

MARCH 1990

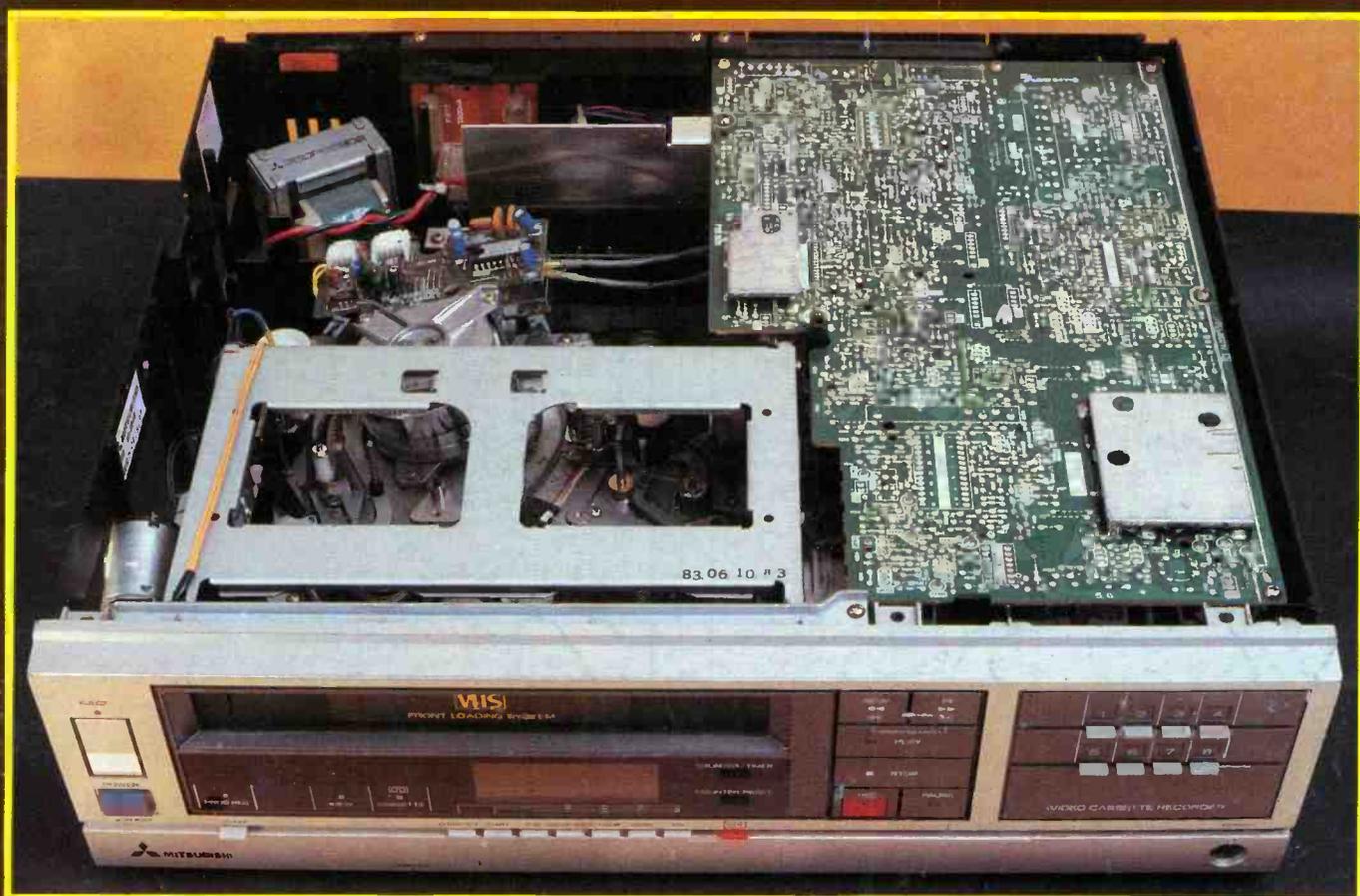
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TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

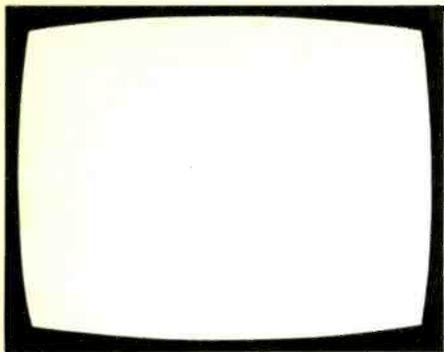
FREE CLEANING CLOTH

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**Servicing the Mitsubishi HS304
Satellite TV Signal Level Checker
Servicing in the 90s • DX-TV
CD Search and Skip Techniques
VCR Clinic • TV Fault Finding**





TELEVISION

March
1990

Vol. 40, No. 5
Issue 473

On sale February 21st

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INDEXES AND BINDERS

Indexes to Vols. 36 and 37 are available at 80p each from the Editorial Office (address above).

Binders that hold twelve issues of *Television* are available for £4.50 from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques out to "Television Binders".

SUBSCRIPTIONS

An annual subscription costs £20 in the UK, £24 overseas (by surface mail). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

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Subject to availability, copies of issues published during the last 12 months are available at £1.80 each from Television, John Denton Services, Unit 13, Thornham Grove, Stratford, London E15 1DN. Please make cheques/postal orders payable to IPC Magazines Ltd.

QUERIES

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

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OUR NEXT ISSUE DATED APRIL WILL
BE PUBLISHED ON MARCH 21

AA119	9p	BD245	50p	BFX29	20p	S2800D	52p	2N5321	80p	78CU1C	190p	AN-7178	270p	LA-1130	240p	M-51514	160p	STK-4021	425p	TA-7207	150p	TDA-1524	350p
AA32	9p	BD246	50p	BFX84	20p	S2800M	52p	2N5386	23p	78C15	190p	AY3-1015	290p	LA-1150	240p	M-51515	160p	STK-4022	425p	TA-7208	150p	TDA-1541	1600p
AC107	25p	BD265	45p	BF82	15p	S2800P	52p	2N5401	12p	78H9KC	800p	AY3-1270	400p	LA-1185	150p	M-51516	200p	STK-4023	800p	TA-7210	260p	TDA-1670A	300p
AC125	25p	BD266	45p	BF87	15p	T2000	72p	2N5418	12p	VALVES		AY3-1350	450p	LA-1201	140p	M-51517	200p	STK-4024	800p	TA-7211	260p	TDA-1701	320p
AC126	25p	BD267	45p	BF88	15p	T2000	72p	2N5436	80p	DAF96	60p	AY3-8910	360p	LA-1210	140p	M-51518	200p	STK-4025	800p	TA-7212	260p	TDA-1700A	300p
AC127	25p	BD278	45p	BF89	60p	T2000	72p	2N5459	80p	DF32	60p	AY3-8912	400p	LA-1230	130p	M-51519	200p	STK-4026	800p	TA-7213	260p	TDA-1700A	300p
AC128K	26p	BD311	100p	BF18	40p	T2P29A	22p	2N5485	12p	0Y86	60p	BO-301	65p	LA-1231	210p	M-51520	200p	STK-4027	800p	TA-7214	260p	TDA-1700A	300p
AC141K	30p	BD312	100p	BF50	14p	T2P30	22p	2N5494	12p	0Y86	60p	BO-313	60p	LA-1232	210p	M-51521	200p	STK-4028	800p	TA-7215	260p	TDA-1700A	300p
AC142K	30p	BD313	100p	BF51	14p	T2P31	22p	2N5504	12p	0Y86	60p	BO-333	100p	LA-1233	210p	M-51522	200p	STK-4029	800p	TA-7216	260p	TDA-1700A	300p
AC176	20p	BD315	150p	BF52	14p	T2P32	22p	2N5519	12p	0Y86	60p	BO-340	100p	LA-1234	210p	M-51523	200p	STK-4030	800p	TA-7217	260p	TDA-1700A	300p
AC176K	20p	BD316	150p	BF56	25p	T2P33	22p	2N5534	12p	0Y86	60p	BO-340	100p	LA-1235	210p	M-51524	200p	STK-4031	800p	TA-7218	260p	TDA-1700A	300p
AC187	21p	BD317	150p	BF64	25p	T2P34	22p	2N5549	12p	0Y86	60p	BO-340	100p	LA-1236	210p	M-51525	200p	STK-4032	800p	TA-7219	260p	TDA-1700A	300p
AC187K	21p	BD318	150p	BF90	45p	T2P35	22p	2N5564	12p	0Y86	60p	BO-340	100p	LA-1237	210p	M-51526	200p	STK-4033	800p	TA-7220	260p	TDA-1700A	300p
AC188	21p	BD319	150p	BF98	45p	T2P36	22p	2N5579	12p	0Y86	60p	BO-340	100p	LA-1238	210p	M-51527	200p	STK-4034	800p	TA-7221	260p	TDA-1700A	300p
AC188K	28p	BD320	150p	BL49	85p	T2P37	22p	2N5594	12p	0Y86	60p	BO-340	100p	LA-1239	210p	M-51528	200p	STK-4035	800p	TA-7222	260p	TDA-1700A	300p
AC189	28p	BD321	150p	BR100	14p	T2P38	22p	2N5609	12p	0Y86	60p	BO-340	100p	LA-1240	210p	M-51529	200p	STK-4036	800p	TA-7223	260p	TDA-1700A	300p
AC191	48p	BD322	150p	BR101	14p	T2P39	22p	2N5624	12p	0Y86	60p	BO-340	100p	LA-1241	210p	M-51530	200p	STK-4037	800p	TA-7224	260p	TDA-1700A	300p
AD142	100p	BD323	150p	BR102	14p	T2P40	22p	2N5639	12p	0Y86	60p	BO-340	100p	LA-1242	210p	M-51531	200p	STK-4038	800p	TA-7225	260p	TDA-1700A	300p
AD149	60p	BD324	150p	BR103	14p	T2P41	22p	2N5654	12p	0Y86	60p	BO-340	100p	LA-1243	210p	M-51532	200p	STK-4039	800p	TA-7226	260p	TDA-1700A	300p
AD161	35p	BD325	150p	BR104	14p	T2P42	22p	2N5669	12p	0Y86	60p	BO-340	100p	LA-1244	210p	M-51533	200p	STK-4040	800p	TA-7227	260p	TDA-1700A	300p
AD162	35p	BD326	150p	BR105	14p	T2P43	22p	2N5684	12p	0Y86	60p	BO-340	100p	LA-1245	210p	M-51534	200p	STK-4041	800p	TA-7228	260p	TDA-1700A	300p
AF124	50p	BD327	150p	BR106	14p	T2P44	22p	2N5699	12p	0Y86	60p	BO-340	100p	LA-1246	210p	M-51535	200p	STK-4042	800p	TA-7229	260p	TDA-1700A	300p
AF126	50p	BD328	150p	BR107	14p	T2P45	22p	2N5714	12p	0Y86	60p	BO-340	100p	LA-1247	210p	M-51536	200p	STK-4043	800p	TA-7230	260p	TDA-1700A	300p
AF127	50p	BD329	150p	BR108	14p	T2P46	22p	2N5729	12p	0Y86	60p	BO-340	100p	LA-1248	210p	M-51537	200p	STK-4044	800p	TA-7231	260p	TDA-1700A	300p
AF130	30p	BD330	150p	BR109	14p	T2P47	22p	2N5744	12p	0Y86	60p	BO-340	100p	LA-1249	210p	M-51538	200p	STK-4045	800p	TA-7232	260p	TDA-1700A	300p
AF239	30p	BD331	150p	BR110	14p	T2P48	22p	2N5759	12p	0Y86	60p	BO-340	100p	LA-1250	210p	M-51539	200p	STK-4046	800p	TA-7233	260p	TDA-1700A	300p
AF279	45p	BD332	150p	BR111	14p	T2P49	22p	2N5774	12p	0Y86	60p	BO-340	100p	LA-1251	210p	M-51540	200p	STK-4047	800p	TA-7234	260p	TDA-1700A	300p
AS215	100p	BD333	150p	BR112	14p	T2P50	22p	2N5789	12p	0Y86	60p	BO-340	100p	LA-1252	210p	M-51541	200p	STK-4048	800p	TA-7235	260p	TDA-1700A	300p
AS217	100p	BD334	150p	BR113	14p	T2P51	22p	2N5804	12p	0Y86	60p	BO-340	100p	LA-1253	210p	M-51542	200p	STK-4049	800p	TA-7236	260p	TDA-1700A	300p
BA145	10p	BD335	150p	BR114	14p	T2P52	22p	2N5819	12p	0Y86	60p	BO-340	100p	LA-1254	210p	M-51543	200p	STK-4050	800p	TA-7237	260p	TDA-1700A	300p
BA146	10p	BD336	150p	BR115	14p	T2P53	22p	2N5834	12p	0Y86	60p	BO-340	100p	LA-1255	210p	M-51544	200p	STK-4051	800p	TA-7238	260p	TDA-1700A	300p
BA154	6p	BD337	150p	BR116	14p	T2P54	22p	2N5849	12p	0Y86	60p	BO-340	100p	LA-1256	210p	M-51545	200p	STK-4052	800p	TA-7239	260p	TDA-1700A	300p
BA157	12p	BD338	150p	BR117	14p	T2P55	22p	2N5864	12p	0Y86	60p	BO-340	100p	LA-1257	210p	M-51546	200p	STK-4053	800p	TA-7240	260p	TDA-1700A	300p
BA158	12p	BD339	150p	BR118	14p	T2P56	22p	2N5879	12p	0Y86	60p	BO-340	100p	LA-1258	210p	M-51547	200p	STK-4054	800p	TA-7241	260p	TDA-1700A	300p
BA159	12p	BD340	150p	BR119	14p	T2P57	22p	2N5894	12p	0Y86	60p	BO-340	100p	LA-1259	210p	M-51548	200p	STK-4055	800p	TA-7242	260p	TDA-1700A	300p
BA160	12p	BD341	150p	BR120	14p	T2P58	22p	2N5909	12p	0Y86	60p	BO-340	100p	LA-1260	210p	M-51549	200p	STK-4056	800p	TA-7243	260p	TDA-1700A	300p
BA161	12p	BD342	150p	BR121	14p	T2P59	22p	2N5924	12p	0Y86	60p	BO-340	100p	LA-1261	210p	M-51550	200p	STK-4057	800p	TA-7244	260p	TDA-1700A	300p
BA162	12p	BD343	150p	BR122	14p	T2P60	22p	2N5939	12p	0Y86	60p	BO-340	100p	LA-1262	210p	M-51551	200p	STK-4058	800p	TA-7245	260p	TDA-1700A	300p
BA163	12p	BD344	150p	BR123	14p	T2P61	22p	2N5954	12p	0Y86	60p	BO-340	100p	LA-1263	210p	M-51552	200p	STK-4059	800p	TA-7246	260p	TDA-1700A	300p
BA164	12p	BD345	150p	BR124	14p	T2P62	22p	2N5969	12p	0Y86	60p	BO-340	100p	LA-1264	210p	M-51553	200p	STK-4060	800p	TA-7247	260p	TDA-1700A	300p
BA165	12p	BD346	150p	BR125	14p	T2P63	22p	2N5984	12p	0Y86	60p	BO-340	100p	LA-1265	210p	M-51554	200p	STK-4061	800p	TA-7248	260p	TDA-1700A	300p
BA166	12p	BD347	150p	BR126	14p	T2P64	22p	2N5999	12p	0Y86	60p	BO-340	100p	LA-1266	210p	M-51555	200p	STK-4062	800p	TA-7249	260p	TDA-1700A	300p
BA167	12p	BD348	150p	BR127	14p	T2P65	22p	2N6014	12p	0Y86	60p	BO-340	100p	LA-1267	210p	M-51556	200p	STK-4063	800p	TA-7250	260p	TDA-1700A	300p
BA168	12p	BD349	150p	BR128	14p	T2P66	22p	2N6029	12p	0Y86	60p	BO-340	100p	LA-1268	210p	M-51557	200p	STK-4064	800p	TA-7251	260p	TDA-1700A	300p
BA169	12p	BD350	150p	BR129	14p	T2P67	22p	2N6044	12p	0Y86	60p	BO-340	100p	LA-1269	210p	M-51558	200p	STK-4065	800p	TA-7252	260p	TDA-1700A	300p
BA170	12p	BD351	150p	BR130	14p	T2P68	22p	2N6059	12p	0Y86	60p	BO-340	100p	LA-1270	210p	M-51559	200p	STK-4066	800p	TA-7253	260p	TDA-1700A	300p
BA171	12p	BD352	150p	BR131	14p	T2P69	22p	2N6074	12p	0Y86	60p	BO-340	100p	LA-1271	210p	M-51560	200p	STK-4067	800p	TA-7254	260p	TDA-1700A	300p
BA172	12p	BD353	150p	BR132	14p	T2P70	22p	2N6089	12p	0Y86	60p	BO-340	100p	LA-1272	210p	M-51561	200p	STK-4068	800p	TA-7255	260p	TDA-1700A	300p
BA173	12p	BD354	150p	BR133	14p	T2P71	22p	2N6104	12p	0Y86	60p	BO-340	100p	LA-1273	210p	M-51562	200p	STK-4069	800p	TA-7256	260p	TDA-1700A	300p
BA174	12p	BD355	150p	BR134	14p	T2P72	22p	2N6119	12p	0Y86	60p	BO-340	100p	LA-1274	210p	M-51563	200p	STK-4070	800p	TA-7257	260p	TDA-1700A	300p
BA175	12p	BD356	150p	BR135	14p	T2P73	22p	2N6134	12p	0Y86	60p	BO-340	100p	LA-1275	210p	M-51564	200p	STK-4071	800p	TA-7258	260p	TDA-1700A	300p
BA176	12p	BD357	150p	BR136	14p	T2P74	22p	2N6149	12p	0Y86	60p	BO-340	100p	LA-1276	210p	M-51565	200p	STK-4072	800p	TA-7259	260p	TDA-1700A	300p
BA177	12p	BD358	150p	BR137	14p	T2P75	22p	2N6164	12p	0Y86	60p	BO-340	100p	LA-1277	210p	M-51566	200p	STK-4073	800p				

VCR PINCHROLLERS

AKAI
 VS9300, VS9500, VS9700, VS9800 **280p**
 VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS10 **360p**

AMSTRAD
 VCR4500, VCR4600, VCR4600 Mk2, VCR4700 **280p**
 VCR5200 **360p**
 VCR7000 **360p**

FERGUSON
 3V00, 3V16, 3V22, 3V23 **280p**
 3V29-30, 3V31-32 **280p**
 3V35-36, 3V38-39, 3V42-43, 3V44-45, 3V48, 3V53, 3V54-55, 3V56-57, 3V58-59, 3V64-65, FV10-11, FV12-14

HITACHI
 VT-11, VT33 **280p**
 VT61-62, VT63-64, VT65, VT86-88, **280p**
 VT110-122, VT120-128, VT130-135, VT138-150, VT168-220
 VT5000, VT8000, VT9300, VT9500 **280p**

JVC
 HR3300, HR3330, HR3360, HR3660, HR4100, HR7700 **280p**
 HR7200, HR7330, HR7660, HR7610, HR7650, HR7655 **280p**
 HRD110, HRD111, HRD120, HRD121, HRD140, HRD150 **280p**
 HRD160, HRD225, HRD455, HRD565, HRD725

