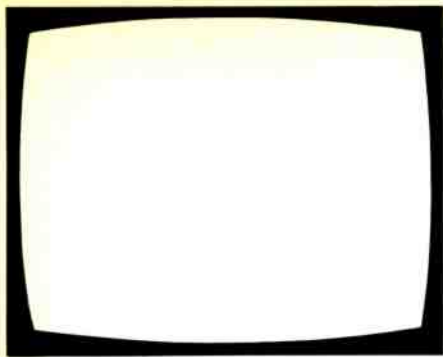
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# TELEVISION

August  
1991

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## INDEXES AND BINDERS

Indexes to Vols. 37 and 38 are available at £1 each from the Editorial office (address above). Photostats of the indexes to Vols. 31-36 can be supplied at £1 each.

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## QUERIES

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

## this month

- 709 Leader**  
**710 Teletopics**  
**712 Letters**  
**716 Salora K and L Chassis Faults List** *Nick Beer and Ian Bowden*  
To complement previous articles on these chassis, a list of faults commonly experienced.
- 717 Latest Servicing Books**  
**718 Test Report: TV Surround Sound** *Ian Martin*  
Programmes and tapes with stereo sound often include Dolby Surround sound encoding. Use of an AV amplifier gives access to this feature and provides a considerable enhancement to TV viewing. A review of the Pioneer VSA730 AV amplifier.
- 719 Next Month in Television**  
**720 Servicing the Ferguson FV31R** *J. LeJeune*  
A rundown on the servicing requirements with this popular VCR.
- 724 CD-I Update** *George Cole*  
The CD-Interactive system is to be launched as a consumer product later this year in the USA and next year in Europe. Latest developments in what could turn out to be a major new addition to the TV/video market.
- 726 TV Fault Finding**  
Reports from Philip Blundell, AMIEE, Eugene Trundle, Ed Rowland, Steve Cannon, Michael Dranfield, K.W. Saxon, Nick Beer, Stephen Leatherbarrow, Roger Burchett and Mick Dutton.
- 728 Servicing the Sovereign CTV6000** *John C. Priest*  
Notes on the few problems that arise with these well-built receivers.
- 729 Simple UHF/VHF Downconverter** *Brian Renforth*  
Modification of a Thorn u.h.f. tuner to act as a downconverter for feeding u.h.f. signals to v.h.f. sets or obtaining hi-fi TV sound via an f.m. tuner.
- 730 Service Briefs - Samsung**  
Official guidance on CD players, microwave ovens and TV sets.
- 732 Programming the Hitachi CPT1476R Series**  
Corrupt data in the memory of a microcontrolled TV set can cause many confusing symptoms. How to reprogramme these popular sets.
- 733 Fifty Years in Radio and TV, Part 8** *Harold Peters*  
Back to the retail side of the industry to experience fresh developments such as satellite TV.
- 735 Video Equivalents**  
**738 What a Life!** *Donald Bullock*  
All manner of problems, including Oscar's Fidelity and a Chinese TV set.
- 740 VCR Clinic**  
Reports from Philip Blundell, AMIEE, Joe Cieszynski, Eugene Trundle, Nick Beer, Ed Rowland, Brian Renforth, Mike Leach, S.A. Featherstone and Ian Bowden.
- 742 Long-distance Television** *Roger Bunney*  
**744 CD Player Casebook**  
Reports from Mike Leach, Ronald Aranha and Philip Blundell, AMIEE.
- 745 Cassette Salvage** *Stan Jackson*  
**746 Test Case 344**

OUR NEXT ISSUE DATED SEPTEMBER WILL  
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AA32	9p	BD332	40p	BTY79	140p	TI117	50p	OA47	10p	PCF801	110p	AN7145	195p	ICL7106	650p	LM3909	80p	STK436	490p	STK7226	800p	TA7310	100p
AC107	40p	BD361	60p	BU100A	110p	TI120	37p	OA90	10p	PCF802	80p	AN7146	210p	ICL7161	90p	LM3911	180p	STK439	600p	STK7308	410p	TA7312	110p
AC125	30p	BD370	30p	BU101	80p	TI122	47p	OA91	10p	PCF806	115p	AN7154	180p	ICL7660	240p	LM3914	160p	STK439	600p	STK7309	460p	TA7313	120p
AC127	30p	BD380	30p	BU105	80p	TI124	47p	OA92	10p	PCF200	100p	AN7155	180p	ICL7661	240p	LM3915	160p	STK441	600p	STK7311	410p	TA7314	110p
AC128	35p	BD410	60p	BU109	80p	TI125	56p	OA93	10p	PC21	65p	AN7168	250p	ICM7556	80p	LM3916	270p	STK443	740p	STK7348	410p	TA7315	240p
AC128K	40p	BD434	28p	BU110	110p	TI127	56p	OA94	10p	PC28	60p	AN7178	270p	KA2101	100p	M50115P	320p	STK457	500p	STK7356	600p	TA7317P	240p
AC141K	45p	BD435	30p	BU111	140p	TI128	30p	OA95	10p	PC29	60p	AN7222	300p	KA2102	100p	M50117P	500p	STK459	500p	STK7358	600p	TA7324	200p
AC167	22p	BD436	30p	BU112	140p	TI131	30p	OA96	10p	PC35	60p	AN7256	250p	KA2103	100p	M50120P	650p	STK461	620p	STK7404	400p	TA7328	200p
AC176	22p	BD438	30p	BU126	65p	TI131	30p	OA97	10p	PC36	60p	AN7257	250p	KA2206	100p	M50120P	650p	STK463	600p	STK7406	600p	TA7335	200p
AC187K	25p	BD439	30p	BU180	150p	TI141	90p	OA98	10p	PC37	60p	AN7310	90p	KA2209	125p	M50120P	650p	STK465	720p	STK7408	880p	TA7336	250p
AC188K	25p	BD440	30p	BU184	100p	TI142	90p	OA99	10p	PC38	60p	AN7311	90p	KA2209	125p	M50120P	650p	STK467	720p	STK7410	880p	TA7337	250p
AC188K	25p	BD440	30p	BU205	70p	TI145	90p	OA99	10p	PC39	60p	AN7312	90p	KA2212	125p	M50120P	650p	STK469	720p	STK7412	880p	TA7338	250p
AC188K	25p	BD440	30p	BU205	70p	TI146	90p	OA99	10p	PC40	60p	AN7313	90p	KA2212	125p	M50120P	650p	STK471	720p	STK7414	880p	TA7339	250p
AC188K	25p	BD440	30p	BU206	100p	TI147	100p	OA99	10p	PC41	60p	AN7314	90p	KA2213	130p	M50120P	650p	STK473	720p	STK7416	880p	TA7340	250p
AC188K	25p	BD440	30p	BU208	70p	TI151	90p	OA99	10p	PC42	60p	AN7315	90p	KA2214	130p	M50120P	650p	STK475	720p	STK7418	880p	TA7341	250p
AC188K	25p	BD440	30p	BU208	70p	TI151	90p	OA99	10p	PC43	60p	AN7316	90p	KA2214	130p	M50120P	650p	STK477	720p	STK7420	880p	TA7342	250p
AD149	60p	BD535	38p	BU208AT	90p	TI2954	42p	OA99	10p	PC44	60p	AN7317	90p	KA2214	130p	M50120P	650p	STK479	720p	STK7422	880p	TA7343	250p
AF125	50p	BD536	38p	BU208D	90p	TI2954	42p	OA99	10p	PC45	60p	AN7318	90p	KA2214	130p	M50120P	650p	STK481	720p	STK7424	880p	TA7344	250p
AF127	50p	BD537	40p	BU209	140p	TI3055	42p	OA99	10p	PC46	60p	AN7319	90p	KA2214	130p	M50120P	650p	STK483	720p	STK7426	880p	TA7345	250p
AF139	30p	BD538	40p	BU209D	80p	TI3055	42p	OA99	10p	PC47	60p	AN7320	90p	KA2214	130p	M50120P	650p	STK485	720p	STK7428	880p	TA7346	250p
AF239	30p	BD643	60p	BU226	190p	TI561	15p	OA99	10p	PC48	60p	AN7321	90p	KA2214	130p	M50120P	650p	STK487	720p	STK7430	880p	TA7347	250p
BA145	10p	BD645	60p	BU312	120p	TI590	15p	OA99	10p	PC49	60p	AN7322	90p	KA2214	130p	M50120P	650p	STK489	720p	STK7432	880p	TA7348	250p
BA148	10p	BD646	60p	BU325	65p	TI591	15p	OA99	10p	PC50	60p	AN7323	90p	KA2214	130p	M50120P	650p	STK491	720p	STK7434	880p	TA7349	250p
BA148	10p	BD647	60p	BU326	65p	TI591	15p	OA99	10p	PC51	60p	AN7324	90p	KA2214	130p	M50120P	650p	STK493	720p	STK7436	880p	TA7350	250p
BA148	10p	BD648	60p	BU327	65p	TI591	15p	OA99	10p	PC52	60p	AN7325	90p	KA2214	130p	M50120P	650p	STK495	720p	STK7438	880p	TA7351	250p
BA155	12p	BD676	40p	BU406	70p	TI406	65p	OA99	10p	PC53	60p	AN7326	90p	KA2214	130p	M50120P	650p	STK497	720p	STK7440	880p	TA7352	250p
BB105B	8p	BD677	38p	BU407	65p	TI407	65p	OA99	10p	PC54	60p	AN7327	90p	KA2214	130p	M50120P	650p	STK499	720p	STK7442	880p	TA7353	250p
BC107B	8p	BD678	38p	BU408	65p	TI408	65p	OA99	10p	PC55	60p	AN7328	90p	KA2214	130p	M50120P	650p	STK501	720p	STK7444	880p	TA7354	250p
BC108	8p	BD680	40p	BU408D	85p	TI409	65p	OA99	10p	PC56	60p	AN7329	90p	KA2214	130p	M50120P	650p	STK503	720p	STK7446	880p	TA7355	250p
BC108	8p	BD681	40p	BU409	95p	TI410	65p	OA99	10p	PC57	60p	AN7330	90p	KA2214	130p	M50120P	650p	STK505	720p	STK7448	880p	TA7356	250p
BC108C	8p	BD682	40p	BU409D	95p	TI411	65p	OA99	10p	PC58	60p	AN7331	90p	KA2214	130p	M50120P	650p	STK507	720p	STK7450	880p	TA7357	250p
BC118	11p	BD705	60p	BU500	100p	TI412	65p	OA99	10p	PC59	60p	AN7332	90p	KA2214	130p	M50120P	650p	STK509	720p	STK7452	880p	TA7358	250p
BC140	20p	BD707	60p	BU500A	75p	TI413	65p	OA99	10p	PC60	60p	AN7333	90p	KA2214	130p	M50120P	650p	STK511	720p	STK7454	880p	TA7359	250p
BC141	20p	BD708	60p	BU500AF	95p	TI414	65p	OA99	10p	PC61	60p	AN7334	90p	KA2214	130p	M50120P	650p	STK513	720p	STK7456	880p	TA7360	250p
BC142	20p	BD709	60p	BU500B	75p	TI415	65p	OA99	10p	PC62	60p	AN7335	90p	KA2214	130p	M50120P	650p	STK515	720p	STK7458	880p	TA7361	250p
BC143	20p	BD736	60p	BU508DF	115p	TI416	65p	OA99	10p	PC63	60p	AN7336	90p	KA2214	130p	M50120P	650p	STK517	720p	STK7460	880p	TA7362	250p
BC147	8p	BD828	75p	BU526	75p	TI417	65p	OA99	10p	PC64	60p	AN7337	90p	KA2214	130p	M50120P	650p	STK519	720p	STK7462	880p	TA7363	250p
BC148	8p	BD828	75p	BU526	75p	TI418	65p	OA99	10p	PC65	60p	AN7338	90p	KA2214	130p	M50120P	650p	STK521	720p	STK7464	880p	TA7364	250p
BC149	8p	BD828	75p	BU526	75p	TI419	65p	OA99	10p	PC66	60p	AN7339	90p	KA2214	130p	M50120P	650p	STK523	720p	STK7466	880p	TA7365	250p
BC157	8p	BD899	60p	BU608	160p	TI420	65p	OA99	10p	PC67	60p	AN7340	90p	KA2214	130p	M50120P	650p	STK525	720p	STK7468	880p	TA7366	250p
BC159	8p	BD901	60p	BU626	160p	TI421	65p	OA99	10p	PC68	60p	AN7341	90p	KA2214	130p	M50120P	650p	STK527	720p	STK7470	880p	TA7367	250p
BC160	30p	BD907	60p	BU636	160p	TI422	65p	OA99	10p	PC69	60p	AN7342	90p	KA2214	130p	M50120P	650p	STK529	720p	STK7472	880p	TA7368	250p
BC171	10p	BD912	60p	BU636	160p	TI423	65p	OA99	10p	PC70	60p	AN7343	90p	KA2214	130p	M50120P	650p	STK531	720p	STK7474	880p	TA7369	250p
BC172	10p	BD933	60p	BU606	75p	TI424	65p	OA99	10p	PC71	60p	AN7344	90p	KA2214	130p	M50120P	650p	STK533	720p	STK7476	880p	TA7370	250p
BC177	14p	BD965	60p	BU607	70p	TI425	65p	OA99	10p	PC72	60p	AN7345	90p	KA2214	130p	M50120P	650p	STK535	720p	STK7478	880p	TA7371	250p
BC178	14p	BD965	60p	BU607	70p	TI426	65p	OA99	10p	PC73	60p	AN7346	90p	KA2214	130p	M50120P	650p	STK537	720p	STK7480	880p	TA7372	250p
BC179	14p	BD965	60p	BU607	70p	TI427	65p	OA99	10p	PC74	60p	AN7347	90p	KA2214	130p	M50120P	650p	STK539	720p	STK7482	880p	TA7373	250p
BC182	7p	BD993	60p	BU920	130p	TI428	65p	OA99	10p	PC75	60p	AN7348	90p	KA2214	130p	M50120P	650p	STK541	720p	STK7484	880p	TA7374	250p
BC182L	7p	BD994	60p	BU921	130p	TI429	65p	OA99	10p	PC76	60p	AN7349	90p	KA2214	130p	M50120P	650p	STK543	720p	STK7486	880p	TA7375	250p
BC183	7p	BD994	60p	BU921	130p	TI430	65p	OA99	10p	PC77	60p	AN7350	90p	KA2214	130p	M50120P	650p	STK545	720p	STK7488	880p	TA7376	250p
BC183L	7p	BD994	60p	BU921	130p	TI431	65p	OA99	10p	PC78	60p	AN7351	90p	KA2214	130p	M50120P	650p	STK547	720p	STK7490	880p	TA7377	250p
BC184	7p	BD994	60p	BU921	130p	TI432	65p	OA99	10p	PC79	60p	AN7352	90p	KA2214	130p	M50120P	650p	STK549	720p	STK7492	880p	TA7378	250p
BC184L	7p	BD994	60p	BU921	130p	TI433	65p	OA99	10p	PC80	60p	AN7353	90p	KA2214	130p	M50120P	650p	STK551	720p	STK7494	880p	TA7379	250p
BC184L	7p	BD994	60p	BU921	130p	TI434	65p	OA99	10p	PC81	60p	AN7354	90p	KA2214	130p	M50120P	650p	STK553	720p	STK7496	880p	TA7380	250p
BC184L	7p	BD994	60p	BU921	130p	TI435	65p	OA99	10p	PC82	60p	AN7355	90p	KA2214	130p	M50120P	650p	STK555	720p	STK7498	880p	TA7381	250p
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<b>AKAI</b> VS1-2, VS4-5, VS15 VS1-2, VS4-5, VS15 V9700 VS125, 126, 155, VS165, 240, 244, VS245, 247, 248, VS250, 512, 515, 516	FF-REW IDLER T-UP IDLER IDLER IDLER ASSY	M1327773 BV327815 BV321979 MZ36696J2	NV333 NV333, NV366 NV333, NV3000 NV333, NV2000, NV3000 NV333 NV366 NV370, NV430, NV730, NV830, NV850, NV870, NVG7, NVG10, NVG12, NVG18 NV370, NV430, NV870, NV730, NV830, NV850 NV730 NV2000, NV3000 NV2000, NV3000 NV2000, NV3000 NV7000, 7200, 7800 NV7000, 7200, 7800 NV8400, NV8600, NV8610, NV8620 NV8600, NV8610, NV8620 NV8620 NV600 NV621-25, NVG40-45	IDLER ARM IDLER UNIT PLAY IDLER IDLER UNIT CAM GEAR IDLER ARM IDLER ARM CAM GEAR IDLER UNIT IDLER UNIT IDLER UNIT CAM GEAR ACTION GEAR IDLER UNIT CLUTCH IDLER UNIT PLAY IDLER CLUTCH IDLER PULLEY UNIT	VXL0997 VXP0401 VXP0433 VVG0016 VXP0325 VXG0017 VXG0158 VXL0997 VXP0521 VVG0200 VXP0581 VXP0331 VXP0329 VVG0069 VVG0016 VXP0344 VXP0343 VXP0245 VXP0243 VXP0343 VXP0488 VXP0767	£4.50 £6.00 £6.00 £11.00	<b>ORION</b> VH200-201 VH555-700, VH844-900, VH1000-1500, VH1800, VP200, VH530 VH535-630, VH635-640, VH893-1440, VH2500- 2600, VH2700-4010, VH5010	IDLER	850A200004	£3.50
<b>FERGUSON</b> 3V16-22 3V16-22 3V23, 3V29-30, 3V31-32, 3V35 3V23 3V29-30, 3V31-32, 3V35-36, 3V38-39, 3V49 3V29-30, 3V31-32 3V35-36, 3V38-39, 3V49 3V35-36, 3V38-39, 3V49 3V58-59, 3V64-65, FV10-11, FV12-13, FV14 3V42 3V44 3V42, 43, 48, 53, 56 3V42, 43, 48, 53, 56	T-UP IDLER T-UP IDLER REEL IDLER ROLLER ASSY T-UP IDLER T-UP CLUTCH REEL IDLER T-UP CLUTCH T-UP CLUTCH IDLER ARM CLUTCH ASSY CLUTCH ASSY T-UP CLUTCH SUPPORT CLUTCH	PU47752 PU49280 PL48967 PU49042A 51402 PU51380 PU55374 PU55373 PU58645 PU55822 PU57658 PU56043-1-4 PU56044-1-5	£4.50 £6.30 £3.00 £4.00 £1.45 £2.60 £2.85 £2.25 £2.50 £13.50 £11.50 £2.80 £2.80	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>AMSTRAD</b> FERGUSON & JVC PU 45979, 3V16, 3V22, HR3300, HR3660 PU 55371V, 3V35, 3V36, 3V38, 3V39, 8943, 8944, HRD110, HRD120, HRD121, HRD225 PU 46414, 8904, 8922, HR3300, HR3320, HR3330, HR3360, HR3600, HR3660 PU 51381V, 3V39, 3V30, 8930, HR7200, HR7300 PU 58635V, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430 PU 58636W, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV14T, FV20R, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430, HRD530 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947 8948, HRD140, HRD150, HRD455, HRD565, HRD725, HRD755, HRP50, R73AF	CAPSTAN MOTOR CAPSTAN MOTOR REEL MOTOR CAPSTAN MOTOR REEL MOTOR LOADING MOTOR	£21.00 £19.50 £19.50 £29.00 £26.50 £8.00
<b>FISHER</b> FVHP520, FVHP530 FVHP615 FVHP615 FVHP840 FVHP905, 906, 908, FVHP910, 916 FVHP975, 990, 999, FVHP5000, 5100	FF-REW PULLEY COMP. IDLER ASSY GEAR IDLER ASSY REEL T-UP ASSY GEAR IDLER ASSY IDLER	H1638531 F11430420400300 F11430490400900 F11430410400900 F11430490402400 F11430420400700	£1.00 £3.30 £5.50 £6.50 £6.20 £5.20	<b>MITSUBISHI</b> 288PQ2801, HS300, 301, 302, 310 288PQ2806, HS303, 304, 320, 330, 700 288PQ3401, HS303, 700	MOTOR REEL SPOOLING MOTOR REEL SPOOLING MOTOR REEL TAKE-UP GEN	£33.50 £31.50 £21.00	<b>NATIONAL</b> MYN 135V5L, NV332, NV333, NV340, NV366 VEM0212, NV730NV770	REEL MOTOR MOTOR REEL GEN	£13.50 £30.00	
<b>GOLDSTAR</b> IDLER	435038A	£2.50	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SANYO</b> 4-529V-10800 (RM11), VTC5000, VTC5150	REEL MOTOR	£6.30	
<b>HITACHI</b> VT11-33, VT63-64, VT14, 17, 19, 38, 57, VT86, 88 VT120-220 VT8000-8300, VT8500-8700 VT8000-8300, VT8500-8700 VT8000-8300 VT8500-8700 VT9300-9500 VT9300-9500 VT9300-9500 VT11-33, VT63-64	FF-REW IDLER PLAY IDLER CLUTCH ASSY CLUTCH ASSY FF-REW IDLER PLAY IDLER PLAY IDLER FF-REW PULLEY FF-REW IDLER PLAY IDLER PLAY IDLER IDLER IDLER FF-REW IDLER	6886971 V-6861482 6879515 6886824 6413663 6414221 6383531 8681471 6861482 681505 687043 6886971	£1.50 £3.20 £7.50 £2.80 £3.60 £3.60 £0.80 £3.30 £3.20 £3.80 £3.80 £1.50	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SANYO</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
<b>HINARI</b> VXL3, VXL20	REEL IDLER	40000009	£1.50	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> 4-529V-10800 (RM11), VTC5000, VTC5150	REEL MOTOR	£6.30
<b>ITT</b> VR3905, VR3906 VR3906 VR3913, VR3943	T-UP IDLER REEL IDLER REEL IDLER	PU51402 PU55374 PU48967	£1.45 £2.85 £3.00	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
<b>JVC</b> HR330, 3660, 4100 HR7200, HR7600, HR7650, HR7655 HR7200, HR7600 HR7650, HR7655, HR7700 HR3300, 3660, 4100 HR7200, 7600, 7650 HR7655, HRD110, HRD120-121, HRD225 HRD110, HRD120-121, HRD225 HRD110, HRD120-121, HRD225	T-UP IDLER SML T-UP CLUTCH REEL IDLER ROLLER ASSY T-UP IDLER LRG T-UP IDLER T-UP CLUTCH IDLER ARM	PU49280 PU53462A PU48967 PU49042A PU47752 PU51402A PU55373 PU55374-3-8	£6.00 £3.00 £3.00 £4.00 £4.50 £1.45 £2.25 £2.85	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
<b>MATSUI</b> VX730, 735, 750, 755, VX810, 820, 880, 990	CLUTCH	850A00005	£6.50	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
<b>MITSUBISHI</b> HS306, 307, 318, 319, HS410, 710	GEAR ASSY	Reference 522P00201	£6.25	<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
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				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
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				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
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				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
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				<b>PHILIPS</b> DV464, VR6462, VR6463, VR6660, VR6860 VR6460, VR6520, 6920 DB532, VR6542, VR6343	IDLER IDLER ARM REEL IDLER	52220334 40340162	£2.50 £1.70 £7.50	<b>SONY</b> BHF 1100D, SL-C7	CAPSTAN MOTOR	£25.00
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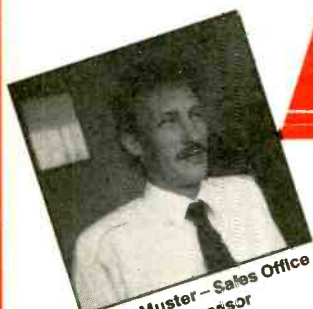






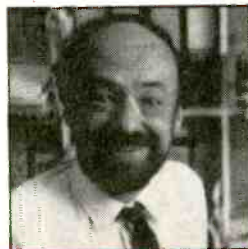
# THE FACES BEHIND THE TELEPHONES

## WVE AT READING



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For  
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Phone David Allen  
0734-876444



Tracy Ward



Nicola Parker

**Grundig**  
Phone Stan Perkins  
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Lisa Haylett



Claire McEnoy

**Philips/Pye Whirlpool**  
Phone Frank Pratt  
0734-876444



Cheryl Kinley



Michele Hinde - Sales Office Supervisor

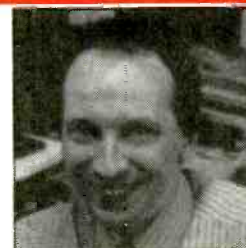
**Ferguson GEC Fidelity**  
Phone Philip Pratt  
0734-876444



Nicky Stannett

Amstrad, Akai, Fisher, Mitsubishi, Moulinex, JVC, Nat Panasonic, Pioneer, Matsui, Goldstar, Saisho, Salora, Sony, Toshiba, Yamaha and many others.

Phone Mike Curtis  
0602-870789



Debbie Povey



Tracie Povey



Michelle Brown

# Willow Vale Electronics Ltd



**WE WILL ONLY SUPPLY TOP QUALITY, BRANDED COMPONENTS. REPUTATION COUNTS WITH US**

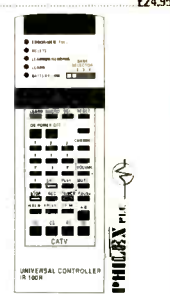
**G.G.L. COMPONENTS**  
 PO BOX 72, UNIT 7, SOUTH JOHN STREET, CARLISLE, CUMBRIA CA2 5AL  
 PHONE (0228) 39693/20358 FAX (0228) 515127

AUTHORIZED DISTRIBUTOR

**BUY WITH PHILEX PLC**

AERIAL ACCESSORIES		INTEGRATED CIRCUITS		TYPE	PRICE (£)	LINE O/P TRANS	REMOTE CONTROLS	TRANSISTORS	VIDEO HEADS		
Coax L/connector	18	TYPE	PRICE (£)	TDA1516	7.75	Decca 100	9.95	Ferguson 1725	12.95	Alba 4000X	21.50
Coax Plug	20	TDA1518	5.50	TDA1518	5.50	Ferguson TX85	21.75	Ferguson 1734	14.95	Alba 5000X	21.50
F Connector	20	TDA1670A	4.50	TDA1670A	4.50	Ferguson TX90 (14")	19.75	Ferguson 1742	14.95	Amstrad 4500/9000	18.75
Fly Lead 2m	75	CNX62A	4.75	TDA1770A	3.70	Ferguson TX90 (20")	21.50	Ferguson 1785	12.95	Amstrad 4600/4700	18.75
Video Lead 2m	75	CNX83A	3.95	TDA1908A	1.95	Ferguson TX99	22.75	Ferguson 1789	12.95	Amstrad 6000	19.95
Y Splitter	95	HA1377	2.95	TDA2004	2.95	Ferguson TX100 90D	19.95	Ferguson TX10 Non Text	12.95	Amstrad 7000	19.95
4 Way Distribution	21.75	HA13001	4.50	TDA2005	2.95	Ferguson TX100 110D	19.95	Ferguson TX10 Stereo	12.95	Ferguson 3V00/39	9.50
Amplifier Mains	21.75	HM6251	5.95	TDA2030	1.95	Fidelity ZX2000 + Modl	12.50	Ferguson 3V23	14.95	Ferguson 3V32	24.95
<b>CAPACITORS</b>		HM6232	5.95	TDA2170	3.95	Fidelity ZX3000	11.50	Ferguson 3V32	14.95	Ferguson 3V42/55	19.50
0.0091uf 1500v	1.25	LA4445	2.45	TDA2270	3.95	Fidelity ZX 27" 36"	21.50	Ferguson 3V35	14.95	Ferguson 3V43	32.50
0.115 5v (back-up)	2.50	LA4460	2.45	TDA2530	6.95	Hinari CT45	19.95	Ferguson 3V43	14.95	Ferguson 3V65/FV11	23.50
1uf at 250v	20	LA4461	2.45	TDA2541	2.95	Hinari CT67	19.95	Ferguson 3V55	15.75	Fisher 615/910	17.50
1uf at 400v	25	LA7801	2.95	TDA2560	2.50	Hitachi CPT1446	22.95	Ferguson 3V55	15.75	Hitachi 8000/9700	17.50
1uf at 400v	25	M293B1	7.95	TDA2577A	3.25	ITT Compact 80	19.95	Ferguson 3V55	15.75	Hitachi VT11/33	17.50
4.7uf at 400v	35	M491BB1	14.75	TDA2577	3.75	ITT CVC25/30/32	9.95	Ferguson 3V55	15.75	Hitachi VT17/19	34.95
10uf at 250v	35	MC13002P	12.95	TDA2578A	2.95	ITT CVC800/1/2/3	23.95	Ferguson 3V55	15.75	Hitachi VT63/64	22.50
10uf at 400v	75	SA11293/02	6.95	TDA2579	3.75	ITT CVC100	19.95	Ferguson 3V55	15.75	Hitachi VT65	34.95
22uf at 250v	40	SA15000A	4.95	TDA2581	2.95	ITT CVC1100	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
33uf at 250v	55	SA15012	4.95	TDA2582	2.50	ITT CVC1200	21.50	Ferguson 3V55	15.75	Hitachi VT66	22.50
47uf at 250v	65	SL1430	1.95	TDA2591/3	2.95	ITT CVC1204	14.75	Ferguson 3V55	15.75	Hitachi VT66	22.50
100uf at 250v	1.25	SL1432	1.95	TDA2594	2.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
<b>DIODES</b>		STK5325	7.95	TDA2600	6.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
TYPE	PRICE	STK5331	6.95	TDA2653AQ	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
R2M	95	STK5332	6.95	TDA3330	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
BY133	15	STK5333	12.50	TDA3560	4.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
BY227	20	STK5335	6.95	TDA3561A	4.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
BY228/800	35	STK5421	7.95	TDA3562A	4.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
BY295/800	35	STK5422	6.95	TDA3562A (TFK)	6.75	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
1N4007	10	STK5471	8.75	TDA3565	4.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
1N5408	20	STK5481	8.95	TDA3571BQ	7.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
BZX61C (1.3 Watt)	20	STK5482	8.95	TDA3576B	7.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
5v, 6v, 7v, 9v, 12v, 15v, 24v, 33v, 68v, 120v, 130v (5 per Value)	1.00	STK7308	7.95	TDA3651	2.75	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
<b>E.H.T. TRAYS</b>		STK7348	7.95	TDA3651AQ	4.75	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
Continental 30AX Focus	8.95	STR441	6.75	TDA3652 Genuine	9.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
DECCA 120/130	7.95	STR4090	8.95	TDA3653	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
GRUNDIG CUC2410 14"	19.75	STR4211	4.50	TDA3653A	4.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
GRUNDIG CUC2410	19.75	STR5412	4.95	TDA3654A	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
18"/26"	19.95	STR4090	8.95	TDA4500	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
ITT CVC20/30	6.95	STR50020	7.95	TDA4501H	5.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
PHILIPS KT3	7.95	STR6103A	6.50	TDA4501H	5.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
RBM T20/22A	7.95	STR8041	9.95	TDA4505E	6.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
THORN 9000	8.00	STR50041	6.95	TDA4600/2	2.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
UNIVERSAL	5.95	STR58041	6.95	TDA4600/2D	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
<b>FUSES</b>		STR6020 (KIT)	5.95	TDA4601DIL	4.75	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
20mm AVS (Pkts of 10)		TAB7227P	2.95	TDA8180 (Genuine)	8.50	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
250MA, 315MA, 500MA, 630MA, 800MA, 1A, 1.6A, 2A, 2.5A, 3.15A 4A, 5A, 6.3A, 8A	1.20	TBA120U	1.95	TDA9503	3.75	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
20mm Q/B (Pkts of 10)		TBA820M	1.75	TEA1014A	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
500MA, 630MA, 800MA, 1A, 1.6A, 2A, 2.5A, 3.15A	60	TDA1035T	2.95	TDA1039	2.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
TDA1037	2.75	TDA1044	2.95	TDA2018A	2.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
TDA1044	2.95	TDA1170S	1.95	UPC1365C	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
TDA1170S	1.95	TDA1510	3.80	UPC1378H	3.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
TDA1510	3.80	TDA1512	3.50	UPC1394C	2.95	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
TDA1512	3.50	TDA1515	4.50	UPC1420CA	8.50	ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50
TDA1515	4.50					ITT CVC1215	19.95	Ferguson 3V55	15.75	Hitachi VT66	22.50

ALBA VIDEO SPARES	FERGUSON VIDEO SPARES	HITACHI VIDEO SPARES	PANASONIC VIDEO SPARES	SANYO VIDEO REPAIRS	Programmable Remote Control Only
VCR4000	3V44/45	VT63/64E	NV777	VTC5000	£24.95
Belt Kit	1.95	Belt Kit	1.95	Belt Kit	1.00
Capacitor Back-up	2.50	Capstan Motor	27.50	Reel Motor (Genuine)	7.95
Pinch Roller	3.95	Clutch Assembly	7.95	Reel Pulley (Genuine)	5.95
Reel Idler	3.95	FF/REW Idler	2.50	Video Head	27.50
Reel Pulley	1.95	Pinch Roller	3.95	<b>SHARP VIDEO SPARES</b>	
Video Head	21.50	Remote Control	19.95	VCR3000/381	
<b>VCR5000</b>		Video Head VT63/64E	22.50	Belt Kit	2.50
Belt Kit	1.95	Video Head VT65E	34.95	Pinch Roller	3.95
Pinch Roller	3.95	VT120/130E		Reel Idler (Genuine)	3.95
Reel Idler	3.95	Belt Kit	1.95	Reel Motor (Genuine)	12.95
Reel Pulley	1.95	Capstan Motor	27.50	Video Head	17.50
Video Head	21.50	Cassette Housing	29.95	VC481/482	
<b>AMSTRAD VIDEO SPARES</b>		Pinch Roller	3.95	Belt Kit	2.50
VCR4500/4600		FF/REW Idler	3.75	Pinch Roller	3.95
Belt Kit VCR4500	1.95	Pinch Roller	3.95	Reel Idler (Genuine)	3.95
Belt Kit VCR4600	1.95	Repair Kit	18.50	Reel Motor (Genuine)	12.95
Modification Kit	6.95	Video Head VT120E	24.95	Video Head	17.50
Video Head VCR4500	18.75	Video Head VT130E	29.95	<b>VCR51582</b>	
Video Head VCR4600	18.75	<b>PANASONIC VIDEO SPARES</b>		Belt Kit	2.50
<b>FERGUSON VIDEO SPARES</b>		NV230/430		Pinch Roller	3.95
3V00/22		Repair Kit (Genuine)	12.95	Reel Idler (Genuine)	3.95
Belt Kit	2.50	Belt Kit	1.95	Reel Motor (Genuine)	18.95
Pinch Roller	3.95	Mode Switch	3.95	Video Head	17.50
Take-Up Clutch (Large)	5.95	Mode Switch	3.95	VC681	
Take-Up Clutch (Small)	5.95	Pinch Roller	3.95	Belt Kit	2.50
Video Head	9.50	Reel Idler (Genuine)	2.95	Pinch Roller	3.95
<b>3V29/30</b>		Tension Band	2.45	Reel Pulley (Genuine)	7.95
Repair Kit	12.95	Video Head NV230	22.50	Video Head	17.50
Belt Kit	1.80	NV333/366		VCA140/VCT72	
Capstan Motor	32.50	Repair Kit (Genuine)	13.75	Belt Kit	2.95
Cassette Lamp	80	Belt Kit	1.95	Pinch Roller	3.95
Loading Belts (5)	1.95	Pinch Roller	3.95	Reel Pulley (Genuine)	7.95
Pinch Roller	3.95	Play Idler (Genuine)	4.95	Video Head	17.50
Reel Idler	2.95	Reel Idler (Genuine)	1.25	<b>SONY VIDEO SPARES</b>	
Take-Up Clutch	2.95	Reel Motor	17.95	Cs/6/7	
Take-Up Idler	1.85	Tension Band	2.45	Belt Kit C5/7	2.50
Tension Band	2.45	Video Head NV333	9.50	Belt Kit C6	1.95
Video Head	9.50	Video Head NV366	24.95	Pinch Roller	4.50
<b>HITACHI VIDEO SPARES</b>		NV370		Reel Pulley C5/7	4.95
VT8000/8700E		Repair Kit (Genuine)	12.95	Rewind Kit C6	3.95
Belt Kit	1.95	Belt Kit	1.95	Video Head	14.95
FF/REW Idler	2.95	Mode Switch	3.95	<b>VIDEO BELT KITS</b>	
FF/REW Pulley	95	Pinch Roller	3.95	Akai VS1/3/5	1.95
Play Idler	3.95	Play Idler (Genuine)	2.95	Mitsubishi HS302	1.95
Take-Up Clutch	2.95	Reel Idler (Genuine)	2.45	Sanyo 1100	1.95
Take-Up Idler	1.85	Tension Band	2.45	Sharp 7300	2.50
Tension Band	2.45	Video Head	12.50	Sharp 8300	2.50
Video Head	9.50	NV370		<b>ORDERING</b>	
<b>3V35/39</b>		Repair Kit (Genuine)	12.95	Please add £100 for P/P U.K.	
Repair Kit	12.95	Belt Kit	1.95	Add 17.5% VAT to this total.	
Belt Kit	1.95	Mode Switch	3.95	Service Manuals £125 P/P each.	
Capstan Motor	22.95	Pinch Roller	3.95	Export Orders P/P charged at cost.	
Cassette Housing	25.95	Play Idler (Genuine)	2.95	Delivery By Return On Stock items.	
Cassette LED	1.95	Remote Control	15.95	Minimum Order £5.00	
Loading Belts (5)	1.95	Tension Band	2.45		
Mains Transformer	23.95	Video Head	17.50		
Pinch Roller	3.95	Video Head	17.50		
Reel Idler	2.95	Video Head	17.50		
Remote Control	14.95	Video Head	17.50		
Take-Up Idler	1.85	Video Head	17.50		
Take-Up Clutch	2.95	Video Head	17.50		
Tension Band	2.45	Video Head	17.50		
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PANASONIC NV370	£12.99	VT-5263/65	£1.75
PANASONIC NV366	£24.99		
PANASONIC NV730	£29.99	SHARP VC-381	1.50
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HITACHI VT17/35/39	£29.99	VC-651/800	£1.50
HITACHI VT120/220	£25.99	VC-7300	£1.50
FISHER FVHP15/10/10	£15.99	VC-8300	£1.00
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HA1389	210p	STK4172	1100p
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HA11225	410p	STK5482	320p
HA11226	225p	STK7308	580p
HA11227	225p	STK7348	600p
HA11235	170p	SIR451	480p
HA11423	210p	SIR452	480p
HA11724	800p	SIR453	480p
HA12413	275p	STR4090	650p
HA13001	195p	STR4090	600p
LA4261	300p	STR50103	500p
LA4270	300p	STR58041	650p
LA4300	130p	STR6020	490p
LA4440	230p	TA7205	100p
LA4465	260p	TA7206	100p
LA4460	170p	TA7193	400p
LA4461	170p	TA7203	180p
LA4462	425p	TA7222	120p
LA4466	425p	TA7229	300p
LA4500	230p	TA7231	170p
LA4505	260p	TA7240	260p
LA4507	360p	TA7241	260p
LA4508	260p	TA7245	400p
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25B-561	130p	25B-561	20p
25B-562	50p	25B-562	25p
25B-564	60p	25B-564	70p
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25B-568	40p	25B-568	40p
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25B-571	15p	25B-571	75p
25B-572	20p	25B-572	35p
25B-573	20p	25B-573	40p
25B-574	15p	25B-574	35p
25B-575	325p	25B-575	250p
25B-576	20p	25B-576	40p
25B-577	15p	25B-577	55p
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25B-662	20p	25B-662	20p
25B-663	20p	25B-663	20p
25B-664	20p	25B-664	20p
25B-665	20p	25B-665	20p
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25B-668	20p	25B-668	20p
25B-669	20p		

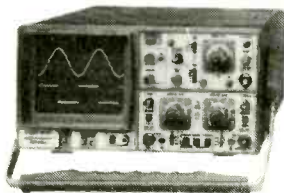


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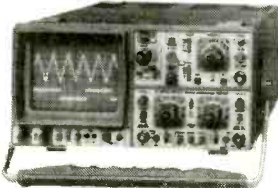
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- Bandwidth: DC - 20MHz
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- Timebase: 0.1s - 20ns/cm
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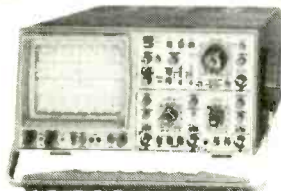
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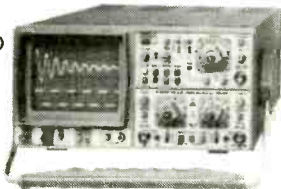
- 3 Channels
- Bandwidth: DC - 100MHz
- Sens: Ch.1, Ch.2, Ch.3, 1mV/cm
- Timebase A: 2.5s - 5ns/cm
- Timebase B: 0.2s - 5ns/cm
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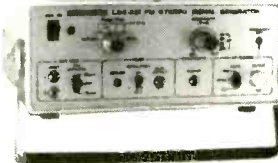
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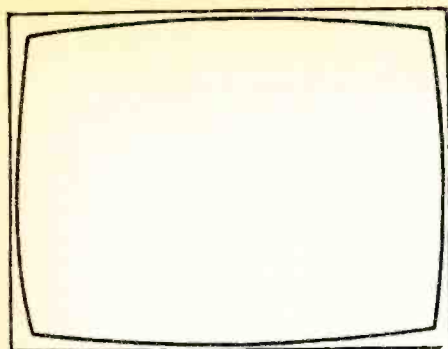
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## COVER PHOTO

This month's cover photograph shows the Ferguson FV31R with the top cover removed. See servicing article on pages 720-3.

## CORRECTION

Under the heading Panasonic TUS100 in TV Fault Finding last month (page 651), the measuring ammeter is connected in series with the 90Ω (say 82Ω) resistor across the polariser terminals.

## The HD-TV Debate

The European Commission has been making heavy weather over plans for high-definition TV in Europe. This is probably inevitable. There are different ways of going about implementing HD-TV, and those who have already invested in development work are unwilling to see their efforts wasted. More to the point though is the prospect of a huge market opening up during the first decade of the next century. Maximising the potential industrial benefit from this is what it's all about.

The European Commission has now tabled a draft directive on HD-TV. If approved by the EC governments, it would lead to the adoption of HD-MAC as the European standard for HD-TV. EC technology commissioner Filippo Maria Pandolfi hopes that the proposals will be adopted by the Council of Ministers and the European parliament this year, to take effect next year. A parallel memorandum of understanding would bind broadcasters and equipment manufacturers to promote D2-MAC as an intermediary standard prior to full HD-MAC. The directive would require all satellite TV services launched after January 1st 1993 to use the MAC standard and stipulates that all TV sets sold in Europe after that date should incorporate a D2-MAC decoder. The Commission proposes to spend some £350m over five years on promoting the use of D2-MAC by broadcasters.

This seems to be a rather heavy-handed approach. There's no doubt that MAC is an excellent TV system, and it has the advantage of being able to advance to wide-screen and high-definition TV in a compatible manner. But why does the Commission seek to impose restrictions and force setmakers to incorporate decoders that many viewers might never use? The aim is clearly to help European manufacturers to take as large a share of the prospective HD-TV market as possible. It would be a repeat of the PAL licensing arrangements of the Sixties and Seventies, making life easier for European setmakers by imposing conditions on the Japanese and other overseas competitors. One has to ask whether this is necessary and in the interests of the viewer?

The proposed directive allows satellite TV broadcasters who use PAL to continue to do so indefinitely, a compromise on earlier proposals that sought to phase PAL out. PAL has turned out to be perfectly adequate for satellite TV, but doesn't offer the evolutionary path that MAC provides towards wide-screen and HD-TV (two separate things, though they tend to get confused). But why try to prevent further use of PAL? The only reason for trying to prevent its further use in satellite TV broadcasting is to force the pace with respect to HD-TV. This seems to be a bit unnecessary, though you can see what lies behind it. We are going to get HD-TV come what may – and a good thing too. The question is in what form? You can pretty well rule out the Japanese NHK/Muse system as, at this point in time, representing obsolete and non-compatible technology. But the extensive work going on in the USA on digital television is another matter entirely. We are already used to digital teletext and sound. The only reason for opposing digital video would be on compatibility grounds. Bandwidth used to be regarded as a major problem, but bit redundancy techniques are enabling digital signals to be squeezed into standard channel bandwidths. Should this be the way to go? There is of course no reason to go digital for the sake of it, especially when MAC meets all possible requirements for development in the immediate future. It also has the advantage of being a fully developed and proven system. Perhaps on these grounds and bearing in mind the investment already made in MAC by European setmakers and broadcasters the decision to back MAC is a reasonable one. BSkyB, the major PAL satellite broadcaster, has agreed to start simulcast wide-screen D2-MAC transmissions from the start of 1994 – provided someone else pays for the simulcasting. In view of BSkyB's financial problems that might be fair enough.

It seems that wide-screen TV will be with us quite soon. The sets have already been developed and are due to go on sale within a matter of months. The main problem is a lack of transmissions. There's also the point, seldom made, that the sets look awful and the 16:9 aspect ratio is appropriate with only a very small proportion of broadcast material – westerns and spectaculars. Even with a 4:3 aspect ratio attention with most programmes is directed to a relatively small area at the centre of the screen. You don't study what's going on (or usually not going on) in the corners! The 4:3 aspect ratio was not adopted at the start of TV broadcasting without good reason. This height-width ratio relates to basic human perception of the world. It was used for theatre prosceniums and in photography long before TV came along. One's field of vision simply isn't 16:9, which is a decidedly uncomfortable ratio. If it hadn't been for Cinemascope, no one would have dreamt of imposing a 16:9 aspect ratio on TV. It's an abomination! But it seems that we shall have to endure it, in whose interests I'm not at all sure.

HD-TV is another matter altogether and has long been a hoped-for prospect. The only problem is how to go about it. MAC gives us an evolutionary, compatible path that serves the interests of owners of existing equipment. Whether it would be adopted as a natural matter of course without the help of EC directives is something one can't be too sure about. Perhaps Mr. Pandolfi is doing the right thing, but laws about fitting decoders and so on seem to be unnecessary at this stage. And if the debate is about whether or not to go digital, this surely depends on one's timescale. As with most forms of communication, the future of TV will be digital. Right now however MAC seems to be the appropriate choice.



# Teletopics

## TV DEVELOPMENTS

Philips has announced that it will launch European 1,250-line HD-TV sets in 1994, a year ahead of schedule. The company says that this is due to the recent decision by the European Commission's HD-TV Work Group and the 16:9 D2-MAC Promotion Group to adopt HD-MAC as the standard for European HD-TV transmissions and to promote D2-MAC 16:9 broadcasting. Philips has also announced faster than expected progress with the development of second-generation HD-MAC components for HD-TV receivers, and that these will be incorporated in a thousand HD-MAC receivers that will be used for reception of HD-MAC signals from the 1992 Barcelona Olympic Games.

Nokia is to show 16:9 HD-TV sets at this summer's Berlin Radio Fair. The company will be launching four wide-screen sets at prices from £1,000 to £3,200 (screen sizes from 28 to 36in.) in the UK next January. The top-of-the-range 36in. model will have a digital chassis, a built-in D2-MAC tuner and a Eurocrypt decoder. Users will be able to employ zoom with the 1,250-line picture in order to cater for the 4:3 format. A feature of the range will be a new user-friendly remote control unit with a rolling ball inside: operation is by inclining the handset in the appropriate way for the TV or video function required then pressing the go button.

Toshiba has just launched in the UK three models that feature Nicam plus Dolby Surround sound. The system allows viewers to hear surround sound effects from stereo video tapes and stereo TV broadcasts encoded with Dolby Surround sound. Brackets are supplied to mount the surround sound speakers above and behind the viewer. Other features include Fasttext, twin Scart sockets, an S terminal and phono audio input and output sockets. Model 3409DB has a 34in. screen and a suggested price of £2,000, Model 2805DB a 28in. screen and suggested price of £820 and Model 2505DB a 25in. screen and a suggested price of £720.

The latest sets from Ferguson also introduce two new chassis. The 14in. portable Model A14R is fitted with the TX80 chassis, whose compact design benefits from a chip that carries out just about all the signal processing: the Toshiba M52038SP chip incorporates the vision and sound i.f. strips, the PAL colour decoder and the timebase generators. As in the famed 9000 series chassis, a single transistor drives the chopper and line output transformers. A microcomputer chip carries out the control operations. Features of this sophisticated little set, which has a suggested price of around £210, include on-screen graphics, child lock, a sleep timer which puts the set into the standby mode half an hour after a button on the handset is pressed, and a menu control system.

Ferguson's latest large-screen models are fitted with the Thomson ICC7 chassis. A new chip here, the TBA8659CN, combines the colour decoder (with PAL/SECAM capability) and timebase generator stages. As in previous Thomson designs, the field output is controlled by a thyristor linked to the line output transformer. Basic model is the A51F at £400. The A51N at £500 features 2 x 20W music power with surround sound. The larger screen A59F is fitted with a Super Planar tube, which is said to be twice as flat as a standard FS tube. Suggested price is £460.

GEC Plessey Semiconductors has announced a single-chip teletext decoder, type MV1815, which can store up to 254 pages in an external memory, giving immediate access to the stored pages. Features include all level-one teletext functions, high-resolution RGB display logic with enhanced graphics, 30MHz video switching and a colour graphics generator that produces 22 additional colours for use in menu options. GPS developed special software called PLATO (Plessey Advanced Teletext Operating system) for the device. Typical power consumption is 25mA at 5V.

## VIDEO NEWS

New camcorders include JVC's GR-SX9 "palmcorder" which features S-VHS picture quality, long play, times six zoom and auto head cleaning at a price of around £930. The larger GR-S505 at around £1,150 has S-VHS picture quality, hi-fi stereo sound, a times eight zoom and an auto head cleaner. There are two new Philips models, the VKR6870 VHS-C palmcorder and the VKR9010, an S-VHS-C model which is VITC compatible. Suggested price for both models is £800.

Aiwa has launched a combined TV/VCR called "The Televideo", Model VX-T1000. It has a 14in. monitor, dual-function remote control handset and a VCR section with several auto features. Suggested price is £420.

Alba has announced a double-decker VCR, Model VCR2222, at £400. Maximum playing time is twenty hours, using two five-hour tapes in the LP mode.

## BROADCASTING AND SATELLITE TV

Oracle faces competitive tendering when its teletext franchise runs out, with the other ITV franchises, at the end of 1992. At present Oracle provides about 1,600 pages of information, including advertising. The latest figures released by the ITC's Cable Division show that during the first quarter of the year there were 23,000 new connections to broadband cable networks, slightly less than the record increase of 32,000 during the last quarter of 1990. The total number of homes linked to broadband systems is now some 172,000, an 84 per cent increase during the twelve-month period.

According to the *Financial Times* satellite monitor there were 75,000 new dish installations in May. Ferguson has reduced the prices of its satellite TV systems by £80-£100. Rights to the Squarial have been bought back by its inventor John Collins for £1. He intends to launch an Astra version late next year.

News Corporation and its three US partners have decided to abandon plans for the proposed 108-channel Sky Cable service.

## TRADE NEWS

Sentra Electronics Ltd. is now trading as ASJ Technik to whom orders, cheques etc. should be made out. Address and telephone no. remain as before - Mandale Mill, Beacon Road, Wibsey, Bradford BD6 3DQ, telephone 0274 690 241, fax 0274 602 701.

Colin Andrew Ltd., which was the sole distributor of spares for Loewe Opta products, has gone into receivership. Loewe withdrew from the UK market last December. The German company hopes to be able to announce alternative arrangements for UK spares shortly.

## HELP FOR THE DEAF

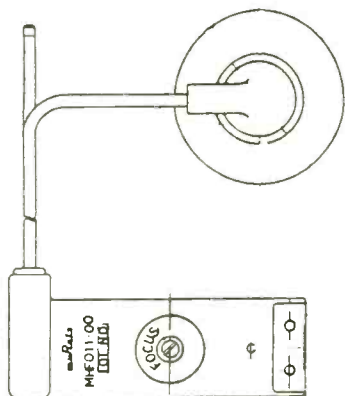
Following a letter in our last issue we have received from P. R. Cox, 59 Hennings Park Road, Poole, Dorset BH15 3QX (telephone 0202 682 795) details of a range of products designed to provide help for the hard of hearing.



**HRS**

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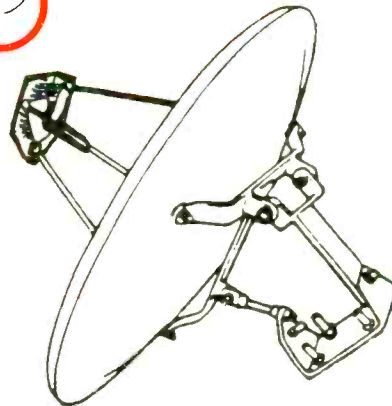
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The company has ten years' experience in supplying and installing such equipment, for home use and in churches and other public buildings. Church loop amplifiers are custom made to suit each individual church.

### **STOLEN**

During a break-in at Aerial Techniques, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH (telephone 0202 738 232) the following items were stolen: (1) several 7in. monochrome v.h.f./u.h.f. TV sets, boxed type YTL575, for system B/G/L (i.e. will not resolve sound from UK transmitters, only buzz, as the sets were awaiting modification); (2) several 10in. NordMende Galaxy multistandard TV sets, Model G25, covering systems B/G/I/L; (3) one Wolsey type TES v.h.f./u.h.f. field

strength meter, Model MC661-c; (4) one type 4810 Elmac scope with yellow metal case. If any readers are approached about this specialised equipment they are asked to contact the local police or David Martin at Aerial Techniques.

### **BLUMLEIN BIOGRAPHY**

Following the publication of a letter from F. P. Thomson, O.B.E., C.Eng., M.I.E.E. last month several readers have written to us to point out that Mr. Thomson's biography of Alan Blumlein has been in preparation for some twenty years and that material collected for the purpose has not been made available again. In view of this anyone considering making material available should ensure that suitable arrangements are made for its return.

# Letters

## **A LIFE IN THE TRADE**

Having enjoyed reading various articles recalling the good old days I'd like to add my own bit of nostalgia. To begin at the beginning, at the age of seven my dad helped me to make my first radio. It was "the world's smallest wireless", consisting of a coil of wire wrapped around a small star-shaped piece of Paxolin plus a crystal diode and a couple of other components – but the large iron headphones weighed about half a ton. A few years later I got to play with my first "real" radio, which was called the "H.A.C.". It was a one-valve, short-wave receiver with plug-in Denco coils. I lost count of the number of HL2 filaments I blew through connecting the batteries the wrong way round!

At sixteen I got an apprenticeship in a small radio shop, being paid the princely sum of £2 a week. Whilst there I did almost everything, from fitting elements in Morphy Richards irons and suffocating on the fumes while they stood "burning off" on the "temperature-adjustment" machine to nearly killing myself with metal-cone c.r.t.s. Fonder memories relate to fitting ITV converters to 9in. Bush TV sets and swapping all the EF80s for EF184s (they used to have a funny orange glow inside, but you should have seen the gain). And how about the Vaseline you had to scrape off the chassis around HMV line output transformers, and having to use a tin opener to change the EY51s in the oil-filled transformers used in projection sets?

I remember going to one Radio Show and seeing the Malcolm Mitchell trio, Robin Richmond and the latest TV technology, including a shiny Philips set with the new auto-contrast photocell at the front and the bomb-shaped KB Royal Star 17in. sets. Gradually the familiar components, such as those embarrassingly smelly selenium rectifiers, funnily-shaped valves and crumbling Metrosils, disappeared and in came the new wonder components such as the red-spot transistor (from a transistor range of about two!) and the silicon diode. At least there was no smell from the silicon diode, but you could get a loud bang from somewhere in the power supply accompanied by an amazing amount of curly foil stuff wrapped around everything. Does anyone remember that most helpful and persuasive person the Radio Spares man, or the new Baird pocket record-player – or that damned train on the stereo test record?

After five years I left to join a national TV rental company, DER. Twenty six years later came the merger with Radio Rentals and the "new" company considered its local bench technician as surplus to requirements. Armed

with a reasonable amount of redundancy pay, my wife and I decided to visit relations in Melbourne. I thought I'd probably never have the money and the spare time together again! On my return, having found that all those "plenty of jobs for TV engineers" weren't there, I took the plunge and became a sole trader. The Enterprise Allowance Scheme helped, and I had courses on business management. After a slow start things gradually picked up.

We've certainly seen some changes over the years, from trying to get one channel from the transmitter down the road using a 60cm set-top ring aerial to sixteen satellite TV channels via a disc of the same size. It's been a good life, and I wouldn't have been in any other trade for anything.

*Chris Plaice,  
Swansea.*

## **TESTING IR HANDSETS**

There have been a number of references in recent issues to testing the output from infra-red handsets. Some have involved circuits, others the use of a transistor radio. One can also send away for a special mirror which, though effective, is costly. All you need to do however is to connect an infra-red LED from a scrap handset across the probes of your digital multimeter and set it to the 200mV range. Fire the remote control at the top of this diode and, if the output is good, you should get a reading of 50-200mV. Those with a digital capacitance meter can insert the diode into the test holes and set the meter to the 2nF range. A good handset will give a reading of 300-1,200pF. These figures may vary with different meters and handsets, but you will always get a definite reading related to the actual infra-red light output.

You must use a digital meter, not an analogue type, as a high input impedance is required – because of the very small photoelectric charge received from the diode. May one hope that this is the last word on the subject?

*L. Mackenzie, T. Eng.,  
Stellar TV and Video,  
Edinburgh.*

## **SERVICING COMMENTARY**

I would like to offer replies to some of the points that John Priest made in his letter in the July issue. First, despite his somewhat jaded view of the current situation regarding the supply of wrong parts and customers' inability to work the latest equipment, I would point out that this has been going on for years. It happened even in the simple old days. When the rotary v.h.f. turret tuner gave way to twiddleable u.h.f. buttons, when the contrast control moved to the front of the set, when the colour knob

appeared and so on – all these and many more innovations resulted in customer confusion and unnecessary service calls. Such calls should however be regarded as invested rather than wasted time. The customer who buys his bits and pieces all over the place then has to get someone to graft them all together is likely to remember the help he has received and to return to make hassle-free purchases in future rather than go back to his local electronics supermarket to make box purchases. Foregoing the profit on a £2 lead is likely to be repaid many times over in terms of future business and recommendations. Customers remember this sort of thing.

The answer to the spread-legged i.c.s is that these are intended for automatic insertion, the inserter head compressing the legs as the item is placed in the PCB. When the inserter is withdrawn the i.c.'s legs respring so that the device remains firmly in place until the soldering process. The solution to the problem is to equip your workshop with either a proprietary lead straightener or an insertion tool. A metal insertion tool will pick the i.c. up out of its protective packaging and keep the pins shorted until the device is in the board. A lead straightener is excellent when a device arrives with its legs bent out of shape.

In reply to Mr. Gadsby, who asked about help for the deaf, I remember many years ago fitting a Rediffusion hearing aid loop in a room in a local retirement home. Though Rediffusion has been taken over by Granada, the division that manufactured such items (I think that hotel systems and music and paging systems were handled by the same division) still exists. From what I can recall, the device consisted of a fairly powerful audio amplifier, about 30W, that drove a full reel of 2A twin tacked around the skirting board. Connection to a TV set would of course require extreme caution from the safety point of view. A set with an audio output jack would be best.

Finally, a note of hope for everyone in the trade. For a long time Mastercare has been the butt of jokes and often unkind comments. A few weeks ago however I needed a front panel for a badge-job VCR that's no longer made. When I phoned Mastercare a very polite young lady went out of her way to find the part number and price, which was very fair. A well-packed panel arrived within a very few days of sending the order, but there was a slight hiccup here – it wasn't quite the right one, almost but not quite. I returned it with a covering letter and this time received the correct part, also three days later a cheque for six pounds odd as a refund for the difference in price between the wrong and the right panel. Well done Mastercare!

*Geoff R. Darby, Proprietor Monitech,  
Northampton.*

## SATELLITE TV INSTALLATIONS

A number of points have been raised by TV and satellite engineers, by phone and during visits to our trade counter, following our reply to R.N. Baker last month. Most of the comments relate to the poor quality of satellite TV installations and the effect on LNB gain of poor workmanship, most of which seems to be due to lack of training. Two satellite TV trouble-shooters (north and midlands) estimate that about 42 per cent of installations are poor, leaving no margin of error for equipment deterioration. Most of the problems would be bad practice at u.h.f. and are far worse at the output frequencies of an LNB.

We find that at 1,450MHz fitting a line coupler with two F connectors results in a loss of 5dB, one over-tight cable

clip introduces a loss of 2dB, a tight cable bend introduces a loss of 1dB, a trapped cable results in a loss of 3.5dB or more and a taped joint in the download a loss of 5dB or more.

With a typical installation using 15m of good cable and an LNB with a gain of 53dB, the losses for cable, tape joint and two over-tight cable clips would be 3dB, 5dB and 4dB respectively. This would result in an apparent LNB gain of 41dB, i.e. a 75 per cent signal loss. With poor cable the cable loss increases to 4.5dB, the result being an apparent LNB gain of 39.5dB, i.e. a 79 per cent signal loss. Using very poor cable increases the cable loss to 6dB, the apparent LNB gain falling to 38dB with an 82.5 per cent signal loss. In view of these figures there's little point in manufacturers bringing out ever higher-gain, lower-noise LNBs if all that happens is that poorer cable is used.

We've noted from faulty LNBs returned for repair, as well as from the results of our tests, that poorer, thinner cables are at best a slack fit in the standard F-type plug, giving rise to poor connections and later to weather problems.

A test installation with 15m of good cable and an LNB with a gain of 53dB introduced a cable loss of 3dB, reducing the apparent LNB gain to 50dB, a signal loss of 25 per cent. Antiference 5540 Quadair cable was used, with RS crimp F connectors and crimp pliers. No losses were noted during the crimping. When heavy pliers were used instead a 1dB loss was introduced at each end – the use of pliers also distorts the crimp seal, leading to weather problems. Standard plastic cable clips were used on the download. On a ladder it was not easy to avoid over-driving the nails, producing losses. Perhaps someone should produce saddles for this purpose now!

In conclusion, while our examples have been exaggerated to show the losses which can occur it's the small losses here and there that in the end lead to complaints.

*J.A. Glenton, MCES Ltd.,  
15 Lostock Road, Davyhulme,  
Manchester M31 1SU.*

Letters in the May and June issues on poor reception due to standing waves prompt me to offer the following theoretical explanation which I hope can be tested in the field. Standing waves occur when there's a mismatch at the receiver and will be made worse when the output impedance at the source is wrong, thus causing re-reflection towards the load. A standing wave is the sum of a forward and a backward wave, but when the transmitter and receiver ends are both mismatched to the cable there can be several waves in each direction, each with a different amplitude and phase relationship.