DAIICHI
 HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS700 **280p**

NATIONAL
 NV100, NV180, NV300, NV333, NV340, NV366, NV600, NV777, NV788 **280p**
 NV230, NV370, NV430, NV460, NV730, NV810, NV830, NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7500, NV8500, NV8610, NV8620, NVG14, NVG7, NVG10, NVG12, NVG18, NVG21, NVG25, NVH65 **360p**

PHILIPS
 VR6460 **280p**

SANYO
 VHR1100, VHR1300, VHR1500, VHR2300 **360p**
 VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20 **280p**

SHARP
 VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300 **360p**
 VC9100, VC9300, VC9500, VC9700 **360p**
 VC387, VC481, VC482, VC483, VC486, VC496, VC581 **360p**
 VC582, VC583, VC585 **360p**
 VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787 **360p**
 VC793, VCT72

SONY
 SLC5, SLC6, SLC7 **360p**
 SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100 **360p**
 SLF1, SLF11, SLF25, SLF30, SLF51, SLF100

 * 76 OHM COX CABLE WITH *
 * SOCKETS FOR TV TO VIDEO *
 * BLACK COLOUR 2 METRES *
 * LONG, ONLY £1 EACH + VAT *

VCR BELT KITS

AKAI
 VP-7100 **160p**
 VS-1 **150p**
 VS-2EG **100p**
 VS-4 **120p**
 VS-5EG **100p**
 VS-9300 **160p**
 VS-9500 **160p**
 VS-9700 **160p**
 VS-9800 **155p**

AMSTRAD
 TVR-1-2-3 **210p**
 VCR-4600 & Mk 2 **210p**
 VCR-4700 **210p**
 VCR-5200 **210p**
 VCR-7000 **80p**

FERGUSON

3292, 3V00, 3V01 150p
 3V16, 3V22, 3V23 65p
 3V29-30 120p
 3V31/32 85p
 3V35-36 80p
 3V38-39 85p
 3V42/43 80p
 3V44-45 65p
 3V45/54 65p
 3V55 65p

FISHER
 VBS-7000 **245p**
 VBS-9000 **120p**

HITACHI
 VT-11, VT-33 **100p**
 VT-5000 **120p**
 VT-5500 **130p**
 VT-8000 **60p**
 VT-8500 **60p**
 VT-9300 **50p**
 VT-9500 **50p**
 VT-9700 **60p**

JVC
 HR-3300, HR-3330, HR-3360, HR-3660, HR-4100 **150p**
 HR-7200 **70p**
 HR-7600 **80p**
 HR-7610 **95p**
 HR-7650 **75p**
 HR-7655 **90p**
 HR-7700 **77p**
 HRD-110, HRD-111, HRD-120, HRD-225 **100p**
 HRD-250, HRD-455, HRD-565, HRD-566, HRD-725, HRD-755

DAIICHI
 HS-200 **200p**

NATIONAL
 NV-300 **160p**
 NV-333 **135p**
 NV-777 **100p**
 NV-2000 **150p**
 NV-3000 **95p**
 NV-7000 **90p**
 NV-7200 **90p**
 NV-8600 **160p**

PHILIPS
 VR-6460 **170p**

SANYO
 VTC-5000 **75p**
 VTC-5300 **100p**
 VTC-5500 **95p**
 VTC-9300 **220p**

SHARP
 VC-381/383/386 **125p**
 VC-6300 **150p**
 VC-7300/7700/7750 **150p**
 VC-8300 **150p**
 VC-8381, VC-9100 **125p**
 VC-9300, VC-9500 **135p**

SONY
 SL-C5, SL-C6 **140p**
 SC-C7 **140p**
 SC-C9 **165p**
 SL-8000-8080 **200p**

TOSHIBA
 V-55/57 **85p**
 V-5250/5280 **230p**
 V-5475 **210p**
 V-5475 **150p**
 V-7540 **160p**
 V-8600 **150p**
 V-9600 **85p**

VIDEO MOTORS

AMSTRAD
 VCR-7000 REEL MOTOR **1700p**
FERGUSON & JVC
 CAPSTAN MOTOR **2100p**
 PU-45979
 CAPSTAN MOTOR **1950p**
 PU-55371V
 DRUM MOTOR **1950p**
 PU-46414
 REEL MOTOR **2650p**
 PU-51381V

NATIONAL
 REEL MOTOR **1350p**
 MYN-135VSL
 FOR NV333, NV366
SANYO
 REEL MOTOR **630p**
 4-529V-10800
SHARP
 REEL MOTOR **1350p**
 RMT0V 1008 GEZZ

SONY
 CAPSTAN MOTOR **700p**
 A-675131A FOR SL6
 CAPSTAN MOTOR **2500p**
 BHF 1100D FOR SL7

VIDEO LAMPS
 VIDEO LAMPS UNIVERSAL **30p**
 12V/60mA (300mm WIRES)
 PANASONIC VIDEO LAMPS **60p**

IDLERS & PULLEYS REPLACEMENTS

HITACHI
 FF REW IDLER **190p**
 6886971
 PLAY IDLER **320p**
 V-6861482

JVC
 IDLER ASSEMBLY **450p**
 PU-47752
 TAKE UP IDLER **145p**
 PU-51402A
 TAKE CLUTCH **225p**
 PU-55373
 IDLER ARM **285p**
 PU-55373-3-B
 FAST FORWARD IDLER **210p**
 PU-45896C

NATIONAL
 IDLER **200p**
SANYO
 REEL PULLEY **520p**
 143-0-662T-01201
SHARP
 IDLER **195p**
 NIDL0005 GEEZ
 IDLER **195p**
 NIDL0006 GEEZ

SONY
 REW. PULLEY **400p**
 A-6706-348-B
 REW. PULLEY **300p**
 A-6706-391-A/B

SERVICE AIDS

SERVISOL PRODUCTS
 V. HEAD CLEANER **100p**
 SWITCH CLEANER **100p**
 SILICONE GREASE **135p**
 FREEZE IT **125p**
 FOAM CLEANER **120p**
 ANTI-STATIC **120p**
 AEROKLEANE **100p**
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UNIVERSAL TRIPLERS

SONY ON/OFF SWITCHES
200p

PHILIPS SWITCHES
150p
 K30, K35, K40, KT3, KT4

40008 SERIES CMOS IC'S

4000 13p
 4001 13p
 4002 13p
 4006 34p
 4007 13p
 4008 38p
 4009 20p
 4010 21p
 4011 13p
 4012 13p
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 4036 180p
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74 SERIES

74HC251 25p
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VK1 AKAI VS9300/9500/9000	
JVC HR3300/3320/3330/3322	
TCE 8903/3V00/3V16/3V22	7 2.40
VK2 NAT. PAN. NV7000/7200B	5 1.45
VK3 SONY SL575	6 2.25
VK4 SONY SL8000/8500/8600	6 3.80
VK5 SONY SL3000UB	7 2.10
VK6 NAT. PAN. NV3000B	6 1.99
VK7 SANYO 9300P	4 2.75
VK8 NAT. PAN. NV2000B	6 1.73
VK9 NAT. PAN. NV8600B/8610/V011	7 1.50
VK10 TOSHIBA V8600	6 1.45
VK13 SANYO VTC5000	2 1.50
VK14 SANYO VTC5300	5 1.85
VK15 JVC HR7650/3V31	3 2.00
VK16 HITACHI 5000	1 1.90
VK17 SHARP 8300	6 1.76
VK18 SHARP 9300	5 1.47
VK19 HITACHI VT8000/8300/8500	3 1.05
VK20 HITACHI VT11/33	6 1.50
VK21 HITACHI 9500	3 1.12
VK22 SONY SL6	6 1.80
VK23 SANYO 5500	3 1.05
VK24 NAT. PAN. NV3000/NV333	6 1.55
VK25 TOSHIBA V7540	5 1.90
VK26 JVC HR 7700/3V23	2 0.96
VK27 THORN 3V29	4 1.75
VK28 AMSTRAD 7000	3 1.45
VK38 AMSTRAD 4500/9000	2 2.85
VK39 AMSTRAD 4600/5200	2 2.85
VK29 NAT. PAN. NU777	4 1.80
VK30 SONY T9	6 2.20
VK31 TOSHIBA 9600	4 1.20
VK32 SANYO 1100-1300-1500	0 0.75
VK33 FERGUSON 3V35-36	0 0.85
VK34 FERGUSON 3V42-3-4-5-8	0 0.90
VK35 FISHER FVHP710-716-722	1 1.20
VK36 PANASONIC NV370-430	1 1.20
VK37 HITACHI 9300	0 0.85

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GENERAL PURPOSE VHS BULB	0.50
3V23 WITH PLUG	1.59
3V29 WITH PLUG	1.59
AMSTRAD 7000	0.45
AMSTRAD 4500/4600/5200/9000	1.80
HITACHI 9300/9500	0.65

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4 BUTTON IR8876	15.00
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V.C.R. 7000 - MD150583	10.00
V.C.R. 8000 - MD150578	10.00

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BC107	0.20
BC141	0.30
BC142	0.30
BC158	0.16
BC212	0.10
BD131	0.33
BD243	0.85
BD244	0.85
BD839	0.96
BD707	1.30
BF757	0.54
BF758	0.54
BR103	0.83
BR303	1.46
BU208A	0.95
BU208D	9.20
BU208/2	2.10
BU326A	0.85
BU426	1.60
BU500	2.50
BU508A	3.70
BU508D	2.20
BU508AF	2.20
BU111	2.50
BUT11AF	3.00
BOW81A	3.84
TP29C	0.39
TP42C	0.59
TP112H	0.40
TP1305S	0.63
2SA1175	0.89
2SC1077	3.00
2SC1172Y	5.50
2SC3156	2.46
2SD1398	2.46

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CAPSTAN BELT	01X0-033-018 1.75
CAPSTAN MOTOR	01X0-040-014 33.00
CASSETTE HOUSING	01X0-040-030 21.00
CASSETTE LAMP	01X0-040-008 1.59
CASSETTE LAMP HOLDER	01X0-033-417 0.90
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LOADING BELT	01X0-040-006 0.80
LOADING MOTOR	01X0-034-059 12.02
PINCH ROLLER ASSEMBLY	01X0-040-015 7.21
REEL MOTOR	01X0-040-017 27.35
RF CONVERTER	01X0-040-003 67.09
TAKE UP CLUTCH ASSEMBLY	01X0-042-013 2.00
TAKE UP CLUTCH BELT	01X0-040-023 0.23
TAKE UP SPL. IDLER ASSY	01X0-040-007 2.13
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TAKE UP IDLER	01X0-040-019 1.44
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AKAI BV327815	4.87
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FERG 3V00 F/F	1.46
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FERG 3V22 TAKEUP late	5.85
FERG 3V29 TAKEUP CL.	2.08
FERG 3V29 TAKEUP SPL	2.13
FERG 3V29 TAKEUP I.D.L.	1.44
HITACHI 6861482	2.90
HITACHI 6861487	2.68
HITACHI 6413663	5.04
HITACHI 6414221	0.70
HITACHI 6383531	2.43
HITACHI 6861472	5.02
HITACHI 6345173	0.40
HITACHI 6861471	2.90
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NAT PAN VXP0243	1.10
NAT PAN VXP0401	1.08
NAT PAN VXP0334	1.22
NAT PAN VXP0341	1.28
NAT PAN VXP0521	4.08
NAT PAN VXP0433	5.50
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SONY SLCs/7-3000	1.27

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AKAI VS9700	3.75
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SHARP VCR300/6500	3.75
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VCR3V32	
BOOSTER	01X0-042-089 24.89
VCR 3V35/36/39	
CAPSTAN BELT	01X0-066-014 1.20
CAPSTAN MOTOR	01X0-065-009 26.44
CASSETTE HOUSING ASSY	01X0-065-016 26.63
CASSETTE MOTOR	01X0-065-003 5.64
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SPOOL CARRIER IDLER	01X0-066-089 2.55
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TAPE SPOOL DR. BELT	01X0-065-014 0.59
UHF TUNER	01X0-065-075 24.20
LOWER DOOR FLAP	01X0-065-424 2.58
UPPER DOOR FLAP	01X0-083-117 0.95
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CASSETTE HOUSING ASSY	01X0-083-069 26.25
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691-1718	29.42
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IR9062	
REP. RC5525 31.36 37.48 41.45	13.00

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ONLY	1.95
ULA	11.00
ROM	5.00
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6561 COMMODORE	7.74
6569 COMMODORE	21.25
6581 COMMODORE	12.00
8360 COMMODORE	19.61
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906114 PLA. COMM.	7.00
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901226 BAS ROM. COMM.	8.71
ZTX122/BC182	0.07
ZTX213	0.15
ZTX214	0.17
ZTX313	0.24
ZTX510	0.39
ZTX551	0.39
ZTX650/1	0.27
ZTX750	0.38
IS 2472	0.31
901227	10.44

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LA7800	3.75
LM1011	3.25
STK439	8.40
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Pocket	14.92
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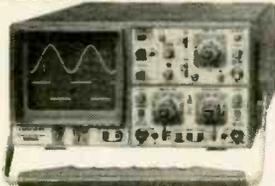
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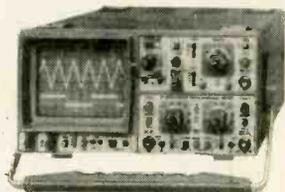
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SPECIFICATION

- * 2 Channels
- * Bandwidth: DC-20MHz
- * Sens: Ch1., Ch2., 2mV/cm
- * Timebase: 0.2s-20ns/cm
- * Triggering: DC-40MHz
- * Active TV-Sync-Separator
- * Variable hold-off
- * Trigger LED indicator
- * Calibrator: 1KHz Square wave
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- * Plus many features

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HM604 60MHz UNIVERSAL



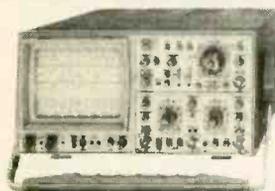
SPECIFICATION

- * 2 Channels
- * Bandwidth: DC-60MHz
- * Sens: Ch1., Ch2., 1mV/cm
- * Timebase: 2.5s-5ns/cm
- * Triggering: DC-80MHz
- * Active TV-Sync-Separator
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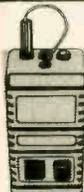


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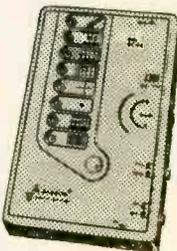
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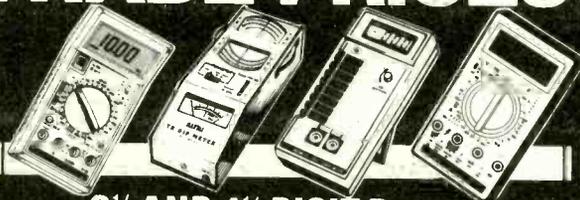


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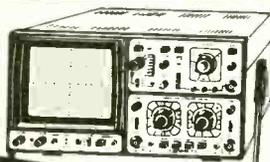
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- BD149 8 Safety cover for 13A sockets - prevent those inquisitive little fingers getting nasty shocks.
- BD180 6 Neon indicators in panel mounting holders with lens.
- BD193 6 5 amp 3 pin flush mounting sockets make a low cost disco panel.
- BD199 1 Mains solenoid, very powerful, has 1in pull or could push if modified.
- BD201 8 Keyboard switches - made for computers but have many other applications.
- BD211 1 Electric clock, mains operated, put this in a box and you need never be late.
- BD221 5 12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.
- BD242 2 6in x 4in speakers, 4 ohm made from Radiomobile so very good quality.
- BD252 1 Panostat, controls output of boiling ring from simmer up boil.
- BD259 50 Leads with push-on 1/4in tags - a must for hook-ups - mains connections etc.
- BD263 2 Oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into patress.
- BD268 1 Mini 1 watt amp for record player. Will also change speed of record player motor.
- BD283 3 Mild steel boxes approx 3in x 3in x 1in deep - standard electrical.
- BD305 1 Tubular dynamic mic with optional table rest.
- BD400 4 Books, useful for beginners, describes amplifiers equipment and kit sets.
- BD653 2 Miniature driver transformers. Ref. LT44. 20k to 1k centre tapped.
- BD548 2 3.5V relays each with 2 pairs changeover contacts.
- BD667 2 4.7 uF non-polarised block capacitors, pcb mounting.

There are over 1,000 items in our Bakers Dozen List. If you want a complete copy please request this when ordering.

12-220V INVERTER KIT. This kit will convert 12V DC to 220V AC. It will supply up to 130 Watts with a large transformer. As supplied it will handle about 15 Watts. Heatsink required. Price is £12.00. Ref. 12P17.

TOASTERS. 2 slice toasters - may need slight attention. Only £3.00 each. Ref. 3P84.

PERSONAL STEREOS. Again customer returns but complete and with stereo headphones a bargain at only £3.00 each. Our ref. 3P83.

MAINS OPERATED MICROWAVE CONTROL PANEL with touch switches. This unit has a 4 digit display with a built in clock & 2 relay outputs - one for power & 1 for pulsed power level. Could be used for all sorts of timer control applications. Only £6.00. Our ref. 6P18.

EQUIPMENT WALL MOUNT. It is a multi-adjustable metal bracket that could be used for mounting flood light, loud speaker, TV camera, even a fan and on almost any sort of wall or ceiling even between wall and ceiling. Our price only £3. Our ref 3P72. Or 2 for £5. Our ref 5P152.

STABILIZED POWER SUPPLY KIT 2-25V 2A. A kit for a bench or lab power supply containing PCB, transformer, heatsink and all other components. Short circuit protected. Case required. Priced at £20.00. Ref. 20P25.

GEIGER COUNTER KIT. Complete with PCB and all components. 9V operation. Only £39.00. Ref. 39P1.

COPPER CLAD PANEL for making PCB. Size approx 12in long x 8 1/2in wide. Double-sided on fibreglass middle which is quite thick (about 1/16in) so this would support quite heavy components and could even form a chassis to hold a mains transformer, etc. Price £1 each. Our ref BD683.

POWERFUL IONISER

Generates approx. 10 times more IONS than the ETI and similar circuits. Will refresh your home, office, shop workroom etc. Makes you feel better and work harder - a complete mains operated kit, case included £12.50 + £2 P&P. Our ref 12P51.

REAL POWER AMPLIFIER for your car. It has 150 watts output. Frequency response 20Hz to 20kHz and signal to noise ratio, better than 60 dB. Has built in short circuit protection and adjustable input level to suit your existing car stereo, so needs no pre-amp. Works into speakers. Ref. 30P7 described below. A real bargain at only £57.50. Order ref: 57P1.

REAL POWER CAR SPEAKERS. Stereo pair output 100w each. 4 Ohm impedance and consisting of 6 1/2" woofer, 2" mid range and 1" tweeter. Each set in a compact plastic built self mounting unit. Ideal to work with the amplifier described above. Price per pair £29.96. Order ref. 30P7.

STEREO CAR SPEAKERS. Not quite so powerful - 70w per channel. 3" woofer, 2" mid range and 1" diameter. Again, in a super purpose built self mounting unit. Price per pair: £27.95. Order ref: 28P1.

VIDEO TAPES. These are three hour tapes of superior quality, made under licence from the famous JVC Company. Offered at only £3 each. Our ref: 3P63. Or 5 for £11. Our ref: 11P3. Or for the really big user 10 for £20. Our ref: 20P20.