It appears that the Amstrad receiver's input impedance is incorrect, or varies with frequency, causing the first reflection. If in addition the LNB is not correctly matched (this wouldn't matter if the receiver was o.k.) a further out-of-phase forward wave is generated. When a long extension cable is fitted the path length of the reflected wave is quadrupled whereas the forward wave path is doubled. Thus cable attenuation improves the situation. The solution would appear to be to fit an in-line bidirectional 3dB attenuator. Stub matching is unlikely to be satisfactory because it's very frequency sensitive. Another approach might be to devise a way (difficult!) of shunting or adding in series a resistor to change the Amstrad receiver's input impedance by up to 10Ω until optimum conditions are established.

Incidentally connecting two cables in series doesn't change the impedance looking in at the cable end, but a



mismatch occurs at the junction because the physical change affects the capacitance and inductance per unit length.

*R.S. Porter, M.Sc., C.Eng., MIEE,  
Stourbridge, W. Midlands.*

### COMMENTARY-FREE SOUND

With reference to Gus Cusik's letter in the June issue, my Sanyo VM-D6 camcorder also sees the infra-red output from my TV remote control unit. What puzzles me is how on earth did Mr. Cusik find this out?!

On the subject of commentary-free sound, with the temporary disappearance of Eurosport via satellite (it's back now but not so good) I scanned the skies for any station carrying the Formula 1 Grand Prix from Canada. I have a steerable system with a triple-band LNB and came across two "feeds". The La Cinq one via Telecom 1C at 5°W provided good coverage but in monochrome (because of SECAM) and a French commentary. The direct one via Intelsat VI F4 at 27.5°W had PAL colour but no commentary or captions, just lots of car noise. This was fine for the first few laps but after about an hour, due to constant leaping about by the TV director, I hadn't the slightest idea who was where in the race! I have since watched the Mexican Grand Prix on RTL with a German commentary and found that I was at least able to keep up with the race. I'm sure that there's a case for commentary-free sound, but I don't think the commentators' jobs are in danger.

*Kevin D. Davies,  
Haverfordwest, Dyfed.*

### HELP WANTED

Can anyone supply a set of scan coils for an A37-590X 14in. tube (GEC C1405H)? Coils from a scrap tube or set might do.

*M. Thomason, 7 Cyprus Street,  
Stretford, Manchester M32 8AX.  
061 864 2919.*

Can anyone supply a mains transformer and circuit diagram for the Farnel 12-4D oscilloscope?

*J.C. Bailey, 29 Peal Road,  
Saffron Walden, Essex CB11 3ET.  
0799 24 713.*

Can anyone supply a G11 RGB text interface panel or a complete non-working text G11?

*M.J. Levy, 19 Totternhoe Close,  
Kenton, Harrow, Middx HA3 0HS.  
081 907 3620.*

Can anyone supply a working i.f./chroma/RGB panel for a Thorn 8800 chassis – panel no. is PC856.

*Bob Netherway, G0PDV, 29 Snowdon Road,  
Fishponds, Bristol BS16 2EJ.  
0272 654 230.*

Can anyone supply any of the following? (1) A 12Ω speaker for the Thorn 1591 chassis (the 14in. not the 12in. model). (2) A LOPT for the Crown TV105. (3) A new tuning potentiometer and centre knob for the Ferguson Model 38030.

*Roddy Ballardie, 6 Crofton Avenue,  
Timperley, Cheshire WA15 6DA.  
061 962 8826 (evenings).*

Can anyone supply a LOPT for a Walters monitor, a very recent green-screen type with intergrated diode. The LOPT is black with eight pins in a half circle. A complete chassis would be very welcome. Walters say "we send all our monitors away for repair".

*David C.J. Tilley, 6 West Down,  
Ashtomas, Nr. Tiverton, Devon EX16 4NR.  
0884 820 765.*

Can anyone supply a TDA1104 field output chip for the Panasonic U2 chassis?

*A.J. Fairbrass, 16 Hillary Road,  
Cheltenham, Glos. GL53 9LD.*

Can anyone supply a component layout diagram for the Lecson AP1 stereo amplifier, serial no. 3794?

*R.J. Hartley, 40 Oldbury Road,  
Hesters Way, Cheltenham GL51 0HJ.*

Can anyone supply a circuit diagram for the Fidelity MC6 music centre? The ERT sheets cover only Models MC3 to MC5.

*John B. Davis, 218 Redmayne Drive,  
Chelmsford, Essex CM2 9EX.  
071 739 4800*

Can anyone supply any of the following? (1) A volume on/off knob for the Thorn 1580/1590 chassis. (2) The three front lower control knobs for a Pye 176 (Philips TX chassis). (3) A red plastic cross-cut tuning key for the Decca 30 chassis, and possibly the plastic lid for piano-key conversion (TSW kit).

I still have available moderately priced new multi-caps and droppers for the Thorn 1400 chassis.

*R. Bailey, 51 Robin Gardens,  
Waterlooville, Portsmouth, Hants PO8 9XF  
0705 241 344.*

### SHARP VIEWDATA

It was gratifying to learn from Roy Baines' review of viewdata systems (June) that the supply of in-stock parts by Sharp "is the fastest amongst the major manufacturers". This supply speed is maintained with over ninety per cent of items ordered, including unusual items such as cosmetic parts and those for old models, and is achieved by using an "on-line" system. This prints the picking note as soon as an order has been received, our Parts Centre staff ensuring that all orders received by 4.45 p.m. are despatched the same day by first-class post (or next-day Securicor delivery for larger items).

Since the introduction of the Sharp Viewdata system we have continually introduced improvements to meet customers' needs. Two of the most significant are the look-up section to help with parts identification using the model number and parts description and "part number retry". The first was noted by your contributor, who then commented on the need to differentiate between the letter O and zero. In fact this is not necessary as the part number retry facility processes incorrect numbers by cross-substituting Os and zeros, Is and ones and even such unlikely combinations as Ss and fives until a correct part number can be identified. The system also copes with the omission of hyphens. But the benefit of this feature will not normally be appreciated by our customers who will not be aware that the system has made the correction.

*Kelvin J. Yue, Consumer Products Division,  
Sharp Electronics (UK) Ltd., Sharp House,  
Thorp Road, Manchester M10 9BE.*

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LA7800	£1.80	SL470471	£4.00	TCA270	£1.80	TDA2640	£3.20	TDA4641	£2.80
LA7520	£7.20	SL486	£3.20	TCA880	£2.20	TDA2653A	£3.20	TDA4610	£6.80
LA7801	£2.50	SL490	£3.80	TDA1085T	£2.40	TD42654	£5.70	TDA5510	£6.80
LA7830	£2.80	SL1430	£1.80	TDA1037	£1.90	TDA2655B	£6.60	TDA5850	£2.80
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# Salora K and L Chassis Faults List

Nick Beer and Ian Bowden

A feature of the Salora K and L chassis is the Ipsalo-3 circuit, which was described in the February 1990 issue. The subject of enabling with these sets was covered in the January 1991 issue (though not the L1 chassis). This article lists various fault conditions we've experienced, starting with the K chassis.

## K Chassis

(1) Starting difficulties are generally due to the 8.5V supply reservoir capacitor CB604 (1,000 $\mu$ F, 16V). A 25V version is an improvement where space permits. CB601 can also cause this problem and 1 $\mu$ F in this position (several different values have been fitted) is best. You may have to replace both these capacitors.

(2) For noise and splashes in the picture suspect CB101 which decouples the tuning voltage.

(3) No sound or picture but two bars present on the display. Check whether TB541 (BC557) is short-circuit.

(4) Height and/or width twitches. The LF0059 hybrid Ipsalo circuit control chip HB600 is the usual cause. Can also be caused by a noisy height control (RTB543) or line phase control (RTB542).

(5) No sound or vision. Can be caused by a faulty TDA2579 timebase generator chip (ICB500). When faulty this chip can load the 12V line with the result that the set trips.

(6) Clicking through either or both speakers, sometimes intermittent. First check the enabling (see January 1991). If this is correct suspect ICC230 (MEA2050).

(7) No teletext. Check the enabling. If the display is blank when text is selected and the enabling is o.k. suspect ICG13.

(8) Random channel change and/or other remote control functions. This fault is caused by noise that's interpreted as valid information by the remote control decoder or the control microcomputer chip. Ensure that the Aquadag braiding is securely earthed at the Rimband, on the right-hand side not in the centre. Remove any paint in this area to ensure good contact. If necessary fit the later, longer earth braid (part no. UC3016). In circuits that incorporate ICC200, add a 200pF capacitor between the remote control input and chassis. Try a 220nF capacitor across RC216 and a 1M $\Omega$  resistor across the IR detector diode. Extra screening around the remote control receiver PCB can help. If all this fails, order the modified type.

(9) No results. You will probably find that the chopper transistor TB701 is short-circuit and the chopper supply filter resistor RB703 (22 $\Omega$ , 5W) is open-circuit. The efficiency diode DB707 (OF799) may also be short-circuit.

(10) Intermittent loss of picture and sound, with the channel display pulsing. Remove the text panel to confirm

that the fault has cleared. The usual cause is the text crystal oscillator: replace all the components here (crystal, transistor, capacitors etc.) then recheck. If the fault is still present suspect the DPU2540 chip.

(11) If the display stays in the TV mode when the text button is pressed the 17.73MHz text crystal is probably faulty.

(12) If only the top line of the text display is present and/or there's no text display line lock, check that the text crystal is operating at the correct frequency. If this is all right, suspect the DPU2540 chip.

(13) Dead set with the chopper circuit working but the line output stage heavily loaded: check DB508 (BY133GP) – applies to 90° sets.

(14) Tuning drift is not uncommon. The causes are split 50:50 between the tuner and the microcomputer and memory chips. These two chips should always be replaced as a pair.

(15) Corruption of stored enable data. The symptoms are varied. If they can be cured by re-enabling the set, replace the microcomputer and memory chips as a pair, then carry out the complete enabling procedure. Prior to chip replacement confirm that there's no random noise from the IR receiver and carry out any modifications that may be necessary – see (8) above.

## Large-screen L Chassis

Some of the above faults also apply with the large-screen versions of the L chassis, e.g. items (1), (9), (11), (12), (13) and (14). Specific faults experienced with this chassis are as follows.

(1) Dead set, whistling. Check whether the 18V rectifier DB606 (RGP15) is short-circuit. If it is, the cause could be the TDA1013A audio output chip ICB103.

(2) Dead set, even in standby. The LF0059 hybrid Ipsalo control chip HB600 is faulty.

(3) No sound or intermittent sound is quite common due to failure of ICB103 (TDA1013A). If it goes short-circuit it will load the 18V rail – see (1) above.

(4) Sibilance has been a problem, especially with sets fitted with FS tubes. Later sets have a larger, deeper Mitsubishi type speaker which overcomes the problem. Ordering the later type and fitting it in place of the original silver and black Philips type provides a cure.

(5) Set dead, runs in standby but there are arcing noises when the set is switched on. Check all the capacitors in the line output stage, especially the flyback tuning capacitors CB507 (15.5nF), CB511 (51nF) and CB512 (68nF).

(6) For intermittent loss of tuning memory or intermittent

scrambling of the memory, replace the SAA1293/4 microcomputer chip and the MDA2061/2 memory chip.

### Small-screen L Chassis

The small-screen L series sets are fitted with 14 and 15in. tubes. One or two of the faults already listed apply, e.g. (14) and (15) under the K listing and (5) under the large-screen L chassis listing (CN15 and CN18 are the tuning capacitors). Other faults we've had are as follows.

- (1) No go. One half of the main switch open-circuit.
- (2) No go, whistles in the run and standby modes. Check that the 22V supply is present – it usually is. The more likely fault is that the osc. start rail is low at about 5V because the 12V zener diode DN17 is leaky or short-circuit.
- (3) Start-up problems. As with the other chassis the 8.5V supply reservoir capacitor goes open-circuit. This time it's CN10, again 1,000 $\mu$ F, 16V.
- (4) No teletext. Check the enabling (January 1991) – bit 7 should be at one for teletext operation. If this is in order suspect the SAA1293 microcomputer chip ID01 or the MDA2061 memory chip ID02 – we've had them both go. If bit 7 can't be correctly enabled, these chips may both be at fault.
- (5) Intermittent or no sound. Faulty headphone socket. If this socket is used, always fit a Salora supplied jack plug to the lead/phones.
- (6) Remote control unit intermittent on some keys. Worn contact mat or PCB in handset.
- (7) Front panel controls doing the wrong thing. Replace the SAA1293 microcomputer chip ID01 and the MDA2061 memory chip ID02.
- (8) No muting on channel change (plops on sound and vision). The muting bit in the enabling option byte is incorrectly set, possibly because of a faulty microcomputer or memory chip or because of scrambling due to IR noise – to cure the latter add a 2,200pF capacitor between the IR input to the microcomputer chip and chassis.
- (9) Intermittent failure to start and cutting out with high beam current on battery operation: change RN06 to 2.7k $\Omega$  (was 5.6k $\Omega$ ) and CN13 to 2.2nF (was 22nF), and replace RN07 (82 $\Omega$ ) with a 1S923 diode (DN20), anode to the 8.5V rail.
- (10) Intermittently scrambles the memory, particularly in a caravan or in areas with strong fluorescent lighting: add a 2,200pF decoupling capacitor between the IR input to the microcomputer chip (pin 12) and chassis.

### Optional Teletext

Optional teletext could be fitted to all these sets except the non-remote control 14in. L chassis model. When text is fitted to 15L sets the breakout link in the remote control handset must be removed. This is done through the battery compartment. What can happen is that the set comes into the workshop without its own handset and one from a non-text set won't operate it when tried. If the handset is

subsequently used with a non-text set, or text is removed from the set, it's advisable to solder a bridging wire across the two contacts formerly connected by the breakout to prevent accidental text-button use causing channel-change lockout.

Teletext and the 12/24V battery kit are usually fitted in the optional-feature box, at the bottom of the set. With Luxor sets there's an option to fit the text unit inside the set, supported by two brackets that sit on two of the back fixing ferrules. A kit allows similar fixing in Salora models.

On the teletext circuits in general, the main problem we've encountered is flashing or flickering characters on the text screen due to a faulty TDU2732 chip. Other faults are listed above.

### An H Chassis Fault

Finally, while on the subject of Salora sets, here's a fault we've occasionally had with the non-remote control version of the H chassis. Hum occurs when one of the three 33k $\Omega$  resistors between the 142V h.t. line and the 33V supply goes high in value.

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## Latest Servicing Books

U-View has published the latest work in its series of circuit diagram manuals. The new edition, *Video Servicing 1989-90*, covers some 227 models in two volumes. These books are of the same size as the previous ones, but the circuits are larger, with clearer definition. All the main manufacturers and many of the economy brands are represented. For a general servicing workshop it's a great boon to have to hand information relating to the economy brands such as Orion, Matsui and Saisho. Although one might prefer to deal with only the longer-established manufacturers, I find that over fifty per cent of the VCRs we handle nowadays fall into the economy category. For someone who has yet to start servicing these, the availability of the information in this book might make it a good time to start – the work can be very lucrative.

The circuits in these books are printed on A4 pages that fold out to A3 size. This makes it easier to trace through the circuits. The surface of the paper is glossy, so greasy marks can easily be wiped off. Greater emphasis has this time been placed on exploded views of the mechanics, and some details on mechanical setting up are included. Although the title of the work is "1989-90", it's helpful to have some circuits for models not covered in previous editions. This is part of the reason for the work being in two volumes, each weighing some 5.5kg.

In comparison with the cost of purchasing separate manuals for all the models covered, these books represent excellent value for money. Presented as they are with a cross-reference index, they provide an invaluable addition to anyone's technical library.

U-View also publish similar servicing manuals covering TV sets, and have in preparation a book that will deal with all the well-known satellite TV receivers. You can obtain the books for £138 from U-View, 29 Warmsworth Road, Doncaster, South Yorkshire DN4 0RP (telephone 0302 855 017, fax 0302 855 267). U-View has a colour leaflet available providing more details. The books can also be obtained from suppliers such as SEME Ltd. and Charles Hyde and Son Ltd.

**Mick Dutton**



# Test Report: TV Surround Sound

Ian Martin

Dolby Stereo, which is not to be confused with the better known Dolby noise reduction technique, is an audio recording/playback system that's used by the motion-picture industry to provide multi-channel sound. This normally consists of conventional stereo, i.e. front left and right channels, plus a centre channel and rear channel(s). The purpose of the centre channel is to "fix" the sound within the picture, something that's especially useful in a cinema where the left- and right-channel speakers are far apart. The rear channels carry ambience and sound-effect information, with a much greater degree of accuracy than a simple surround-sound system can provide. Using information extracted from the two front channels, moving background sounds can be accurately "steered" to the correct position. The result is an audio environment that not only surrounds the viewer but also retains the spatial relationship of the recorded sounds accurately.

Dolby ProLogic is a more sophisticated version of this system, providing an even greater surround-sound effect. It's compatible with Dolby Stereo, and indeed with ordinary stereo and mono signals. Processing is usually available to create pseudo-surround signals if desired when the original signal source does not provide surround sound. Conventional stereo and mono systems simply ignore the Dolby Stereo and ProLogic surround-sound signals.

The good news for viewers and listeners is that Dolby Stereo and ProLogic encoding can be carried by a simple two-track system such as a stereo videotape or a Laserdisc. Furthermore the signals survive the broadcast transmission process, and as a result are available with many terrestrial and satellite TV programmes. It's possible to reproduce Dolby Stereo/ProLogic sound in the home using only four audio channels, a phantom centre channel being created by splitting the centre signal and feeding half to the left and half to the right channel. Space and budget permitting, you can of course go for the full five channels. Fig. 1 shows some possible domestic speaker arrangements.

As a result of the growing interest in obtaining this high-quality sound, a number of products aimed at the home user are beginning to appear on the market. Known as "AV amplifiers", these link the TV and audio systems together as a home entertainment system. They should certainly be of interest to *Television* readers.

## The Pioneer VSA730

One such product is the Pioneer VSA730 ProLogic amplifier. This is a powerful five-channel amplifier (three 60W r.m.s. front channels and two 15W r.m.s. rear channels) with Dolby ProLogic and several other enhanced-sound modes for creating a studio or stadium ambience. It uses variable reverberation delays and responses, many of which can be customised and stored in a memory. In addition the amplifier provides input selection from five AV and five audio sources and enables different sources to be dubbed and monitored simultaneously. Bass and treble controls are included, along with a complex balance control for all five channels. Should technofear strike, a bypass switch does just that and you are left with good old plain vanilla stereo, with a flat frequency response and no acoustic enhancements. The infra-red remote control system has full control over all

these functions and is also able to learn the functions of other handsets. It might sound rather a nightmare to operate, and I must admit that I've still got a lot to learn, but basic use is straightforward. The biggest problem for the newcomer lies in connecting it all up. This is where it really helps to be an enthusiast.

All ten audio and video inputs are via RCA-phono sockets, as are the two VCR recording and the two audio cassette tape outlets. A phono monitor (video only) socket is also provided. Unfortunately there are no S-VHS connectors. Binding posts are provided for the front and centre channel speaker outlets while snap connectors take care of the lower-power rear channels. A remote control bus output is fitted so that other Pioneer products that use the "SR" bus, such as the CLD1540 Laserdisc player, can be controlled.

## Typical Installation

As an example of the VSA730's use, Fig. 2 shows my own installation. In practice connections will vary depending on the combination of equipment used. It's essential to have a TV set with a monitor output, otherwise it will be impossible to feed the TV sound to the AV

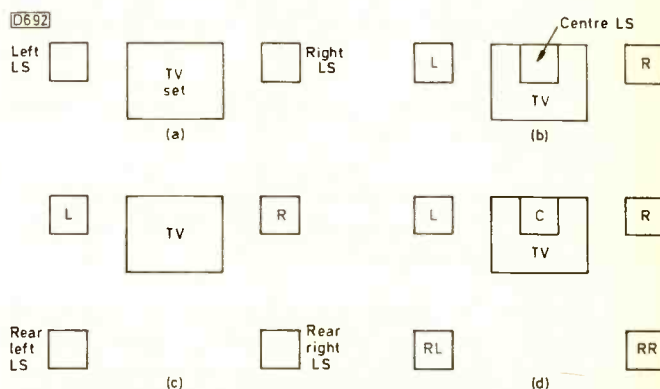


Fig. 1: Typical domestic speaker arrangements for stereo and surround sound. (a) Two-channel stereo. (b) Three-channel Dolby Stereo with a true centre channel. (c) Four-channel Dolby Stereo with a phantom centre channel. (d) Five-channel Dolby Stereo with a true centre channel.

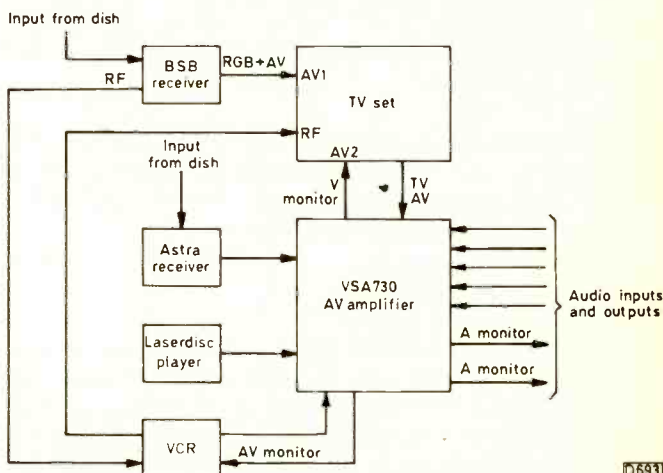


Fig. 2: AV connections to the Pioneer VSA730 AV amplifier used by the author, shown simplified.

amplifier. Likewise it's useful to have a TV set with one or more AV inputs, as it's desirable to be able to feed the selected AV signal from the amplifier back into the TV set, for example when viewing a Laserdisc routed via the AV amplifier.

Since the AV amplifier doesn't have RGB inputs I connected my BSB receiver to the TV set's AV1 input. The VSA730's monitor output was taken to the TV set's AV2 input. The Astra receiver, Laserdisc player and VCR were then connected to the AV amplifier's inputs along with other miscellaneous audio equipment. As a result it's possible to feed the TV and BSB signals, as composite video, through the AV amplifier and, by selecting AV2, to view the outputs from the Astra receiver, Laserdisc player or VCR. It's also now possible to record the Astra receiver's output while for example watching the output from the Laserdisc player. This is not as confusing as it may sound, because the VSA730's large display includes an input and dubbing display that indicates the signal routing.

### Remote Control

One of the most convenient features is to be able to sit in your favourite chair and adjust the volume and balance remotely. As an aid to setting up the correct balance an internal pink-noise generator enables each of the speakers to be "shushed" in turn. I found that the remote control handset is a little too large for comfortable use however. Furthermore most of the keys are multi-function ones. It was a little difficult for me to get used to the unit as I already have a Pioneer CU-AV100 learning remote control handset which has a different and possibly more logical key layout and is already pre-programmed for the VSA730. Further the VSA730's handset didn't operate the Pioneer Laserdisc player's chapter search functions correctly, although the older learning remote control unit does. It was possible to learn the correct commands, but not to replace the incorrect ones. As a result of all this, the new remote control unit has not yet had much use.

The amplifier's large fluorescent display is essential for keeping abreast of what's going on. When static it displays the name of the input source, the monitor output source, the surround mode, the tone control settings, the reverberation delay time and the current preset memory selection. When balancing the speakers, left/right balance is indicated by a centre cross that moves accordingly, while front/rear and centre balance are indicated by a -dB display. The default setting will probably be all right unless your room is a peculiar shape. In any case you can store several preset conditions in the memory. Additional features enable you to switch on/off independently the front, rear and centre speakers and also to change the centre speaker mode from normal to "wide" or "phantom" (for when there's no centre speaker).

### Results

In use, the Dolby effect is very apparent. During the opening sequence of *Back to the Future*, ticking clocks can be heard from all round the listening position - left, right, front and rear! When watching movies with a large centre-front dialogue content sudden effects coming from behind can be quite startling. Digital Laserdiscs, Nicam and BSKyB digital audio from the Marco Polo satellite provide very impressive results. The sound quality with Sky Movies varies a lot however, from excellent in *Mississippi Burning* to very poor with some other features. I had to turn the Dolby sound off with *Police Academy 6*, as launderette-

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# TELEVISION

## ● THE B AND O 39XX SERIES

Bang and Olufsen have a reputation for sophisticated sets full of innovation. The 39XX series is no exception and could be a bit of a mystery without a helping hand to guide you through its operation. Quite complex signal switching is incorporated, and there's microcomputer control. As usual B and O have designed their own chopper power supply. While following conventional practice there's an unusual powerfail loop system, controlled by the microcomputer chip, to shut the set down in the event of excessive loading. The remote control system involves a transceiver in the set, enabling it to communicate with a master control panel. The deflection system incorporates a TDA8432 picture geometry chip, a still display module to ensure stable menus whether or not the deflection is synchronised, and interlaced/non-interlaced operation. In the non-interlaced mode the odd and even fields are superimposed: this mode is used for stationary displays such as teletext.

## ● THE MINI DISC

Sony's recently announced mini disc audio format is due for UK launch late next year and is expected to have a considerable impact on the consumer electronics market. The 2½in. opto-magnetic discs store up to 74 minutes of digital sound and are erasable so that they can be used like audio tape. George Cole describes the system and the techniques used.

## ● STETHOSCOPE FAULT FINDER

A high proportion of faults nowadays are of the intermittent type, presenting great problems when it comes to fault diagnosis. P.J. Ratcliffe has found that an "electronic stethoscope" can be a great help. It consists of an audio amplifier, headphones and a d.c. bias.

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type sound "effects" were present throughout the movie. The surround-sound signals with some videotapes and Laserdiscs seem to miss out randomly, though these tend to be the older titles. The general rule appears to be "if it says Dolby Stereo, it is: if it doesn't, it could be".

### Conclusion

To sum up, the Dolby Stereo/ProLogic facility is well worth having if you want to hear movies in their original

"cinema" form and to enhance all other musical sources. To this end the Pioneer VSA730 does the job well.

The biggest headaches are in connecting everything up and, especially, in placing the speakers. Most TV sets tend to live in corners, which don't lend themselves to good, open, symmetrical sound. Perhaps the biggest question is whether people will be willing to rearrange their living rooms to get the best from the sound. Getting permission from the missus to spend the money is one thing, getting permission to move the sofa is another problem altogether!

## Servicing the Ferguson FV31R

J. LeJeune

When Thomson of France took over Ferguson it was inevitable that Ferguson products would start to reflect the new ownership. This was evident with the FV30B, FV31R and FV32L series of VCRs. Although the introduction of the FV30B was beset with various difficulties, now seemingly resolved, all three machines have given a good account of themselves in the field. The power supply trouble that afflicted the FV30B (see *Television* July 1990) doesn't seem to have been present to the same extent with the other two models, and apart from two or three fairly common ailments the machines have performed well. Perhaps the biggest problem has been the customers' inability to understand the user's instruction manual, something that's beyond the scope of the present article.

### The Power Supply

Let's grasp the nettle and begin with the switch-mode power supply, which shares a PCB with the servo system. My July 1990 article on the FV30 covered its operation in some detail, but for the occasional reader a brief description follows.

Fig. 1 shows the mains input and chopper circuitry. The power supply provides six outputs and also acts as a mains-isolation barrier. Note that a small spark can sometimes be seen when the recorder is connected to an earthed-braid aerial, and that a slight "sensation" can be experienced when you rub the back of your hand or a bare arm along the machine's metal case. These are quite harmless: they are caused by switching-frequency currents flowing to earth via the capacitance of the transformer. Similar effects can be experienced with most isolated-chassis TV sets that use a high-frequency chopper circuit.

The outputs are at 12V, 6.5V, 16V, 30V, -22.5V and -25V, derived from secondary windings on the chopper transformer LP40. We're not this time showing the MC34060 chopper control chip IP60 which contains an oscillator and a comparator circuit, providing a variable mark-space ratio squarewave output to drive the chopper circuit. Its comparator is fed with a potted down sample voltage derived from the 12V rail and a 5V reference voltage derived from the 30V rail. The circuitry was shown in Fig. 2, page 697 of the July 1990 issue. As IP60 obtains its supplies from the secondary side of the chopper transformer, a start-up oscillator is required on the primary side of the circuit. TP16 and TP17 form a relaxation oscillator that serves this purpose, bringing the power supply to life at switch on. The half-wave rectifier DP11 charges CP14 via RP12 to provide the oscillator with a small supply. Similarly CP38 is charged via RP11 to provide a start-up supply for the amplifier transistor TP28 and the complementary-symmetry driver transistors

TP32/3. The start-up oscillator's output is fed to the base of TP28 via CP18 and RP28.

Once the power supply starts up, the 12V line is established and IP60 comes into operation, pulling the start-up oscillator into synchronisation via CP16. IP60's output is coupled to the primary side of the circuit via transformer LP52, which provides mains isolation. DP38 then increases the voltage across CP38 to around 11V, this supply taking over from the feed via RP11. TP01 switches on, dumping the supply to the start-up oscillator: DP21 turns on to disable the oscillator itself. The drive via LP52 is now applied to the base of TP28 via CP27. When the output reaches full power the comparator in IP60 receives its sample input from the slider of PP57. This potentiometer should be adjusted slowly while monitoring the 12V supply at test point BP08.

TP24 and TP26 form an excess-current trip.

The d.c. outputs are distributed to the servo circuits, the signal board and the timer/operation board. Some of these supplies are applied directly, others pass via transistors that act as switches controlled by the operation circuit. The switching system used in the FV31R is shown in Fig. 2.

The base of TP77 is biased from the -25V rail via the network RP93/RP77/DP61. In this state TP77 is non-conductive. When the tuner or E-E mode is selected, pin 7 of connector BP05 changes from an open-circuit state to 5V. Thus DP61 turns off and TP77 switches on, in turn switching TP75 and TP73 on to provide 5V, 9V and 12V outputs to the signal board and 12V to the servo system. When any deck function is required, pin 1 of BP05 goes high and TP71, TP72 and TP70 switch on, the latter supplying 16V to the servo system for full operation. Note that TP71's base bias is provided by TP73 via RP80.

Failure to operate should be tackled by first ensuring that the voltages required for full operation are available from the supply. If none of them are present the trouble will be in the chopper circuit. If some are present but others are not, check the switching transistors as appropriate. Check that BP05/7 goes positive in the tuner and E-E modes and that BP05/1 goes high from 0V when any deck function is selected.