ELECTRONIC SPACESHIP. Sound and impact controlled, responds to claps and shouts and reverses when it hits anything. Kit with really detailed instructions. Ideal present for budding young electrician. A youngster should be able to assemble but you may have to help with the soldering of the components on the pcb. Complete kit £10. Our ref 10P81.

12" HIGH RESOLUTION MONITOR. Black and white screen, beautifully cased for free standing, needs only a 12v 1.5 amp supply. Technical data is on its way but we understand these are TTL input. Brand new in maker's cartons. Price: £22.00 Free Delivery. Order ref: 25P10.

14" COLOUR MONITOR made by the American Display Tek company. Uses high resolution tube made by the famous Japanese Toshiba company. Beautifully made unit intended for console mounting, but top and sides adequately covered by plated metal panels. Full technical spec. on its way to us. We have a limited number of these. All brand new still in maker's cartons. Price: £89 each plus £6 insured carriage. Order ref: 89P1.

COMPOSITE VIDEO KITS. These convert composite video into separate H, sync, V, sync and video. Price £8.00. Our ref: 8P39.

BUSH RADIO MIDI SPEAKERS. Stereo pair. BASS reflex system, using a full range 4in driver of 40hms impedance. Mounted in very nicely made black fronted walnut finish cabinets. Cabinet size approx 8 1/2in wide, 14in high and 3 1/2in deep. Fitted with a good length of speaker flex and terminating with a normal audio plug. Price £5 the pair plus £1 post. Our ref 5P141.

3 1/2" FLOPPY DRIVES. We still have two models in stock: Single sided, 80 track, by Chicon. This is the manufacturers metal case with leads and IC connectors. Price £40, reference 40P1. Also a double sided, 80 track, by NEC. This is uncased. Price £59.50, reference 60P2. Both are brand new. Insured delivery £3 on each or both.

ATARI 65XE COMPUTER
At 64K this is most powerful and suitable for home and business. Brand new, complete with PSU, TV lead, owner's manual and six games. Can be yours for only £45 plus £3 insured delivery.

REMOTE CONTROL FOR YOUR COMPUTER. With this outfit you can be as much as 20 feet away as you will have a joystick that can transmit and a receiver to plug into and operate your computer and TV. This is also just right if you want to use it with a big screen TV. The joystick has two fire buttons and is of a really superior quality, with four suction cups for additional control and one handed play. Price £15 for the radio controlled pair. Our ref 15P27.

ASTEC PSU. Mains operated switch mode, so very compact. Outputs: +12v 2.5A, +5v 6A, ±5v 5A, ±12v 5A. Size: 7 1/4in long x 4 9/16in wide x 2 3/4in high. Cased ready for use. Brand new. Normal price £30+, our price only £12.95. Our ref 13P2.

VERY POWERFUL 12 VOLT MOTOR. 1/3rd Horsepower. Made to drive the Sinclair C5 electric car but adaptable to power a go-kart, a mower, a rail car, model railway, etc. Brand new. Price £20 plus £2 postage. Our ref 20P22.

SINCLAIR C5 WHEELS INCLUDING TYRES
2 x 13" & 2 x 16" dia.
£24 A SET Ref 24P3

PHILIPS LASER

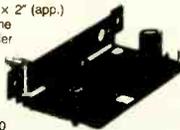
This is helium-neon and has a power rating of 2mW. Completely safe so long as you do not look directly into the beam when eye damage could result. Brand new, full spec, £35 plus £3 insured delivery. Mains operated power supply for this tube gives 8kv striking and 1.25kv at 5mA running. Complete kit with case £15, ditto for 12v battery. Also £15. Our ref 15p22.

ORGAN MASTER. Is a three octave musical keyboard. It is beautifully made, has full size (piano size) keys, has gold plated contacts and is complete with ribbon cable and edge connector. Can be used with many computers, request information sheet. Brand new. Only £15 plus £3 postage. Our ref 15P15.

FULL RANGE OF COMPONENTS at very keen prices are available from our associate company SCS COMPONENTS. You may already have their catalogue, if not request one and we will send it FOC with your goods.

12 VOLT BRUSHLESS FAN. Japanese made. The popular square shape (4 1/2in x 4 1/2in x 1 3/4in). It is electrically run fans not only consume very little current but also they do not cause interference as the brush type motors do. Ideal for cooling computers, etc., or for a caravan. £8 each. Our ref 8P26.

MINI MONO AMP. on p.c.b. size 4" x 2" (app.) Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of £1.15 each of 13 for £12.00



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POPULAR ITEMS - MANY NEW THIS MONTH

JOYSTICKS for BBC, Atari, Dragon, Commodore, etc. All £5 each. State which required.

TELEPHONE TYPE KEY PAD. Really first class rear mounting unit. White lettering on black buttons. Has conductive rubbers contacts with soft click operation. Circuit arranged in telephone type array. Requires 70mm by 55mm cut out and is connected by 10-pin IDC socket. Price: £2.00 each. Order ref: 2P251.

SUB-MIN PUSH SWITCHES. Not much bigger than a plastic transistor but double pole. PCB mounting. Three for £1. Our ref BD688.

AA CELLS. The most popular of the rechargeable NICA0 types. 4 for £4.00. Our ref. 4P44

20WATT 400HM SPEAKER. With built-in tweeter. Really well made unit which has the power and the quality for hi-fi reproduction. 6 1/2in diameter. Price £5. Our ref 5P155. It is heavy so please add £1 to cover postage if not collecting.

MINI RADIO MODULE. Only about 2in square with ferrite aerial and solid die tuner with its own knob. It is a superhet and it operates from PP3 battery and would drive a crystal headphone direct but be better with our mini mono amp. Price £1. Our ref BD716.

BULGIN MAINS PLUG AND SOCKET. The old faithful 3 pin with screw terminals. The socket mounts through a 1 1/2in hole and the mains is brought in by the insulated plug. Used to be quite expensive but you can have 2 pairs for £1 or 4 of either plug or socket for £1. You could make yourself a neat and compact bench panel with these. Our ref BD715, BD715S or BD715P.

MICROPHONE. If you want a low cost microphone then just arrived we have a very small hand-held dynamic mic with on/off switch in the handle, its lead terminates with one 3.5 plug and the other a 2.5 plug for remote control. Price only £1. Our ref BD711.

MOSFETS FOR POWER AMPLIFIERS AND HIGH CURRENT DEVICES. 140v 100w pair made by the famous Hitachi Company. Reference 25K413 and its complement 25J118. Only £4 the pair. Our ref 4P42. Also available in H pack. Ref: 25J99 and 25K343 £4.00 a pair. Ref. 4P51.

TIME AND TEMPERATURE LCD MODULE. A 12 hour clock a Celsius and Fahrenheit thermometer a too hot alarm and a top coil alarm. Approx 50x20mm with 12.7mm digits. Requires 1AA battery and a few switches. Comes with full data and diagram. Price £6.00. Our ref: 6P12.

REMOTE TEMPERATURE PROBE FOR ABOVE. £3.00. Our ref: 3P60.

A REAL AIR MOVER. Circular axial fan moves 205 cubic foot per min which is about twice as much as our standard 4 1/2in fans. Low noise mains operated 6 1/2in dia. brand new. Regular price over £30.00. Our price only £10.00. Our ref 10P71.

600 WATT AIR OR LIQUID MAINS HEATER. Small coil heater made for heating air or liquids. Will not corrode, lasts for years. Call size 3in x 2in mounted on a metal plate for easy fixing. 4in dia. Price £3.00. Ref. 3P78 or 4 for £10.00. Our ref: 10P76.

EX-EQUIPMENT SWITCHED MODE POWER SUPPLIES. Various makes and specs but generally +5, +12v ideal bench supply. Only £8.00. Our ref: 8P36.

ACORN DATA RECORDER. Made for the Electron or BBC computer but suitable for others. Includes mains adaptor, leads and cable. £12.00. Ref. 12P15.

PFTF COATED SILVER PLATED CABLE. 19 strands of .45mm copper will carry up to 30A and is usually undestructible. Available in red or black. Regular price is over £120 per reel. Our price only £20.00 for 100m reel. Ref. 20P21 or 1 of each for £35.00. Ref 35P2. Makes absolutely superb speaker cable!

NEW PIR SENSORS. Infra red movement sensors will switch up to 500w mains. UK made. 12 month manufacturers warranty, 15-20m range with a 0-10min timer, adjustable wall bracket. Only £20.00. Ref: 20P24.

MITSUBISHI 3 1/2" DISC DRIVES. Brand new drives. 1/2 height double sided, double density warranted. Our price £60.00. Ref: 60P5.

10 MEMORY PUSHBUTTON TELEPHONES. These are customer returns and 'sold as seen'. They are complete and may need slight attention. Price £6.00. Ref: 6P16 or 2 for £10.00. Ref: 10P77. BT approved.

NON-MEMORY PUSHBUTTON TELEPHONES. Same condition as above with radial £3.00. Our ref: 3P79. BT approved.

SPECTRUM PRINTER INTERFACE. Add a centronics interface to your Spectrum complete with printer cable for only £4.00. Our ref. 4P52.

SPECTRUM SOUND BOX. Add sound to your Spectrum with this device. Just plug in. Complete with speaker, volume control and nicely boxed. A snip at only £4.00. Our ref. 4P52.

BBC JOYSTICK INTERFACE. Converts a BBC joystick port to an Atari type port. Price £2.00. Our ref. 2P261.

TELEPHONE EXTENSION LEAD. 5mm phone extension lead with plug on one end, socket on the other. White. Price £3.00. Our ref: 3P70 or 10 leads for only £19.00! Ref. 19P2.

LCD DISPLAY. 4 1/2" digits supplied with connection data. £3.00. Ref: 3P77 or 5 for £10. Ref: 10P78.

CROSS OVER NETWORK. 8 Ohm 3 way for tweeter midrange and woofer nicely cases with connections marked. Only £2.00. Our ref: 2P255 or 10 for £15.00. Ref: 15P32.

REVERSING LIGHT ALARM. Fits to car reversing light and sounds when reversing. Only £2.00. Our ref. 2P248.

BASE STATION MICROPHONE. Top quality uni-directional electret condenser mic 600r impedance sensitivity 16-18KHz - 68db built in chime complete with mic stand bracket. £15.00. Ref: 15P28.

MICROPHONE STAND. Very heavy chromed mic stand, magnetic base 4" high. £3.00 if ordered with above mic. Our ref: 3P80.

SOLAR POWERED NICAD CHARGER. 4 Nicad AA battery charger. Charges 4 batteries in 8 hours. Price £6.00. Our ref: 6P3.

HIGH RESOLUTION MONITOR. 9in black and white, uses Philips tube M24/306W. Made up in a lacquered frame and has open sides. Made for use with OPD computer but suitable for most others. Brand new. £16 plus £5 post. Our reference 16P1.

MAINS 15 WATT SOLDERING IRON. Price £3.00. Our ref: 3P65.

SOLDERING IRON STAND. Price £3.00. Our ref: 3P66.

SHARP PLOTTER PRINTER. New 4 colour printer originally intended for Sharp computers but may be adaptable for other machines. Complete with pens, paper etc. Price £16.00. Our ref: 16P3.

CAR IONIZER UNIT. Improve the air in your car, clears smoke and helps prevent fatigue. Case req. Price £12.00. Our ref: 12P8.

NEW FM BUG KIT. New design with PCB embedded coil 9v operation. Priced at £5.00. Our ref: 5P158.

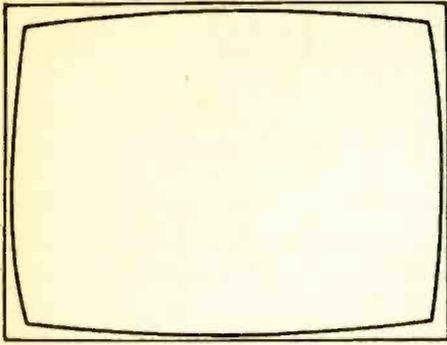
NEW PANEL METERS 50UA. Movement with different scales that are brought into view with a lever. Price only £3.00. Ref: 3P81.

STROBE LIGHTS. Fit a standard edison screw light fitting 240V 40w. Flash rate available in yellow, blue, green and red. Complete with socket. Price £10 each. Ref: 10P80 (state colour required).

ELECTRONIC SPEED CONTROL KIT. Suitable for controlling our powerful 12v motors. Price £17.00. Ref: 17P3 (heatsink required).

EXTENSION CABLE WITH A DIFFERENCE. It is flat on one side making it easy to fix and lock tidy. 4 core, suitable for alarms, phones etc. Our price only £5.00 for 50m reel. Ref: 5P153.

METAL PROJECT BOX. Ideal for battery charger, power supply etc. Sprayed grey size 8" x 4" x 4 1/2" Louver for ventilation. Price £3.00. Ref: 3P75.



TELEVISION

The Satellite TV Era

The era of satellite TV in the UK is well and truly with us, now that Sky has passed its first anniversary and BSB is about to start its services. The latest satellite TV monitor figures from the *Financial Times* suggest that some 61,000 Astra installations were carried out during January, bringing the total to date to around 560,000. January's figure is a decline on December's, but the figures have been jumping around somewhat erratically over the past few months and there appears to have been a pre-Christmas boom followed by generally tighter trading conditions as we enter the Nineties. It has also to be borne in mind that the FT's figures are based on monitoring a very small sample of households, only some 4,000. Although these have been selected carefully to reflect the overall composition of the population, there is nevertheless considerable scope for error. With no licensing to provide a guide, estimates of the number of satellite TV installations remain guesswork. The FT's assessments do however seem to correspond with the general feeling in the trade and what one can tell by observation.

Sky Television has to be congratulated on getting through its first year. It seems to be taking a firm hold. Rupert Murdoch has stated that Sky Television will probably cost him around £400m before he starts to see a profit. That sounds a lot, but then the idea of starting a new mode of broadcasting in competition with established services was bound to be costly. When cable viewers of Sky are taken into account, it seems that something like one and a quarter million households now have access to Sky. This is more or less on target and provides a pretty solid basis for further advance.

Sky Television has claimed that its launch was the most successful consumer electronics launch ever, comparing its first year with the 30,000 colour TV sets and 118,000 VCRs sold during their respective launch years. That's probably stretching it a bit. Colour TV started late during its launch year and was initially restricted to the BBC services. Nevertheless Sky's start represents good going, helped undoubtedly by the low cost of receiving equipment and the lack of scrambling during the first year. One has to recall that ITV wasn't a success initially. It took a couple of years of substantial losses before the era of the famed "licence to print money" dawned. In more recent times we've seen a similar pattern with Europe's first pay-TV broadcast service, Canal Plus, which is now in its fifth year. Its start looked like a total disaster, but profits then began to build up. Last year there was a further 18 per cent rise in profits as subscribers rose by some 300,000. The total number of subscribers now exceeds three million, which is the limit Canal Plus set itself for French viewers. The company is now busy spawning offshoots in other countries.

Once you've got the audience, the advertising follows. Sky has now signed long-term agreements with three major advertisers, Beecham, Unilever and United Biscuit. It would be surprising if, having got so far, Sky did become the disaster that once seemed likely. An independent survey carried out for Sky by Continental Research, the same firm that does the monitoring for the FT, suggests that Sky takes 23.4 per cent of the viewing time of those able to receive its programmes. This would represent a major shift in viewing habits, and would confirm Sky's successful entry into the broadcasting industry.

The FT's satellite TV monitoring has also been taking a look at future prospects, on the basis of its consumer research. The result looks like quite a rosy future for satellite TV. By the end of 1993 some five million UK households are expected to have satellite TV receivers. That represents one in four. It also seems that the satellite TV market is taking a more recognisable shape, appealing in particular to mid-market families with children at home.

Right now of course attention is about to switch to BSB, whose service start is imminent. At one time it was widely thought that there would be no room for two satellite TV broadcasters in the UK, providing nine channels. This now seems less likely to be the case. Ironically, Sky's pioneering efforts could help BSB, which is launching into a market already knowledgeable about and prepared for satellite TV. There will of course be less revenue all round as the cake is split between more and more services, but all that could mean might be tighter budgeting.

BSB's signals should be more reliable, but the technology it has adopted makes its equipment that bit more expensive than Sky's. It remains to be seen whether this will have much effect in terms of High Street sales. BSB has certainly ensured that it has sound financing, which will enable it to bid successfully for programme material, in particular films, the most important material for the new services. The initial investment made by BSB's shareholders was £425m. A further £900m has now been agreed, subject to the approval of the consortium companies' shareholders. BSB aims to break even within three years of its launch and to pay back its borrowings within six years. For the plan to work out it will need three million subscribers within two years. Despite the relative success story of satellite TV so far, this still seems to be an optimistic aim. It has the money to stay the course however. The promotional budget for the first three years has been set at £300m, which will be split between general advertising (one third) and promotion for receiving equipment - including it seems "inducements" to buy receivers. It has been admitted that this could amount to subsidies.

The evidence, a year into the satellite TV era, is that things are going well. From the dealer's point of view there's a fair amount of business to be done, though not a lot of profit. Questions remain, but we are less sceptical than a few months back.

EDITOR

John A. Reddihough

Please note that the telephone numbers below are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 341.

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COMPETITION

An error occurred in the wordsearch box on page 299 last month. The competition appears, corrected, on page 383 - there's still time for you to enter!

CORRECTIONS

See page 365.

YEAR PLANNER

There are errors in the Year Planner provided with the January issue. An announcement about this will be made next month.

COVER PHOTO

This month's cover photograph shows the Mitsubishi HS304 with the top cover removed. See servicing article on pages 354-6.

Servicing the Mitsubishi HS304

John Coombes

The HS304 was Mitsubishi's first front-loading VCR. It was sold in large quantities during the period 1983-4 and was also released under the Salora brand name as Model V8300.

Common Faults

One of the most common faults is that the picture has random lines across it, as if the tracking is set incorrectly. The cause is misalignment of the guide poles. You can tackle this fault in the field, using a known good prerecorded tape. Adjust the guide poles so that the lines slowly disappear up and/or down the screen. If the guides are turned incorrectly the number of lines will increase. This adjustment should be done only as a temporary measure however. The correct way to adjust the guide poles is to use a scope to check the f.m. envelope at test point TP2C. Insert a hexagonal key in the top of the guide roller with the set screw in front of the guide slackened off slightly. Adjust for a perfectly shaped f.m. waveform then tighten the set screw. Use a slight amount of locking paint to prevent further misalignment.

The reel motors are another common cause of trouble. For no play, intermittent play and/or very noisy rewind/fast forward or no fast forward check the take-up motor. It should spin freely when removed. The fault is caused by a worn bearing and the only solution is to replace the motor. There are other possibilities however. Check the pinion take-up cog which may have moved down the shaft with the result that it no longer meshes with the take-up spool. Alternatively you may find that it is split or that a few of the slits have been removed, displaced or badly damaged. The best replacement is the type used in Model HS330 as it can be fitted on the shaft with grub screws, preventing further trouble. For no rewind check the supply motor which will have to be replaced if faulty.

Power Supply Faults

The usual cause of the "no results" symptom is that the 3.15A fuse F901 is open-circuit or blown. If it has blown, check bridge rectifier D906 (M4B51) and the protection capacitors C909/910/911 (all 4,700pF) for shorts. Alternatively the 400mA fuses F971/2 on the primary side of the mains transformer may be open-circuit or blown. The latter will be due to shorted turns on the mains transformer T971, but this is a very rare occurrence.