Trouble in the chopper section is likely to be either simple or catastrophic, the latter identified by a blown mains input fuse (FP01). In this case the cause could simply be a faulty diode or two in the bridge rectifier, but more often the chopper transistor TP37 goes short-circuit. As this is usually between its collector and base, it's an even bet that TP32, TP33, TP28, TP26 and TP24 will have been destroyed. It's also worth checking all the associated diodes. The reasons for failure of TP37 are not always clear, but check RP08, DP08 and CP08 and the print around them. Then go to RP26 which should be 2.55kΩ. If

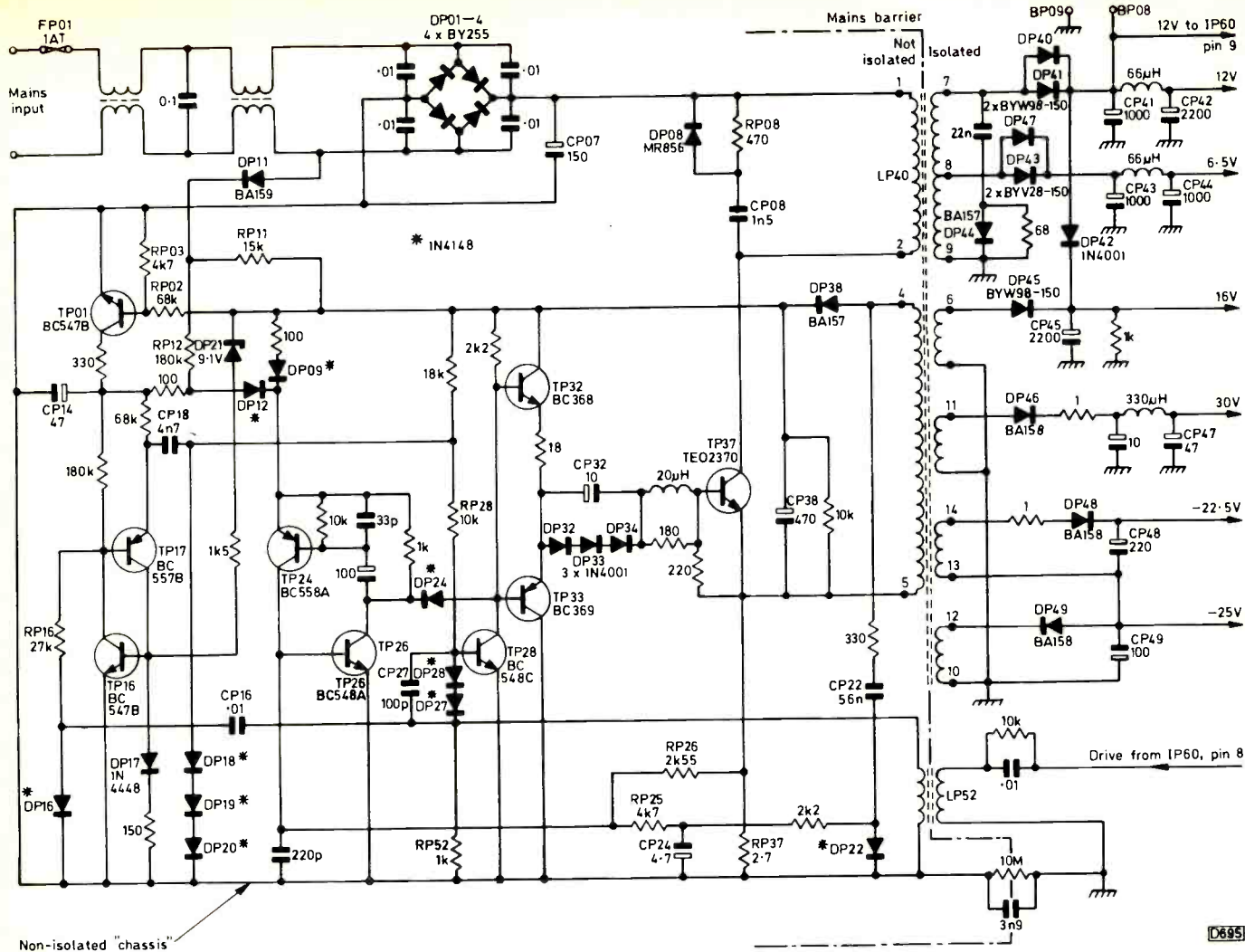


Fig. 1: The chopper power supply circuit. IP60 (not shown) on the secondary side of the circuit provides a variable mark-space ratio drive that's coupled to the primary side via isolating transformer LP52.

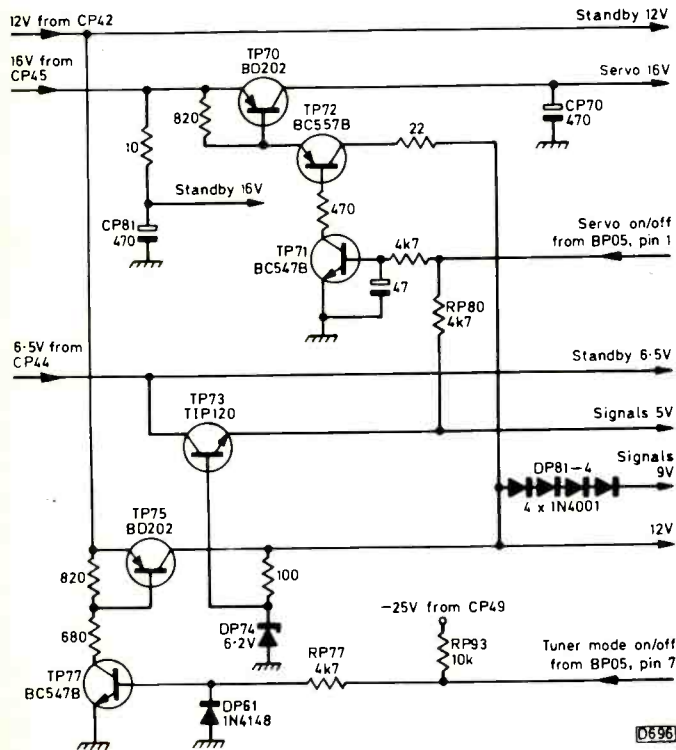


Fig. 2: The power supply switching system.

it's 2.87kΩ, order a 2.55kΩ resistor from Ferguson: the lower value increases the sensitivity of the over-current trip, giving better protection to TP37.

### Servo Section

In my experience the FV31R's servo systems operate with almost total reliability. The EF6801 U4 DTD 243 microcomputer chip used here, IT01, also handles the mechacon functions, so there's no separate mechanism control section. Drum rotation is detected by an optical sensor on the lower drum assembly. Fig.3 shows the arrangement of the light interrupter. No "digital" transistors are used and the design is a straightforward one. There's only one mechanical switch on the deck, the record safety switch, all other sensing being done by optical means.

As with other mechanisms of Japanese origin, the functions are controlled in part by a mode-control assembly that consists of motor-driven cams and a photo-interrupter. To check out this system, start with the 16V and 5V supplies, then the mode sensor LED and photodiode, and after that the mode motor control chip IT55 and the cassette housing detector inverter transistor TX01.

The right and left reel sensors have given trouble in this machine, the cause being dry-joints. Check for take-up reel sensor signals reaching pin 13 of the 74HC14 parallel-



to-serial converter chip IT68 and supply reel sensor signals reaching pin 11. If these signals are present, check for supply and take-up signals at test points BT13 and BT14 respectively.

Setting the head-switching point is simple. Connect test point BT16 to chassis for about one second while playing back the MH-2 test tape staircase pattern. To confirm that the setting is now correct you can connect a scope to test point BW10, triggering its sync from BW11. The switching point should occur 6.5 lines before the start of the field sync pulse.

## Mechanism

The cassette housing assembly is conventional and straightforward. It's secured into the machine by two screws at the front corners, clipping into the chassis at the back. To operate the deck with the housing removed, leave the assembly connected to the machine, load a cassette, cover the end sensor with black tape and ensure that the start sensor is blocked by the cassette. Light from the start and end sensor infra-red illuminating LED is passed into the cassette by a light guide.

The lower drum assembly can be removed complete with the loading-arm guide track ends and V blocks. Take out three screws and the unit will become free: a further three screws will release the guide track and V blocks. A single photo-interrupter produces the drum FG and pulse signals (see Fig. 3): don't interfere with the positioning of the transparent housing. Upper drum replacement is easy: the red and brown terminal feedthroughs match the leadout wires.

The capstan motor assembly is also held in place by three screws, which are spaced around the bearing. The drive circuitry is on a thin-film printed circuit that's mounted on the motor frame along with the FG pickup. If the unit is defective it should be replaced as a complete item: it can't be repaired. As mentioned before, only one mechanical switch, the record safety switch, is used in this deck, all other switching functions being opto-electronic. The operation switches on the front panel are of the buckling-steel membrane, or "oilcan", type.

The deck terminal board is released after removing another three screws. It carries links to the mode control motor and the record safety switch, also the capstan brake solenoid, the feed and take-up reel sensors, the mode

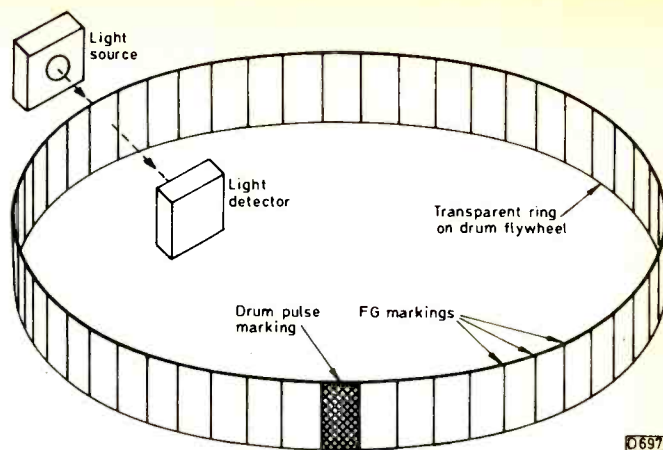


Fig. 3: The drum FG and pulse photo-interrupter.

control sensors and the infra-red LED for the start and end sensors. A 16V supply is fed to the board via pin 8 of the plug. After removing this board you may find that the capstan brake is free and will possibly come adrift from the assembly. A peg on this brake fits into the curved slot in the board.

Back tension is specified as 30-45g/cm. I recommend setting it to the lower rather than the higher figure, adjustment being by means of a black, crosshead peg. Care is essential when handling the tape-tension arm: ideally, cotton gloves should be worn if it has to be touched, as moisture from the fingertips has a bad effect. Careful back-tension adjustment will ensure long video head life.

The simplest solution to the problem of retrieving a cassette when you have a dead machine with one fully loaded is to disconnect the mode control motor's supply leads then supply the motor with 6V from a battery or bench power supply. The machine can in this way be made to unload the tape from the drum. You can wind the cassette housing up to the full eject position by hand: turn the pulley and belt that form a reduction drive from the cassette motor.

In normal use only occasional maintenance will be required. Keep the tape path clean and free of dust and lint. Make sure that all rollers are clean and rotate freely, and that the pinch roller is parallel with the capstan shaft. Ensure that with the tape loaded to the drum the loading arms come to rest in the V blocks tidily.

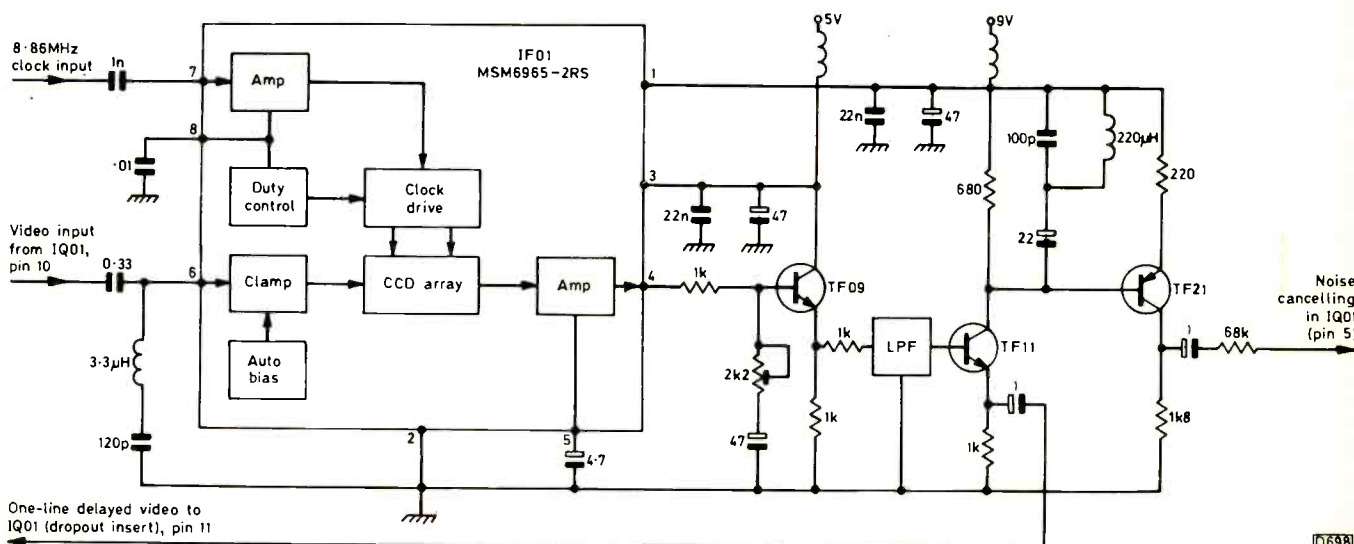


Fig. 4: The CCD delay line arrangement used in the dropout circuit.

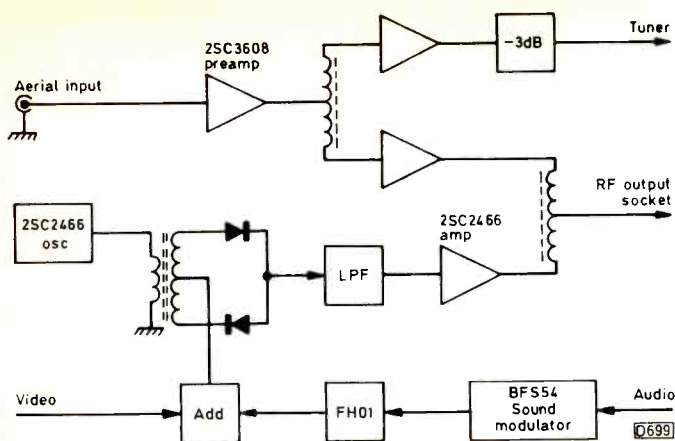


Fig. 5: The modulator and splitter system.

The surfaces of the full erase and audio/control pulse heads should be cleaned using an approved solvent such as isopropyl alcohol. Give the same treatment to the guide rollers, the capstan shaft and the tape-tension arm end that's in contact with the tape. Clean the drum with a chamois leather moistened with a suitable cleaning agent. Scrub the head gently to and fro in the plane of rotation, applying just enough pressure to feel its profile. Try not to touch the drum surfaces that are in contact with the tape as grease and moisture from the skin can attract dirt and are frequently corrosive. Cotton gloves are a wise precaution.

## Signal Circuits

The signal board is the large one that covers the deck. It lies across the top of the machine with the copper print uppermost, carrying the tuner, the i.f. section, the head amplifiers, the YC processing circuitry, the audio and bias/erase oscillator and the test-signal generator.

The tuner/i.f. section is conventional, using well-known chips such as the TD6316AP for the tuning loop, the TDA2541 i.f. chip and a TDA120T for the intercarrier sound. The record/playback circuitry is also straightforward, the chips being widely used types. A fair number of transistors are employed in the signals processing sections and there are some interesting innovations. For example a charge-coupled device that's clocked at 8.86MHz (see Fig. 4) provides the one-line (1H) delay for the dropout compensator: changeover switching from direct to delayed video is carried out by IQ01 which receives a drive pulse from the dropout detector in the f.m. amplifier chip IQ40. The TA7772P head amplifier chip IQ80 contains individual recording and playback amplifiers. Head switching on playback only is carried out in IQ80, controlled by a drive signal from the drum FF line.

The full erase voltage at the head is 40V peak-to-peak at 70kHz, the head being driven directly from a tap on the oscillator transformer. The audio erase head is driven in the same way. Potentiometer PS06 adjusts the audio bias level: it should be 2.4mV r.m.s., monitored across BS04 and BS05 (chassis). The audio record amplifier incorporates A.L.C.

For loss of the E-E signals it's worth checking TT06 (BC558B) and coil LT03.

## Timer/display/operation Panel

The 64-pin HD614081S SA 37 microcomputer chip IK60 presides over the timer/display/operation panel. The M8716AB1 chip IK25 provides a real-time clock signal at

128Hz by division from a 32.768kHz crystal – the type used in digital watches. Keyboard commands are fed to IK60, which provides drives for the fluorescent display and the operation LED indicators. It supplies the on-off monitor and on-off servo control voltages for the power supply switching transistors at pins 27 and 26 respectively. Communication between IK60 and IT01, the microcomputer chip in the servo section, is via a data bus which also feeds tuning information to the signals board. The output from the SL486 infra-red receiver goes to IK60's interrupt pin 22.

## Remote Control Unit

The remote control unit is rather a handful, the presentation being of the landscape variety. It performs well however, handling like a calculator or electronic organiser. Timer programming can be done via the handset, which holds the programming in its memory for subsequent transfer via the IR link to the memory in the recorder. The 80-pin M34201M4 chip IB01 runs at 400kHz: its full potential is not used in this model. A customised LCD display is used, designed to complement IB01. A second crystal oscillator runs at 32.768kHz, operating as a real-time handset clock. The pulse output from pin 18 of IB01 drives three LEDs which are powered at 4.5V, the supply to the rest of the circuit being at 3V.

## Modulator and Splitter

The aerial input is fed to a single-stage preamplifier that uses a grounded-emitter 2SC3608 transistor. This feeds a two-way splitter which drives two further stages, one for each output. The first output is attenuated by 3dB and is then passed to the tuner. The second output is passed to the r.f. output socket via a transformer in which the machine's r.f. output is combined with the off-air signals. The modulator employs a 2SC2466 transistor arranged in a tuned-line Colpitt's oscillator circuit: the oscillator's output is modulated by the video signal in a diode-bridge system. The audio subcarrier is generated by a BFS54 transistor in an oscillator circuit with a varicap diode for frequency modulation. The 6MHz f.m. output is filtered by FHD01 and is then mixed with the video input to the diode bridge. The resultant carrier plus subcarrier go via a low-pass filter to a 2SC2466 ground-base amplifier then to the signal combining transformer. The modulator requires video and audio inputs both at 1V peak-to-peak. Separate 12V supplies are fed to the modulator and the amplifier/splitter sections as the machine can be used in the E-E mode or in a tuner mode as a remote controlled channel selector for a non-remote control TV set without the modulator being powered. Fig. 5 shows the general arrangement.

## Tailpiece

The circuit diagrams in the manual are clear and well laid out, but there are one or two errors, notably "CRT WRIGHT" at pin 33 of IT01 – this should be "CTRL WRITE". At video training courses you often hear it said that ninety per cent of VCR faults are mechanical: this certainly seems to be true of the FV31R and its sister machine the FV32L. Their electronic circuitry is uncomplicated and reliable, even taking into account the notorious switch-mode power supply. The main problem presented by the power supply is not the fact that it goes wrong occasionally but that servicing is a stressful experience when this does occur.



# CD-I Update

George Cole

The second Compact Disc Interactive (CD-I) conference was held at the Royal Lancaster Hotel, London at the end of May. CD-I is the "Multimedia" version of the audio compact disc: CD-I discs store a mix of sound, video, text, graphics and animation, all under the control of the user (hence "interactive"). It's intended as a consumer product, the CD-I decks looking like ordinary CD players and plugging into existing domestic TV sets and hi-fi systems. Operation is controlled by a remote handset. The CD-I format is supported by Matsushita, Philips and Sony. For details of the system parameters see page 454 of the April 1990 issue of *Television*.

The news that CD-I is to be launched in the USA this autumn and in Europe next year added an air of excitement to this year's conference. For CD-I to succeed as a mass-market product it will need a good range of attractive software. Philips is well aware of this and has been busy making arrangements with numerous publishers and software developers. For example Philips and Maxwell Communications have formed a joint venture called Maxwell MultiMedia which plans to launch a series of CD-I language learning discs next year. The Japanese CD-I consortium now includes some two hundred hardware and software companies. A European CD-I consortium was announced by Philips, consisting of TV companies, software houses, hardware companies and publishers. Members include Maxwell Communications, Central Television, Pearson (publisher of the *Financial Times* and a member of the BskyB group), Carlton Communications, Bartelsmann and Elsevier.

Philips Interactive Media Europe has been formed to strengthen CD-I publishing in Europe. With an HQ in London, there will be subsidiary companies in France, Italy, Benelux, Spain, Germany and the UK. A publishing deal has also been signed by Philips with the Japanese games giant Nintendo, the plan being to put games on to discs that can be played by a low-cost CD-ROM XA (CD read-only memory with extended architecture) player or a CD-I deck – see "bridge discs" later.

There was a lot more software around this year, with a definite emphasis on electronic pin-ball games and even a CD-I version of *Battleship!* There were also analogue Laserdisc titles that have been transferred to the CD-I format. One of the best examples was *Harvest of the Sun*, about the life and works of Van Gogh. The Time-Life

Photography disc puts a series of ten books on to a single CD-I disc: it contains information about cameras, film and techniques, enabling you to practice taking shots without film while seeing the results instantly on the TV screen.

A number of companies plan to launch "CD-I ready" discs. These will contain a mix of CD audio tracks (called "red tracks" after the colour of the CD digital audio standards book) and CD-I material like pictures, text and lyrics (known as "green tracks"). Users will be able to play the discs in the normal way with an ordinary CD player but will need an additional CD-I player to see the green tracks. Philips' US software firm American Interactive Media (AIM) showed several CD-I ready discs, including titles recorded by Louis Armstrong and Pavarotti.

The first CD-I ready disc in the UK was made for ICI by Epic. It's a promotional disc for doctors, containing CD-I material on a drug used for treating high blood pressure. The disc also contains several conventional CD audio tracks. Philips has produced a professional CD-I golf package for European golf clubs.

## Format Extensions

Three CD-I format extensions were announced by Philips. The first is that CD-I players will incorporate a full-motion video (FMV) system approved by the Moving Pictures Expert Group (MPEG), which was set up by the ISO/IEE. MPEG represents a world standard for motion video: the approved system uses a video compression algorithm known as discrete cosine transform (DCT). A number of microchip manufacturers are to start producing cheap MPEG chips in large quantities but these won't be available until the year end at the earliest. Thus the first players, to be launched in the USA, will be referred to as "FMV ready": the players will have a small slot at the back for a plug-in module that can be inserted by the user. According to Philips there's no policy on how retailers charge for the FMV chipset – some retailers may include it in the initial purchase price, others may not. It's hoped that FMV chips will be in good supply by the time that CD-I reaches Europe next year.

The second format extension is Photo CD, a format developed by Philips in conjunction with Kodak. It enables users to store up to a hundred 35mm photographs on a disc and watch them using a TV set as a monitor. All CD-I players will be able to play Photo CD discs. The third extension is that CD-I decks will also be able to play CD-plus-graphics discs which store simple graphics and text on an audio CD.

## Hardware

The first consumer CD-I player, Model CDI910, will be sold in the USA by Philips under the brand name Magnavox. The machine displayed at the conference, see the accompanying photograph, looks like a conventional CD player. It can handle 3 and 5in. audio, CD+G, Photo CD, CD-ROM XA bridge and CD-I discs. Remote control is employed and optional accessories will include a mouse, children's controller and IR receiver. The suggested retail price is \$1,400 (about £850) though the actual selling price is likely to be just under \$1,000 (around £650). Initially there will be four categories of software: children's, special interest, music and games. Disc prices are expected to range from \$19.95 (£12.50) to \$59.95 (£38).

The interesting CD-I Discman, of similar size to a conventional portable CD deck, was shown by Sony. Its features include a 4in. LCD screen and mouse control.



A prototype Philips CD-I player, beneath a monitor.

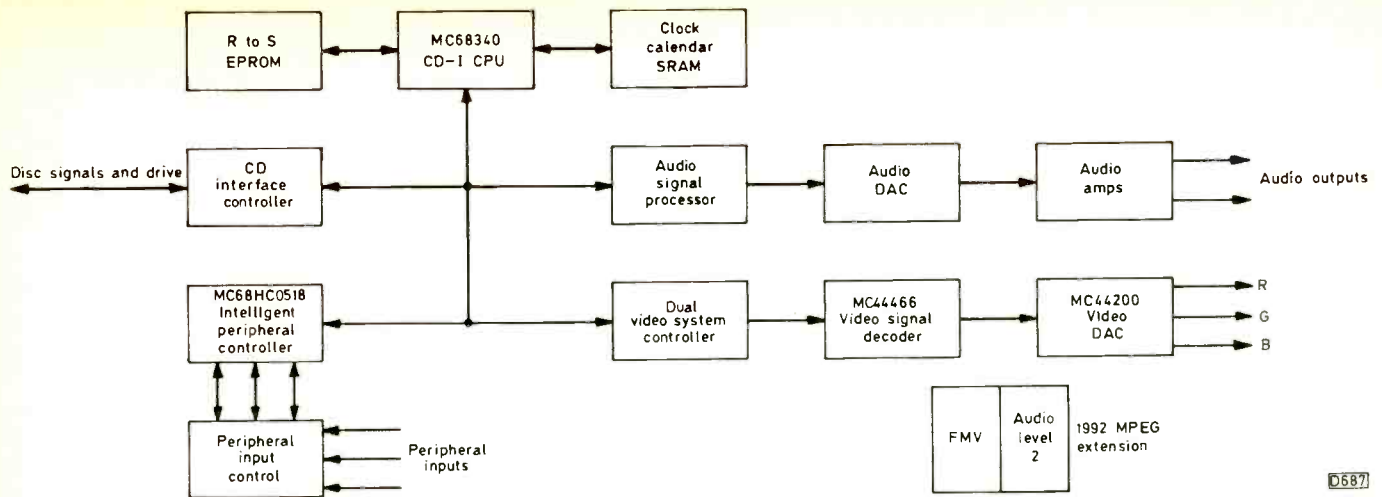


Fig. 1: The basic CD-I chip set at the present stage of development.

Weight without battery is 850g, and the dimensions are 135 × 54 × 160mm. Sony plans to launch the Discman in Japan towards the end of the year. Launches in the States and Europe will follow in mid-1992 and end 1992 respectively. The price should be around £600.

Technics demonstrated a portable CD-I player that was about the size of a midi audio system amplifier. Its front has a central disc slot, power and eject buttons, a headphone socket and an IR sensor. Back connections include a scart socket, phono audio, RS232 and RS422 computer interfaces, an S-video connector plus D2B and a.c. power sockets. No launch details were released.

### Chips

A very interesting talk was given by Ray Burgess of Motorola, the giant US microchip manufacturer that's producing the CD-I player chips. Development of the CD-I chip set is expected to fall into four phases. First is the basic set already developed. The second stage will be the addition of the MPEG chip to provide FMV. Stage three will see a move towards greater functional integration while the final stage should, in 1994-6, see the arrival of the single-chip CD-I player. The aims are to reduce the power requirement, increase the degree of integration, increase the features provided, and decrease the cost and size. This will allow manufacturers to produce small, portable CD-I players and build CD-I decks into desktop computers.

Philips and Motorola first announced the CD-I silicon chip set based on Motorola's 68000 microprocessor i.e. in 1989. All the key items are to be made available to CD-I licensees this year.

Fig. 1 shows the basic CD-I chip set as at present.

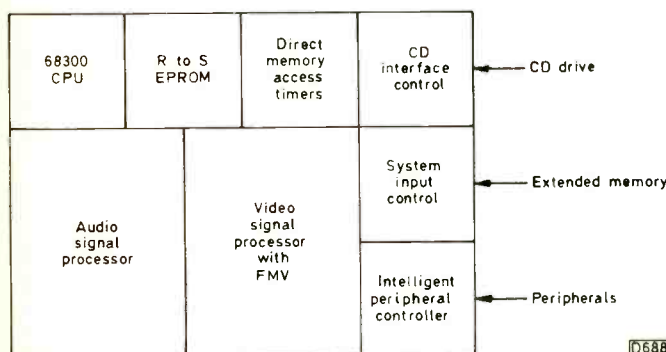


Fig. 2: How a single-chip player is envisaged.

Overall control of the players's operations is undertaken by the MC68340 chip, a dedicated CD-I CPU (central processing unit). It's a 32-pin microprocessor with twin-channel direct memory access (DMA) able to handle data at a transfer rate of 33Mbytes/sec. This provides scope for extending the format at a later date. The audio signal processor (ASP) decodes the CD-I audio signal which employs ADPCM (adaptive delta pulse code modulation).

The MC44666 video signal decoder (VSD) decodes the CD-I video data stream, simultaneously handling two video channels in normal and high-resolution modes and sorting out the interleaving of four video planes. Its video output is in the form of a digital RGB signal which is converted to analogue form to feed to a TV set by the MC44200 DAC.

The MC68HC0518 is an intelligent, programmable peripheral controller that enables the CD-I player to be interfaced with various peripherals such as an IR controller, joystick, disc drive and keyboard.

The final aim, a single CD-I chip, is expected to incorporate around two million transistors using 0.35 micron CMOS technology. Its size should be just over seven square millimetres and the anticipated price is less than \$10 – under £6. Fig. 2 shows the block layout.

Also announced at the conference was a licensing deal between Philips and C-Cube Microsystems: C-Cube will produce MPEG video compression and encoding chips to enable software houses to produce CD-I titles with FMV.

### Bridge Discs

One of the most impressive demonstrations at the conference was given by Graham Brown-Martin, chairman of the Cambridge multimedia company Next Technology. His company has developed "bridge" software that enables CD-ROM XA discs to be played via a CD-ROM drive fitted with an XA card or a CD-I player. This means that users could play a CD-ROM XA bridge disc using a work or school computer connected to an appropriate CD-ROM drive or, at home, a CD-I deck.

The production of bridge discs involves some compromises because CD-I has better sound and picture quality than most desk-top computers. In addition it's not possible to include FMV on a bridge disc, though motion video running at 12.5 fields/sec is possible. Despite this, software developers will be attracted by a system that enables discs to be made for two formats. Next Technology plans to sell bridge software libraries by the end of the year.



# TV Fault Finding

*Reports from Philip Blundell, AMIEE, Eugene Trundle, Ed Rowland, Steve Cannon, Michael Dranfield, K.W. Saxon, Nick Beer, Stephen Leatherbarrow, Roger Burchett and Mick Dutton*

## Philips GR1-AX Chassis

This set was dead with the 95V supply low at 15V. Checks in the chopper circuit showed that the BF487 driver transistor 7614 was conducting excessively – its collector voltage was much lower than the correct figure of 82V. Resistance checks in its base circuit failed to reveal anything amiss, so we decided to try bridging the capacitors here. C2618 (27nF) was open-circuit: it's of the blue plastic block type. **P.B.**

## Philips 2B Chassis (AG06 version)

When this set was switched on it would go to standby immediately and wouldn't come out, either by using the buttons on the set or the remote control unit. As I'd come across this problem before I changed X2402. The set then came on and after tuning in and adjusting the analogue control settings everything was fine. According to the manual you may have to set the tuner options before being able to tune in: it depends on what version of the control microcomputer chip is fitted in the set. **P.B.**

## Sony KVM16TU

A common affliction with this little set is dry-joints at the base and emitter connections of the line output transistor Q802. The effect is no go of course, either intermittent or permanent. **E.T.**

## Ferguson TX86 Chassis

We've had several faults with these sets recently, as follows: (1) Dead set. The TIPL791A chopper transistor TR6 and its TEA2018A control chip IC4 had both failed, as did the replacements. The cause of the trouble was eventually traced to the 1N4001 diode D8 being short-circuit. It's in the current sensing network connected to pin 3 of the chip. Presumably failure of D10 or D23, which are in series with D8, would have the same effect.

(2) Set tripping was the result of the TIPL791A line output transistor TR13 being short-circuit.