If the power on/off switch doesn't operate and all days of the week light faintly check whether the 10Ω safety resistor R915 has gone open-circuit. You will sometimes find it necessary to replace the 9V standby transistor Q903 (2SC1983) in this event.

If the machine won't switch off, check whether R908 (1.8kΩ) or R910 (56Ω) is open-circuit.

For no clock display check for -27V at the collector of Q902 (2SA715). If this voltage is missing D904 (RM1) is probably open-circuit. If the -27V supply is present check Q902.

If playback is all right but there are no E-E signals

check that the 30V a.c. output is being provided by T971 then check D901 (RM1) and Q901 (2SA673) as necessary for being open-circuit.

Servo Faults

If the drum doesn't rotate - this problem can be intermittent - check whether R403 (82Ω) on the drum motor drive board is open-circuit. Also check for dry-joints here. If necessary check the LB1620 drum motor drive chip IC401 by replacement and for dry-joints on the drum MDA board.

If, at power switch on, the drum motor speed is excessive, check whether transistor Q4B0 (2SC2603) on the control (mechacon/servo/power) panel is open-circuit. If necessary check the d.c. conditions around Q4B0 and IC4A8 (AN6344). Check Q4B0 and IC4A8 by replacement if necessary.

For excessive drum speed check the voltage at pin 1 of IC4A8. The reading here should be about 9V. If the voltage is low or missing suspect IC4A8 and check whether Q4A2 (2SA1115) is open-circuit.

Slow sound with a noise bar on the picture indicates a capstan servo fault. Check the voltage at pin 16 of IC4A3 (M54896P). It's connected to the switched 9V line. A short in IC4A3 can drag the voltage down.

Excessive capstan speed will give lines on the picture like poor tracking and fast sound. Check that the FG pulses are present at pin 6 of plug and socket CE. If so C4F9 (0.22μF) is probably open-circuit.

If the capstan motor is inoperative, check IC4A0 (M50129P) by replacement or by noting the d.c. conditions.

A faulty capstan motor can result in the machine taking a long time to come out of the visual search mode.

When R4K9 (1.5Ω, 2W) in the capstan motor drive circuit goes open-circuit you get snowy vision with a slight picture at the top. If left to run in this condition the VCR will cut out.

For displaced colour/picture jitter check the 9V supply at pin 14 of IC4A1 (TC4066BP). If the reading is low suspect the chip - check it by replacement.

Mechanical Problems

If the machine half loads then cuts out, check whether the loading belt is dirty or stretched and replace as necessary. If the loading belt is o.k. replace the loading motor.

No record but playback all right could simply be that the cassette tab is missing or fractured. The other likely cause is that the record prevention switch is open-circuit, broken or incorrectly positioned.

For bent verticals/picture skewing check the back tension, which should be 27g/cm. Excessive back tension over a long period of time will result in early failure of the heads. If you find that there's a constant 5g/cm variation, check the springs and spring holder, also that the tension arm is not bent or incorrectly set.

No play or intermittent no play can be caused by a faulty dew sensor or the lead connections to the sensor.

have had is with X6A1/VC6A1. If necessary check the crystal(s) and the condition of the trimmers. If still in trouble with no playback colour check IC6A0 (HA11741) by replacement or by checking the d.c. conditions.

Dry-joints around IC2A0 (M51450P) usually result in intermittent playback luminance. They can also cause intermittent failure to record a picture, intermittent colour recording or intermittent speed variation. It's best to resolder all the pins - clean them very well before doing so.

Remote Control

The HS304 has a cable-connected remote control system. If there's no operation, check for poor connection at the remote control socket, which you may find broken. Check also for a broken jack plug and the connections within it for dry-joints or for shorts if twisted. If still in trouble check for a break within the remote control unit - the panel may be cracked or there may be a poor connection or dry-joint between the lead and the PCB. If necessary check whether the lead is open-circuit. Try cleaning if any of the individual buttons give trouble. You may have to replace the unit.

Video News

George Cole

The following is a round-up of some of the more interesting recent releases in the consumer video market.

Panasonic has introduced an S-VHS VCR, Model NV-FS100B, that incorporates several features designed to reduce the effects of internal and external vibrations. These include a non-resonant plastic chassis, BMC (bulk moulded compound) side panels and a cabinet base made of a sandwich of sheet metal and mica. This latter feature combats floor-sourced vibration. The NV-FS100B incorporates a three-line comb filter to reduce dot interference and colour and luminance streaking, and is equipped with a number of editing features including a flying head, insert edit, audio dub, sound-on-sound recording which allows a linear sound track to be mixed with a hi-fi recording, and interval recording which makes a two-second recording every four seconds for animation effects. The deck and the remote control handset both feature a jog/shuttle dial for precise editing. Other features include: hi-fi stereo sound, a Nicam decoder, VISS, VASS, intro scan, time search, a digital scanner for bar-code timer setting, a four-head system for trick effects, long play, digital tracking, a tape remaining indicator and a one month/eight event timer. The suggested retail price is £999.95.

Panasonic has also released an editing controller, Model VW-EC300. It's designed to work with Panasonic models, such as the NV-FS100B, that are equipped with a five-pin editing terminal. The VW-EC300 offers manual and programmed assemble editing, insert editing and audio dubbing. Up to eight scenes can be programmed for automatic assemble editing, and there's a jog/shuttle dial for precise editing. The suggested price is £329.95.

Hitachi's Model VTM640E VCR has a built-in digital processor that allows the user to make up his own video

titles. Other features include long play, audio dub, VISS, simulcast recording, a 79-channel tuner and a one year/eight event timer. All for £400.

Several manufacturers have launched VCRs that are able to record teletext subtitles. The Philips VR6293 has an integrated decoder and a timer that can be preprogrammed to record teletext. Other features include a one month/four event timer, child lock and a tape remaining indicator. The suggested price is £379.

The Sanyo VHR5240E incorporates an integrated decoder with fastext enhancement. Other features include insert edit, a real time counter and a one year/six event timer. The suggested price is £450.

Ferguson's Model FV37H teletext VCR requires an optional decoder priced at around £100. Other features include hi-fi sound, a Nicam decoder, long-play audio recording, a real-time counter, VISS, a 48-channel tuner, a one year/eight event timer, child lock and digital tracking. The suggested price is £499.99.

JVC is offering four VCRs that have teletext capability when used with an optional fastext decoder. Model numbers and suggested prices are HRD520EK (£329), HRD610EK (£359) and HRD830 (£500). Price of the decoder is around £100.

Sharp's "user-friendly" VCR, Model VCA615HM, is designed to simplify timer programming. The deck has an on-screen display system that includes programming prompts and lists the chosen TV broadcasts to aid checking. There's also a 65-function remote-control handset which has a large LC display to guide the user step-by-step. Other features include a one year/eight event timer with a built-in hundred-year calendar (!), long play and a random repeat function. Suggested price is £349.95.

The Panasonic NV-M10B camcorder has been introduced as a replacement for the NV-M7. Features include hi-fi stereo sound, a flying erase head, a two-speed ×8 zoom and the VISS marking system. The suggested price is £1,099.95.

Three new camcorders have been released by Ferguson. The FC23 is an S-VHS-C model based on the JVC GR-S707. It has a full-size head drum for optimum picture quality: other features include hi-fi stereo sound, ×8 zoom, a flying erase head, insert edit, three-speed animation effects, a three-speed fast shutter (1/250th, 1/500th and 1/1,000th sec), long play, two-speed picture search, VISS marking and full auto and manual features. Suggested price is £1,499. The FC27 at £699.99 is a VHS-C model based on the JVC A1, featuring a flying erase head, ×6 zoom and a 1/1,000th sec fast shutter. At £999.99 Model FC28 offers a flying erase head, ×8 zoom, insert edit, VISS marking, a three-speed animation mode and a 1/1,000th sec fast shutter.

Pioneer's Model CLD1450 compact disc video player has PAL and NTSC playback capability. It shifts the chroma subcarrier frequency from the NTSC 3.58MHz to the PAL 4.43MHz while leaving the 525-line/60Hz field frequency unchanged, relying on the ability of many modern PAL TV sets to handle the 525/60 standard. The suggested price is £580.

A domestic still video camera, Model MVC-C1, that can record up to ten seconds of sound with each picture has been launched by Sony in Japan. The sound can be recorded automatically 0.4 seconds after the shutter has been pressed or added manually within five minutes of taking a shot. It sells for the equivalent of £380 but there is no suggestion to date of a UK launch. Sony suggests

that around 100,000 still video cameras were sold in Japan during 1989.

Sony has also launched in Japan a home colour video printer, Model CVP-G500. It can produce prints from all video sources, including a TV set, VCR and a still video camera. A thermal-dye transfer process is used, each print taking around seventy seconds to process. It costs the equivalent of around £720, a pack of thirty print sheets costing the equivalent of about £11.

Letters

BAKELITE REPAIRS

Some time ago I wrote asking for help after acquiring a Bush Model TV22 with Bakelite case. I was inundated with help from readers in obtaining parts for the set, which now takes pride of place in the living room. My thanks to all who assisted. Recently, while wandering through the local auction rooms, I couldn't believe my eyes. There was an elderly Bush Bakelite radio, Model DAC90A, which with its large Bakelite knobs makes an absolute match for the TV22. It was snapped up for £3 (the TV22 cost £90!).

I won't go on too much about the cost of UL46s and UY41s these days (16 quid the pair and, to younger readers, they are those glass valve thingies). The main problem however was a triangular shaped hole at the top of the set, measuring about 1½in. square. How on earth the set's showpiece, the dial glass with its long-defunct home and light service markings, had survived remains a mystery. I hope that the following notes on my experience repairing the Bakelite may help others with a similar problem.

The hole was first thoroughly cleaned using a spirit type cleaner I use for disc drives. No attempt was made to smooth the edge of the damage as I felt that a rough surface would hold the filler better. My initial attempt was made with car body filler of the paste type, but this didn't make a satisfactory bond with the Bakelite. Enter mate one, a car body man who advised using glass fibre. Once on, this made a permanent bond. I found it best to put Sellotape on the outside of the case and apply the mixture from the inside. This avoids the need to sand the finished surface.

The next and main problem was colouring. After using up most of the kids' felt tips and crayons, along with all their modelling paints, I had nearly despaired of getting the colours anywhere near Bakelite. Enter mate two, who is studying at art college. After examining the problem he came up with a colouring method which gives an effect almost undetectable from the original. It's easy to carry out by totally non-artistic people like myself.

The paints required are made by Rowney and are obtainable from high street stationers. Get Mars black 36, burnt amber 223 and cadmium scarlet 507. Squeeze small amounts from each tube side-by-side. Don't mix them. Instead, take a piece of old sponge or rough towelling and dab the cloth lightly into all three paints together, then on to the repair, overlapping the good area slightly. If you are not happy with the result, keep dabbing - it will soon come right. Don't wipe the paint into the repair: to dab it on is the secret. The paints dry to a matt finish and can be coated with varnish for a gloss finish: don't use the wife's nail varnish - some makes

result in the colours going wonky!

Although I'm very pleased with the result, as an afterthought I'm toying with the idea, should a further repair of this type be necessary, of photographing a good section of the cabinet and implanting the photograph on to the damaged section. I wonder whether anyone has any other thoughts on this?

David C.J. Tilley,
Ashthomas, Nr. Tiverton, Devon.

INTERFERENCE PROBLEMS

Roger Bunney's article on interference problems (February) was excellent. My own interest in DX-TV and DX-radio is also marred by local interference - in fact even general domestic radio and TV reception is difficult in this part of North London. The problem is that Southgate is exceptionally hilly. My own street is in a pronounced dip, making radio/TV reception extremely patchy. Not one satellite dish is in evidence here, though many are to be seen in adjacent streets towards the hill tops surrounding the dip. In addition to this the houses are in terraces of four, with the result that interference from domestic equipment is similar to that experienced in blocks of flats.

While much effort is put into minimising interference to TV reception, the same is not the case with radio reception. My neighbours have on the other side of the living room wall a faulty central heating thermostat. This produces twenty second bursts of interference that ruin local f.m./stereo radio reception at frequently repeated intervals. They also have two colour sets. The main set downstairs in the living room, fed from a loft aerial,

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HA1406	110p	TA7361	245p	STR441	460p						
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HA11443	350p	TA7609	280p	STR455	660p						
HA11715	210p	TA7613	360p	STR4090	625p						
HA12002	280p	TA7641	145p	STR6020	480p						
HA13001	185p	TA7691	165p	STR7030	590p						
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causes the usual but bearable after-dark heterodynes. The second set, with its own loop aerial, is used in the upstairs front bedroom. It produces very harshly-modulated harmonics that render my a.m. receivers totally unusable for the entire evening. In particular I have a Philips multiband radio with tuned r.f. stage. When this is used with an indoor long-wire aerial it serves as an excellent DX receiver during the day. When the upstairs portable next door is in use in the evening however medium and long wave reception is impossible apart from the strongest local stations.

The interference is over the entire bands but peaks at 1,500kHz and 600kHz in the medium wave band and at 300kHz and 150kHz in the long wave band. On the short wave bands there are many closely-spaced, very weak harmonics at the h.f. end of the scale, with progressively diminishing ones as the 49m band is approached. This doesn't present much of a problem, so at least some short wave listening is possible in the evening. But if I turn to the f.m. stereo tuner, which uses an indoor quad aerial, I'm stymied by the faulty thermostat!

I've tried using a vertical whip aerial fed by grounded coaxial cable instead of the long-wire aerial for a.m. This reduces the interference to a negligible level but doesn't provide enough signal pick-up from the stations required, even when the aerial is appropriately repositioned for optimum results. Has anyone any suggestions or ideas?

*Ivor Nathan,
Southgate, London N14 4ND.*

PHILIPS K30 CHASSIS

This set came in because it was tripping. We checked everything – earths, dry-joints, the tube's external coating, edge connectors and mains plugs – but the set still refused to start up. Then a small patch of insulation tape was noticed on the bottom of the line output transformer. Peeling this off revealed a small hairline crack. The tape had burnt and replacing the transformer provided a complete cure – it's the first K30 transformer we've had to replace.

What sort of an "engineer" would try to repair a line output transformer with tape?

*J.R. Cutts,
Houghton-le-Spring, Tyne and Wear.*

CHRISTMAS CAPERS

Keith Hamer and Garry Smith's article on BBC Christmas captions (January) brought back a few memories. I hope the following notes will fill a few gaps and provide some other details of interest.

I think the 1974 BBC-1 Christmas caption featured four skaters rotating around an ice rink, though I may be wrong. New identifications were used in 1975, or it may have been 1974, with BBC-1 changing the globe from blue on black to custardy yellow on blue with large letters, used up to 1981. BBC-2 changed from the rotating cube to revolving blinds, used up to 1979. BBC-1 North East retained the old globe (the word "colour" becoming "north east"), but for some reason the blue tint became brown! This soon changed in line with the main globe, with "north east" below the "BBC-1". I also recall that BBC-1 North featured a rotating "N" instead of the globe up to 1974.

Christmas 1974, I think, saw both Tyne Tees and Yorkshire substituting their now classic opening themes,

with Tyne Tees using the "Christmas means ITV" jingle – twice during the duration of the "transmitters in service" slide – while Yorkshire used Dickens style Christmas music. The "Yorkshire Television in Colour" symbol was replaced with a decorative slide featuring the appropriate days – Christmas Eve/Day and Boxing Day. Incidentally Yorkshire abandoned the "transmitters in service slide" around this time with a transmitter location map.

I well remember the BBC Schools' grey scale circle/countdown clock and the rather unusual music that went with it (sounded as if it had won a schools' competition). The music changed in 1973, with two new themes, the circle/clock going in 1974 or 1975 to be replaced with the "diamond", using the two new themes.

The above is recalled from memory, and I've no written records, so my apologies if I've got a date or two wrong. I hope that Keith and Garry succeed in obtaining further photos/video recordings of these old identifications.

*Brian Renforth,
London N15*

HELP WANTED

Can anyone provide any information or data, or suggest any books or magazines, that deal with digital frame storage?

*Mark Harris, 16 Caxton Street,
Barnsley, South Yorkshire S70 2LF.*

Can anyone help me obtain a remote control unit for a Fisher FVH-P910 VCR?

*S.W. Byatt, 8 Manor Close,
Bromham, Bedford MK43 8JA.*

Can anyone supply an LA1387 chip? It's used in a Sanyo CTV but is not available here.

*Mas'od bin Haji Latib, 12 Jalan Biru Muda,
Taman Bukit Pasir, Batu Pahat, Johor,
83000 Malaysia.*

Can anyone supply a tuner presetting cover for a Sharp VC8300H/W?

*W. Stewart, 76 Marischal Court,
Aberdeen AB2 1DW (tel. 0224 576 122).*

Can anyone advise on converting a Bush TV22 to 625-line operation? A reasonable picture and sound can be obtained using a home-made modulator, but winding up the line hold control produces a non-linear picture and I don't want to stress the line output transformer.

*Keith Harrison, 56 Denbydale Way,
Royton, Oldham, Lancs OL2 5TN.
061 652 9436.*

Would any reader be prepared to sell (preferably) or lend me the official manuals for the Sony C6 and C6 Mk. 2 VCRs, preferably complete with supplementary information including mechanical and electrical alignment?

*D.J. Chambers, 20 Rylands Lane,
Weymouth, Dorset DT4 9TZ.*

Can anyone provide a circuit diagram for the Sonata CTV3001?

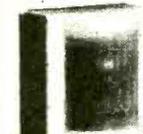
*J.S. Bonnar, 3 Wallace Road,
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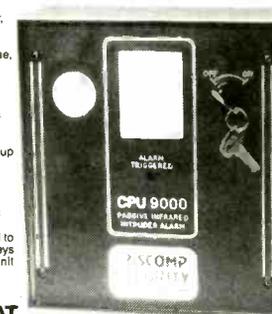
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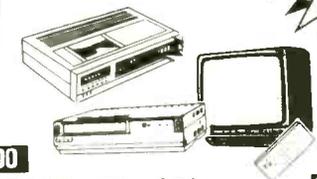
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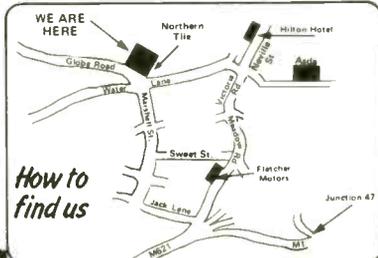
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Satellite TV Servicing

John Hopkins

It's been a while now (July 1987) since I wrote in these pages on getting started with satellite TV. Since then it seems to me that all the world and his dog have got or are going to get an Astra system! Those of you who read about my early struggles have probably become experts by now and can give me quite a few pointers. Those of you who still have trouble may find the following notes on my more recent experiences helpful.

The first thing I learnt is that no matter how well the LNB is made it always lets in water once the British weather has got at it. So always coat all seams and screws with a silicone rubber sealant. Also coat the seam around the spider trap. And yes we have had spiders making their homes in the head assembly.

Now for a few faults with the satellite TV receivers we handle.

Tatung Early Bird

A problem you can get with the Tatung Early Bird is no response to remote control commands. There are three possibilities here.

(1) The remote control handset's batteries are not properly seated. They sometimes spring out of the clips and need reseating.

(2) The remote control membrane has burnt out. You can test the remote control handset by holding it close to an a.m. radio and pressing the buttons. If the handset is o.k. you'll hear a rapid pulse from the radio set.

(3) The IR detector is faulty. It's marked IC104 and is mounted on the right-hand side of the front panel. A similar fault occurs when the IR detector doesn't line up with the window in the front casing.