(3) Line collapse was caused by a dry-joint on the 330nF line scan coupling capacitor C94. **E.R.**

## Hitachi CPT2198 (G8Q Chassis)

This set was dead and the customer said that the fault had originally been intermittent, i.e. the set would sometimes fail to switch on from cold. Replacing TH902 in the start-up circuit restored normal operation. Note Steve Cannon's comments in a letter on page 406 of the April 1991 issue. **E.R.**

## Hitachi CPT2176

A problem we've had with a couple of these sets is that the tuning information can't be stored. You can tune the set in, but when you try to store the station by pressing the preset button the picture goes off. With the memory chips used in modern sets a negative supply is usually obtained from the line output transformer. With this Hitachi model the supply is -30V and the memory chip is IC1102. We've

found that R772 goes open-circuit: it's a 1.2k $\Omega$ , 0.5W resistor off the line output transformer. **S.C.**

## Panasonic TX21T1

The trouble with this set was that the picture would go off intermittently and the screen would go dark. With faults like this one of the first things to do is to check the voltages supplied to the video processing chip by the contrast and brightness controls. In this set the contrast control voltage should be 1.5V for minimum contrast and 4.3V for maximum. When the fault developed the voltage was low at 1V. Now the chip could have been pulling the line low but we decided to eliminate other possibilities first. The electrolytic C311 seemed a likely suspect and on a recent Panasonic course we were told that it had given trouble. Not this time however: the fault was still present when it had been replaced. Only when C626 was disconnected did the fault disappear. A new 10nF, 50V ceramic capacitor provided a complete cure. **S.C.**

## Zanussi BS665-2

Intermittent failure of the BU508A line output transistor T2E was the problem with this 22in. teletext receiver. The cause was a dry-joint on the line driver transformer TR1E. If you phone Zanussi's technical department about this they will tell you to replace the transformer, but resoldering is usually enough. **M.Dr.**

## Triumph CTV8209

Although this set appears to be identical to the Fidelity F14 the component reference numbers don't match and a lot of the circuitry is different. One set that came in had no sync at all. A scope check at pin 5 of the TDA4503 chip showed that there was no signal here. Line pulses from the collector of the BU508A line output transistor are fed to this pin via the two 22k $\Omega$ , 1W resistors R138/9 and an RC integrating circuit. R139 was open-circuit. If you get the same fault with the F14 check R109 which consists of ten 5.6k $\Omega$  resistors in series. The signal at pin 5 of the TDA4503 chip should consist of a line-frequency sawtooth waveform at approximately 6V peak-to-peak.

Another Triumph set had loss of memory when cold. The fault was difficult to trace without the correct manual. R160 (470k $\Omega$ ) was open-circuit. **M.Dr.**

## ITT80 90° Chassis (Panel CVC824)

This was a nasty one. The screen would flash white, then the power supply would trip momentarily, after which normal operation was resumed for fifteen-twenty minutes. If the set was left running the cycle would be repeated with increasing frequency.

We found that the 122V h.t. line was high at 128V, but setting this to the correct voltage had little effect. Subsequently the line output transformer, the tripler, the chopper and line output transistors and many other parts were changed, all to no avail. The fault was due to flashovers in the tube, proved by connecting the set back-

to-back with another one of the same type, whereupon the fault disappeared. I quoted the customer for a replacement tube but he declined and left the set with me for spares.  
**K.W.S.**

### **Amstrad CTV1400**

These very reliable sets are normally strangers to our workshops. When we do see them they generally need the line driver transformer resoldering (intermittent no results) or simply a clean up of the channel push-buttons. This particular set was more of a problem. The power supply would shut down after approximately three to four minutes. I touched the chopper chip IC502 with a finger but quickly (very) withdrew it: I could now read STR451 on the end! After many inconclusive checks and replacements with no real faults being found the chopper transformer T501 was replaced, curing the problem. It's type RB20826.  
**S.L.**

### **Triumph CTV8209**

This Triumph set is actually the Fidelity CTV14 (later ZX3000 chassis version) in disguise. The fault with this one was a bright raster with flyback lines. We quickly traced the cause to the fact that the RGB output transistors were biased hard on. The zener diode that returns the emitters of the output transistors to chassis was short-circuit. Once this was replaced I was rewarded with a picture that was normal apart from the fact that there was no red content. The red output transistor TR11 (BF869) was open-circuit all ways.  
**S.L.**

### **Sony KV1442**

There was no problem with this set until its owner moved. Attempts at retuning were then made but while the set would search it wouldn't stop on reaching a station. Stop is initiated by feeding back a signal from the a.f.c. circuit to pin 35 of the microcomputer chip. We could detect no change here when a station was reached so we moved back to the tuner panel and the a.f.c. circuit, which is in a screened can. When this was opened we found several suspect joints. After resoldering these the set locked perfectly, even with very weak stations. Note that the a.f.c. functions, the intercarrier sound section and volume control are within a single chip.  
**M.D.**

### **Salora K Chassis**

The customer's complaint was that on occasions the set wouldn't switch on from cold. As h.t. was present at the collector of the chopper transistor TB701 in the fault condition we checked for shorted diodes around the power supply and that the 8.5V rectifier connected to pin 18 of the Ipsalo transformer wasn't open-circuit. A replacement hybrid chopper control chip was then fitted, but still no go. As the 8.5V supply is very critical we checked the 1,000 $\mu$ F reservoir capacitor CB604. It had gone low in value, the result being ripple on the 8.5V line. This was upsetting the hybrid chip.  
**M.D.**

### **Panasonic U4 Chassis**

A severely defocused and overbright picture suggested that there was an internal short in the tube – we've had this before with Panasonic sets fitted with Mullard tubes. This time however the fault was caused by a faulty line output

transformer. There was excessive leakage between the focus and first anode supplies because of spillage which had entered via the rear cover ventilation slots. A new transformer was required.  
**N.B.**

### **Sanyo Digitouch TV Handsets**

I've had a couple of these handsets in which the transmit LED has flashed all the time and the unit didn't work. The cause is dry-joints or broken leg(s) on the ceramic resonator in the handset.  
**N.B.**

### **Feedback on Modifications**

Faced with teletext interference on an elderly 19in. set fitted with the Rank A823 chassis (single chip decoder and a Co-op logo no less!) I decided to try Colin Doman's modification (January 1989, page 175) to the field flyback blanking circuit as it seemed easier to do than other suggestions. I'm pleased to say that it worked very well. This old faithful is now giving excellent results – original tube too.

Since D.R. Bracknell's suggested soft-start addition to the Philips G8 chassis (September 1985) I've modified a number of these sets without trouble. Recently however an otherwise satisfactory G8 with the BY34 power panel refused to start up at all with soft-start added, although it appeared to be o.k. without the soft-start feature and the h.t. could be set correctly. The component tolerances seemed to be such that the control transistor kept the thyristor turned almost off. A quick think suggested modifying the panel to the GEC version, but a look through my files indicated that an even later version of the G8 power panel existed. Converting to this circuit provided a cure to the problem. The modifications are as follows: change the preset to 22k $\Omega$ , with a 5.6k $\Omega$  resistor in parallel and the chassis return changed to 10k $\Omega$ ; change R1384 to 4.7k $\Omega$ ; add a diode in parallel with the charging capacitor C1376, anode to chassis – Philips suggest a BY207 but GEC use a BA154. Interesting that all the G8s I've modified so far have shown no reluctance to start – perhaps I've been lucky!  
**R.B.**

### **Philips K30 Chassis**

The basic fault with this set was comparatively easy. Plug MO2, where the c.r.t.'s Aquadag coating is connected to the main chassis, had broken the print and was sparking over intermittently. As a result the set would trip. Someone unknown at Granada had changed the line output transistor to a BU326A, which had promptly shorted all round. The next step he seemed to have taken was to change the line coupling capacitor to the wrong value. After that the set had been dumped. It came into my possession via the local wholesaler, along with some CTX-Es with butchered print.  
**R.B.**

### **Hinari CT6**

This fault had beaten Visionhire and everyone else so far but with the help of a gentleman at Alba it proved to be simple. The symptom was alternate vertical dark and light bars that moved across the screen at what appeared to be about four times the line speed, unvarying but not locked. Everything else was normal.

No fault with the power supplies could be found and the decoupling of the feed to the tuner was o.k. The Alba gentleman unwittingly put me on the right track when he



suggested that I check the brightness circuitry and its connections to the 12V line. Whilst ramping the brightness up and down I operated the contrast control and found that the fault disappeared at low contrast. Closer inspection then showed that the intensity of the lines varied as the contrast level changed. Stripping out the selector board – not a job to be attempted without good lighting –

revealed all. C016 (0.1 $\mu$ F, 50V) which decouples the contrast rail was dry-jointed, or to be precise had never been soldered. Incidentally the waveform that modulated the video signal came from the ramp generator circuit. C015 and C017 could cause the same problem via the colour and brightness rails respectively. Nice to solve a tricky one now and again!

R.B.

## *Servicing the Sovereign CTV6000*

*John C. Priest*

The Sovereign CTV6000 is a 14in. colour portable that was distributed by Telefusion Ltd., a firm that no longer trades. In the main these sets were marketed through Telefusion's Trident cash and carry outlets during 1980/81. From what I have been told by a friend who was a brown goods buyer for Telefusion the sets sold well. As few of them have come my way until fairly recently it seems that they are reliable. They were imported, the layout and design suggesting that the source was Germany rather than the Far East. Since they are well laid out and uncluttered servicing presents few problems.

There are four PCBs, all supported on metal frames. The bottom and largest panel contains the timebase circuitry, with the tuner/i.f. panel being to its left. Substantial plugs and sockets join these two panels, which are mounted horizontally on a common metal chassis. A short distance to the left of the junction between these two panels there's a row of connectors that carries the colour decoder panel which is mounted upright, aligned front to rear. This panel has its own U-shaped metal frame, whose lower ends are securely screwed to the sides of the base frame. At the other end of the timebase PCB there's another vertical panel. This is the switch-mode power supply panel, which is again carried by a metal U-frame that's screwed to the base frame. The panels are all easy to remove and refit. As already noted the connectors are substantial, and as a result these have never been a source of intermittent problems etc.

Apart from the small c.r.t. base panel the only other module in the set is the control assembly. It has a po-po mains switch plus volume, brightness, contrast and colour potentiometers which are mounted in a vertical line to the right of the c.r.t. A six-button varicap tuning switch and preset assembly is mounted parallel to the other controls. In my experience the tuning assembly is the only part of the set that gives much trouble. Unfortunately I don't know of a source of replacement switch units, but the assembly usually responds to careful application of switch cleaner.

Complementary pairs of BF469/470 transistors are used in the RGB output stages, driven by a TDA2530 matrixing chip. The other colour decoder chips are a TDA2522 and a TDA2560. The only faults I've had with the decoder section have been a faulty TDA2530 chip and intermittent grey-scale potentiometers. I've had no problems with the tuner/i.f./audio panel. The timebase panel has a TDA1180S chip for the sync and line generator functions and a TDA1170 field timebase chip. This is also trouble free apart from an occasional dirty height control. BD524 and BU208 transistors are used in the line driver and output stages. The line output transformer is coupled to a tripler which has a clipped-on focus control.

The switch-mode power supply is of the conventional Siemens self-oscillating type and is remarkably trouble free. Recently I've had problems with two sets whose

symptoms were low contrast and brightness with some moire patterning on the screen. This patterning varied in step with adjustment of the contrast and brightness controls. In both cases the cause of the trouble was C722, which is the h.t. reservoir capacitor for the 200V supply to the RGB output stages. It's mounted on the power supply panel and although the circuit gives the value as 47 $\mu$ F, 350V in both cases a 250V type has been fitted and had almost zero capacitance when tested. The original capacitor is quite squat and is so fitted to the vertical PSU panel that it projects close to the focus control on top of the tripler on the timebase panel.

Original replacements for C722 are not available and standard 47 $\mu$ F, 250V capacitors are too long, getting in the way of the focus control with the result that the power supply panel cannot be correctly fitted to the timebase panel. After some hunting about I found that the 47 $\mu$ F, 250V capacitor (C657) used in the Grundig CUC70 chassis is suitable physically and electrically as a replacement. The Grundig capacitor has three peripheral negative tags with a positive centre pin whereas the original Sovereign capacitor has only the usual pair of tags. There's plenty of space on the panel to accommodate the Grundig capacitor however, and two minutes with a mini-drill soon provides the pair of holes needed for the two extra earth tags. When the capacitor is fitted you'll find that there's adequate clearance between it and the focus control when the panels are reassembled.

It may also be worthwhile replacing the h.t. smoothing capacitor C723 at the same time. The value is 10 $\mu$ F, 250V. It's on the timebase panel rather than the power supply panel and this time there is no difficulty about fitting a standard type of capacitor.

When these capacitors have been replaced, check that the h.t. to the line timebase is correct at 105V. The test point is at R604, the 22 $\Omega$ , 11W wirewound resistor on the timebase panel close to the line output transformer. R709 on the PSU panel provides adjustment: set it with the contrast and brightness controls at minimum. At the same time check the 200V supply at C722. If you have any difficulty getting a full 105V, or if the 200V rail is high, check the 105V reservoir capacitor C718 on the PSU panel. It's a 47 $\mu$ F, 150V type.

Any tuning problems that can't be resolved by cleaning the varicap switch unit should draw attention to the 32V supply, which is derived from the 200V rail via R328 (22k $\Omega$ ) with the usual TAA550 stabiliser. These items are fitted on the tuner/i.f. panel. The u.h.f. tuner itself has given no problems.

Finally, if you do get one of these sets in for repair ask the owner whether he or she still has the original instruction book. It came in a strong polythene envelope together with a circuit diagram and setting-up instructions for the decoder and grey scale. It's well worth photocopying if you can lay your hands on one.

# Simple Downconverter Unit

Brian Renforth

The downconverter described in this article converts signals on the u.h.f. channels 21-68 to the v.h.f. Bands I and II. In use you simply connect it to the Band I/II receiver's aerial input socket: no modifications are required to the receiver itself. This is an ideal way of applying u.h.f. signals to a v.h.f. set and of obtaining hi-fi TV sound via an f.m. tuner.

## Tuner and Power Supply

I used a type T21 mechanical tuner – the sort found in the Thorn 1500 chassis. It's sad that these fine sets are generally scrapped these days, but this does mean that obtaining a tuner shouldn't be too difficult. As a u.h.f. tuner the T21 has good gain and fair selectivity. There's no reason why a different type of tuner shouldn't be used, but I found that the type used in the GEC Series 1 chassis wouldn't work.

What I required was good output from 45-108MHz. The modifications described below were adopted after experimenting on a trial-and-error basis. A 12V supply for the tuner was obtained via an external transformer. Any battery eliminator that provides between 7-12V will do,

though the smoothing is critical: not less than  $4,700\mu\text{F}$  is required if hum bars are to be avoided.

## Tuner Modifications

It's helpful to have the Thorn 1500 chassis circuit to hand when carrying out the modifications to the tuner unit. First remove the i.f. plug SKT1: connect the length of coaxial lead to a standard coaxial plug instead. Connect the 12V lead to the external supply. The lead that goes to the base of the r.f. amplifier transistor should be connected to the slider of a  $1\text{M}\Omega$  potentiometer connected to the tuner's case. Remove the i.f. coil's slug and connect a switch to it so that it can be shorted out for Band II use. Fig. 1 illustrates these points.

To obtain the correct output I fitted a long-leaded  $22\mu\text{F}$  capacitor as shown, i.e. with one lead sleeved and wrapped around the L352 bar, close to the tuning gang, and the other end connected to the emitter of the mixer transistor VT352 via a short length of insulated wire – solder it to feedthrough capacitor FT351. Keep these connections well insulated.

## Setting Up

When you've carried out these modifications, connect the unit to a TV set switched to ch. 2 or an 88-108MHz f.m. radio. Tune in a local signal via the tuner in the normal way then peak the gain using the  $1\text{M}\Omega$  potentiometer. This setting can be left. Position the extra capacitor for maximum output. When the overall peak is found, glue it in place. Leave the tuner's cover off. Use PVC tape to cover the top, ensuring that the additional capacitor and lead are well insulated from the case.

## Use

For channels 2-4 I use a Thorn 1400 receiver while for Band II an Alba Model 8006D is used. With the tuner set up as just described, the performance throughout the u.h.f. spectrum is about the same as that obtained using the set's own u.h.f. tuner. Reception via the Band II receiver is good.

The tuner will work via an upconverter, which is useful for resolving SpE System B or D audio signals where conditions permit. I've also successfully received Italian Band I stereo f.m. signals.

There's a slight drawback in using a tuner modified in this manner, the possibility that local signals will appear, though weakly, at other parts of the band. This isn't really much of a problem however. In stubborn cases selecting a different channel, 3 or 4, may help.

## Conclusion

I'm well pleased with the outcome of adapting this tuner as a dual-purpose unit, especially as the financial cost, using spares from the junk box, was zero. The completed unit can be housed in a box for set-side use, reminiscent of those Band III-I converters that were used in the Fifties for Band I only sets!

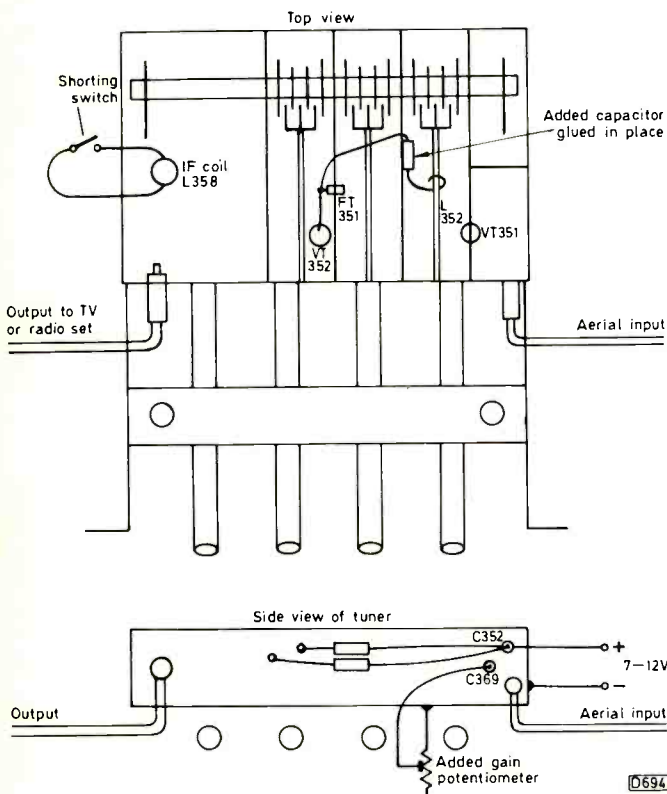


Fig. 1: Modifications to the Thorn T21 tuner unit to act as a u.h.f./v.h.f. downconverter. The added capacitor is a  $22\mu\text{F}$ , 16V mini electrolytic – the value is not critical. The negative lead is left open-circuit, insulated using heatshrink and wound around L352; the positive lead, also insulated, is taken to the emitter of VT352 by connecting it to FT351. Glue the capacitor in place once optimum conditions have been established. Fine tune the system at switch-on, using the v.h.f. knobs. Cross-modulation may be experienced with strong local signals appearing in other parts of the band.



# Service Briefs – Samsung

The following information has been compiled from recent Samsung Service communications.

## CD Players

**CD-11, SCM7000/7500/8000:** If the disc doesn't spin or spins slowly due to one or more of the rubber cushions in the disc tray sticking to the disc tray reducing the tension in the two small cushion-lifter arm springs. If this fails, replace the lifter-disc-holder.

For skipping/jumping modify the pick-up traverse by removing the control spring beneath the angle adjust screw.

A revised alignment procedure has been issued.

**CD11, SCM-7500:** Inability to read the TOC with some discs occurs because some manufacturers place their own coding in the TOC area. The fault shows up as excessive reading time or an ER display. To cure replace the microcomputer chip IC2105 with part no. 12109 401 590 which has new software.

**SCM-6000/6800 (G35 chassis):** Improvement of CD lead-in. Reduce the value of R2806 from 330Ω to 120Ω, part no. 11018 827 121. Note that the circuit diagram shows the value as 1kΩ.

## Microwave Ovens

**RE555/610/670/777TC:** If random fuse blowing or excessive vibration from the transformer is experienced, especially at lower power levels, suspect first the MCP3020 opto-isolator chip on the control panel, part no. 72179 001 162. It seems that many engineers try replacing the transformer, magnetron etc. at great and unnecessary cost.

**RE670/777TC:** Carry out the following modifications if the temperature probe indicator comes on when no probe is connected, especially when cooking foods with high moisture content or liquids. Reduce the value of R19 from 510kΩ to 15kΩ (up to 22kΩ will do). Increase the value of C16 from 33μF to 220μF (up to 470μF will do). Add a 56kΩ, ½W resistor (68kΩ will also do but 56kΩ is best) between the base and emitter (chassis) of TR8, i.e. across the probe switch and C16.

**RE990CT:** If the error display shows ERR1 during combination or convection cooking the oven temperature sensor is likely to be faulty. Display ERR2 is not used. ERR3 indicates that the oven is too hot to operate the auto-defrost mode. Allow it to cool.

No or an intermittent clock display means that the interrupt request line at pin 31 of the microcomputer chip is low or missing because C4, C5 or C13 is short-circuit or leaky. They are 0.1μF, 50V disc ceramic capacitors.

Note that the sectional cut in the top of the door is normal: it's an aid to door opening. Tell the customer this in the event of a query.

If problems are experienced with setting the clock at initial power-on, use the following procedure. Apply power. Press the clock pad twice. Press the clear pad.

Enter the time in the 12-hour clock. Press the clock pad. The colon should now flash.

## TV Receivers

**BT309K:** For no picture/blank raster from cold or after a short running time replace the video detector can, part no. 32719 503 010B.

**CI210R:** Ensure that the correct battery lead is used with this set, part no. 3Z-DC LEAD. When operating at 13.8V the standby current should be 73mA and the full-on current 2.3A; at 24V the standby current should be 110mA and the full-on current 1.4A.

**CI330F/Z:** If the mains transformer's primary winding is open-circuit, replace the transformer and the line output transistor Q404. Use type 2SD870, not another 2SC1893. A transistor is supplied with the replacement transformer.

**CI338/514:** A small picture whose size varies with adjustment of the brightness control is the symptom when there's a dry-joint at the E connection (125V) of Q801 (STR3125).

For low brightness and a washed out picture, with just an increase in the flyback lines when the first anode voltage is adjusted, replace R207 (120kΩ, ½W), R208 (127kΩ, ½W) and C519 (330pF, 1kV). The capacitor is on the c.r.t. base panel.

For intermittent channel jumping, particularly to no. 12, remove the control PCB, take the upper and lower screening plates from the IR amplifier and refit the detector diode snugly on to the mounting collar. Then reassemble.

**CI338F/GA/XA/Z, CI340ZA, CI347FA, CI515FA/ZA:** Random failure of the mains input fuse F801 occurs because of current surges in the degaussing coils. Replace the 800mA fuse with a 1AT anti-surge type.

**CI338GF/X, CI347FF, CI348ZF, CI517F/Z:** For low and unstable h.t., at approximately 100V, with Q0403 getting hot, replace the 47Ω fusible resistor R806 – part no. 31059 001 050.

**CI338Z:** A channel display stuck on 88, with channel changing o.k., occurs when the 5V supply at pin 24 of IC4 is low. Check TR805 and DZ809.

**CI340XA:** For tuning drift or loss of tuning at switch-on, ensure that RC16 on the remote control PCB is of the correct value, i.e. 4.7nF, marked 472. If marked 47, i.e. 47pF, replace with the correct value.

**CI348/GZ:** Fine horizontal lines across the screen or striations on the left-hand side are caused by pickup from the chopper or line output transformer on the lead to the c.r.t. base panel from plug MCT02. Tie the lead to the loom from MCT01 to the c.r.t. base.

**CI348ZF:** A new microcomputer chip, RIC01, is now supplied. When this is fitted the switch-on sequence is different – the set comes straight on when the power switch is pressed instead of going to standby. To re-establish the previous sequence, fit a 3.3kΩ resistor in position RR27 and remove the 1N4148 diode RD17. The new chip is type M50431-101SP (the suffix was previously –100SP). Part

no. for both chips is 32109 101 160.

If the set goes off again five seconds after switch on and works normally when restarted, or otherwise shuts down intermittently, remove CNR05 from the remote control PCB and confirm that the set is now o.k. If so remove the control PCB and spray the cabinet front around the IR lens - ensure that you cover the fixing clips - with RFI/EMI shielding. This is available from RS under part no. 551-570. When dry, refit the PCB and CNR05, but route its screened lead behind the mains transformer.

**CI517F/ZF:** New c.r.t. types were introduced (51GGH91X and 5120B22, both part no. 32019 255 106). The original tube, type 5106B22 part no. 32019 270 810, has different fixings, so the tubes are not interchangeable.

**CI517FF:** Early sets do not have an AV operation facility. In later production models AV operation is obtained by switching to channel 8.

**CI537G/ZG:** To improve performance the chopper transistor was changed from type 2SC3552 to type BU508AF, part no. 32149 401 230.

**CI537ZG/541ZG:** For whistle on sound at low level, altering with the volume control setting and disappearing when the sound is muted, increase the value of RC11 from 1µF to 10µF.

Flashes of one colour then no picture can occur when the sandcastle pulse is not clamped to 0V. Remove R407 (330Ω) and fit a wire link in its place. Then fit a 140kΩ and a 190kΩ resistor in series in place of wire link J52.

For field bounce with off-air reception or an unstable VCR playback picture adjust the line hold and a.g.c.

controls. There's no field hold control but with the TDA8305 chip the field sync is affected by the setting of the line hold control!

When replacing the c.r.t. order the exact type as different types that are not all interchangeable have been used.

**CI537V:** In the event of repeated failure of the 2SC3552 chopper transistor Q901, check whether R910 (270kΩ) is high in value or open-circuit. It's worth checking this resistor whenever repairs are carried out in the power supply.

For field roll from cold when changing channels, the situation improving when the set has warmed up, replace the 0.47µF, 50V tantalum capacitor C307.

Buzz on sound at low volume settings or when the sound is muted, varying when the remote control is used, occurs when the lead from CN03-PH03 is too near the audio stage. It carries serial clock pulses and data. Redress and tie it clear of the audio stage.

### TV Chassis

**P36A/P50F chassis:** For poor field sync, especially with text or satellite TV reception or between advertisements when at black level, reduce the value of R218 from 560kΩ to 390kΩ and add a 1MΩ resistor between pins 2 and 37 of IC501 (i.e. between the 12V supply and the input to the sync separator).

### VCRs

A forthcoming "service briefs" will deal with Samsung VCRs.

AN236	02.30	STR2025	07.00	STR2013	04.60	TDA3651A	02.10	BU407	02.55	2SC535	02.30	<b>BELT KITS</b>	02.80	SU8000 9050	01.89	<b>ELECTROLYTIC CAPACITORS</b>	02.12	
AN5010	02.95	STR2028	05.00	STR3125	05.80	TDA3651A	02.10	BU407D	02.55	2SC581	02.30	02.20	V51 V52 V55	02.90	LOADING BELTS	02.35	220UF 63V	02.24
AN5236	02.95	STR2029	05.00	STR4090	05.80	TDA3652	02.20	BU408	02.55	2SC683	02.30	01.15	V59300	02.45	JVC FER3V29	02.30	100UF 63V	02.24
AN5521	02.95	STR2338	05.00	STR5412	04.50	TDA3652A	01.95	BU408D	02.55	2SC741	02.30	01.15	VCR4600	02.45	JVC FER3V25	02.35	220UF 63V	02.24
AN6135	01.40	STR2129	05.10	STR6202	04.50	TDA3653	01.50	BU426	02.70	2SC783	02.30	02.20	3V22 3V30	01.40	HITACHI VT19300	02.38	470UF 250V	02.40
AN6248	02.90	STR2145	05.10	STR11006	05.90	TDA4100	03.95	BU509	02.05	2SC828	02.30	01.15	3V23	01.60	PINCH ROLLERS	02.40	4.7UF 250V	02.26
AN7120	02.90	STR2155	05.10	STR4090	05.80	TDA4503	03.05	BU508A	02.75	2SC840	02.30	03.05	3V29 3V30	02.60	VCR3000 9800	02.50	10UF 63V	02.34
AN7143	02.45	STR2240	04.90	STR50103A	03.25	TDA4505	03.00	BU508D	02.85	2SC901A	02.30	03.05	3V42 43	02.60	V512 3 5 10	02.50	10UF 250V	02.34
AN7168	02.50	STR2240	04.90	STR50113	03.25	TDA4510	03.10	BU526	02.78	2SC998	02.30	01.15	V5108 244 516	02.50	V5125 240 512	02.50	47UF 250V	02.26
BA300	01.30	STR2401	04.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	100UF 250V	02.34
BA306	01.30	STR2401	04.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	01.15	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
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BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
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BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
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BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
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BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
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BA5102	02.30	STR3044	03.90	STR50213	03.50	TDA4510	03.10	BU526	02.78	2SC998	02.30	02.00	VT3000	02.50	VCR1000	02.50	2200UF 16V	02.70
BA5102	02.30																	



# Programming the Hitachi CPT1476R Series

Microcomputer chips are now widely used, to control various functions in TV sets. The extent of the control operations varies from just volume and tuning in simpler sets to control of the signal processing and deflection circuitry via master and slave devices and a digital bus in all singing, all dancing models. Unfortunately when problems occur with microcomputer chips the symptoms can be many, depending on what they control. The days when faults like no sound or field collapse were nearly always due to a simple cause in the relevant output stage are passing. Nowadays we may have to deal with new fault conditions where the microcomputer chip or a slave device is the cause. All manner of weird and wonderful faults can be introduced by microcomputer control.

Hitachi has used microcomputer control for some years now. Generally, as with other manufacturers, the systems have been very reliable. There is however a particular problem you get with the CPT1476R/1646R and CPT2196/2198/2578 ranges. When the problem occurs, the microcomputer chip tells its separate memory i.c. to open its memory. The LED display changes from the programme number to the letters "CH". As a result the customer thinks "what's on?" and starts to press the buttons on the remote control unit in an attempt to restore the programme number display. This doesn't have much effect as far as the viewer can see, but most of the numbered buttons that have been pressed will have set or reset a particular bit in the microcomputer control system's memory. Eventually the customer gets bored with trying to get rid of the erroneous display and then or later switches the set off. When the set is next switched on the display is back to normal and the customer thinks no more about it. Until, that is, the set starts to do odd things because of the corrupted information in its memory, things like going into standby after a couple of minutes, not going into the teletext mode when asked, not tuning in, remaining permanently in the video or RGB mode, or lighting random characters or dots in the LED display.

## Reprogramming

The only remedy is to reprogramme the memory, restoring its contents to their correct states. To do this you have to dismantle the remote control unit and add a programming switch between two pins of the chip. With the CPT1476R and CPT1646R pins 15 and 23 of the SAA1250 chip IC1 should be soldered to a pushbutton switch. With the larger-screen sets the chip is an M50467: wire pins 12 and 20 to the switch. Fig. 1 shows the switching arrangements.

When the switch is pressed the LED display should show "CH". Press the switch again and the display should change to "OP". Now press number 1 on the handset, producing "P1" in the display. Press the standby button on the handset and the set will go into the standby mode and enable the memory's contents to be altered.

Press the store button on the set itself and hold it in. While doing this press button number 9 on the handset. The set should now come on with channel number 9. If there's a dot in the display this must be removed before programming can commence. Other channels should also be checked to see if a dot is illuminated. To remove the dot, select a channel which doesn't have an illuminated dot

and press the store button. With the store button still pressed, use the handset to select the channel number with the unwanted dot. The display should then show two flashing bars followed by the channel number which should now be dot free. If the offending dot is still present, repeat the procedure until it's extinguished.

The programming procedure depends on the model.

## Small-screen Models

With the small-screen Models CPT1476R/1646R, start by pressing the programming switch three times. The display should then be as shown in Fig. 2(a). The handset numbers correspond with particular segments in the display: pressing the relevant number will light or extinguish, i.e. set or reset, a particular segment of the display and memory location in the i.c., see Fig. 2(b). Press the relevant buttons until the display is as shown in Fig. 2(c), i.e. with byte one segments 1 and 2 of the bit display are lit and segments 3,4,5,6, 7 and 8 are out.

Once this first step is correct, pressing the programming switch again should advance to byte number two as shown in Fig. 2(d): press the appropriate buttons to light segments 1 and 2 of the byte 2 display.

Press the programming switch again to advance to byte three, then press the appropriate buttons to obtain the display shown in Fig. 2(e): with byte three only segments 3 and 5 should be lit.

Once this is correct, press the programming button to

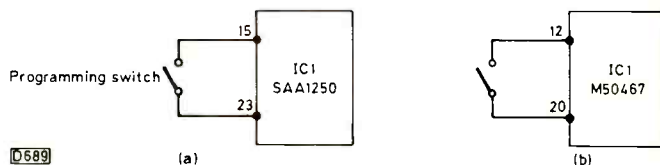


Fig. 1: Adding a programming switch to the remote control handset, (a) with the small-screen models, (b) with the larger-screen models.

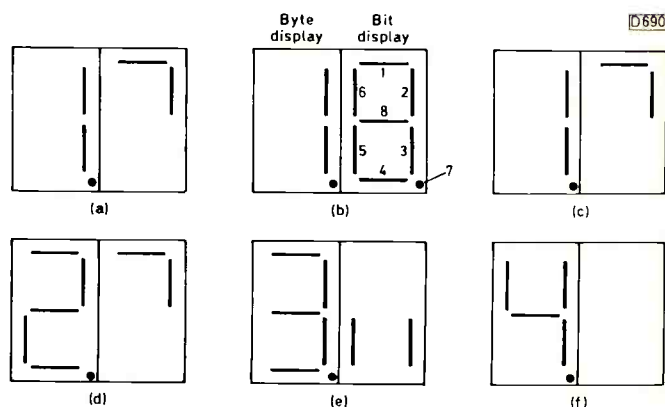


Fig. 2: Programming displays for Models CPT1476/1646.

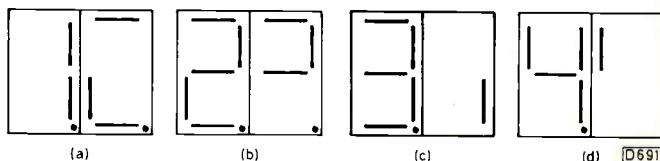


Fig. 3: Programming displays for Models CPT2196/2198/2578.

advance to the last byte, number four. With this byte the programming is correct when no bits are lit, as shown in Fig. 2(f).

When all the bytes have been set correctly press the handset's standby button to fill the memory. The set will then go to standby. Programming is now complete and the set can be turned on and tuned in.

### **Large-screen Models**

The procedure with the large-screen Models CPT2196/2198/2578 is as follows. When the programming switch has been pressed three times the display should be as shown in Fig. 3(a). The handset numbers correspond with the same bit segments as with the small-screen models, see Fig. 2(b). Thus with byte one bits 1, 4, 5 and 7 should be lit/set.

Press the programming switch again for byte two and set

the bits as shown in Fig. 3(b). Press the programming switch once more for byte three and set the bits to obtain the display shown in Fig. 3(c). Press the programming switch the final time for byte four and set the bits as shown in Fig. 3(d).

When everything has been set correctly press the handset's standby button to fill the memory. Then turn the set on and tune in the channels.

### **Recommendation**

Once these procedures have been carried out the set should be in good working order. It's probably advisable to check the memory's contents whenever one of these sets comes in for repair of any sort of fault, as the memory could have been corrupted without any obvious symptoms being shown – until a later date, when a callout might be needed.

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# ***Fifty Years in Radio and TV***

## **Part 8**

**Harold Peters**

With the closure of Pye's manufacturing activities at Lowestoft, prior to the plant being handed over to Sanyo by Philips, the beginning of 1981 saw me back in the retail side of the business – but in unique surroundings. Roy Snelling's premises, in a field six miles east of Norwich, are enormous. The business has a clientele to match, built up mostly by personal recommendation.

### **Signal Distribution System**

Within the complex the three broadcast signals plus a locally generated crosshatch pattern were distributed to about a hundred points at a level of 1mW. The ambition at the time was to add the PM5544 professional pattern. I soon began to see where I fitted in, and within three months the ambition was realised. We chose the vacant ch. 65, where we expected Channel Four. True vestigial sideband shaping was provided, and a K rating equal to a broadcaster's main station was achieved. When Channel Four eventually came almost all our rental sets were accurately pretuned and we had no opening day panic.

### **The Philips K30**

I realised that for the first time in fourteen years I was going to have to face the customer directly, but I didn't expect the involvement to be as abrupt as it was. At the time, sets in the Philips range suffered from smeary pictures and sibilance on sound. Angela Rippon read the news, and her voice extended well beyond the upper limits of the system. The design of the K30 chassis originated in Eindhoven, where systems B and G were the main consideration. Travellers abroad amongst you will know how much better our system I is in comparison. Little account had been taken of the need to get the sound de-emphasis correct, or to tune the vision detector for a system whose group delay characteristics didn't include any pre-distortion at the transmitting end.

Five minutes in a house with a 22nF capacitor and a trimmer kit made a world of difference. It wasn't a question of haphazard twiddling: the amount of adjustment required had already been established on the bench, using pulse and bar modulation and a range of models. We

were also troubled by a poor decoding margin with teletext. Here again, judicious adjustment of the vision detector coil or the a.f.c. coil, which had to be phase shifted by exactly 90°, usually provided a cure.

The chips in most sets were dedicated TV types, but we came across our first microcomputer chip. It was the TMS1000 used in the KT3/K30 teletext models. The circuit description didn't really explain why it was there. It simply acted as an interpreter, translating Eindhoven's RC5 remote control code into the one used by Mullard, Southampton when Mullard designed the teletext chip set.

### **Summer of '81**

The summer of 1981 saw the wedding of Charles and Diana. There was the usual call for all hands to the pumps as more sets than we had the capacity to soak test on the rack went out each day. The overspill was accommodated on repair trolleys. Our policy of next-day delivery allowed us to give each set a seven-hour soak test with the PM5544 pattern before despatch. It paid off handsomely in reducing callbacks, as it does to this day, but nevertheless on the day itself we were all out on house calls.

Events like this bring out the idiot factor amongst viewers. My seven calls included two to people who had taken their new VCRs home with them still boxed – the "my brother knows about these things" approach. Two more were to people who had moved their sets into the front room for the first time in a decade, forgetting that they'd abandoned the aerial extension last time they decorated! I got them all sorted out by lunchtime and was able to rush off in the afternoon to witness a much more interesting spectacle, the start of the Tall Ships Race from Great Yarmouth. The sight of half a dozen huge square-riggers moving out to sea with their crews manning every spar of the rigging is one you never forget.

### **VCRs and Channel 4**

By now VCRs were beginning to catch on. Those from Japan were on meagre allocation and went straight out. We'd tested all three systems in use at the time and had decided to concentrate on VHS. Maybe the Betamax



model we tried wasn't representative, but the results were not so good. We had a number of Philips 2000 system machines: though the controls were user friendly the picture quality and reliability were poor. It was the availability of prerecorded tapes that clinched the dominance of VHS of course, together with the fact that nearly all the bugs had been ironed out before the system was launched.

1982 saw the start of Channel Four, and our test pattern had to be moved to the end of the band. The first Channel Four programme was *Countdown*: I was impressed by the quick ability at mental arithmetic shown by a young girl called Carol Vorderman.

### **Into Satellite TV**

For us 1982 was "the year of the satellite". Having decided that the Russian Gorizont craft would provide watchable pictures we placed an order for some American equipment from one Graham Lawson, who had just opened a small office under the name Megasat somewhere near St. Pancras station. When the kit arrived we spent happy hours in the pouring rain assembling the dish from four petals and a bag of ironmongery. While the base was hardening we went inside to do the electronics part and convert a 26in. set to Secam. A week later we moved the dish to its mount, fitted the LNB and went home. "Tomorrow we get the picture" we said. We were wrong. When dawn broke the dish had gone. Thieves had waited till we fitted the LNB then nicked the lot. So we did in a way make history. Not as we intended by being the first in the area with satellite pictures but by being the first victims of a satellite TV robbery.

When a replacement dish arrived a few weeks later we made our first attempt at receiving satellite TV pictures. Megasat had obligingly pretuned the receiver to the Gorizont channels, and we'd worked out roughly where the satellite was. Within five minutes we had a picture of sorts. All that remained for us to do was to optimise it.

This was easier said than done. Articles by Steve Birkill and others had primed us with information about polar mounts, circular polarisation, PTFE wedges and focal points. What they didn't tell us was that there is dish adjustment weather. It's either pouring down, blowing a hurricane, or the sun is right behind the wanted satellite, causing so much dazzle from the white dish that you have to wear sunglasses. Other hazards were passing military aircraft, which can focus their blast on you if you're by the LNB, and the body's presence which has an effect on the dish adjustments. Thank goodness that Gorizont operates in the lower-frequency C band, which is much less critical than Ku band when you are dealing with a dish six foot or more wide. By the time that Ku band TV came we were ready for it. One more snag we found out about the hard way was that Gorizont had developed a wobble. This is seen from Earth as a vertical figure of eight movement: position the dish during the morning and by teatime the pictures were snowy. Happily the interest the satellite TV pictures created made it all worthwhile.

As Eutelsat and Intelsat started to provide regular programming we received more and more pictures. By the time that I retired Roy Snelling had built for himself a "Vidiwall", with nearly thirty different pictures on display. With tongue in cheek we placed our Gorizont monitor next to the one for the American CNN service. Our original C-band receiver still provides a good Russian picture after nearly six years of continuous use. It has outlived two Secam monitors and three Gorizont satellites!

Visits to the annual Cable and Satellite TV exhibition showed that its purpose is to make money rather than to entertain. No one asked viewers what they wanted from the new TV services, or what they were prepared to pay for them. Maybe satellite TV would have got off to a less shaky start if the cable TV operators had done their homework better. Perhaps then we wouldn't have seen the rise and fall of so many satellite TV channels, such as TEN, Mirrorvision, Europe, Music Box etc. Even Superchannel couldn't make the grade, despite being backed by the best from the BBC and the ITV networks. Like Laservision, they just didn't catch on. By my retirement time in 1988 nothing in space had achieved profitability.

### **Video Developments**

Video did catch on however, initially as a means of watching prerecorded tapes, then later as a means of programme time shifting. It seems that the average viewer prefers to be able to control the timing of the programme he wants to watch rather than to receive extra programmes from space. This might of course change as improvements in programming are introduced.

During its first seven years, VHS progress towards good basic machines resulted in pictures as acceptable as the original transmissions. It looked as though a lot of attention had been paid to group delay and other important parameters, because in the E-E mode, i.e. when monitoring the broadcast signal translated to ch. 36, it was still possible to see error-free teletext pages on the TV set used as a monitor.

HQ circuitry, often called Dolby for pictures, meant anything from tweaking the white clip to a virtual redesign. Enhancement would perhaps have been a better description, and I feel that it ought to have been made switchable. Very few HQ machines performed well with the above teletext test, so there must have been a group delay impairment. In fact when I looked for a suitable machine with which to create standard test tapes, or use for copying other cassettes, I had some difficulty and eventually opted for a little-used pre-HQ single-speed model. Copying from one HQ machine to another produced a virtually unwatchable result.

Setting the clock, programming the timer and tuning in the stations was a fairly routine business until the arrival of the microcomputer chip. Now no two models are alike, and this applies with TV sets as well. As a result it has become almost impossible to carry out servicing in the home.

### **Changing Scene**

Perhaps I'm getting too detailed, but that's how it is with TV. Look up from your bench to see what's going on in the world outside and you get worried. Japan has moved to Wales, France has captured Ferguson and Philips' efforts to increase its share of the US market have left it in trouble. At last British Rail has caught up with the record-breaking Mallard series engines I mentioned in Part 1, but without those line-side signal boxes that enabled trains in trouble to be spotted as they passed. I found all this rather depressing, and the prospect for the Nineties, with MAC, conditional access, the compact video disc and a fifth terrestrial channel to beat with all those VCRs, left me feeling decidedly tired. Fortunately retirement was not far away, and Roy let me phase myself out by working on a part-time basis. With any luck, an interesting and fulfilling working life in TV was about to have a happy ending.

# Video Equivalents

As a follow up to last month's Granada TV/VCR equivalents lists, we are this month listing mainly various machines that are JVC clones. Table 1 provides a Ferguson, Thorn Rentals, JVC VCR equivalents listing.

Portable tuner equivalents are as follows:

- Ferguson 3V03 = JVC TU41
- Ferguson 3V25 = JVC TU22
- Ferguson 3V28 = JVC TU24
- Ferguson 3V47 = JVC TU510

Camera equivalents are as follows:

- Ferguson 3V04 = JVC GS1000
- Ferguson 3V06 = JVC CVG71P
- Ferguson 3V20 = JVC GX88E
- Ferguson 3V34 = JVC GZS3E

Camcorder equivalents are as follows:

- Ferguson 3C01 = JVC GZ-S1
- Ferguson 3C03 = JVC GR-C7
- Ferguson 3V41 = JVC GR-C1
- Ferguson 3V50 = JVC GR-C2
- Ferguson FC05 = JVC GR-45
- Ferguson FC06 = JVC GR-C9

There are various ITT/JVC clones as follows:

- ITT P4833 = JVC HR2200
- ITT TR3913 = JVC HR7200
- ITT TR3943 = JVC HR7650
- ITT VR3605 = JVC HR-D110
- ITT VR3905 = JVC HR-D120
- ITT VR3906 = JVC HR-D140
- ITT VR3975 = JVC HR-D225
- ITT VR3984 = JVC HR7655

The Decca/Tatung 8300 is the HR7200 and the 8400 the HR-D120.

The Toshiba V55/V57 are JVC HR-D110/D120 clones while the V65/V66 equate with the HR-D140/D150.

GEC VCRs are Hitachi clones, as follows:

- GEC V4000 = Hitachi VT8000
- GEC V4001 = Hitachi VT9300
- GEC V4002 = Hitachi VT9500
- GEC V4004 = Hitachi VT33
- GEC V4005 = Hitachi VT63
- GEC V4100 = Hitachi VT11

Popular Salora models have been Mitsubishi or Sanyo clones:

- Salora SV6500 = Sanyo VHR1100
- Salora SV6600 = Sanyo VHR1300
- Salora SV8200 = Mitsubishi HS303
- Salora SV8400 = Mitsubishi HS306
- Salora SV8500 = Mitsubishi HS304
- Salora SV8800 = Mitsubishi HS-B20

Here are one or two B and O equivalents:

- B and O VHS63 = Philips VR6462
- B and O VHS80 = Hitachi VT11/17/19
- B and O VHS90 = Hitachi VT64

Machines that use the Philips' "Charlie" mechanism include the B and O VHS82 and the Pioneer VR505 and VR707.

**Table 1: Ferguson, Thorn, JVC VCR Equivalents.**

Ferguson	Thorn	JVC
3292	8900	HR3300
3V00	8902	HR3330
3V01	—	HR4100
3V16	8904	HR3660
3V22	8922	HR3320
3V23	8924	HR7700
3V24	—	HR2200
3V29	—	HR7200
3V30	8930	HR7300
—	8940	HR7350
3V31	8941	HR7650
3V32	8942	HR7655
3V35	8944	HR-D120
3V36	8943	HR-D225
3V38	—	HR-D110
3V39	—	HR-D110
3V42	8945	HR-D455
3V43	—	HR-D725
3V44	—	HR-D140
3V45	8947	HR-D150
3V48	—	HR-D565
3V49	—	HR-D110
3V52	—	HR-S100
3V53	—	HR-D755
3V54	—	R73AF
3V55	8948	R73AF
3V58	—	HR-D370
3V59	—	HR-D180
FV11R	—	HR-D170
FV12L	SFV12L	HR-D230
FV13H	—	HR-D430
FV14T	SFV14T	HR-D530

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15414	0.05	2SC2063	0.99	AN371	1.02	BC460	0.42	BY081	0.32	BZ088A	1.35	HD38750A-7	6.43	ME3000	2.37	SGE4F206	0.90	T9035	1.49	TD4103A	1.97	TI106M	0.77
15921	0.10	2SC2078	1.10	AN5120N	4.08	BC462	0.42	BY082	0.34	BZ088A	0.68	HD38800A5	14.12	ME2555	0.84	SGE5F910	1.36	T9051	8.07	TD41005A	2.02	TI106M	0.34
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2N3053	0.35	2SC2085	1.85	AN5250	5.04	BC463	0.30	BY084	0.43	BZ085	0.69	HISH1010	14.50	ME3240	0.49	SK5110	2.15	T9057V	3.44	TD41010AE	4.25	TI106M	0.34
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2N3703	0.18	2SC2233	1.60	AN5701N	1.66	BC467	0.10	BY097	0.10	BY197	0.12	BY197	0.12	BY197	0.12	SL43	5.65	TA7051	1.74	TC41034B	2.42	TI106M	0.38
2N3705	0.15	2SC2236	1.69	AN5701N	1.75	BC467	0.28	BY098	0.14	BY198	0.17	BY198	0.17	BY198	0.17	SL47	3.30	TA7054	2.55	TD41035T	1.70	TI106M	0.38
2N3706	0.14	2SC2278	1.14	AN6300	4.40	BC550	0.19	BY099	0.17	BY199	0.17	BY199	0.17	BY199	0.17	SL48	3.45	TA7060A	0.71	TD41036	2.64	TI106M	0.38
2N3707	0.16	2SC2314	0.87	AN6510	4.54	BC556	0.13	BY100	0.37	BY197	0.70	HM9032	3.22	MM5314N	8.99	SL490	7.24	TA7061AP	1.27	TD41037	2.68	TI106M	0.38
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2N3823	1.17	2SC2678	6.75	AN6552	0.68	BC638	0.20	BY245	0.50	BY210-600	0.35	KB200C	4.25	MM1400V	13.65	SN29717N	7.77	TA7089P	3.10	TD41082	4.51	TI106M	0.38
2N3904	0.50	2SC2671	0.91	AN6510	1.18	BC639	0.49	BY249	0.49	BY210-900	0.19	L269C	1.27	MM1435V	13.20	SN29718N	3.66	TA7092P	9.94	TD41151	0.95	TI106M	0.38
1N4101	1.33	2SC288A	0.33	AN715	1.14	BC640	0.24	BY254	0.67	BY254	0.67	LA1201	1.14	MM1455	10.04	SN29719N	6.04	TA7093P	3.99	TD41150	1.27	TI106M	0.38
2N4240	2.60	2SC3153	3.20	AN715	2.52	BC641	0.24	BY254	0.67	BY254	0.67	LA1201	1.14	MM1455	10.04	SN29719N	6.04	TA7093P	3.99	TD41150	1.27	TI106M	0.38
2N4444	1.56	2SC372	1.40	AN715	2.17	BC642	0.36	BY256	0.15	BY226	0.15	LA1230	1.18	MM1455	10.04	SN29723AN	14.46	TA7109	3.71	TD41200	1.51	TI106M	0.38
2N4905	9.99	2SC373	1.16	AN7146	9.90	BD116	0.70	BY257	0.40	BY227	0.30	LA1231	3.04	MPC13555C	1.98	SN29764AN	6.00	TA7120P	0.64	TD41235	3.88	TI106M	0.38
2N5293	0.50	2SC383	1.33	AN7151	2.37	BD124	0.42	BY258	0.33	BY228	0.60	LA1357N	3.06	MPC2567	0.60	SN29767	4.55	TA7122BP	0.87	TD41236	5.52	TI106M	0.38
2N5294	0.50	2SC388	0.45	AN7158	2.70	BD132	0.42	BY259	0.30	BY229-600	1.28	LA1363	3.02	MPC5670	0.48	SN29770B	4.17	TA7124AP	2.34	TD41270	3.73	TI106M	0.38
2N5296	0.55	2SC394V	0.81	AN7158	2.67	BD133	0.53	BY262	0.57	BY229-900	0.90	LA1364	3.05	MPC5670	0.48	SN29772B	5.75	TA7129P	1.90	TD41327A	6.94	TI106M	0.38
2N5297	0.55	2SC403C	0.60	AN718	0.60	BD135	0.57	BY263	0.50	BY263	0.50	LA1365	3.05	MPC5670	0.48	SN29772B	5.75	TA7129P	1.90	TD41327A	6.94	TI106M	0.38
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Machine No.: NV330 NV777  
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BETA B				
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VC386 VC387 VC388 VC477 VC481 VC482 VC930 VC970 VC3300  
VC9100 VC9300 VC9400 VC9500 VC9600 VC9700  
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Head Part Nos.: 1430242 T02200  
Machine No.: VTC5350 VTC5500  
Head Part Nos.: 1430762 T02000  
Machine No.: VTC9300 VTC9455 VTC9500  
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Machine Nos.: 5458104  
Head Part Nos.: VT4000 VT4200 VT5000 VT5500  
Machine Nos.: 5458161 5458165  
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BETA D	Price
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01X0 027 085	£46.02
01X0 033 825	£47.05
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VT8700 VT9000 VT9300 VT9500 VT9700 VT9900

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Machine No.: SL3000, 8000, 8080, SLT 6Me, 7, 7E, 7ME  
Head Part Nos.: A6762 012A, 038A, 055A, 129A  
Machine No.: SL5W, 5000 5100 SLC5, C6, C7  
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Machine No.: SL3000, 8000, 8080, SLT 6Me, 7, 7E, 7ME  
Head Part Nos.: A6762 012A, 038A, 055A, 129A  
Machine No.: SL5W, 5000 5100 SLC5, C6, C7  
Head Part Nos.: A6762 072A, 122A, 136A, 139A, 213A  
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Head Part Nos.: A6762 012A, 038A, 055A, 129A  
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**MITSUBISHI**  
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Machine No.: SLC20, C30, C33, C40, C44  
SLF1, F30, HF72, T20, T30

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# What a Life!

**Donald Bullock**

As I walked to the workshop the Reverend Goode's battered little Fiat creaked into the drive. Beaming suitably as he got out, he spread his palms towards his cargo. I dived in and got the set out and into the workshop. A Ferguson one with a TX100 chassis.

"It works" the Reverend intoned, "but everyone looks touched by the devil."

"Most of them are" I quipped.

"Shouldn't take you long" he intoned.

"Vicar, the last one I did for you was an absolute ba.." I saw his face cloud. "Er, very bad" I said, struggling.

"Well, it won't cost much I'm sure" he replied, easing his ample form back into the car.

## Tackling the TX100

The set had terrible picture geometry plus a three-inch band of line frilling that was reminiscent of the effect you used to get with a faulty stick-type tripler. Being one of the larger screen sets, it had the little scan-correction panel. I adjusted the width potentiometer (RV72) and the E/W control (RV71) whilst observing a crazy crosshatch pattern. When doing this I found that the band of frilling moved as the geometry varied and that one could be improved at the expense of the other. But even at best the picture was totally unacceptable.

Not having another correction panel to try, I worked manfully on the one in the set. But there didn't seem to be anything wrong with it. So I moved back through the line output stage to the driver circuit where I found that a damp finger test at the base of the BC372 transistor TR8 played havoc with the frilling. Further tests showed that the voltages here were a bit odd, but a new transistor did no good. I eventually found that the feed resistor in the supply to the stage, R143, had risen in value from 15Ω to something like 330Ω!

A replacement resistor put matters to rights, and a message was sent to the Reverend to say that all was well.

## Oscar's Fidelity CTV14S

Shortly after that little episode Mrs. Gunge came in with her spotty son Oscar. She was carrying a Fidelity colour portable, a CTV14S, which is not the most commonly encountered version of the ZX2000 chassis.

After handing the set over Mrs. Gunge waved her arm in my direction and nudged Oscar. "See what I mean?" she said to him. "Mr. Bullock's got all the right gear. And he's been at it for years. You need these meters and things. It's no good trying to do it your way."

Then she turned to me. "Oscar's got two of these sets you see. This one's dead and the other has a broken tube. He wanted to try panel swapping but I told him we'd bring it along to you to have it done right."

Off they went and I soon found that the BUX84 chopper transistor was short-circuit. I fitted another one and switched on. The new BUX84 immediately failed. For want of anything better to do I decided to test the line output transistor, though I've never known one to fail in these sets. It was o.k. I suspected the line output

transformer, which does fail, but decided to work logically as Mrs. Gunge thought I did. After fitting another BUX84 I disconnected R828 to remove the load from the power supply and switched on. Up came the h.t. I switched off, reconnected R828 and disconnected the rectifier diodes fed from the line output transformer. When I switched on again the BUX84 failed as before. I looked at my dwindling supply of BUX84s and decided to reconsider my policy.

There was another ZX2000 set in the shed, with a defective tube. I fetched it, took out the line output transformer and fitted it in Oscar's set. This restored the brightness and background noise, but there was no vision or sound. After studying the manual I checked the varicap tuning voltage at point A4. It read 1.5V and didn't vary when I changed channels. I looked at the signals panel and decided that it would be quicker to borrow the one from the other set. It made no difference. Perhaps the supply to the tuning system was missing? A check through the feed circuit on the main panel showed that R914 was open-circuit. So I fitted the one from the stock set.

This brought the picture and sound back, but there was no colour and only channels 1, 2 and 3 could be selected. Suspecting a fault or two on the control panel, I borrowed the one from the stock set and switched on. It made no difference, and I noticed that the top of the picture was cramped and that I had half a screen-full of bright flyback lines over the picture.

I surveyed the main panel in the stock set, the one from which I'd pirated the line output transformer and R914. There seemed to be only one course open to me. I decided to replace these items and fit the whole panel in Oscar's set. When I switched on everything came right except my equilibrium.

As I put the set back together I reflected that I'd mended Oscar's set by swapping panels from my stock set with its broken tube. Exactly what Mrs. Gunge had stopped Oscar from doing on the basis that it was an unscientific, hit-and-miss approach. So much for sophisticated test equipment.

When they came back to collect the set Mrs. Gunge enthused over the lovely picture. She turned to Oscar and said "See that? Mr. Bullock got it right in no time at all, because he uses his brain and test equipment. Panel swapping indeed!"

But Oscar wasn't listening. He was eyeing a pile of Fidelity panels tucked around a broken tube in the upturned Fidelity cabinet at my feet "Mr. Bullock's got an old Fidelity just like mine" he said.

"Oh yes, so I have. Well wouldn't you know?!" Goodbye Mrs. Gunge, goodbye Oscar" I spluttered while pocketing the money Mrs. Gunge had paid me.

## JVC HRD150/Ferguson 3V45

The customer who brought this machine in had already tried two other dealers, both of whom had wisely given it back to him. The problem was that in use the capstan motor would intermittently stop, at which point the drum would spin rapidly as though to compensate.

I soon wished that I'd been the third to hand it back. It seemed to have a built-in perversion: it would work perfectly for days, then go haywire at its own whim. Eventually, after a very long dance indeed, I was reduced to a spate of violence against it while scanning the circuit with my giant magnifying glass.

I found that by concentrating on a small area I could instigate and stop the trouble. It turned out that the 5-1V

zener diode D408 was the cause of the problem: it was neatly cracked at its cathode end.

### **Ferguson 3V29/JVC HR7200**

"Daddy can't seem to repair your video recorder" I heard my wife telling our children. I applied myself with extra vigour. The tape in the Ferguson 3V29 ran erratically, disturbing the vision and making the sound intolerable. So I sent for and fitted a replacement capstan motor, but to my dismay it made no difference. Next I worked on the mechacon board, and eventually bought another one from a graveyard. Still no better. The power supply panel was the last resort, and I eventually found that the 7.5V zener diode D5 was leaky. Its replacement tamed the runaway capstan and brought the machine up to par, but I'm still working on the rehabilitation of my competence rating.

### **Philips CTX-E Chassis**

"Screen like a rainbow" said the customer. She was right: the purity was hopeless. I put on my Merlin hat and gave the tube a wave of my magic degaussing wand. After that all was well. So something was wrong with the set's degaussing circuit. I took out the posistor and sealed its fate by opening it up, expecting to find it severely indisposed. But it looked fit and well. I then punished the front of the tube whilst viewing a red raster. The set was still o.k. I next used the degausser to aggravate the tube's face by switching it off whilst in close proximity. This left the display slightly impure, and subsequent switching on and off produced no improvement.

A continuity check on the degaussing coils showed that they were open-circuit. The wires are terminated in a crimp-type plug, so I removed this, bared the wire ends and checked again for continuity. As all was well I soldered the wires in place, bidding the set farewell after a final wave of my wand.

### **Bush 2040**

"Bright green screen" said the customer about this Turkish-made set. My first step was to look for the green driver transistor on the tube's base panel. It was Q903, type KTC2068. Meter tests and scope component-tester checks cleared it so I next used the scope to check the inputs from the chroma output panel. The green signal seemed to be distorted, but I got nowhere with tests on this panel. Then an identical set came in with a different fault. I borrowed the chroma module but the fault remained after fitting it. So it was back to the tube base panel, where the main remaining suspect was the BF421 green output transistor Q904. It passed all the tests of course.

After wasting more time I could see no alternative to condemning Q904 despite its performance when checked. So I swapped it over with the red output transistor Q902 and got a bright red screen. Not having a BF421 I fitted a BF423. The result was an excellent picture.

### **Fisher FVHP905**

This machine came in with sluggish tape transport problems. After the usual cleaning I fitted a new idler and then noticed that a tension spring was missing in the loading gear area. I found it in the works. After refitting it fast forward was all right but rewind was still groggy.

A new set of belts was fitted and whilst at it I lubricated

the worm assembly. But rewind remained poor and sluggish. I decided to take out the spool holder for thorough cleaning and then noticed that its retaining clip washer was much thicker than that retaining the other spool holder. After replacing it with one of the proper thickness all was well.

I later learnt that the machine had been brought in on the rebound from an earlier trip to Snoddies, from where it had emerged worse than when taken in. If only customers would tell us these things before we discovered them the hard – and expensive – way.

### **Huanyu 37C-3**

A local hotel has a batch of these Chinese-made sets, and I'm still feeling my way around them. One came in with the mains fuse open-circuit. In addition the bridge rectifier and the 6 $\Omega$ , 6W surge limiter resistor R901 had failed. I indicted the STR4211 chopper chip and replaced it, but the set stubbornly refused to come on though the fuse remained intact.

Checks around the STR4211 showed that the 2.7V zener diode ZD907 had perished while R909 (270k $\Omega$ ) had gone high in value. For good measure I checked the 2SD898B line output transistor Q781 and found that it was short-circuit. Replacing these items brought the set back to life.

### **Bush 2321**

This was another Turkish mystery. "Bright white screen or jet black screen" was the report. I put the set on the soak-test bench and switched on. The result was uncontrollable brightness. Shortly afterwards I moved the set to the service bench and plugged it in. This time the screen remained dark, though the tube's heaters lit up to the accompaniment of an e.h.t. rustle.

After extensive and fruitless examination of the d.c. brightness and contrast control circuits I turned my attention to the TDA3562A colour decoder chip IC501. As the voltages around it were haywire I fitted a replacement. I was still no further forward however: the set continued to alternate between maximum and no brightness at its own whim, and a detailed examination of both sides of the PCB provided no help. I decided to make some checks in the beam limiter circuit. Two resistors here, R424 (27k $\Omega$ ) and R425 (56k $\Omega$ ), are connected to the h.t. line, but where were they? I had to find them because there was no voltage at the junction of R425 and R255. I eventually found them hidden under the line output transformer which had to be taken out to change them. Two new resistors completed the repair.

### **Ferguson TX100 Chassis**

The line output transformer had failed and the replacement to hand was of Konig manufacture. The original transformer had what at first sight looked like a screened lead that went to the tube's base panel. In fact the "screening" is a high-voltage conductor, the lead carrying the tube's focus and first anode voltages. The Konig transformer has an unscreened lead for the focus voltage and a separate green lead for the first anode supply. After sorting all this out the set was still dead. As the power supply was all right I checked back through the line output stage and found that the BC372 Darlington line driver transistor TR8 had failed. A replacement cured the trouble and the set was removed from the bench with a sigh of relief.