If text appears on the screen or the sound, colour, brightness etc. vary when you use the remote control unit, change IC102. Tatung stocks two types. One interferes with Tatung sets while the other interferes with some other makes of TV receiver. Make sure that the replacement isn't of the same type.

The Early Bird doesn't work well with some decoders. Increasing the value of C231 to 1,000 μ F (16V) helps.

I've not had any overheating problems with this unit. The Tatung Service Department is first rate and the circuit diagram is very easy to follow. Spares are usually by return of post. Pity about the case . . .

Bush SR2000

The Bush SR2000 tends to drift off tune. For this fault check C8 on the front panel. It's supposed to be 0.22 μ F but could read anything.

If the picture flickers and blanks out, change the r.f. modulator. Note that two types, one horizontally and the other vertically mounted, have been used in these receivers. With the vertical one it's very difficult to adjust the channel set control because the back of the receiver gets in the way. To overcome this problem I suggest that you drill a small hole in the plastic back. This will save you embarrassment should the adjustment be needed.

If, with some TV sets, the picture jitters, rolls and jumps, remove R77 from the panel, link R19 and add

about 180pF across R9.

If you find that a decoder doesn't work, check the following points. (1) The video baseband link must be removed. (2) C68 is sometimes fitted back-to-front. (3) Adjust the baseband gain control.

This is not a bad looking unit and there have been no overheating problems. It's easy to install but there are no internal skew controls. The back-up service is not bad but the circuit diagram is poor and unless something is done about the service manual this will be another "sorry mate we don't repair them" piece of equipment.

Pace SS3000

For hum on picture the with the Pace SS3000, check for a dry-joint on C2 (2,200 μ F). Another possibility is a faulty mains transformer. Note that the Ferguson SRA1 is basically the same unit.

The SS3000 is a really nice receiver with clean lines and no external controls. The response from the Service Department is quick. A pity about the dry-joints. I seem to be the only one to find it difficult to get German and French sound with Screensport.

Ferguson SRA1

Ferguson has introduced several modifications to the SRA1 satellite TV receiver to give improved circuit protection. The extra components required are available from the Ferguson Service Division as a kit, part number 00X6-666-001, and the recommendation is to carry out the modifications whenever one of these receivers comes in for service. Details are listed below. Receivers with the prefix R in the serial number or with the fifth and sixth digits in the number as letters have been modified in production. If in doubt look at R145: the replacement polyswitch looks like a disc capacitor.

The fusible resistors R145/6/8 in the power supply are all replaced with fuses as follows. (1) Replace R145 with a Raychem polyswitch type RXE090. (2) Replace R146 with a 1A Bussman fuse type MCR. (3) Replace R148 with a 1.5A Wickman fuse type TR5-F19370.

The two 12V feeds to the u.h.f. modulator are modified as follows. Remove zener diodes D10 and D11 and capacitors C101, C102, C111 and C112. Replace R149 with a 400mW, 2.4V zener diode, anode to pin 5 of the modulator. Similarly replace R150 with a 400mW, 2.4V zener diode, anode to pin 3 of the modulator.

Replace R147 in the 12V feed to the audio detector chip U1 with a 4.7 Ω , 0.25W, 5% carbon film resistor. Replace Q33's emitter resistor R161 with a 220 Ω , 0.25W, 5% carbon film resistor. Add an 0.1 μ F, 63V ceramic capacitor across R161, on the component side of the panel.

The polyswitch used to replace R145 is a self-resetting thermal fuse. To reset the device the short-circuit across the input from the LNB must be removed and the mains supply disconnected.

The integrity of the earth wire in the mains lead should also be checked. With 5V a.c. at 10A applied between chassis and the earth lead the resistance must not exceed 0.5 Ω .

VCR Clinic

Reports from Steve Beeching, T.Eng., Eugene Trundle, Philip Blundell, Eng. Tech., Stephen Leatherbarrow, Alfred Damp, Mick Dutton and Chris Plaice

JVC HRD180

Hello everyone. Sorry you've not heard much from me for a while but the farm and the specialist camera/camcorder servicing operation I run keep me pretty busy. The technology is still advancing, and bringing with it ever more mind-boggling faults. The hotline between myself and Nick Beer has been fairly buzzing of late, for reasons that will be divulged another time. Meanwhile here's a case where the fault symptom and the defective component were not clearly related, the sort of thing that causes us considerable hardship.

The machine was a JVC HRD180 with which Mastercare was having problems. I was asked to help out as a JVC authorised service centre. More often than not the playback picture was very poor. The fault was easy to see: the poor-quality playback picture had lots of very small herringbone squiggles all over it and a grainy look, with black tadpole-like spots trailing across on peak whites.

The first thought that crossed my mind was the obvious one that the outputs from the heads were low. Our local Mastercare branch is very good about supplying engineer's notes however. They showed that the heads and the HA11870NT preamplifier chip had been replaced, also that there had been some problem with the power supply as a regulator had been changed twice along with some circuit protectors. To be on the safe side I spent some time just cross-checking, in case some point had been missed. This included verification of the preamplifier operation, the LP/SP switching and the adjustment of the head tuning circuits. The latter were left temporarily misaligned as it was impossible to determine their correct alignment at this stage.

The head drum seemed to lack power, and gave the impression that it was running on the slow side, but a locked picture was obtained. At one point early one morning a good quality picture came up and then deteriorated before I could check anything. Some recordings were made as a check. They played back reasonably well on another machine. So it was difficult to know exactly what were the fault symptoms and what were red herrings. Scepticism about everything seemed to be the only logical approach to adopt.

Time was spent checking the operation of the luminance playback circuitry. This included changing the PU22282A chip IC101. All to no avail, except that the upper and lower edges of the f.m. waveform at pin 22 of IC101 were seen to be ragged and not smooth as with an HRD170 used for comparison (it's the single-speed version, and happened to be hanging around). I next hijacked the HRD170's preamplifier and tried it in the faulty machine. This move was inconclusive but suggested that the preamplifier was all right. I was still suspicious about the f.m. carrier however: it seemed to contain excessive h.f. content, causing beat patterning. So if the preamplifier was o.k. the problem was possibly due to the filter circuit between the preamplifier and IC101. This was checked, but no evidence was found to suggest that there was a faulty component here. The only likely item left was the lower drum unit with the rotary transformer and motor. This was changed, but the symptoms persisted.

I next tried some panel jockeying to try to isolate the cause of the fault. The preamplifier was again swapped, this time for an HRD180 one. The servo panel was swapped and the power supply rails were again checked for level and ripple. I also checked the r.f. unit, but as the testing was on the video output this was a move of desperation. The HRD180 was then put aside for a while for further thought – actually the further the better . . .

After a week or so the situation was reappraised. So far I'd eliminated the video heads, the lower drum and rotary transformer, the preamplifier, the luminance processing, the power supplies and the servo, also the tuner and r.f. modulator. A helpful suggestion from JVC was that the only thing left was the cabinet. Thanks, Kevin!

Eventually one quiet Saturday morning the HRD180 was put back on the bench. The fault had not gone away. There was still a poor picture and the f.m. waveform had fuzzy edges. That bothered me: you know the feeling in the back of your mind, a nagging "there's the clue". Then it dawned! Clearly the cause of the problem, if it was not the f.m. carrier filters, was that the signal from the video heads was not of the correct frequency. This in turn meant that the drum speed was incorrect.

As the servo and drive amplifier, along with the power supplies, had been checked and cleared, what else was there that could affect the drum motor? Only the stop/start signal from the syscon microcomputer chip, but as the drum stopped and started correctly this must be operational. Pin 7 of the M50965-612SP system control microcomputer chip IC601 should be high for drum "off" and low for drum "on". It sat at 3V and had a sawtooth waveform on it. So that was it, the sawtooth was modulating the speed of the drum motor and the f.m. signal coming off the tape! Once the microcomputer chip had been replaced clear pictures were obtained. Guides, switching points and the head tuning circuits were then set up and the repair completed.

Poor picture quality due to a faulty syscon microcomputer chip, would you believe it? I'm sure that the trade price of a new machine was less than my invoice, despite full time not being charged. **S.B.**

Sanyo VHR5200

"New unsold stock, no deck functions, wanted for sale Saturday" the job ticket read. We dismantled the machine, put it on its side, and were surprised to find that it burst into life when we poked and prodded at the underside of the deck.

They didn't get it back for Saturday as we had to order a new capstan motor. The original one had a couple of dead spots in its rotation, which is unusual for an electronic direct-drive motor. Once the motor stopped at a dead spot nothing would happen until it was flicked by hand. **E.T.**

Grundig VS500

This machine chewed tapes. When a cassette was inserted the deck went as far as the half-load position then the tape spilt out of the cassette and off the guides.

The cause of the problem was that the left-hand spool wasn't being braked as spring 26 had come off. When the spring was refitted in its hole in the chassis normal operation was restored. **P.B.**

Philips VR6561

On playback there was no sound and a blank raster. We found that the +10d (record) supply was present at all times as the RE2 line didn't go high in playback. It comes from the P608 board where T7701 (BC328) was open-circuit base-to-emitter. **P.B.**

Amstrad 4600/4700/6000/6100/TVR2/TVR3

If the machine is apparently dead, with no clock display, see if it will load a cassette. If the deck functions are normal the problem is usually confined to the FIP801 display's heater supply. The cause is an open-circuit here or, very commonly, a faulty mains transformer. Incidentally these mains transformers are not very reliable – when defective they usually run very hot. If the machine won't accept a cassette, check the +28V output from the power supply. If this is low the 14DN332 timer chip is almost certainly faulty.

The timer chip is also usually the cause when display segments that shouldn't be lit up are alight. This fault can however be caused by the zener diode in the power supply between the heaters and the +28V rail. **S.L.**

Setting up Amstrad VCRs

A few words about setting up Amstrad VCRs. It's a very straightforward process due to the simplicity of these machines.

First, use the scope's trigger channel to monitor the head switching pulses and the other channel to look at the control track pulses. What you should see is shown in Fig. 1. If the conditions aren't as shown, adjust the appropriate potentiometer (test point and potentiometer circuit reference numbers vary from machine to machine – refer to the manual).

Next transfer one input from the control track pulses to the playback f.m. signal. Adjust the audio/control head (large brass adjustment) for maximum f.m., then adjust the customer tracking control. Maximum f.m. has been obtained when the waveform amplitude will only decrease. Finally, trim up the f.m. waveform shape with the relevant guide.

If the switching pulses are incorrect this will show up as a bright-up between head scans. Adjust the switching roughly for no bright-up (two controls, i.e. Ch.1/2, with the VCR4600, only one control with the other models). For precise setting a check can be made on the video waveform.

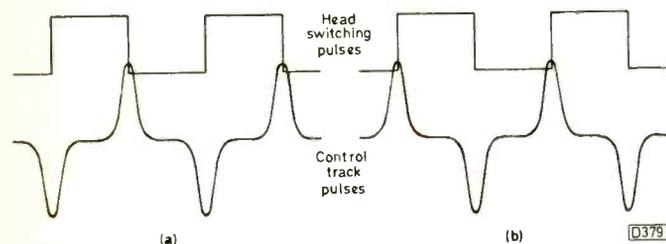


Fig. 1: Setting up waveforms for Amstrad VCRs. (a) Models VCR4700/6000/6100/TVR3 VCR. (b) Model VCR4600 only. In both cases with the tracking control in the centre, detent position.

Adjust the sound for the best frequency response with a known good music recording (this is second best to an azimuth tape of course). White noise is also a good check. **S.L.**

Hitachi VTM622

This brand new VCR had a healthy appetite for tapes. The damage was not creasing: the tape was being stretched so much that oxide had fallen off in places to reveal the clear backing. A check on the tape back tension sent the scale needle to over 60 grams. The tension pole positioning was correct, and after removing the tension band we found that the supply reel was still very stiff. When the reel had been removed a black circle mark was seen on the tape deck chassis. The spacing washer under the supply reel had never been fitted. **A.D.**

Philips VR6760

This machine came in with a long list of faults: no hi-fi sound on playback of any tape; no normal sound; and no E-E sound through the TV set, with the picture distorted – the distortion took the form of a black-and-white bar that rolled up and across the screen, similar to sync bars breaking through from an adjacent channel. After chasing several red herrings we found that the culprit was transistor T607 on board P606. It was open-circuit, as a result of which the +11b supply was missing. **A.D.**

Fisher FVHP615

This machine came in with the usual complaint of chewing tapes and poor rewind. Both idler assemblies were replaced and the machine was returned to the customer. A few weeks later it came back with the symptoms of wow and flutter and tape chewing, but only at the very start of a tape. This had started to happen after replacing the idlers.

When we played a fully rewound tape in the machine we found that the capstan speed varied and that as the tape was being taken back into the cassette it slipped down the guide and was crushed on the lower edge of the housing. This indicated high take-up torque, which was found to be over 200 grams. The cause of the problem was the take-up reel. These reels have a clutch at the bottom and this one had virtually seized. **A.D.**

Amstrad VCR4600

A very common fault that's recently started to occur is failure of the left-hand sensor. Complaints range from no play or fast forward to intermittent stopping in the record mode. **M.D.**

Ferguson 3V65

This machine came in for head replacement. When we'd done this we made a recording and found that the picture/colour etc. were normal. The machine was therefore returned to the subscriber who subsequently complained that it played his tapes only in monochrome. When we tested the machine in the workshop with a prerecorded tape, sure enough no colour. The reason for this was that the upper drum had been fitted 180° out of its correct position, something that's very easy to do with this model as the "relay pins" are both made of the same colour plastic. **C.P.**

Teletopics

SATELLITE TV NEWS

BSB's five-channel DBS service is due to start in early April, now that the technical problems have been sorted out and the financing has been arranged. Receiver-decoders are expected to sell at around £300 and will also be available to rent. Aerials come in three shapes, the Matsushita 40cm Squarial, a 35cm dish made by Channel Master, and a 35cm "ovaloid" from Marconi. Channel Master is a US company which has set up a factory at Blackburn to produce the dishes. The LNBs are being produced by Continental Microwave of Luton - the company has contracted to supply a million LNBs, which use a gallium arsenide chip developed by the US firm Anadigics, during 1990-91.

Sky Television celebrated its first anniversary on February 5th. The same date saw the start of scrambling on the Movie Channel. Not all films will be scrambled to start with, though full encryption is due to be implemented by late March. Those who have signed Sky's £4.49 a week subscription deal will not have to pay any extra to have a decoder and watch the Movie Channel initially. For others a subscription will cost £9.92 a month plus a £15 deposit for the decoder. There has been some criticism in the trade of Sky's decision to use its own contractors to install the decoders.

December saw an increase in Sky installations to an estimated 110,000, the second highest monthly total. This followed a curious drop in installations during November to only 35,000.

DIGITAL AUDIO FOR S-VHS

JVC has released preliminary details of a digital audio system it has developed for use with the S-VHS VCR format. At present S-VHS equipment uses a linear audio track or a helical track for analogue stereo hi-fi sound. The latter system works by frequency modulating the right and left audio channels on to carriers whose frequencies are 1.8MHz and 1.4MHz respectively - see Fig. 1. The hi-fi signal is recorded at a deeper level in the tape than the video signal, using what is known as depth multiplex recording.

The new system, which is known as the depth multiplexed signal bias recording system, records in the helical track a high-quality pulse-code modulated digital audio signal whose sampling rate is 48kHz with 16-bit quantisation. There is also an optional four-channel mode with a 32kHz sampling rate and 12-bit non-linear quantisation. In comparison, the Video-8 PCM system uses a 31.25kHz sampling rate and 10 to 8-bit quantisation.

The S-VHS PCM audio signal modulates a 3MHz carrier, using a quadrature differential phase-shift keying (QPSK) modulation system in which each phase change represents two bits. This method of modulation is also used by the Nicam digital stereo broadcast system. To improve the recording characteristics, an 11MHz a.c. bias signal is added.

The PCM signal is frequency multiplexed with the f.m. audio signal, both sets of signals being recorded by the same set of heads. The f.m. signal is recorded in the deepest part of the tape's magnetic coating, with the

PCM signal on top. The video signal is then recorded above both sets of audio signals. The system's transmission rate is 2.6Mbit/sec. It uses a powerful doubly-coded Cross-Interleave Reed-Solomon (CIRC) error correction system.

JVC adds that the PCM sound can be recorded on existing S-VHS and S-VHS-C tapes and that the system is fully compatible with current S-VHS hardware. No details have so far been given on when the first VHS PCM equipment will be released.

VIDEO PRINTER FROM NEC

NEC has introduced a video printer, Model FV-510EK, which can produce 6 x 4in. colour prints from various video sources, including camcorders, VCRs and still video cameras. The FV-510EK has a two-field image memory store which can also be used for special effects such as picture enlargement and multiple printing. An integrated character generator allows the user to superimpose various messages on the prints via a remote control handset.

A sublimable dye thermal transfer process is used for printing. This works by ink paper composed of yellow, cyan and magenta dyes being brought into contact with cartridge paper. Heat from a dot-matrix printing head transfers the dyes on to the plain paper. The normal printing time is seventy seconds, though there's also an optional forty-five second high-speed mode.

The FV-510EK has inputs for composite video, S-video, and RGB signals. Dimensions are 430 x 105 x 410mm (w x h x d); weight 9.5kg. Suggested price is £1,299 and the ink cartridges and paper are sold in packs of 20 and 75 for £16.99 and £39.99 respectively.

DIXONS

Kingfisher's bid for Dixons has been referred to the Monopolies and Mergers Commission, which has been asked to report by April 27th. Meanwhile in its defence document Dixons has forecast profits for the year to April 28th of not less than £70m, compared to £78.4m last year. This surprised analysts who had been forecasting profits of around £40m. The difference appears to be accounted for by previously excessive provisions against warranty claims, a pension fund holiday and good trading over the Christmas period.

1990 BATC CONVENTION

The 1990 British Amateur Television Club convention, which will be held on Sunday, May 6th, has moved to a new venue at Harlaxton Manor, near Grantham, Lincolnshire. The Manor is ideally situated, being only two miles from the A1, and has ample car parking space and good-quality, reasonably-priced catering arrangements. In addition to the exhibition there will be a full lecture programme covering various aspects of amateur television.

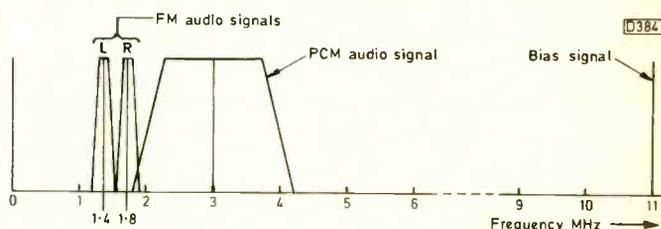


Fig. 1: Frequency spectra of the f.m. and PCM audio signals laid down by depth multiplex recording with the S-VHS system. The azimuth offset used with the drum-mounted audio heads is $\pm 30^\circ$.

sion. The Manor stands in many acres of beautiful grounds and there are several local attractions. Grantham itself is three miles away. The BATC extends a welcome to all readers.

WILLOW VALE AT 25

Reading based Willow Vale Electronics, the largest distributor of brown and white goods spares in the UK, celebrates its 25th anniversary this year. Peter Bartlett, founder and managing director, started trading in second-hand TV's from a lean-to garage at the side of his West London house during the swinging Sixties. Since then he has built up a firm with an annual turnover in excess of £8m, employing over 100 people. A purpose-built warehouse in Manchester provides distribution over the whole of the north while Reading looks after the south as far north as Birmingham. Double D of Bournemouth, Central Audio Services and Ohms and Watts of Nottingham have recently been added. Over 80,000 different spare parts are stocked and the company represents Philips, Sharp and Grundig amongst consumer electronics and home appliance manufacturers.

BUSINESS NEWS

SEME's recent appointment as official spares distributor for Panasonic has been so successful that the operation has more than doubled in size. A second fax line and two additional telephone lines have been added - the additional lines are on the main number 0280 823 523. The number of different items stocked has increased sixfold to 5,300 and SEME has over 100,000 Panasonic spares items "on file".

Japanese hi-fi manufacturer Pioneer Electronics is investing nearly £20m on a new factory at Wakefield. It's expected to open in May next year and will create about 500 jobs over three years. Initially CD players will be produced but the intention is to add other audio and AV products.

Brian Palmer, who founded Hinari, is to set up a new firm with another far-eastern sounding name, this time Akura Electronics. It will initially operate as a brown goods importer located in Scotland. The product range is expected to include TV sets, VCRs and audio equipment - starting with a 14in. CTV with remote control sold through Co-op outlets.

TECHNICAL DEVELOPMENTS

Philips and Matsushita (Panasonic, Technics etc.) have set up a company called D2B Systems to develop a domestic digital bus (D2B) system that will provide data control and communication with audio, video and other consumer electronics equipment so that domestic systems can be integrated to simplify operation. The company will be located at the Philips Electronics' Mitcham, Surrey site and is being supported by Sony and Thomson.

Grundig's latest CTV chassis, the CUC4400, includes a feature we've not come across before in TV sets, a MOSFET chopper transistor, type BUZ90A. The associated control chip is type TDA4605. This will obviously call for extra care when carrying out checks. The CUC4400 chassis is designed to drive 90° tubes.

Kodak has announced and demonstrated a CCD telecine that can be used to transfer film to any of the proposed HD-TV standards. The equipment will be developed jointly with Rank Cintel.

NBC of the US, which is owned by General Electric,

IRISH T.V. DEALERS

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Galvone Industrial Estate
Galvone, Roxboro,
Limerick
Tel: Limerick 061 47577

has set up a joint operation with Philips and Thomson to develop an HD-TV system for use in the USA. The system is known as ACTV and the hope is to have it operational by 1993. It would provide a wide-screen as well as a higher definition display.

VIDEOTEXT INFORMATION SERVICE

We have been asked to make it clear that the videotext information service referred to in the January Teletopics column, in connection with the new Wizard Distributors' catalogue, was designed, developed and is operated by ASWO (UK) Ltd., Heston House, 7/9 Emery Road, Brislington, Bristol BS4 5PF (0272 724 475). Wizard acts as ASWO's distributor for the north of the country. The heart of the system is a database containing repair information pooled from various European countries, covering video, TV and CD players amongst other equipment. It has been developed to include spares ordering. The system is now supported by Ferguson, Hitachi and Philips.

CORRECTIONS

Our apologies for the following errors that occurred in the February issue:

- (1) Ipsalo-3 circuit, Fig. 1 page 275. The hybrid chopper control chip HB600 is type LF0059, as given in the text, not type LA0059.
- (2) CD Player Casebook, page 281. Pioneer Model PD7050. "Disc clamp" should have read "disc stabiliser", which is a separate arm. Output "phone" sockets should have read "phono" sockets. In connection with Fig. 2 (Model PD-X303) the bar magnet should be stuck as closely as possible to the spindle without fouling it.
- (3) Colour pattern generator circuit, page 282. IC7 should have been shown as type 74LS04 (the 06 is an open-collector version).
- (4) There was an error in the wordsearch block on page 299. A corrected version appears on page 383.

Note that the chassis shown in the cover photograph is the small-screen version of the Salora L type (15L series) which can be quickly identified by the tripler and metal plate. Coverage of the Salora K and L chassis will be resumed next month.

Servicing Compact Disc Players

Part 13: Search and Skip Techniques

Joe Cieszynski

Our subject this month is the methods employed in CD players to enable the user to search forwards or backwards through a piece of music (rather like the visual search facility with a VCR), to pause, to skip to a particular track or to play the music tracks in an order different from that in which they are laid down on the disc. Players with an optical sled or a radial tracking arm use similar principles. We'll start with the methods commonly employed in players with an optical sled.

Despite the number of different user options listed above, the player performs them all by means of a set of defined jumps. Typically, there may be three jump methods – by one, ten or a hundred tracks. Before going any farther I should point out that by jumping a track I mean to move across the spiral, not a track (or piece) of music. We'll consider commonly used one/ten/hundred-track jump techniques in turn: similar methods are used by players whose jump increments are different.

Single-track Jumps

With a single-track jump the two-axis device is moved by $1.6\mu\text{m}$ (the width of the track) either forwards or backwards across the disc. This is used in the pause mode, where the disc continues to rotate and the two-axis device must jump back by one track per revolution repeatedly to maintain a constant position, and also in the search and skip modes in conjunction with ten- and hundred-track jumps.

The operation is as follows. The audio amplifiers and the tracking servo are both muted and a pulse is applied to the two-axis driver to make the assembly move forwards or backwards by one track width. As this takes place, the FZC (focus zero cross) signal is used to detect the point where the beam reaches the adjacent track. At this instant a brake pulse is applied to the two-axis coil for a period of about $200\mu\text{sec}$, after which the tracking servo mute is removed so that precise tracking can once more be attained. Fig. 1 shows the pulse waveform required to produce this jump.

Ten-track Jumps

The ten-track jump is used for music search. The idea is to move the two-axis device across ten tracks ($10 \times 1.6 = 16\mu\text{m}$), play a small portion of music, then jump a further ten tracks and so on. During the playing time the audio level is reduced by around 12dB, but it's still possible to hear the music passage being scanned. It's not possible to recover any music during the actual jump because the audio stages are then muted. The servo is also muted during the jump, but only for the first six tracks when the drive pulse generated by the servo logic moves the two-axis device over a distance of $9.6\mu\text{m}$. While the final four tracks are being skipped the servo is used to provide braking. We'll look at this in greater detail later on.

The ten-track jump is precise, the tracks being counted as the beam crosses them. This is done by

monitoring the TE (tracking-error) signal derived from the optical assembly – the TE signal is still present though the tracking servo is muted. Fig. 2 shows one cycle of the TE signal during a jump. Fig. 3 shows the drive waveform for a single ten-track jump, in relation to the TE signal.

Hundred-track Jumps

The hundred-track jump is employed when the user selects skip in order to move to a particular piece of music or when repeat has been selected. The audio is muted during the jump.

Such a large jump is beyond the scope of the two-axis device, which can move through only $70\mu\text{m}$ (a hundred tracks is $160\mu\text{m}$). To obtain this jump the sled motor is energised for a predetermined period which is calculated to move the optical assembly through just under a hundred tracks. The player then reads the data in the Q subcode and notes the running time, comparing this with the information stored in the table of contents (TOC) which the player read when the disc was inserted. From this the player is able to determine the exact position of the assembly in relation to the disc and can decide how much farther it must be moved in order to comply with the user's request. If the beam is within less than ten tracks a one-track jump will be performed as many times as necessary. If the beam is within ten to a hundred tracks of the required point a combination of ten- and one-track jumps will be performed. If the assembly must still move by more than a hundred tracks another hundred-track jump will be performed.

Fig. 4 shows the drive signal for a hundred-track jump. The sled motor is energised for a period of about 5msec during which the optical assembly moves across approximately eighty tracks. The servo braking sequence then follows for another 1msec. As a result, the laser will have moved across about a hundred tracks and by reading the Q subcode the player can decide if further track jumps are required.

The normal sled control circuit must be overridden during a hundred-track jump because the movement is being controlled by the servo logic. If you refer to the sled motor control/drive circuit shown in Fig. 1, Part 11

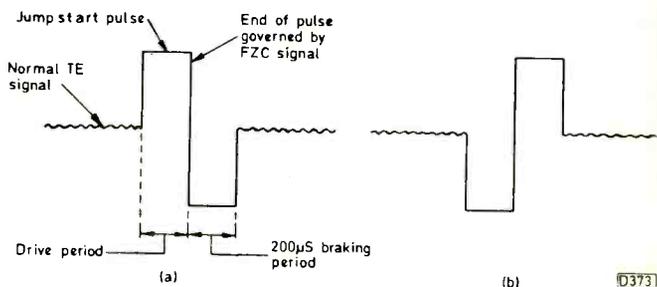


Fig. 1: Single-track jump pulses, (a) for a forwards jump, (b) for a reverse jump. The pulse makes the two-axis device move across the disc by approximately one track width, after which the tracking servo again takes control in order to maintain precise tracking.

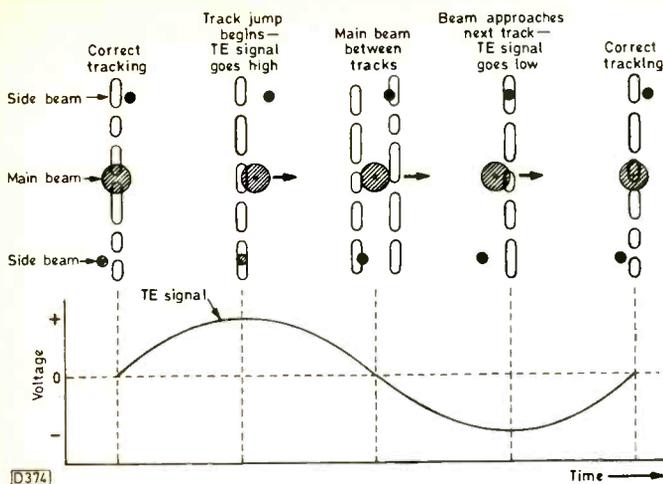


Fig. 2: One cycle of tracking-error (TE) signal obtained during a jump.

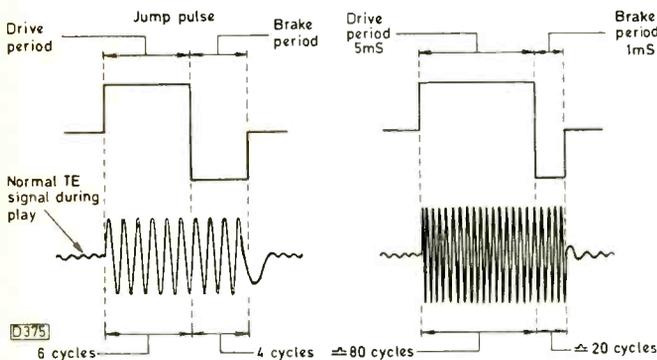


Fig. 3 (left): Correlation between the jump pulse and the TE signal. When six cycles of the TE signal have been counted by the control system the drive section of the jump pulse is terminated and the brake action commences, by bringing the tracking servo into operation in a pulsed mode.

Fig. 4 (right): Jump pulse/TE signal relationship during a hundred-track jump.

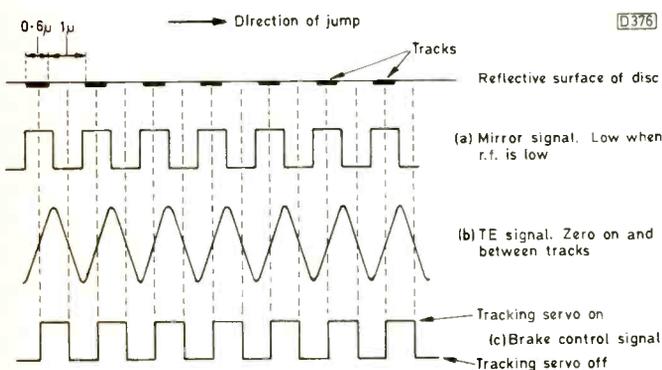


Fig. 5: The mirror signal is low only when the beam is between tracks, as at (a). The TE signal is in the null condition when the beam is aligned with and between tracks, as shown at (b). By using a gate to compare these signals, the brake pulse shown at (c) is obtained. This closes the tracking servo loop each time the beam leaves the track, making use of the servo's retrogressive action.

(January), the logic closes switch TM2 to remove the ramp input to the sled amplifier and closes either TM5 for a forward jump or TM6 for a reverse jump for the 5msec drive period. TM5/6 is then opened and the tracking servo, acting on the two-axis device, is put into the braking mode. Finally TM2 is opened to obtain normal sled operation.

When any sort of track jump is being performed the anti-shock circuit (see Fig. 11, Part 10, December) must be switched off, otherwise it will oppose the jump action. This is done by the logic control in the servo chip.

It's interesting to scope the TE signal with a working machine during a large skip: you can actually see the bursts of a hundred TE cycles followed by a few bursts of ten- and then one-cycle jumps. This is of no practical use, but it does provide a visual illustration of the skip technique just outlined.

Braking

It's necessary to prevent the optical assembly from overshooting the required point on the disc during a ten- or hundred-track jump. For this purpose the tracking servo, as previously mentioned, is used as a brake towards the end of the jump. The braking makes use of a reaction that occurs naturally in the tracking servo. When, during a jump, the optical assembly is moving across the disc the tracking servo has a tendency pull the beam back on to the track it's leaving (opposing the jump) and pull it towards the adjacent track that it's approaching (aiding the jump). Because of this the tracking servo is switched off during the initial part of the jump, be it for one, ten or a hundred tracks. To apply the braking action towards the end of the jump, the tracking servo is switched on and off rapidly as the beam crosses the tracks. It's switched off during the periods when the beam is approaching the next track and the servo will want to aid the movement, and on when the beam is leaving a track. In other words the player makes use of the tracking servo's retrogressive action.

The mirror signal plays an important role in the braking action. In Part 10 (December, page 114) we saw how the mirror signal is generated by monitoring the r.f. signal - the mirror detector looks for a major fall in the r.f. If the r.f. falls to zero for any reason the mirror logic level changes. During a track jump the mirror signal will register a loss of r.f. each time the beam is exactly between two tracks (the condition illustrated in Fig. 15, Part 10, December, page 114). The TE signal on the other hand - see Fig. 5 - is at zero when the beam is between tracks and when it's directly over a track. By comparing the mirror and TE signals the player can determine when the beam is leaving a track and when it's approaching one. This information is used to switch the tracking servo action on and off to provide the braking action. Fig. 5 shows the signal comparison.

With a single-beam optical assembly the tracking servo responds, during a track jump, in a similar manner to the servo with a three-beam assembly despite the difference in the way in which the TE signal is produced (see Part 10, December).

Access Time

Access time is the time taken for a player to find the required track during a track-skip operation. One might assume that this depends entirely on the number of tracks skipped. Though a large jump will take longer than a short one, anyone who has compared the performance of different CD players will know that some have much faster access times than others. Why?

Let's consider first a basic, budget player that uses a two-axis device and sled. When a skip that makes the optical assembly move across almost the full radius of

next month in

TELEVISION

TV/VCR SPARES GUIDE

Next month's issue will contain the 1990 edition of our Spares Guide, a handy reference to sources of spare parts for TV receivers and video equipment, listing brands, manufacturers and stockists. It's produced as a separate folded card which can be kept on one side for ready access to those vital addresses and telephone numbers.

● SERVICING MONOCHROME PORTABLES

The cost of a brand new monochrome portable is so low that many would query the viability of servicing them. Much of the circuitry is fairly standard and straightforward however, which means that most faults can be dealt with during the maximum hour or so that you can afford to spend on a set. David Botto outlines the circuit techniques used and fast fault-finding procedures to enable you to carry out repairs while making a reasonable profit.

● COMPACT DISC FORMATS

The digital audio compact disc format is just one of a number of systems that put data on a 12cm laser-scanned disc. Other formats include CD-Graphics, CD-Video, CD-Interactive and CD-ROM. There are also unofficial variants, and discs with erase/record capability are on the horizon. George Cole provides a guide to the various standards used for CD systems.

● FAULT FINDING ON CCD IMAGERS

Most consumer video cameras and camcorders released in recent years use a solid-state imager of the CCD type. Though faults with these are rare, they can occur. Steve Beeching discusses possible problems so that you can at least identify the causes of the symptoms they produce.

● SERVICING CD PLAYER SERVOS

The next instalment in Joe Cieszynski's series deals with servo adjustments and fault location, starting with the verification of servo operation.

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Fig. 6 (right): Principle of the linear motor. The current fed to the coil from the sled control circuit makes the motor move forwards or backwards depending on the direction of current flow.

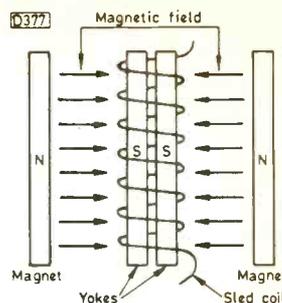
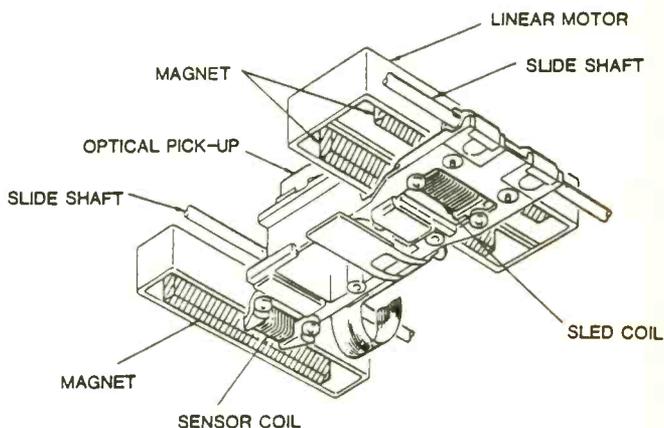


Fig. 7 (below): The Sony linear motor used in some players.



the disc is selected, you hear a series of mechanical squeaks and hisses accompanied by rapid variations in the optical unit's speed as the player goes through the routine of performing numerous hundred-track jumps followed by the final smaller jumps. Remember that between each jump the player reads the Q subcode information to check the position of the assembly. The two-axis device has little difficulty in carrying out its part during this operation: it's the sled mechanism that may be hard-pressed to respond quickly and accurately to the promptings of the skip control system. In many of the players at the lower end of market the sled mechanism uses a brush-type d.c. motor that drives a mesh of nylon gears. The access time is thus governed largely by the quality and soundness of this drive mechanism.

The problem is that to manufacture a gear assembly capable of providing high-speed access at a price that's economically acceptable is very difficult. So for very fast access time, i.e. less than one second for a skip across the disc, a more efficient (and quiet) arrangement has to be used.

Radial Tracking Arm

One such mechanism has been in existence from the early days of CD players – the Philips radial tracking arm which, as we saw in Part 11 (January), enables the optical assembly to follow the track continuously in a similar manner to the stylus in the groove of a vinyl disc. For a track jump the arm can easily and speedily be swung across the disc, thus giving fast access.

The Linear Motor

There's an alternative to the radial tracking arm. Some up-market players employ a linear motor to transport the optical assembly. A two-axis device is still used, but the slow, noisy gear assembly is eliminated. The principle of the linear motor is shown in Fig. 6. It

responds quickly and efficiently, permitting not only fast access for skips but also enabling the user to program the player to repeat a particular portion of the disc continuously – perhaps just a single line or phrase. Indeed such is the performance of some players, for example the Technics SL-P1200, that the illusion of an instant skip time is achieved.