# VCR Clinic

*Reports from Philip Blundell, AMIEE,  
Joe Cieszynski, Eugene Trundle, Nick Beer,  
Ed Rowland, Brian Renforth, Mike Leach,  
S.A. Featherstone and Ian Bowden*

## Philips VR6367

I knew that I had trouble with this one as soon as I tuned it in: there was no test pattern, no E-E output and hum was present on the loop-through signals. A dummy cassette was inserted but the machine wouldn't go into the play mode as the head was rotating slowly. The 13V supply at the head servo was found to be low at 9V, but was correct at the power supply. This was due to a break in the earth line between the power supply and module P607: on removing the board a section of print between pin 8 of plug B13 and pin 1 of plug B19 was seen to be burnt out. When this was repaired the machine worked, but the servos didn't lock as the control track pulses were missing – there was an internal short between pin 13 of i.c. 8501 and chassis.

I've had this strange fault now with two dealer repairs. The only cause I can think of is that they've accidentally swapped over plugs B13 and B19 at some time. The plugs are of the same size and are close together on the board.

**P.B.**

## Philips VR202

This machine was dead, with the BUT11AF chopper transistor short-circuit and the 3-3Ω surge limiter resistor open-circuit – the fuse was intact. Nothing unusual here, but the replacements again blew, which was unusual. I should have checked the other transistors, shouldn't I? One of the drivers, 7126, was short-circuit. In went a replacement, along with another BUT11AF etc., and the machine was then powered via the variac. It worked and produced the correct voltages, but the BUT11AF was getting very hot and obviously wasn't going to last long. A scope check showed that the drive waveform was low while the frequency was much too high considering that there was no load. Problems like this are usually cured by replacing all five transistors in the chopper circuit, but not this time! Eventually C2127 (330nF) was found to be open-circuit.

Incidentally, don't worry if you cannot get the BUT11AF's drive waveform to look like the illustration in the manual: it's the correct size but is drawn upside down! Press the invert button if your scope has one.

**P.B.**

## Philips VR202

The deck carried out the command when play was selected but there was no picture or sound and no other deck commands would be accepted until the mains input was interrupted. It seemed that the microcontroller chip was crashing during its program: anyway a new P8052AH JSTD1-1U solved the problem.

**P.B.**

## Sanyo VTC5000

This ancient Betamax machine was still much used by its owner who was keen to have it restored to working order. His complaint was of a cogging effect on the picture, similar to the effect produced by an open-circuit anti-hunting capacitor in a flywheel line sync filter circuit. A few scope checks around the servo confirmed that the drum was hunting. The next check, on the d.c. supply to the drum motor, revealed the presence of a 600Hz ripple.

To rule out the possibility of the fault being caused by a high impedance in the power supply I disconnected the drum motor and ran it from an external bench supply. The fault persisted.

As this machine uses a direct-drive motor there's little else, other than a worn lower drum assembly, that could cause the fault. A suitable replacement was obtained from a scrapped machine, restoring normal operation. This is not the first time I've had the problem. In fact any machine can produce the symptom when the drum motor runs erratically.

**J.C.**

## Sanyo VHR4350

The playback picture kept drifting into lines and snow – recordings were similarly affected. The sound didn't vary, and the capstan speed was correct. The cause of the problem was that the head drum wasn't phase locked, because no PG pulses were being fed back into the servo system. The little PG coil inside the drum motor has a printed link to the motor's connection plug and there was a dry-joint in the circuit. It's not difficult to dismantle the motor and repair it.

**E.T.**

## Sanyo VHR3300

The problem with this machine was intermittent failure to record: when the fault was present the machine would go straight into play, even when the cassette's safety tab was unbroken. The cause was a broken tab-sensor switch. We often come across this, though the fault is usually more certain. Our man-on-wheels who brought the machine in was puzzled by the three seconds each way wind/rewind cycle performed by the machine each time a tape is loaded. This is programmed into the control microcomputer chip.

**E.T.**

## Ferguson FV10B

This fault could probably apply with any VCR but serves to show that things aren't always what they at first appear to be. Because of regular (one second) drum speed variations a servo fault was suspected. We noticed however that there was quite a lot of graphite around the base of the audio-control head. Closer inspection showed that the head had been screwed down almost to its limit and was damaging the top edge of the tapes. Head realignment restored normal drum operation and of course improved the sound quality. The customer denied that the machine had been tampered with though he did admit that his son had removed the cover – "he's usually quite good with electrical things". Now where have I heard that before?

**E.R.**

## Panasonic NV-G25B

After replacing the head drum and attending to most of the usual noisy bits I found that the start sensing didn't work. When I selected fast forward I discovered that the end sensing didn't work either – the motor kept running against the clutch when the tape reached either extremity. Shorting either of the relevant pins (18 or 19) of the syscon

microcomputer chip (IC6001) to chassis showed that the circuit beyond this point worked, i.e. the machine cut out/shuffled/went into rewind. In view of this and the fact that failure of both sensors was unlikely, also that a pair of back-to-back infra-red output LEDs are used, it seemed likely that the drive to these LEDs was missing. We've had this on several occasions, but not previously with this model.

The drive consists of a pulse waveform with a variable mark-space ratio for the different modes. It comes from pin 6 of IC6001 and is first inverted by the DTA144EA digital transistor QR6012 which has been responsible for loss of the signal in the past. Not this time however. Its inverted output passed through the driver transistor Q6019 correctly then through the feed resistor R6006 to pin 12 of BP6001. This 12-pin connector links the main PCB to the mechanism behind the mode switch. The connector here doesn't solder through the PCB: its leadouts are connected to pads on the same side of the board. Pin 12 had never been soldered, thus depriving the LEDs of their drive. The question is did the machine ever work and if so how stretched are the customer's tapes?! **N.B.**

### **Panasonic NV-J30**

After running for three hours this machine would cut out to stop, remaining powered, whatever mode it was in. Restarting it would provide a few more seconds of action before it once more decided to have a rest. We suspected loss of reel tacho pulses from the ON2170 opto-interrupter IC1501 beneath the take-up reel. The pulses were in fact there but were of only 250mV peak-to-peak amplitude – a rather inefficient use of the 5V supply! The supply was found to be low at only 2.2V however. It's developed from a 12V feed by a regulator in the syscon section on the main PCB and goes to many areas. When the feed to the opto-interrupter was disconnected the voltage rose to 5V. A new ON2170 restored normal action. **N.B.**

### **Samsung SI7220**

The complaint was of vertical jitter on playback, the symptom suggesting that the setting of the PG shifter VR201 was incorrect. When VR201 was adjusted the symptom varied but couldn't be cured completely. In fact VR201 couldn't be set correctly. This suggested that the drum motor was the cause of the problem. A replacement proved this to be the case. **N.B.**

### **JVC HR7200/Ferguson 3V29**

These fine machines go on and on. A weakness, which has been reported in these pages before, is the coaxial aerial input socket which is directly connected to the booster unit. The socket has a tendency to work loose, resulting in poor contact with the aerial plug or even breakage. If the socket is broken it can be replaced, using a beefy soldering iron, but if it's intact the contacts can be carefully realigned to ensure good contact with the aerial plug, after which a reinforcement ring from a scrap TV coaxial socket should be fitted. I wonder why JVC didn't fit such a ring in the first place? **B.R.**

### **Panasonic NV333**

This machine had a fault I've not come across before: there was no record f.m., but playback was o.k. Another company had told the customer that the heads were faulty.

True, they weren't very clever. Reverse search was poor, but normal playback was fine. I started by checking the various record supplies, of which there are several. This revealed that the "except rec high" line was at 5V in the record mode when it should have been low. Following through the circuit I came to transistor Q3020: it was o.k. but the 220µF, 6.3V capacitor (C3094) connected across its emitter and collector was short-circuit. Fitting a replacement restored normal recording. **M.L.**

### **Pye DV468**

This machine produced a blank raster in all modes: there was no test signal, no playback and no E-E signals, just a blank white raster. Modulators have given problems with these machines in the past, so I tried a replacement taken from a scrap machine. No difference, so out with the meter. The test signal is generated within IC7451, a TDA3755 chip on board P306. It's fed to the demodulator via the TDA3760 chip IC7151 on the same board. I decided to start on this board. D.C. checks soon revealed that there was no +12V supply at plug 5S4. This supply comes from the BC376 transistor T7607 on the main panel. When removed this transistor proved to be open-circuit, a replacement restoring good pictures in all modes. **M.L.**

### **Philips VR6467**

Our field engineer brought this machine in with the report "sound faulty, fit rack, suspect pinch roller". Now if you don't know it this deck does tend to produce sound fading problems: the pinch roller hardens, pulling the tape down across the audio head with the result that the audio section is taken below the audio head. So I thought here goes, another rack assembly (though I find I'm not fitting as many now as in the past). But after fitting it the sound still warbled. The capstan motor and associated circuits were then checked and found to be o.k. Back on the deck I released the tension on the arm/bracket 268. This pushes the pinch roller into place and the warble stopped. So I replaced the bracket, again to no avail. Changing the capstan itself also failed to provide a cure, but slight pressure on the capstan holding assembly did the trick. So I took the white cap off the top, revealing the cause of the trouble: the top brass bearing had worn to an oval shape. A replacement cured the fault and occupied the rest of the morning's working time, though I'd learnt a lot more about these decks. **S.A.F.**

### **Panasonic NV-MS1**

The complaint was of a knocking noise in play and record. It was soon tracked down to the capstan motor. There was no noise however when the motor was turned by hand via the reel drive pulley. A scope was connected to the three outputs (pins 1, 3 and 23) from the capstan motor driver chip IC2005 to the motor coils. This revealed the presence of spurious spikes on two of the three connections – the third appeared to have none of these spikes. After removing the battery compartment to gain access to the motor the reason for these spikes could be seen: some dark particles clung to the magnetic outside edge of the capstan rotor. This magnetic ring is used to produce the output from the FG head, so every time the particles, which appeared to be ferrous, passed the head a short burst of spurious pulses were passed to the capstan speed servo. The noise was caused by the servo trying to correct the speed. **I.B.**



# Long-distance Television

Roger Bunney

The 1991 Sporadic E season which started in early May has to date been rather a flat one. There have been plenty of signals, but apart from a little exotic reception on two days the results have been less than spectacular. The season could be a "late developer" of course, and maybe conditions will have improved by the time that this is read.

There was SpE reception on most days throughout May and into June, and some really intense tropospheric activity during the last week of May. The collated SpE log is as follows:

- 5/5/91 TVE (Spain) chs. E2, 3; +PTT (Switzerland) E3.
- 6/5/91 TVE E2; TSS (USSR) R1, 2; NRK (Norway) E2.
- 7/5/91 TSS R2; CST (Czechoslovakia) R2; TVE E2, 3; RAI (Italy) IA; TVA (Italian private station) IA.
- 8/5/91 TVE E2, 3, 4; RAI IA; Canal Plus L3.
- 9/5/91 RAI IA, B; TVA IA; TVE E2, 3; JRT/HTV (Yugoslavia) E3; RTP (Portugal) E3.
- 10/5/91 TVE E2, 3; +PTT E3.
- 11/5/91 TVE E2; SVT (Sweden) E2.
- 12/5/91 TVE E2, 3; RAI IA; JRT/HTV E3.
- 13/5/91 TVE E2, 3; RAI IA; RTM (Morocco) E4.
- 14/5/91 TVE E2, 3, 4; TVE-2 E2; RAI IA, B; TVA IA; RTP E3; JTV (Jordan) E3 at 0935 BST.
- 15/5/91 RTP E3.
- 16/5/91 RAI IA; TVE E3, 4.
- 17/5/91 TVE E2, 3; RAI IA, B; TVA IA; a wideband f.m. studio-transmitter link with music etc. was heard at 48.2MHz.
- 18/5/91 RAI IA.
- 19/5/91 JRT/HTV E3.
- 20/5/91 TSS R1, 2; TVE E2, 3; NRK E2.
- 21/5/91 NRK E2, 3 (Kautokino), 4; YLE (Finland) E3, 4; SVT E2, 3, 4; DR (Denmark) E3; RUV (Iceland) E4; TVP (Poland) R1, 2; CST R1, 2, 3.
- 22/5/91 TSS R1, 2 (including 0249 test pattern and Leningrad identification); YLE E3, 4; NRK E2; SVT E2, 3; TVE E2, 3; RTP E3.
- 24/5/91 TVE E2, 3; RAI IA; RUV E3, 4.
- 25/5/91 DR E3, 4; SVT E2, 3, 4; NRK E2, 3, 4; TVE E2, 3.
- 26/5/91 TVE E3.
- 27/5/91 NRK E2, 3.
- 28/5/91 TVE E2, 3, 4; +PTT E3; RAI IA.
- 29/5/91 TVE E2; NRK E2, 3; SVT E3.
- 30/5/91 RAI IA.

31/5/91 TVE E2, 3; RAI IA, B.

1/6/91 TVE E2, 3, 4; RAI IA, B; TSS R2; Canal Plus L2, 3.

2/6/91 Canal Plus L3; TVE E4; TVE-2; RTP E3.

There was a slight tropospheric lift on May 9th, with Benelux signals in Band III and at u.h.f. noted throughout the south/south east. A further minor lift occurred on the 20th when TVE was received on ch.E5 and several u.h.f. channels. This time the opening was restricted to the north and north west. The major tropospheric opening started on the 25th and lasted through to the 31st. On the 25th Denmark, Sweden, many German transmitters, RTL Plus ch. E36 and the SSVC ch. E48 UK Forces transmitter were received. The 28th to the 31st saw sustained Band III/u.h.f. reception from NRK, Denmark DR and TV2, Germany and the Benelux countries. An interesting signal was RTL Plus ch. E59, logged by David Glenday well to the north in Arbroath. The best day was undoubtedly the 31st, with reception from most of the above sources plus SAT-1 relays, RTL and former East German stations. The u.h.f. channels were crammed with signals during much of the four-day period. On June 1st conditions declined dramatically.

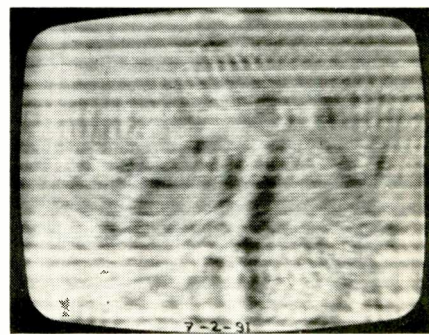
My thanks to David Glenday (Arbroath), Roger Fussell (Torpoint), Peter Schubert (Rainham), Simon Hamer (Powys), Cyril Willis (King's Lynn), Tim Anderson (St. Leonards) and Brian Williams (Penarth) for sending in their reception loggings.

Anthony Mann in Perth, Australia writes that during late April he was receiving excellent F2 signals on the EW path, from New Zealand and eastern Australia. Records seem to have been broken on the 28th, with reception from 50MHz amateurs in South America and San Diego, California. His main catch was a 525-line system M signal at 55.24MHz. From its direction the possibilities are Daytona Beach Florida, Houston Texas, Little Rock Arkansas or Chihuahua Mexico. The spectrum up to 50MHz was wide open to signals from as far as Namibia, Botswana and Hawaii.

Todd Emslie received many F2 signals in Sydney during the opening, mainly from New Zealand, the USSR, Malaya and Korea/the Philippines (ch. A2 at 55.25005MHz). Robert Copeman received many of the same signals at Mount Waverley, Victoria. A unique catch here was a 49.75MHz system M signal with Chinese characters floating over a 625-line Chinese ch. C1 signal. Can anyone throw any light on this mystery?

## News Items

**UK:** The ITC is expected to advertise Channel 5 licences this winter. The network will consist of 32 transmitters, 25



Left: Middle East Broadcasting identification, a new satellite service via Eutelsat II F1 (13°E) at 11.554GHz horizontal. Centre: The "3" logo from Thailand TV, received by Anthony Mann in Perth, Australia. Right: Classic F2 reception, from the USSR with the clock three hours in advance. This ch. R1 signal was received by Ryn Muntjewerff in Holland.

of these being co-sited with BBC/ITC transmitters. The service should be operational some time in 1994.

**Czechoslovakia:** The first independent TV station, NTV-Nezavostoa Televize, came into operation in Prague on April 3rd, using channels R21 and R29. The test pattern is transmitted from 1700 to the start of programming at 1830 local time. Output powers are low, intended for local reception in Prague.

**Bulgaria:** A remarkable situation here. In the Sofia region the secret service is jamming the first and second programmes from Belgrade on chs. E32 and E23. Belgrade had previously ceased ch. 25 transmissions due to heavy jamming. The authorities have also been jamming the Greek first programme in south-west Bulgaria.

**Sweden:** Tele-2 is to start operations this autumn as a rival to Televerket, offering nationwide video links via satellite uplinks and fibre-optic cables laid alongside railway lines.

**Iceland:** Teletext tests are to start this autumn, the system being known as Textavarp. Nicam stereo is expected to start early next year.

**Germany:** The federal states of Brandenburg, Mecklenburg and Berlin are to form a broadcasting operation known as Nordostdeutscher Rundfunk (NOR), absorbing SFB. A third service is to use the former DFF Landerkette channels. New identifications are being used with the SWF Fubk pattern, SWF/BADN 1 NORD and SWF/BADN SW3/N (SWF-3).

**USA:** Tests of Super NTSC are being carried out, the system combining digital video processing with non-interlaced 1,050-line scanning. For conventional receiver use the signal is converted to standard 525-line NTSC form prior to transmission. For Super NTSC reception a decoder that would add something like \$300 to the cost of a receiver would be required.

### Transmitter News

The BDXC tell us that the following Belgian RBRT TV2 transmitters are now equipped for stereo sound: Brussels-RAC ch. E25, Egem ch. E46, Genk ch. E47 and Schoten ch. E62.

A couple of Bulgarian transmitters, Arbanasi BT-1 ch. R3 50W and Schumen ch. R5 100kW are possible here during an SpE opening. The high-powered ch. R3 transmitter remains unidentified. It might sound unduly optimistic to suggest reception of the 50W transmitter, but some years ago I received an Icelandic 10W ch. E2 relay in Southampton using crossed dipoles.

### Satellite TV

The contract to launch Eutelsat II F5 has been signed. Its orbital position will be 7°E. The craft will have 16 Ku band transponders for telephony and TV traffic. For test and evaluation purposes the European Cup Final on May 29th was uplinked via Eutelsat II F2 using an HD-TV standard.

During late May Eurosport returned to Astra 1A and Eutelsat II F1, though via different transponders. It seems that the European Sports Network (TESN) is still trying to close the channel down.

AsiaSat-1 is now in operation in Band C on a test basis, controlled from Hong Kong by Hutchvision Ltd. Its southern footprint covers from Egypt to Japan and its northern footprint from Mongolia to Indonesia, taking in some 41 countries with almost fifty per cent of the world's population. The plan is to transmit one Chinese-language and four English-language channels in PAL to the south, with the channels duplicated in NTSC form to the north. Current tests are on transponder N5 to the north, at

## AERIAL TECHNIQUES

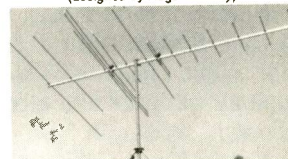
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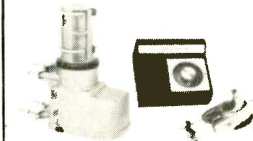
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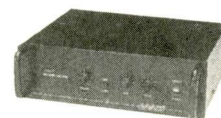
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3.38GHz, and S6 at 3.94GHz to the south. The satellite has 24 transponders in all.

The Italian state broadcaster RAI has confirmed that it intends to start satellite TV transmissions this year using the D2-MAC standard.

CTL (Luxembourg) plans to introduce a French-language RTL-2 service via Astra 1B shortly, bypassing French government regulation.

If you want to tune into Space Shuttle TV, look in at the 2.214GHz Shuttle downlink frequency.

### New Zealand Ch 1 Transmitters

Simon Hamer has provided the following details of New Zealand transmitters that use ch. 1, whose nominal vision carrier frequency is 45.25MHz. Use of a scanner to note the offsets will enable these stations, which could be received in the UK via F2 propagation, to be identified.

Station	Offset	ERP
Hikurangi, Northland	+10.4kHz	10kW
Hedgehope, Southland	zero	100kW
Kaukau, Wellington	zero	100kW
Mt. Murchison, Nelson	+10kHz	2kW
Mt. Studholme, Nelson	-10.4kHz	10kW
Te Aroha, Waikato	-10kHz	100kW
Whakapinake, E. Coast	+10.4kHz	10kW

Mt. Studholme carries TV2, the others TV1.

### Vintage OB

In these days of live international hookups it's easy to forget that history was made only 41 years ago, on August 27th 1950, when live TV pictures were for the first time transmitted across the Channel from the main square in



Calais. The technology used was significant, a 4GHz microwave link being employed at a time when Band I TV was just expanding across the UK, with very few transmitters. Earlier tests had proved that s.h.f. links could be used. The Calais-London circuit involved several hops, first from Calais to Dover, then to Lenham, both at s.h.f., next to Wrotham at v.h.f., then a radio link to London University Senate House at Bloomsbury and finally a coaxial cable feed to Alexandra Palace. Pioneering technology was used and recordings of the programme are occasionally shown on BBC-TV. We've come a long way, from Calais Town Hall to seeing live Scud attacks on Riyadh via a single hop from a small SNG dish in the desert to the London Teleport.

### Book Review

During a recent holiday I found *European Scrambling Systems, Circuits, Tactics and Techniques* by John McCormac a fascinating read. It's published by MC2 Publications, Waterford, Eire and is available at £29 including UK postage from J. Vincent Technical Books, Bayling Publications, 24 River Gardens, Purley, Reading RG8 8BX. Each known and used encryption standard is

included, with a clear description of its operation, the history of its use, the various descrambling methods and notes on possible future modifications to the method of encryption. Those with experience in circuit design and current TV engineering will find that sufficient information is provided to construct decoders. In addition to the various MAC standards the book delves back to cover simpler schemes such as that used with the Premiere film channel (SAVE), the Canal Plus/RAI Discret shuffle and the Filmnet system. The anti-hacking and dirty-trick techniques described are an education in their own right.

Information provided includes circuit designs for the forthcoming Irish microwave distribution system. Tangential subjects such as industrial espionage and reverse engineering (taking a circuit apart to find out how it works) are covered. There's a description of the Sky decoder, which is referred to as a "dumb terminal" – the real work is done by the Smart card which contains within its gold square a microprocessor, ROM, EEPROM and RAM in addition to the shorting links. We read how clone Videocrypt decoders were enabled by a single decoder.

The book is an absorbing account of modern electronic encryption, decoding and piracy. It has a soft glossy card cover, A5 format and runs to several hundred pages.

## CD Player Casebook

*Reports from Mike Leach,  
Philip Blundell, AMIEE  
and Ronald Aranha*

### Pioneer PDX540

I've found that chip failure in modern Pioneer players is a rare occurrence. Generally speaking these machines are quite reliable. This one had a problem however, very slight distortion on both channels, mostly from cold. Once the machine had warmed up the sound was o.k. So a spot of freezer came in handy. The culprit turned out to be the CXD1135QZ main decoder/signal processor chip IC3. A similar symptom could have been caused by the RAM chip, but in this case it was all right. M.L.

### Ferguson CD08

This machine wouldn't read discs: when the tray closed, the disc rotated only very slowly. My experience is that this is a common problem with CD players. The sled motor had seized, so the laser unit couldn't return to the centre of the disc to read the TOC. A new motor put matters right. M.L.

### Pioneer LDV200

This machine was a Laservision player with a difference: it was used in conjunction with a special P.A. system for karaoke evenings. The chap who struggled into the shop with it was in a panic. "Can you fix it?" he pleaded. The boss said yes and that it would be ready the following day. Bosses always say yes. Before they become bosses they say no to everything: they get promoted for saying no all the time then start saying yes. However that may be, the problem with the machine was that it spun the 12in. Lasersdisc extremely fast anticlockwise.

As I didn't have a circuit diagram the obvious first step was to check the circuit protectors in the power supply. Everything seemed to be o.k. so I stripped the machine down and tried to muster some enthusiasm. At one point the machine seemed as if it might work. In view of this I turned the machine over and inserted a disc. The fault

appeared again of course. What to do next? As you can imagine, the disc motor is fairly hefty. A connector on its PCB plugs into the motor drive board. When I wiggled this board about the motor stopped spinning. Basically the plug was loose. Tightening the contacts cured the fault, which was a great relief.

When the boss came back from having his tea we were listening to *Strangers in the Night* without the words and playing about with the P.A. system's pitch control. These karaoke players are extremely clever: the pitch control on the amplifier alters the pitch, not the speed at which the music is played. This is presumably to compensate for bad singers like myself! M.L.

### Philips CD230

The tray and turntable motors were constantly powered and there was no -10V supply at pin 4 of IC7560 – when checked the reading was +10V! The 2.2Ω safety resistor in the feed to pin 4 of this chip was open-circuit. P.B.

### Sony CDP-C100

This player is equipped with an automatic disc changer that enables ten discs to be played in a row. You can choose from a large number and wide variety of selections. It was installed at a hotel to serve in-house music requirements. The problem was skipping and inability to read certain discs. When test disc YEDS-18 was played the machine read the TOC but started skipping. A scope check was then made on the r.f. output to assess the eye pattern. The r.f. signal's peak-to-peak amplitude was found to be just 0.2V when it should have been between 1V and 1.4V. This suggested that the KSS150A optical unit was at fault. When a replacement was fitted and the relevant adjustments were carried out the machine worked normally, the r.f. output being 1.1V peak-to-peak R.A.

# Cassette Salvage

**Stan Jackson**

Video cassettes tend to be taken for granted. Too many of them are thrown in the refuse bin when they malfunction. But this is not necessarily how a tape should end its useful life.

## Symptoms

Let's start by outlining a few of the symptoms produced by a faulty cassette. Poor and/or intermittent fast forward and rewind is one. Another is a tape that on play or record produces a noisy, intermittent picture, sometimes accompanied by noise bars across the picture. These are an indication that the tape is running at the wrong speed, placing a strain on the motor and transport system. As a result the heads and tape transport path become coated with oxide particles, a clean-up job being required before the machine can be used again. The extreme case is when a tape gets well and truly entangled in the machine.

For some time I pondered over this problem and dismantled many cassettes in an attempt to rectify the faults, always without success. Eventually I arrived at a solution, and I'm pleased to say that the problem is now a thing of the past. The following notes outline the steps to take.

## Tangled Tape

If the tape is entangled within the machine, switch off and use a pair of scissors to cut the tape at both sides of the cassette. Great care is called for in clearing the jammed tape from the machine, which usually means opening it up. After clearing the entangled tape, use a known good cassette to test the record and playback operations. If no damage has been done, all well and good: if not, use a cassette cleaning tape and try again – this usually restores normal operation.

## Repair Procedure

The following procedure should be adopted to repair the cassette itself. First prepare a clean work surface. Then, after removing the edge label, use a good-quality Phillips screwdriver of the correct size to remove the cassette casing screws. Place these in a saucer or something similar so that you don't have to search around on the floor afterwards to find the odd screw. At this stage hold the cassette firmly to prevent it coming apart. With the cassette in the same position as when inserting it in the machine, right side uppermost, rotate it through 180° so that the front label edge is at the rear. The loading flap should now be towards you, with the hinge at the top edge. With the front edge held so that the loading flap remains in place, lift the top edge of the case from the lower section and put it aside. This gives access to the reels and the tape transport system.

To the rear centre you'll see the reel-stop or braking mechanism, which consists of three levers. The centre lever exerts pressure on the one at each side: when the centre lever is depressed the side levers can be moved away from the reel edges, allowing them to move freely. The centre lever is easily disturbed when the case is open and is

simple to replace as no springs or attachments are connected to it. Slight pressure on the centre lever frees both reels so that the tape ends can be drawn out for splicing. Draw about nine inches from each reel forwards towards you. Hands should be perfectly clean and dry, the work surface likewise.

## Tape Splicing

I prefer to splice manually, and draw a line on a piece of paper to assist with the lining-up procedure. Cut the tape ends as square as possible and use a three-quarter inch length of splicing tape, carefully attached to the tape side that faces away from the front and towards the inside of the cassette. Before splicing, ensure that both tape ends are correctly aligned and are not twisted with respect to the tape run from reel to reel. If a tape-splicing kit is available, so much the better. Apply a fractional amount of white chalk powder to the splice, using the tip of your little finger. Then after wiping your hands remove the residue carefully with a duster. This ensures that no adhesive is present around the splice, avoiding complications at a later stage. If the splicing operation is done with a closed cassette and no other work is required, gentle pressure on the reel-brake lever, accessible through a small hole in the centre underside of the cassette, will release the reel brake, allowing the tape to be drawn out. The tip of a ball-point pen is ideal for this purpose.

## Cassette Overhaul

Back now to the cassette overhaul procedure. It's a good idea to sketch the tape patch before dismantling the cassette – note that the left-hand threading differs from the right as the tape makes its way past the pins and rollers. A sketch will avoid confusion when you reassemble the mechanism.

Carefully lift the reels, one at a time, from the casing. Then, with the tape clear of its run, place the reels aside. I've found the ideal lubricant for the next stage to be Sainsbury's Sheen, a cleaner-polisher. You'll find that with time a sticky, greasy substance builds up in the interior of the cassette case and on its mechanism. Deal with this as follows.

First clean and polish the lower plastic casing of the cassette. Do this by applying a small amount of the cleaning fluid to the reel compartment areas. There are two circular areas, each of which must receive attention. Clean the left-hand area with a clockwise motion and the right-hand area with an anticlockwise motion, so as to disturb the braking levers as little as possible. A clean lint-free cloth should be used to apply a few drops of the fluid, after which polish with a light motion until dry. Repeat this operation on both surfaces and check the result with the tip of a finger. The surface should be silkily smooth. Then clean the underside of each reel in the same way, being careful not to touch the tape.

Now for the tape rollers and guide pins. Lift out the chrome rollers, clean them with a drop of the polish on the tip of a duster, then replace them. Do the same with the left-hand nylon roller. Gently prise the steel pins, one at each side, from their sockets. Clean them, replace and press home. Next replace the reels, one at a time, operating the braking levers so that the reels drop into place. Insert the right-hand reel first, guiding the tape carefully through its path via the rollers and pins. Note that, as previously mentioned, the left-hand path differs slightly from the one at the right.



Before closing the case activate the brake lever, by application of gentle pressure, in order to free the reels. Check that the tape runs correctly by rotating each reel in turn. Finally, with the brake in position, rotate one reel slightly to take up any slackness. Place the top of the casing in position very carefully and, when aligned, press down and secure with the centre screw first followed by the remaining screws. Load the cassette into the VCR and wind fully forward, then fully rewind. This is especially necessary with tapes that have been out of use for a long period.

You may ask whether all this is worthwhile? The satisfaction obtained from reviving a dead tape is great indeed. Best of luck!

# TEST CASE

## 344

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

Sherlock's coming along well: he seems to learn more about TV servicing during a week at the bench than he could in a year at technical college. As he says, it all comes alive on the bench. On one or two occasions he has himself come alive, to everyone and in particular Sherlock's consternation!

During quiet periods we set Sherlock to work on second-hand stock equipment. One such item was a Sony TV set, Model KV2204, which had come up for a decision on whether to refurbish or scrap it – the decision depends mainly on the condition of the tube and the cabinet. Though old now these sets are good. This one's cabinet was in excellent condition and it was complete with an RM604B remote control unit, a point in its favour. On test all worked well apart from the quality of the picture: the display was ill-defined and had a sickly green hue, especially in areas that should have been red.

Sherlock carefully discharged the tube's bowl capacitance before connecting a tube tester, a precaution based on bitter experience of damage to himself and to the testing machine. The emission indicator needles were slow to rise, and when they had eventually crept up to their final positions the readings for all three guns were low: the red gun was almost "on the floor". Various degrees of reactivation were tried with little success. At the end of it all the Sony set's picture was still poorly and the newsreader still looked as though he'd just crossed the Channel in a force 9 gale.

The Service Manager has to authorise the scrapping of a set. He was about to condemn this one when a gleam came into his eye. He trotted off to the warehouse then staggered back, some moments later, with another 22in.

Sony set. It had a broken cabinet and a label on which "PSU U/S" was written. He had Sherlock test its tube – there was no charge left in it from last October. To their delight the tester/reactivator showed that the emission was very good. So the decision was taken to make one good set from the two then sell the set at the company's retail arm, Tower Road Television. Sherlock set to work.

An hour later the deed was done, but when the reassembled set was switched on there was a bright green picture with no other colour visible at all! The display remained green while the brightness, contrast and colour controls were wound from one end of their travel to the other. It stayed green while all the drive and background presets were twiddled. The brightness and contrast of the green image could be altered, but no other colour could be obtained. Sherlock checked that the newly fitted tube had the same type number as the previous one. It had: 570BE22.

His next move was to check the drives at the tube's cathodes. He found that there were perfectly good waveforms of about 90V peak-to-peak at each gun. So the tube tester was hooked up once more, this time by the Service Manager himself. The tube again passed the test with flying colours. S.M. replaced the base and e.h.t. connectors and switched on – Sherlock and the others having by now gone out to lunch. Up came a picture with just about every colour of the rainbow. Once the set was converged and set up the display was very good indeed. How do you account for that? See next month for the answer and another test case puzzler.

### ANSWER TO TEST CASE 343 – page 669 last month –

As Sherlock continually finds, dealing with electronic equipment faults is seldom straightforward. His struggle last month was with a little TX90 Ferguson set with the two linked symptoms of low brightness and no colour. Checks showed that the cause of the troubles certainly lay within the colour decoder chip IC103. But for the device itself to be responsible it would have had to have developed two separate faults simultaneously. This was unlikely unless there had been a flashover from the tube or a high-voltage section, and there was no reason to suspect that such an event had occurred.

There's one common factor however with the luminance and chroma signal processing carried out within the chip. Television Ted soon latched on to this. It's the line-rate pulse that's fed to the chip, within which it's used for luminance signal clamping, PAL switch phasing and burst gating. In the TX90 chassis it enters the UPC1365C chip at pins 19 and 23, which are linked together externally. The pulse comes from the line output transformer via a network of diodes, resistors and capacitors. There was a good pulse at the transformer but a very peculiar waveform at the chip.

Perhaps the most vulnerable component in the pulse shaping network is the high-value (270k $\Omega$ ) resistor R171. It proved to be virtually open-circuit, a replacement restoring full colour and brightness. Good old Ted!

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VC9500, VC9700, VC381, VC8381, VC383,	
VC388, VC482.	
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VS2, VS3, VS4, VS5	£5.20
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AN3392	£2.95	AN7420	£1.95	HA11716	£4.75	LA4183	£2.20	SA5030	£3.50	STK5421	£6.50	TD1010A	£1.40	BRY56	£0.20
AN3821K	£5.95	AN7470	£2.20	HA11717	£4.75	LA4190	£1.75	SA5042	£8.00	STK5421	£6.50	TD1010A	£1.40		
AN3822K	£6.95	BA1335	£2.50	HA11718	£4.75	LA4192	£1.75			STK5451	£5.30	TD1011	£1.40	BU208A	£1.00
AN5010	£3.95	BA1355	£2.20	HA11724	£8.00	LA4201	£1.60	STA301A	£3.95	STK5451	£5.30	TD1015	£1.50	BU208D	£1.00
AN5011	£3.95	BA1502A	£2.50	HA11727	£8.00	LA4260	£2.30	STA401A	£4.50	STK5461	£5.50	TD1170N	£1.50	BU326A	£1.20
AN5030	£4.50	BA5115	£2.50	HA11736	£6.50	LA4461	£2.30	ST4411C	£2.75	STK5482	£5.95	TD1170S	£1.50	BU396	£0.95
AN5033	£5.25	BA5204	£2.20	HA11744	£9.95	LA4270	£2.75			STK5482	£5.95	TD1506	£4.35	BU407	£0.70
AN5071	£1.20	BA5402A	£2.50	HA11745	£7.50	LA4280	£2.95	STK0029	£4.75	STK5720	£4.25	TD1510	£3.60	BU408	£0.95
AN5135K	£3.95	BA5406	£1.50	HA11745NT	£7.50	LA4420	£1.50	STK0039	£4.75	STK5725	£4.25	TD1510S1	£3.95	BU426A	£0.80
AN5150	£5.50	BA5408	£2.20	HAHA11747A	£7.50	LA4422	£1.50	STK0040	£6.25	STK5730	£4.25	TD1515A	£2.50	BU426E	£0.70
AN5151N	£6.50	BA6104	£2.20	HA11747ANT	£7.50	LA4440	£2.50	STK0049	£6.50	STK6732	£11.75	TD1515Z	£1.95	BU500	£1.50
AN5256	£2.20	BA6109	£1.60	HA11749	£4.25	LA4445	£2.20	STK433	£5.25	STK7308	£5.95	TD1770A	£1.50	BU508	£1.00
AN5265	£1.75	BA6122	£2.20	HA11750	£4.25	LA4446	£2.20	STK435	£5.50	STK7309	£5.50	TD2002	£0.80	BU508D	£1.00
AN5410	£3.95	BA6124	£2.50	HA12002	£1.95	LA4460	£1.80	STK437	£7.50	STK7348	£4.95	TD2003	£0.95		
AN5435	£2.20	BA6208	£1.95	HA12003	£2.20	LA4461	£1.80	STK443	£8.95	STK7404	£6.95	TD2004	£1.95	2N3055	£0.50
AN5436	£2.20	BA6209	£1.95	HA12045	£3.25	LA4465	£2.30	STK457	£7.50	STK8050	£9.50	TD2005	£1.95	2N3773	£1.50
AN5510	£2.75	BA6218	£1.95	HA12016	£3.75	LA4466	£2.30	STK459	£7.75	STK8250	£8.95	TD2006	£1.50		
AN5512	£2.95	BA6219	£2.20	HA13001	£1.90	LA4500	£2.50	STK463	£9.50	STK8260H	£12.50	TD2030	£1.50		
AN5515	£2.20	BA6229	£2.20	HA13007	£4.50	LA4505	£2.80	STK465	£9.95			TD2030	£1.50	2SA1106	£2.75
AN5521	£2.20	BA6238A	£1.95	HA13119	£2.50	LA4507	£2.50	STK1050H	£7.25	STR370	£5.20	TD2030	£1.50	2SA1186	£3.95
AN5610N	£4.50	BA6239A	£2.20	HA13118	£2.75	LA4508	£2.50	STK1060	£7.95	STR371	£5.20	TD2600	£6.00	2SA1489	£2.95
AN5615	£2.95	BA6302A	£1.80	HA13403V	£5.50	LA4510	£1.75	STK1070H	£9.75	STR380	£5.20	TD2611A	£1.30	2SA1516	£2.95
AN5620X	£3.50	BA6304	£1.75			LA4520	£1.50	STK2028	£7.50	STR381	£5.20	TD2653A	£3.50		
AN5622	£2.20	BA6305	£1.95	KA2101	£1.95	LA4570	£2.75	STK2029	£6.50	STR440	£5.20	TD2653B	£3.50	2SB528	£0.60
AN5635N	£3.75	BA6328	£2.20	KA2206	£1.75	LA6358D	£1.20	STK2038H	£9.50	STR441	£5.20	TD2653C	£3.50	2SB631	£0.60
AN5709	£1.75	BA6411	£2.20	KA2212	£1.20	LA7031	£2.60	STK2048H	£9.75	STR450	£5.20	TD2653D	£3.50	2SB775	£1.80
AN5701	£1.20	BA7005	£2.20	KA2261	£1.20	LA7032	£2.95	STK2125	£6.75	STR451	£5.20	TD2653E	£3.50	2SB863	£1.95
AN5750	£3.75	BA7023L	£2.50	KA2284	£1.20	LA7042	£2.80	STK2129	£6.95	STR453	£5.20	TD3560	£3.90		
AN5753	£1.95	BA7751AL	£1.95			LA7520	£2.25	STK2139	£8.00	STR454	£5.20	TD3561A	£3.90	25C1403A	£4.50
AN5900	£1.40			LA1130	£2.50	LA7900	£1.50	STK2155	£9.50	STR455	£5.20	TD3562A	£4.50	25C1413A	£2.60
AN6130N	£2.50	EX8341	£4.50	LA1135	£2.50	LA7901	£1.90	STK2230	£6.50	STR457	£5.20	TD3590	£4.50	25C1815	£0.10
AN6136	£1.95			LA1140	£2.20	LA7906	£2.50	STK2240	£9.50	STR459	£5.20	TD4500	£3.95	25C1913	£1.20
AN6247	£1.75	HA1196	£1.75	LA1150	£1.75	LA7808	£2.75	STK2250	£9.50	STR1096	£4.95	TD4503	£4.50	25C1969	£1.75
AN6250	£1.50	HA1197	£1.80	LA1170	£1.75	LA7820	£2.75	STK2401	£6.50	STR2005	£4.95	TD4506	£3.95	25C2166	£1.00
AN6310	£5.50	HA1199	£1.50	LA1185	£1.60	LA7830	£2.20	STK3042	£6.50	STR2010	£6.20	TD4510	£3.95	25C2235	£0.40
AN6326N	£3.50	HA1238	£2.95	LA1230	£1.50	LA7831	£2.50	STK3044	£5.75	STR3115	£5.95	TD4600	£2.75	25C2335	£1.20
AN6327	£3.50	HA1339A	£3.50	LA1231N	£2.00			STK3062	£6.75	STR3125	£6.20	TD4600-2	£2.50	25C2570	£0.50
AN6328	£3.50	HA1367	£3.50	LA1363	£1.20	LB1403	£1.50	STK3088H	£9.50	STR4211	£4.50	TD4600-2D	£2.50	25C2581	£2.75
AN6330	£2.95	HA1372	£3.50	LA1385	£1.50	LB1405	£1.50	STK3102H	£5.75	STR4212	£5.20	TD47250	£4.95	25C2581	£2.75
AN6332	£4.75	HA1377	£2.20	LA1385	£1.95	LB1405	£1.50	STK3150H	£9.50	STR5015	£6.20	TD47250	£4.95	25C2611	£2.80
AN6340	£3.75	HA1388	£2.95	LA1460	£2.75	LB1416	£1.50	STK4017	£7.75	STR5412	£5.20	UPC575C	£1.00	25C3153	£3.20
AN6342N	£2.50	HA1392	£2.20	LA2000	£1.75	LB1649	£2.50	STK4025	£6.50	STR50200	£6.20	UPC1025H	£2.30	25C3156	£3.70
AN6344	£4.75	HA1394	£2.50	LA2100	£2.95			STK4121H	£6.95	STR50103A	£4.50	UPC1185H	£2.50	25C3281	£2.95
AN6346N	£3.75	HA1396	£3.75	LA2200	£1.50			STK4122H	£5.95	STR50401	£5.20	UPC1188H	£2.75	25C3300	£2.95
AN6356N	£3.85	HA1397	£2.50	LA2400	£1.50	LC7137	£4.50	STK4131H	£6.75	STR58041	£5.20	UPC1191V	£1.20	25C3409	£2.75
AN6357N	£4.50	HA1398	£2.50	LA3101	£1.75	LC7363	£3.75	STK4132H	£6.75	STR58041	£5.20	UPC1197C	£1.60	25C3466	£2.95
AN6359N	£5.50	HA1122W	£2.95	LA3160	£0.95	LC7800	£2.75	STK4141H	£7.50			UPC1230H	£2.50		
AN6360	£2.50	HA11211	£2.90	LA3161	£1.20	LC7815	£2.95	STK4141V	£7.95	TA7193P	£4.00	UPC1237H	£1.20	25D358	£0.60
AN6362	£4.50	HA11215A	£2.20	LA3201	£0.85			STK4142H	£7.30	TA7205AP	£1.00	UPC1241H	£1.95	25D371	£2.50
AN6371	£3.25	HA11219	£1.75	LA3210	£0.95	LM1303N	£1.50	STK4151H	£7.50	TA7217AP	£1.60	UPC1253C	£2.30	25D424	£3.95
AN6387	£5.59	HA11221	£2.20	LA3220	£1.50	LM3914N	£2.75	STK4152H	£7.85	TA7222AP	£1.30	UPC1277H	£2.50	25D476	£1.00
AN6562	£1.50	HA11223W	£2.50	LA3300	£1.65	LM3915N	£2.75	STK4161H	£7.95	TA7229P	£3.25	UPC1278H	£2.50	25D525	£0.90
AN6610	£1.80	HA11225	£1.95	LA3301	£1.30			STK4162H	£7.95	TA7230P	£1.50	UPC1288V	£2.75	25D600	£0.70
AN6671K	£4.95	HA11226	£4.50	LA3310	£2.75			STK4171H	£8.95	TA7232P	£1.95	UPC1318AV	£2.75	25D768	£1.20
AN6676	£5.50	HA11227	£2.20	LA3350	£1.30	MS218C	£1.95	STK4172H	£8.95	TA7233P	£2.50	UPC1335V	£2.75	25D811	£2.95
AN6677	£4.95	HA11235	£1.95	LA3361	£1.20	MS218P	£0.95	STK4181H	£8.95	TA7240AP	£2.95	UPC1363C	£2.75	25D845	£2.95
AN6876	£1.50	HA11244	£2.95	LA3370	£2.50	MS1102L	£2.95	STK4191H	£9.50	TA7241AP	£2.95	UPC1364C	£4.20	25D898B	£2.95
AN7062	£2.75	HA11251	£1.50	LA3376	£2.20	MS1104L	£3.20	STK4192H	£9.50	TA7243P	£1.50	UPC1365C	£2.95	25D1207	£0.60
AN7106K	£2.50	HA11401	£2.80	LA3600	£1.50	MS1358P	£4.75	STK4332	£4.50	TA7250BP	£2.95	UPC1373H	£1.20	25D1275	£1.20
AN7143	£2.50	HA11423	£2.20	LA4030	£2.50	MS1393AP	£1.50	STK4352	£5.90	TA7251BP	£2.95	UPC1387C	£1.95	25D1276	£1.00
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AN7148	£2.30	HA11580	£2.25	LA4032P	£1.90	MS1521L	£1.90	STK4803	£8.50	TA7271P	£2.50	UPC1403CA	£6.75	25D1398	£1.50
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AN7156N	£2.50	HA11703	£4.50	LA4101	£1.00	MS4543L	£1.75	STK4843	£8.95	TA7281P	£2.75	BC516	£0.25	25D1407	£1.95
AN7161	£3.50	HA11704	£5.20	LA4102	£1.40	MS4544L	£2.75	STK4853	£9.50	TA7299P	£2.95	BC517	£0.25	25D1426	£2.95
AN7166	£3.70	HA11705	£5.95	LA4110	£1.75	MB3712	£1.50	STK5211	£6.75	TA7317P	£1.50	BC639	£0.22	25D1427	£3.30
AN7168	£2.75	HA11706	£3.75	LA4145	£1.70	MB3730	£2.20	STK5314	£6.75	TA7607AP	£2.20	BC640	£0.22	25D1439	£2.20
AN7169	£2.95	HA11710	£3.75	LA4160	£2.20	MB3731	£2.75	STK5315	£6.75	TA7609P	£2.70	BD243C	£0.50	25D1453	£1.85
AN7171K	£3.50	HA11711	£6.50	LA4170	£1.75	MB8841	£5.75	STK5324	£5.75	TA7611AP	£2.20	BD244C	£0.50	25D1455	£2.95

## T. POWELL

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BC184	CO.09	BD244C	CO.30
BC212	CO.09	BD278A	CO.80
BC213	CO.09	BD434	CO.80
BC214A	CO.07	BD508	CO.90
BC214B	CO.07	BF195	CO.07
BC214L	CO.09	BF196	CO.15
BC237	CO.07	BF197	CO.15
BC238	CO.07	BF198	CO.07
BC307	CO.12	BF199	CO.14
BC308B	CO.07	BF244	CO.40
BC327-25	CO.07	BF259	CO.22
BC328-40	CO.05	BF422	CO.15
BC337	CO.07	BF458	CO.22
BC372	CO.95	BF459	CO.22
BC392	CO.15	BF469/BF471	
BC411	CO.25	BF471	CO.25
BC461	CO.25	BF472	CO.25
BC547	CO.07	BF472	CO.25
BC548	CO.07	BF870/BF472	
BC549	CO.07	BU108	CO.25
BC557	CO.30	BU108	CO.25
BC559B	CO.07	BU126	CO.70
BC639	CO.18	BU208	CO.10
BC640	CO.30	BU208A	CO.10
BD131	CO.50	BU208D	CO.10
BD132	CO.40	BU208T	CO.10
BD137	CO.35	BU208T	CO.10
BD237	CO.22	(TOSHIBA)	
BD238	CO.22		
BD243B	CO.30	BU326A	CO.10
BD243C	CO.40		

DIODES AND THYRISTORS			
BA157	CO.07	BY206 (BY896R)	DA91
BR100	CO.20		
BR101	CO.40	BY210/800	BYV96
BR103	CO.75		
BR303	CO.15	BY227	CO.20
BR396	CO.75	BY228	CO.20
BT116	CO.25	BY229	CO.15
BT128P	CO.40	BY239	CO.50
BT129P	CO.40	BY260	CO.30
BT151/800R		BYV96D	CO.55
		BYV56	CO.50
		BYV96E	CO.50
		BY127	CO.08
		BY133	CO.20
		BY164	CO.90
		BY164/SKB202	CO.90
		BY179	CO.10
		BY179/SK208	CO.10
		BY184	CO.65
		BY189	CO.20
		BY190	CO.20
		BY223	CO.20

ASK FOR SEMICONDUCTORS NOT LISTED

## VIDEO HEADS

<b>AMSTRAD</b>			
3HSSV-VCR7000 (Saisho/Orión)		£18.00	
PSF1-VCR4500,5200,9000		£15.00	
PSF2-VCR4600,4700		£15.00	
PSF3-VCR6000		£21.50	
<b>FERGUSON</b>			
3HSSV-2 Head universal		£7.50	
3HSSVA-3V42,44,45,46 etc		£20.00	
3HSS4VB-3V32,HR7655		£25.00	
3HSS4VC-3V48,HRD565		£26.00	
3V48,58,59,65,FV10,11,12,13,14,20,21,26			
And most other Fergusons		POA	
<b>HITACHI</b>			
3HSSHA-VT8000,9000 series		£17.00	
3HSSHB-VT11,33 etc		£17.00	
10082-VT120,220		£29.00	
10081-VT130,135		£30.50	
<b>PANASONIC</b>			
3HSSN-2 Head universal		£7.50	
3HSSU1N-NV100,370,380/Philips VR6460		£11.00	
3HSSU2N-NV230,470,480,G9,10,11,15PX		£21.00	
3HSSU3N-NV430,460		£16.00	
3HSS3N-NV777,330		£18.50	
3HSS4NB-NV730		£26.00	
3HSS4NA-NV366		£24.00	
NV630,33,40,45,46,130, & most other Panasonics		POA	
<b>SANYO</b>			
3HSSSY-VHR1100,1110,1300		£20.00	
3HSS3SV-VHR1500		£34.00	
<b>SHARP</b>			
3HSSSP-VC9300,9500,9700,381,481,482,483,486 etc		£17.00	
3HSSSPB-VC581,583,651,670 etc		£17.00	
VC7000,8000 series (Brass)		£42.00	
<b>OTHER MAKES</b>			
Alba 4000, Goldstar 8000, Sentra 8000, 1000		£15.00	
Fisher FVHP510,520,530,615,710 etc		£18.00	
Fisher VBS7000,9000 etc		£25.00	
Hinari VXL2,4,3,20,25		£15.00	
Hinari VXL5,6,20H		£30.00	
Mitsubishi HS306,710		£18.00	
Orión VC150,180,VH1,2,3 etc		£18.00	
Saisho VR100,605,705,805,905		£18.00	
Samsung Universal 2 Head		£24.25	
Toshiba			
V71,73,74,75,81,82,83,84,85,87		£20.00	
Toshiba V93		£21.00	

ASK FOR VIDEO HEADS NOT LISTED

The above heads are new and replacements.

BELT KITS			
Belt Kits for most models are stocked. Some examples are:			
AKAI			
VS1.2.5	1.20		
VS4.6.9.15	1.10		
Ask for models not listed.			
<b>AMSTRAD</b>			
TVR1.2.3, VCR1600, 4700,5200	1.90		
Ask for models not listed.			
<b>FERGUSON/JVC</b>			
3V00/3V16/3V22 etc.	1.60		
3V29/3V30	1.20		
3V35,36,38,39	1.10		
3V42,43,44,45,48,53/54/55/57	1.00		
Ask for models not listed.			
<b>PHILIPS</b>			
VR6367,6467,6561,6751/6760	2.25		
VR6460,6920,6520	2.40		
Ask for models not listed.			
<b>SANYO</b>			
VC5000/5150/6500	0.65		
VHR1100,1300,1500	1.00		
Ask for models not listed.			
<b>SHARP</b>			
VC3 VC402/500/571/581/582/583/584/585	1.10		
VC9300/9500/9700	1.95		
VC8000/8300	1.95		
Ask for models not listed.			

Many other belt kits in stock. Examples are Alba, Funai, GEC, Goldstar, Granada, Grundig, Hinari, ITT, Mitsubishi, NEC, Orion, Saisho, Samsung, Schneider, Sony, Tensai etc.

### NEW LINES

Universal Video Head Pulley	£16.00
Video Idler Spring Kit	£5.95
Video Washer and E Clip Kit	£5.00

### LINE OUTPUT TRANSFORMERS

Decca 100	9.50
ITT CVC20	12.50
ITT CVC25 30/32	9.50
ITT Compact 80 Series 110	16.75
ITT Compact 80 Series 90	19.75
ITT CVC45	18.00
ITT 1109F	14.00
ITT CVC1204	11.50
ITT CVC800/1/3	21.50
ITT CVC1100	16.50
ITT CVC1150/1175	20.00
ITT 6325	18.50
ITT 3546	18.50
ITT 1200.1	20.00

Other ITT transformers available

Fidelity all models up to 20" ZX3000	10.50
Fidelity Panel for ZX2000	1.00
Fidelity 22" ZX3000	24.50
Hinari CT4.5 & TVA1	14.75
Philips KT3	12.95
Rank Bush T20A	11.50
Thorn TX100 Green Spot 110	16.75
Thorn TX90 Mains Trans	18.85
Ferguson TX90 LOPT	17.75
Ferguson 3V35,36 Mains Transformer	23.00
Ferguson 3V44/44-45 Mains Transformer	18.85
Sony - Please state model for price	
Universal Tripler	4.75
Universal Tripler with focus unit	9.75
Decca 120/130 series tripler	8.50
Thorn TX100 Focus Unit Kit	9.00

### VIDEO MOTORS

<b>REEL MOTORS</b>	
Ferguson 3V29/30	£20.00
Ferguson 3V58,59,65,FV10,11,12,13,14,20,21,22	£17.25
Ferguson FV260	£14.50
Hitachi 8000,8300,8500	£8.50
Sanyo VTC5000,5150,5400,5300,6500	£7.50
Sharp VC9300, 9500 etc, Original	£15.00
Panasonic NV333,366 Original	£13.20
All other Panasonics	POA
<b>DRUM MOTORS</b>	
Ferguson JVC (Mechanical models)	£23.00
Matsui VX730,735,735A,755,770,	£21.63
Sharp 7000 series Original	POA
All Panasonic Original	POA
<b>CAPSTAN MOTORS</b>	
Ferguson 3V35,36 Original	£22.50
Ferguson/JVC (Mechanical models)	£20.00
Hitachi VT11 Original	£30.00

VS310,315,320,380	2.40
385	2.40
Ask for models not listed.	
<b>HITACHI</b>	
VT11/14/17/19/33/34/35/38/39/88	1.30
VT8000,8500	1.00
VT9300,9500-9700	1.00
Ask for models not listed.	

<b>MOORE CONTROL MOTORS</b>	
Ferguson 3V42,43,44,45,48,49,52,53	£6.00
Ferguson 3V58,59,65,FV10,11,12,13,14,20,21,22,26	£4.50

**Sharp Reel Motor Pulley only**  
Replacement of plastic pulley on a number of Sharp Reel Motors with the above metal pulley gives better rewind/FF performance.



### IDLER ASSEMBLIES

<b>FERGUSON</b>	
Take up Clutch (Mechanical models)	£5.00
3V29/30 Take up Idler	£2.00
3V29/30 Take up Clutch	£2.85
3V29/30 Reel Idler	£3.00
3V35 Reel Idler	£3.00
3V35,36,38,39 Take up Clutch	£2.85
3V58,59,64,65,FV10,11,12,13,14 Idler Arm	£1.80
Clutch Assembly 3V44,45,48,49,52,53,54,55	£14.00
Clutch Assembly 3V42,43	£14.00

<b>FISHER</b>	
FVHP615,905,910, Idler Assembly Original	£5.00
FVHP615 Gear Idler Assembly	£4.35
FVHP905,910 Gear Idler Assembly	£5.00
FVHP520,530 Idler	£3.00
FVHP520,530 Pulley	£0.70

### HITACHI

VT11,33 etc. Original Idler Arm	£2.50
VT11,33 etc. Idler Replacement	£1.75
VT9300,9500 etc. Play Idler	£3.65
VT9300,9500 etc. FF Idler	£2.95
VT9300,9500 etc. Idler	£2.95
VT8000,8500 etc. F/F Red Idler	£2.95
VT8000,8500 etc. Play Idler Assembly	£3.00
VT8000,8500 etc. FF Rew Pulley	£0.70
VT11,33 etc. Clutch Assembly	£8.00

<b>PHILIPS</b>	
VR6460,6920 Idler Arm (Original)	£3.00
DV464,6462,6463,650 etc. Idler Mod. Kit	£4.50
VR6542,6843 Reel Idler	£6.50
VR6542 Reel Drive Pulley	£7.75
VR6843 Reel Drive Pulley	£9.50
<b>PANASONIC (All Original)</b>	
NV370 Idler Arm Unit VXP0521 Gen.	£3.00
NV8600,8610 Play Idler VXP0243	£0.95
NV332,777,788 Idler Unit VXP0463	£3.00
NV600,688 Idler VXP0515	£3.00
NV333,366 Idler Arm 2 Unit VXL0997	£10.50
NV8400,8600,8610 etc. VXP0245	£0.95
NV333,366 etc. Idler VXP0401-NV700,7200,7800 Idler VXP0344	£0.90
NV2000,3000 Play Idler VXP0331-NV2000,3000 Idler Unit VXP0329	£1.10
Back Tension Bands	From £1.50
All Panasonic Maintenance Kits	POA

QUOTE PANASONIC PART No FOR PARTS NOT LISTED

<b>SANYO</b>	
Idler VHR1100,1300,1500	£5.50
Idler VHR2100,2300,2500,2700	£5.50
Reel Drive Pulley Unit VTC5000,5150,6500	£5.00
Idler Roller Assembly VTC5000,5150,6500	£2.25

<b>SHARP</b>	
Idler VC9300,9500 etc	£1.75
Idler VC481,581 etc	£1.95
Idler (original) VC9300,481,581 etc	£3.50
Idler Assembly (original) VC651,681,685	£6.50
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ROLLERS FOR AKAI, SAMSUNG, MITSUBISHI, NEC, ETC. IN STOCK

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Panasonic Models TC21	





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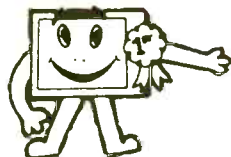
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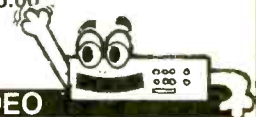
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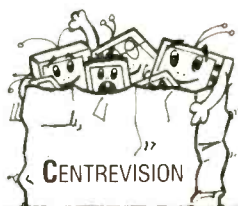
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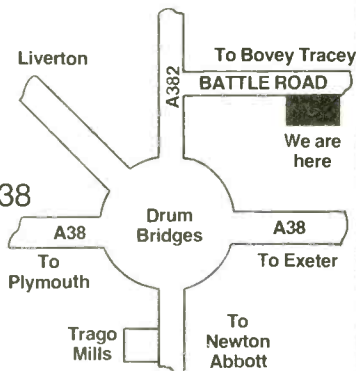
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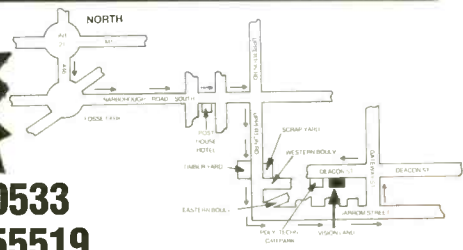
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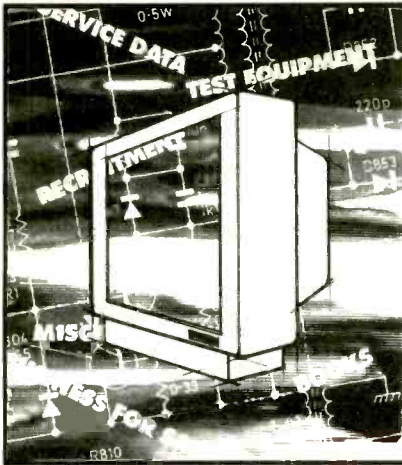
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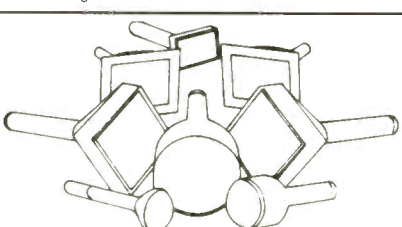
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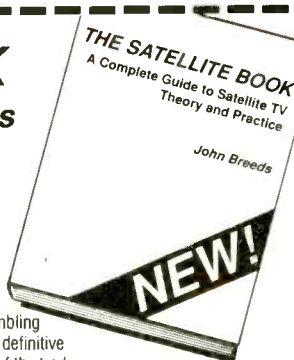
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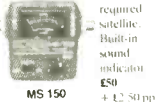
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Detailed applications (two copies) with curriculum vitae and the names and addresses of three referees including telephone numbers and indication of earliest availability to take up appointment should be received by: The Registrar, Papua New Guinea University of Technology, Private Mail Bag, Lae, Papua New Guinea by 15 August 1991/

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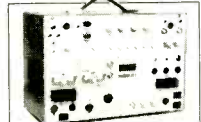
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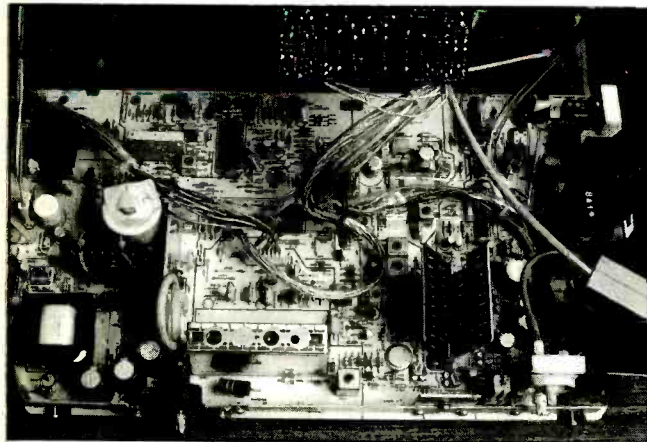
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