Fig. 7 shows the Sony linear motor that's used in some players. The way in which the motor is driven is the same as with a brush-type d.c. motor but the movement is far better controlled – and much quieter. The sensor coil has nothing to do with the motor's operation: it's used to detect when the optical assembly has returned to the TOC area at the start of a disc.

Identifying F2 TV Signals

Tim Anderson

As readers of Roger Bunney's column will know, the peak of the current sunspot cycle is now with us, giving reception via the F2 layer of exotic signals from such far-away places as China, Australia and the USA. The aim of this article is to provide hints on identifying such signals rather than on account of F2 signal propagation itself. For more information on the latter subject you can consult Roger Bunney's excellent book *A TV-DXers Handbook* (published by Bernard Babani (publishing) Ltd.), or one of the many amateur radio textbooks listed in magazines like *Practical Wireless*, or even the series of Data Sheets published by Screen Europe (2 Burry Road, Silverhill, St. Leonards, East Sussex TN37 6QX).

F2 reception does not occur daily. In fact there are distinct seasons. Reception in the northern hemisphere is best during winter, with a distinct peak in October, November and December.

The nature of F2 propagation means that the pictures received can be very smeary, often with multiple images. To make identification even more difficult, if the maximum usable frequency (m.u.f.) has not risen sufficiently there may be no sound with the picture. Sound gives you a valuable clue from the language used. But don't despair! F2 pictures can be extremely strong. Twice one February I found that Dubai ch. E2 was watchable here on the south coast using a 49MHz helical whip aerial twenty feet above ground! So, faced with a smeary, multiple-image display with probably no or distorted sound, how do you set about identifying the picture?

You have to become something of a detective, working your way through various clues until you arrive at a logical conclusion. This will not necessarily prove that your reception is from a particular country, but after following the clues I'll list it will be a pretty fair bet that your conclusion is correct. There is unfortunately no substitute for a readable station caption or test pattern.

Clues

The clues I use as aids to identification are as follows: direction of signal; time of day; the countries with Band I transmitters in the direction from which the signal is picked up; whether the signal has VITS (vertical interval test signals) or teletext in the field blanking period; and a detailed knowledge of the test cards and patterns used by different countries.

The direction from which the signal arrives may seem to be an obvious clue, but check this with a great circle map rather than the more usual Mercator projection found on wall maps or in atlases. The earth is round (an oblate spheroid to be precise). If you trace a signal that arrives on a bearing of 90° from south England back

across an ordinary map you will pass through Europe, Russia, north of China and out into the North Pacific. By looking at a bearing of 90° on a great circle projection centred on England you will be able to trace the signal's true path, through central Europe, passing over the Black and Caspian Seas, down through India and on to the south western corner of Australia, giving you a rather different set of options for the source of your exotic signal!

Once you've established from what part of the compass the DX signal is coming from, a quick look at the time of day here will give you an idea of the distance the signal has travelled. If you are lucky enough to catch a glimpse of a clock in the picture a check with a world time chart or map will provide your "cross bearing" on the original line. F2 propagation is very logical. As a rule-of-thumb, F2 signals are best when noon occurs midway between you and the transmitter. Generally such signals appear from the Far East first thing in the morning, the distant south east next, then Russia and China, swinging around to the Middle East. At around 11:30 GMT, look out for Zimbabwe and Nigeria. In the afternoon look for signals from the Americas. There may be a second period of reception from Africa in the late afternoon and on into the evening due to transequatorial propagation. So you now know more or less from what part of the world your exotic signal comes from. A quick scan through the *World Radio and TV Handbook* should help you to decide the exact place from which it originates.

Knowing which countries have Band I transmitters is easy if you have a copy of the WRTH, but at around £20 a go not everyone has a copy on their bookshelf. You may find one in your local library, but as a guide Table 1 lists all the ch. E2 transmitters outside Europe. A quick look at the transmitter powers will give you an idea of the most likely transmitters to be received – typically those in Malaysia, Dubai, Iran, Russia and Zimbabwe. A list of all the Band I transmitters would be enormous when you consider the large number there are in China, the USA and the USSR. Table 2 lists a few higher channel transmitters you may receive from time to time, but bear in mind that even at the sunspot peak the m.u.f. very rarely rises to the top of Band I. Ch. E3 is probably the highest frequency at which you can hope for reception, but you never know.

Australia and New Zealand are in a class of their own. You are likely to see only their lowest channels. For Australia this is ch. 0, with a nominal vision carrier frequency of 46.25MHz. There are just two ch. 0 transmitters in Australia. The vision carrier for DDQ0, Queensland, is 46.172MHz, with stereo sound carriers at 51.67 and 51.91MHz. In the case of ABMN0, New South

Table 1: Ch E2 transmitters outside Europe

Country/station	Location	Power
Equatorial Guinea/TVN	Malabo	—
Ghana/GBC	Kisi	5kW
Kenya/VOK	Timboroa	10kW
Seychelles/RTS	Mahe	1kW
Sierra Leone/SLT	—	1kW
Zimbabwe/ZTV	Gwelo	17.5kW
Iran/IRIB	—	—
Lebanon/CLT	*	1kW
UAE/RCTV	Trade Centre	150kW
Malaysia/RMT	Genting Sempah	112kW

*Three transmitters.

Table 2: Some major transmitters above ch E2

Country/station	Channel	Power
Benin/TB	E4	10kW
Canary Islands/TVE	E3	350kW
Ghana/GBC	E3, 4	5kW
Kenya/VOK	E4	10kW
Morocco/RTM	E4	—
Nigeria/NTA	E3	250kW
	E4*	40/60kW
Tunisia/RTT	E4	32kW
Zimbabwe/ZTV	E4	20kW
Bahrain/BT	E4	120kW
Iran/IRIB	E3	—
Jordan/JTV	E3	104kW
Saudi Arabia/Ch 3 TV	E3	5kW
Syria/SBT	E3*	100/200kW
	E4	200kW
China/CCTV	Many	—
India/TVI	E4†	10kW
N. Korea/KCT	R3	10kW
S. Korea/KBS	A3	1kW
Malaysia/RTM	E3	38kW
Mongolia/MTVC	R2	20kW
Thailand/BE	E3	650kW

*Two transmitters.

†Several transmitters.

Table 3: Some of the 50MHz beacons.

Frequency	Callsign	Country
50-003	PY1RO	Brazil
50-005	ZS2SIX	S. Africa
50-015	SZ2DH	Greece
50-025	6Y4RC	Jamaica
50-0325	ZD8VHF	Ascension Is.
50-039	FY7THF	French Guiana
50-0575	TF3VHF	Iceland
50-063	KH6HI	Hawaii
50-075	VS6HK	Hong Kong
50-088	VE1SIX	Canada
50-5	5B4CY	Cyprus
52-2	VK8VF	Australia
52-5	JA2IGY	Japan
52-5	ZL2VHM	New Zealand

Wales, the vision and sound carrier frequencies are 46.24 and 51.74MHz respectively. New Zealand's lowest channel is ch. 1, with the vision carrier at 45.25MHz and the sound carrier at 50.75MHz.

The next pair of clues are provided by the VITS and teletext. Some countries, such as the UK, have both in the field blanking period, i.e. the thick dark line you see at the top of the picture when it rolls or you intentionally misadjust the TV set's vertical hold control. VITS are inserted to test all sorts of things in the studios, transmitters and distribution links: for the engineer it's rather like having a permanent test pattern. They can be seen as a few lines, dots and sometimes colours that

don't move. Teletext can be seen as a series of twinkling, ever-changing lines in the field blanking period.

Old DX-TV hands will know that the VITS very rarely change, and that some countries can be identified by the VITS pattern alone. Because of the nature of an F2 picture however it can be very hard to make out the exact VITS and teletext patterns. Nevertheless the fact that VITS and/or teletext are present provides a clue. Equipment for producing VITS and teletext is expensive and cannot be afforded by many third world countries. So, as another rule-of-thumb, if the F2 signal has VITS or teletext it's probably backscatter from Europe. This is only a general rule however. Dubai for example has VITS and teletext, and as with UK TV the day starts with pages of teletext.

Test Patterns and Logos

The final set of clues, a detailed knowledge of test patterns and station logos, comes with experience, though there are fortunately a lot of aids to gaining this experience. These include the photos in the DX-TV columns that appear in various magazines, the *Guide to World Wide TV Test Cards* published by HS Publications (7 Epping Close, Derby DE3 4HR) and the *TV Bildkatalog* which can be obtained from Aerial Techniques of Poole (see advertisement for address) - this latter publication deals with only European stations unfortunately.

At first glance the FuBK test pattern may look the same wherever it comes from. But look hard at all those photos and you'll find subtle differences that can be seen even on a weak or smeary F2 picture. The Iranian FuBK pattern for example doesn't have the usual red and blue horizontal bars with two grey squares at the right in the bottom lines of the centre part: instead it has a continuation of the colour bars at the top of the pattern. With even a weak signal this shows up as two very dark blocks rather than the "European" two light ones in the bottom right-hand corner.

It also helps to have a passing knowledge of the texts and alphabets used in different parts of the world. Although the picture may not be clear enough for you to be able to read individual letters, knowing whether the script is Chinese, Cyrillic, Indo-Chinese or Roman will help a great deal with the identification of mystery signals.

Other Aids to Identification

It's a great help to have some sort of receiver capable of monitoring the frequency range 30-60MHz. This frequency range contains large quantities of foreign PMR, telephone and army communications signals. Monitoring them can pay dividends, giving you a very clear idea of the main direction of signal propagation. Tuning through 40-50MHz in the morning has sometimes given me a plethora of Arabic and Israeli PMR signals at very high levels, while with propagation from the USA and Canada you can hear breakdown trucks being ordered to highway RTAs and police descriptions of suspects!

Monitoring the 50MHz amateur band is also a great help. Most amateur communications in this band are single-sideband or Morse (c.w.), whereas most of the PMR etc. is narrow-band f.m. The amateur callsign prefixes tell you from exactly where they originate. In addition there are a number of world wide automatic

transmitters that send out a continuous identification signal. These beacons transmit various forms of Morse, so you'll need a receiver that can resolve c.w. - single-sideband will do. Don't worry if you cannot read Morse: most of the transmissions are slow enough to enable the individual dots and dashes to be written down and deciphered later. Amateur radio books generally list these transmitters, their prefixes, callsigns and locations. Table 3 lists some of the 50MHz beacons.

A passing knowledge of world news and sport is also relevant. For example, on one occasion I spent several days watching a smeary signal from 100°. The programme was obviously a golf tournament, but no captions could be made out. Shortly afterwards while listening to the sports news on breakfast TV I heard that a golf tournament in Dubai had just ended. Since the only other station on ch. E2 in that region is Iran, which would have been most unlikely to have been showing such a programme, it was a fair bet that I'd been watching Dubai TV.

Access to a short-wave receiver can also help. In addition to foreign news one can monitor station WWV which provides a bulletin on solar activity that affects the ionosphere and thus the m.u.f. The WWV radio station is run by the US National Bureau of Standards. It's at Fort Collins, Colorado, and transmits a constant time signal on 2.5, 5, 10, 15 20 and 25MHz. At several set times each hour there are various announcements. The

one that interests us is at eighteen minutes past the hour, when three sets of figures are given. The first is the solar flux at 2,800MHz. The higher the number, the better are the chances of good F2 propagation in Band I. Numbers above 200 indicate that there's a chance of such propagation while at 250 it's almost a certainty! The second figure is the "A index", which is a measure of the earth's magnetic field. The normal range is around 5-20. At anything higher an aurora is likely and F2 paths will be disturbed. The third figure is the "K index". This is a similar measure to the A index: anything over 5 indicates the likelihood of an aurora and little F2 propagation. Observed solar flares are also reported, along with predictions of geomagnetic activity: "disturbed" or "storm levels" again indicate poor chances of F2 propagation. The most consistent frequency for WWV reception seems to be 10MHz, but this does vary with short-wave conditions. If necessary listen in at 28.885MHz: you'll hear amateurs passing these figures on to their colleagues around the world at about twenty minutes past each hour.

Some of these hints and tips may seem obvious to old hands, but I hope that some of them will have given you all a little food for thought. I wish you good hunting and I hope that you will send details of any reception to Roger Bunney c/o the magazine. The more information we get, the easier it will be to identify these exotic signals.

Long-distance Television

Roger Bunney

December was another unusually active month for winter. There was something for everyone, and much news in the broadcasting field. As space is short we'll go straight on to the SpE log:

- 4/12/89 TVP (Poland) ch. R1.
- 6/12/89 CST (Czechoslovakia) R2.
- 7/12/89 MTV (Hungary) R1; JRT (Yugoslavia) E3; TVE (Spain) E2.
- 12/12/89 A very good SpE opening this day with TSS (USSR) R1, 2, 3, 4; TVP R1, 2, 3; MTV R1, 2; CST R1, 2, 4; ARD (West Germany) E2, 3, 4; ORF (Austria) E2a; DR (Denmark) E3, 4; NRK (Norway) E2; SVT (Sweden) E2; JRT E3, 4; TVE E2, 3, 4; RTP (Portugal) E3; TDF (France) L2, 4; RAI (Italy) IA, B; RTSH (Albania) IC.
- 13/12/89 TVR (Rumania) R2; CST R1, 2; TSS R1, 2; TVP R1; RAI IA, B; TVE E2, 3, 4; TVE-2 E2; TDF L3.
- 14/12/89 TVE E2.
- 18/12/89 MTV R1.
- 21/12/89 SVT E2.
- 23/12/89 TSS R1; CST R1; TVE E2, 3, 4; RAI IA, B.
- 24/12/89 TSS R1.
- 27/12/89 TSS R1.
- 28/12/89 TVE E2.
- 29/12/89 TDF L2.

By the usual standards then December was a rewarding month for SpE. With the continued high sunspot

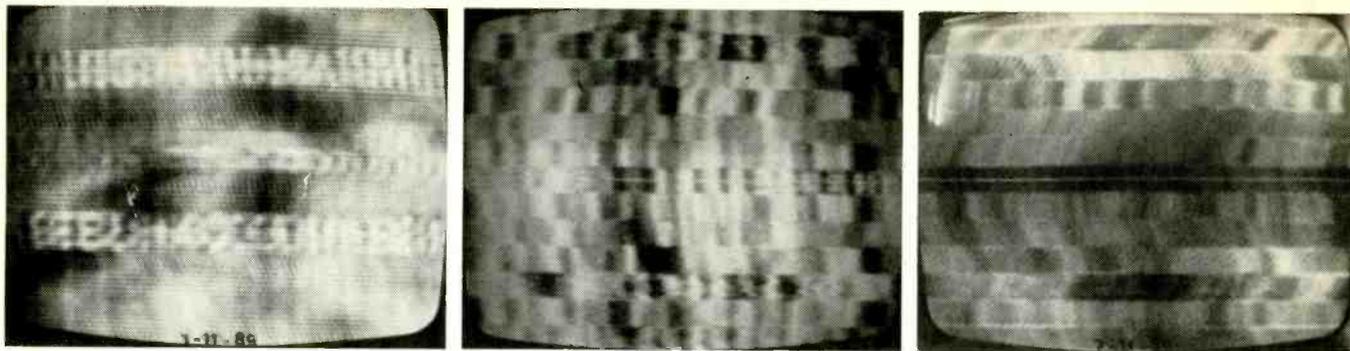
activity F2 layer propagation was also active, though to a lesser extent than in November. Details are as follows:

- 4/12/89 TSS R1.
- 9/12/89 Unidentified ch. E2 signal.
- 10/12/89 TSS R1; unidentified R1 signal; China C1 (definite identification); Australia ch. 0 (weak 46.25MHz video).
- 27/12/89 TSS R1 - two signals.

Iain Menzies in Aberdeen logged auroral reception on December 1/6/24/27/29/30th, the latter day producing an identified NRK ch. E2 signal.

Tropospheric activity produced rewarding results in some areas. When last month's column was being written tropospheric activity was building up, though it was mainly confined to the midlands and north with reception from an easterly direction. December 3rd produced a massive event however, with Bands III/IV/V crammed with signals. Apart from the usual signals from West German and Benelux transmitters there was reception from DDF (East Germany) on chs. E6/7/8/11/12/27/34/37/39, from Poland on chs. R8/35, from some ten new Danish TV2 u.h.f. stations, from SVT-1/2 in all bands and, perhaps the most dramatic reports, TSS (Russian) signals were seen in East Anglia in Bands III/IV/V and in Leeds in Band III. Unfortunately the opening produced few signals along the south coast. Further lifts were noted on the 5th, 7th (with Swiss and West German Band III/IV/V signals) and the 27th, the latter being the most rewarding, with Benelux, West German, Danish, Swedish and Norwegian signals seen in North Wales on chs. E5/6/7/8/9/10/11.

My thanks to Simon Hamer (North Wales), Peter Schubert (Rainham), Tim Anderson (St. Leonards), Bill Cotterill (Tipton), Roger Fussell (Torpoint) and Iain Menzies (Aberdeen) for sending in reception reports.



Examples of F2 reception. Left, an advertisement on the Australian ch. 0 received by Ryn Muntjewerff in Holland last November. Centre, Armaco TV, Saudi Arabia ch. E3 received by Tim Anderson at St. Leonards, East Sussex last October. Right, characteristic "good-quality" F2 reception, this time from Dubai ch. E2 by Ryn Muntjewerff, again in Holland last November. For more on F2 see Tim Anderson's article on the previous pages.

Some interesting points have arisen. Tim Anderson reports that there's a ch. R1 transmitter somewhere in the Indian Ocean. Is this where the mystery 525-line test grid originated from perhaps? Gosta van der Linden (Holland), a member of the Benelux DX Club, has a video tape of Malayan RTM-1, RTM-2 and TV-3 and Singapore SBC TV reception: all the stations viewed on this tape have teletext/VITS in the field blanking period, though many signals received in Europe and thought to be from Malaya often have empty field blanking periods. This suggests that many of the signals are from elsewhere. Bangkok perhaps? Or maybe it's just that teletext is not carried all the time. I recall that commercial information is carried by the Kuala Lumpur teletext service. Perhaps someone can throw light on this?

Ryn Muntjewerff (Holland) says that during the December 3rd tropospheric event one Dutch DXer received no fewer than 18 Russian and several Polish transmitters. Dalibor Frkovic (Yugoslavia) reports that TV Nlvi Sad is using an American type colour bar test pattern with the identification "TVNS" in the right-hand corner. The Yugoslavian PM5544 test pattern has "ZRT" at the top and "TV NLVI SAD" at the bottom. Hugh Cocks reports from the Algarve, Portugal, that it has poured with rain for weeks, the peak being nine inches in one day. He has received Australia ch. 0 and several ch. A2 and 3 stations, his SpE highlight last summer being reception of WLBZ ch. A2 at Bangor, Maine. The CNN feed to the Canaries is via the Gorizont satellite at 41.5°E. Hugh says that the Moroccan "2M International" transmissions on chs. 21/28/33, seen in the Algarve, are subscription programmes that use Discret-2 scrambling at times. He also receives a System N, 625-line transmission on ch. A3 via TE during the evenings.

News Items

UK: Jaybeam has discontinued the manufacture and supply of domestic TV aerials and will in future concentrate on telecommunications systems. This is sad news for aerial engineers and weak-signal enthusiasts who have respected the company's high-quality equipment for many years. Jaybeam will be remembered in particular for its skeleton-slot stacked Band III arrays when ITV started in the mid Fifties, for its Multibeam X-director system and for the wideband Astrabeam Band III arrays.

This leaves Antiference as the sole major UK manufacturer. The firm's high-gain u.h.f. range has recently

been rationalised as follows: the XG21/W has been dropped, leaving the XG5/W, XG8/A or W, XG9/B, XG10/C/D, XG14/W and XG18 in /A, /B and /C/D versions. The UP1300 wideband v.h.f. head amplifier has also been discontinued. It was a useful preamplifier with 19dB gain and is still available, if you hurry, from your friendly aerial store or wholesaler!

Belgium: The ch. E50 Canal Plus Belgique transmitter at Wavre, with 500kW e.r.p., has replaced the low-power outlet at Brussels.

USSR: Bernd Trutneau of the BDXC reports on the Russian TV service time zone arrangements. All programmes start at the Ostankino TV centre and are uplinked from there to various satellites for distant (Eastern) areas or are microwave linked to closer areas. Time shifting takes place at Ostankino. The time-shifted versions of CT-1 are known as Orbita IV, III, II and I while CT-2 is known as Dubl. IV, III, II and I. The most distant regions receive the IV' version, the numbers reducing progressively as Moscow is approached. Normally each version of Orbita and Dubl. covers two time zones.

Sweden: The experimental period for amateur radio operation at 50MHz has been extended to the end of 1990.

Poland: A contact of Andy Emmerson reports that the main ch. R2 Warsaw transmitter (TVP-1, 90kW e.r.p.) is likely to be replaced with a new transmitter at Praga outside Warsaw on the eastern side of the Vistula. The R2 transmitter will eventually close since its second harmonic will fall within the new Polish f.m. band, 88-108MHz, when use of the OIRT 66-72MHz band is discontinued. At present there are TVP-1 on chs. R2 and R27, TVP-2 on ch. R11 and the Russian CT-1 service (via Gorizont) on ch. R51. The intention is to move TVP-1 to ch. R11, TVP-2 to ch. R27, start a new regional TVP-3 service on ch. R41 and leave CT-1 on ch. R51.

Finland: A fourth, cable-distributed channel is to come into operation in Helsinki, Tampere and Turku, initially starting with programmes from 1900-2200.

Portugal: The Roman Catholic church hopes to operate one of the two private TV channels that are due to come into operation later this year. It already runs two commercial radio channels.

Turkey: A pay-TV network offering five-six scrambled

movies each day throughout the week is to be established. Distribution will be via terrestrial transmitters, the subscriber receiving a smart card for decoder enabling – not unlike the Canal Plus system.

Miscellany

Those considering the use of a telescopic mast for their DX aerials, but daunted by the cost, will find Pat Hawker's Technical Topics column in the December 1989 issue of the RSGB's publication *Radio Communication* of particular interest. He reports on a low-cost, DIY extendable mast based on the use of scaffold poles. The basic support frame is bolted to the side of the house and allows a central, single alloy pole of up to 20ft in length to telescope upwards from the frame. Full details for the relatively simple but effective mast are given. If carefully constructed it would allow an aerial system to be telescoped from say 15 to 30ft.

Reg Newman (Cheshire) reports that the Sentra multi-standard Model STX600 CTV receiver is on sale at his local Co-op electrical store. It covers v.h.f. and u.h.f., with infra-red remote control, and is able to handle PAL, SECAM and NTSC variations – including on-screen graphics. Reg uses the set for satellite TV viewing and finds that with the various standards available the results are startling – for example EBU news circuits using 525-line NTSC can be viewed in full colour.

My local paper the *Romsey Advertiser* ran a feature recently on the various businesses that have operated at a particular shop during the past century. These include a baker, hairdresser, plant dealer, dry cleaner, confectioner and at present a charity shop. Of interest is the fact that at one time during the thirties it was used as the base for a wired radio/sound service. Mr. Tate, who ran it, was also known for having built the first TV set in the area – a mechanical one for the Baird 30-line system, using a scanning disc and selenium cell. The sound and vision signals were received from separate medium wave transmitters in London. The year was 1934, and the display was the size of a matchbox!

Despite his northerly location at Aberdeen, Iain Menzies is receiving satellite TV signals from 45°, 27.5° and 1°W and 10°, 13°, 16°, 19° and 23.5°E with his recently bought Amstrad satellite TV receiver. The Marconi LNB with its 1.8dB noise figure is obviously a limitation, but many of the signals seen are viewable. The low-level EBU New York-Europe feed at 27.5°W is received at P2 quality. Iain recommends the Amstrad system as an inexpensive introduction to satellite TV. He turns the dish manually – a cheap polar mount would help considerably.

Satellite TV News

Bindu Padaki (Bangalore) reports that the Orbita II service at 754MHz and the Orbita III service at 714MHz are still being well received from the Ekran satellite though the signal strength tends to fluctuate during the evening. 3-SAT has been carrying the DDR-1 news service in an evening slot – DFF has been invited to become part of the consortium that operates 3-SAT. The TVE-1 service via ECS-1 F5 at 10°E became "TVE Internacional" on December 1st last. It carries the basic TVE-1 service with variations.

Remember the five mystery Ku band transponders seen during the autumn at 41°W? It seems that Intelsat has leased NASA's Pacific and Atlantic (41°W) TDRS

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craft, which have both C and Ku band transponders, and could have been tuning up late one night!

Kopernikus DFS-2 is due to be launched into orbit at 26.5°E by Ariane this month as a reserve for DFS-1. It will also provide additional news and videoconferencing feeds. TDF-2 is to be launched on the same flight, giving further DBS facilities at 19°W. TDF is to use D2MAC while DFS will use PAL. Antenna-3 hopes to use an Astra transponder to give increased coverage.

Several new West German services have appeared on Astra – Pro-7, 3-SAT, SAT-1 and RTL+. 3-SAT appears with both vertical and horizontal polarisation from Kopernikus DFS-1 at 23.5°E, and is repeated at 13°E. RTL+ also downlinks at 13°, 19° and 23.5°E, all of which suggests that there's an awful lot of capacity available.

Satellite trackers may have wondered about the caption "BBC Prague 525-N SNG Uplink" which appeared during the Prague freedom activities in December. SNG stands for satellite news gathering – it's a small vehicle equipped for this, with basic editing etc. facilities, allowing complete on-the-spot news packages to be uplinked back to London.

Activity at 7°E, a very quiet bird at present, may be about to increase. Projected services are as follows: UK transponders 6A (11.639GHz) and 6B (11.676GHz), both with horizontal polarisation; Sweden transponders 4A (11.475GHz) and 4B (11.511GHz), both horizontal; Spain transponders 1A (10.974GHz) horizontal, 9 (11.138GHz) vertical, 11 (11.555GHz) vertical and 12 (11.658GHz) vertical. It's rumoured that an independent Spanish TV channel may be about to start to use this craft.

TV Fault Finding

Reports from Philip Blundell, Eng. Tech.,
Chris Plaice, Ian Bowden, Chris Avis, Mick
Dutton, Stephen Leatherbarrow, Hugh
MacMullen and Nick Beer

Philips 10CX120

An intermittent fault is common with these sets: varying brightness or sound, with the channel display going to 88. The cause is usually dry-joints on the tuner or the power supply transformer earth connections, though it can be due to faulty plate-through connections on the double-sided PCB. When this fault occurs, check for a voltage drop between the tuner's can and the power supply earth.

P.B.

Philips KT4 Chassis

Intermittent loss of sound and vision, with just snow and no channel display, can be due to loss of the 5V supply. Check for dry-joints on regulator transistor 7114 in the SOPS module. You'll probably find that the other components which use the same heatsink will also be dry-jointed.

P.B.

Philips NC3 Chassis

This set had a good fault to come back to after the Christmas holiday. There was a monochrome picture with false line lock and the brightness and contrast controls were inoperative. The cause of all these symptoms was a misshapen sandcastle pulse that confused the TDA4505 chip. The 680k Ω line pulse feed resistor was o.k., so a new chip was needed. As the chip had been damaged by an e.h.t. flashover from the line output transformer we also replaced the transformer.

P.B.

Ferguson SRA1

We've had several interesting problems recently with this satellite TV receiver, as follows:

(1) The picture, on channels with horizontal polarisation only, would intermittently break up, giving a display that was half picture and half snow, accompanied by hum on sound. The cause was a faulty bridge rectifier, BR3.

(2) Intermittent failure of the remote control functions was caused by a hairline crack, about half an inch long, behind the IR receiver screening can, at the legs of the tuner box.

(3) Intermittent failure to switch to horizontal polarity can be due to an unfortunate combination of receiver polarising voltage and a slightly out-of-tolerance LNB. You'll probably find that when the receiver and LNB are teamed up with another pair they will work normally. I gather that the receiver's manufacturer may come up with a modification to alter the switching voltage slightly.

C.P.

Ferguson 16A1 (TX90 Chassis)

The fault with this set was field collapse and as usual there were several dry-joints on the output transistors TR104 and TR105. Resoldering these connections made no difference however. TR105's collector voltage was then found to be zero, though the transistor itself was all right. A short-circuit could be measured between the collector lead and chassis. This didn't make any sense

until we looked at the circuit for the larger-screen version (16 and 20in. models) of the chassis instead of the 14in. version circuit we'd started off with. There's an extra zener diode, D137 (68V), in the large-screen version, between the collector of TR105 and chassis. It had gone short-circuit.

I.B.

Ferguson TX100 Chassis

After successfully repairing a power supply fault (short-circuit chopper transistor) in this set we found that there was another fault. It appeared only when the set was tuned to BBC-1, and was most noticeable on darker scenes. The symptom was a flicker in the brightness level in the darker areas. After spending some time checking components in the i.f. and video areas we arrived at the colour decoder chip IC3 (TDA3562A). A replacement was tried just in case, and much to our surprise it cleared the fault.

I.B.

GEC C1403 (ITT Pico 1A Chassis)

We got MCES to repair the CMR800/3 tuner/i.f. module as it was producing random flashes on the picture when the set was hot. When the repaired unit was refitted however it was impossible to tune in any signals at all. Since we find that MCES repairs are extremely reliable we checked the supplies to the module. There was no tuning voltage as the 2.2k Ω feed resistor R1154 to the stabilising zener diode D1151 was open-circuit, but replacing it made no difference. Though D1151 read all right when checked with a meter a replacement restored the tuning voltage and normal working.

C.A.

Hitachi CNP190

Most of these reliable old sets have now been written off due to exhausted tubes. We recently had one in with very erratic field clamp however. The cause was a faulty field output transistor, type 2SC936. This device now seems to be unobtainable anywhere: one supplier we tried sent us a BU208A as an "equivalent" - it was useless, presumably because of inadequate gain. We then recalled a past letter in *Television* recommending the R2008B syclops transistor used in the Ferguson 9000 chassis as a more reliable replacement in Sony GCS conversions. We tried one in the Hitachi set - perfect!

C.A.

Triumph CTV8208/Amstrad CTV1409

When the owner was presented with our estimate for a new line output transformer, line output transistor, bridge rectifier diodes and SR-2M safety zener diode he wisely declined. We then (unwisely?) decided to recondition the set for resale, using a line output transformer from a scrapped set. This produced a good picture, but when the set was being soak tested we noticed that an apparent field sync problem resulted in slight but noticeable vertical jitter. Replacing the LA7820 sync/timebase generator chip made no difference, but we found that the fault cleared when an analogue meter was

connected to pin 11 (field sync output). All the components in this area seemed to be within tolerance, so we reduced the value of R427, which is connected between pin 11 and chassis, from 220k Ω to 180k Ω . A bodge? Maybe, but it exterminated the jitter bug. C.A.

Salora 20L30 (L Chassis)

We've found Salora/Luxor sets to be very reliable, so when this one arrived in the workshop we hardly knew where to begin. The symptom was a white line across the picture, two inches from the top. It looked just like a linearity fault, but we couldn't find anything wrong with the field timebase circuit. So we checked the power supply voltages, which we should have done first, and found that they were on the low side. The chopper circuit is controlled by the LF0059 thick-film chip HB600 and when this was replaced our field problem had been cured. M.D.

Grundig CUC70 Chassis

No sound on this set was an easy one to sort out: R366 (82 Ω) was open-circuit while C366 (1,000 μ F) was short-circuit. M.D.

Sony KV1822

Intermittently dead was the complaint. When the set failed in the workshop we found that the power supply didn't start. The initial supply to the control circuit is via R603/4, both 47k Ω , from the positive side of the bridge rectifier. When the chopper circuit starts up, the control circuit receives its supply from the chopper transformer via R621 and D610, with C612 (3.3 μ F) as the reservoir. We found that this capacitor had gone low in value. It's worth checking C611 (220 μ F, 6.3V) at the same time. M.D.

Amstrad TVR2

This was a good one: when the aerial was connected the set went dead! Investigation revealed that when the fault occurred the output from the power supply was normal but the line drive disappeared. As most of the signal processing is carried out in the μ PC1420 chip we checked the supplies then replaced this i.c. This made no difference. Chassis isolation problems were next suspected, but this couldn't be the cause as the set went dead or oscillated on and off if different lengths of wire were used as the aerial. I eventually traced the cause to a faulty 500kHz oscillator associated with the μ PC1420 chip. It was unstable as the 0.0015 μ F series capacitor was defective.

While on the subject of this i.c., if the resistor that supplies pin 37 is faulty the result is no sync. You may find it to be 120k Ω or 150k Ω . We've also found the chip to be responsible for no colour or loss of one colour. S.L.

Mitsubishi BB1207B

This 12in. monochrome portable suffered from varying line speed. It should have been an easy problem to deal with – either the oscillator coil or one of the two green capacitors C508/9 (0.033 μ F and 0.068 μ F respectively). After fitting a brand new oscillator coil from Mitsubishi there was no line oscillator output at all. The voltages around Q501 and Q502 were haywire – Q501 in particular had a very high emitter voltage, some 3V.

Having picked up the set on numerous occasions, spent half an hour or so then put it down again to attend to more pressing jobs, I finally twigged it. The new line oscillator coil (L501) had been incorrectly assembled by the manufacturers: as the Perspex former had been inserted 180° out, Q501 had no earth connection to its emitter. H.MacM.

Philips KT3 Remote Control

This remote control fault was a silly one. The customer's complaint was of too much sound. I called and reduced the sound level at the pluggable panel, drank the customer's terrible coffee and went home. During the evening the customer phoned to complain that the sound was again too high. The fault was in the SAF1031 chip in the remote control handset. H.MacM.

Ferguson 37363 (TX9 Chassis)

This set came in because of a very noisy push-button unit, something that's not uncommon. Replacement is a nice easy job, and the set was then put on soak test. Some days later the picture disappeared. Back on the bench we found that there was very weak vision with little or no sync. A scope check showed that the low-amplitude signal was present at the output of the TDA2540 i.f. chip. We found that it had been replaced before, with one of dubious manufacture. N.B.

Panasonic TC492G

This is now an old model, but these sets still usually perform superbly. The symptoms noted on the job card suggested that the line output transformer had a fractured case, something we've come across before. It was a good excuse to demonstrate to a nearby junior engineer the use of a variac and its advantages. The idea was to bring up the supply while monitoring the h.t. line and watching the transformer's case. The h.t. came up and stabilised nicely, so there was no problem here. Soon afterwards there was a discernible hiss from the case. A new transformer put matters right. The set also required a new mains lead and volume control knob. It's amazing to see the condition of some mains leads when sets come in for repair. It bears repeating that leads, plugs and adaptors should all be checked whenever a unit is serviced. N.B.

Panasonic U3 Chassis

This set was dead except for the characteristic squeal indicating an overload. A quick check on the operation of the power supply is to disconnect the feed resistor to the line output stage. This is R559 (22 Ω , 20W) on the right-hand side chassis frame. When we did this and added a dummy load the power supply worked all right. Tests were therefore made on the usual components in the line output stage – the EW modulator diodes D552/3, the rectifier diodes and their reservoir capacitors fed from the line output transformer, and the line output transistor. All were o.k. Suspicion therefore fell on the transformer itself, an unlikely item to fail in a Panasonic set. In this case however it was the cause of the trouble. There was a short to chassis at the top end of the primary winding. This was confirmed by open-circuiting the three pins (the winding has a centre tap). N.B.

Test Report: Satellite Signal Level Checker

D.J. Stephenson, B.A., I.Eng.

For several months I carried out satellite TV installations using a cheap, "in-line" signal strength meter. I became increasingly dissatisfied with the time it took to do each job – especially now that sales are increasing significantly. Most of my time was being wasted while fiddling about making temporary connections to and from the meter and running up and down the ladders to switch the LNB supply off and on to avoid blowing fuses and safety resistors in the receiver.

It seems that Astra dish alignment is simple and quick to do with the strong signals received in the south. If recalls are to be avoided it's a little more critical north of Mrs. Thatcher's empire. The problem is in getting consistent and sufficient carrier-to-noise ratio with all the Astra beams, using a 60cm dish and the popular Marconi LNB. The obvious solution is to use a larger, 80cm dish, but customers dislike having a dish of this size stuck on the front of their nests.

Signal Strength Meters

The "in-line" type of signal strength meter, which is basically a simple peaking meter driven by the set-top receiver, has to be continually reset as full-scale deflection is reached. So it's not really a suitable instrument for the professional installer, especially as the needle flops about like a windscreen wiper even when the dish is correctly aligned. This is particularly the case if little Johnny is flicking through the channels on the receiver. Another point is that it's not possible to compare signal strengths to assist with LNB fault diagnosis. A further risk with this type of meter is that of shorted F connectors (four separate connections in total) – this will involve extra work replacing fuses or safety resistors inside the receiver.

An obvious way of saving time is to fix the dish and align it before any cabling is done. This "bolt up and forget" approach calls for a signal strength meter that powers the LNB from its internal batteries. There are several instruments of this type on the market, with various advantages and disadvantages. There are wide-band peaking meters that cover the entire primary satellite i.f. band 950-1,750MHz, with switchable attenuators to give an indication of relative signal strength, and there are tunable versions that give an absolute indication of the signal strength on a particular

channel. After balancing the pros and cons I acquired one of the latter type. It's the Maspro LC2E satellite signal strength checker – I love that quaint Americanism!

The Maspro LC2E

The LC2E is extremely well engineered, using mainly surface-mounted components, and is housed in a strong metal case. Its front control panel carries a rugged analogue meter that's calibrated in dB μ , a rotary attenuator switch, a rotary channel selection switch, a rotary fine tuning control and a pair of power indicating LEDs. Connection to the LNB is via the familiar F connector. Ten internal D-type batteries (not provided) supply 15V for the LNB. The price includes a simulated leather carrying case and strap. One rather curious feature is a lock and key on the case. Surely if someone wanted to nick the contents they'd take the case as well?!

Although it has been adequate until now, the one significant disadvantage is the limited primary satellite i.f. coverage of 975-1,275MHz. Most satellites have a transponder or two that operates within this restricted range however. Two Astra channels are covered, at 1,214MHz and 1,258MHz. One of these has horizontal polarisation and the other vertical polarisation. So provided these transponders don't fail the checker can do its job. Fortunately BSB reception equipment down-converts to a first i.f. range of 950-1,350MHz, so no problems are expected here. The eight pretuned frequencies provided – see Table 1 – can each be varied by ± 10 MHz by using the fine tuning control.

Features

Table 2 lists the instrument's specification. Its main features are as follows:

15V d.c. can be supplied to the LNB by setting the relevant front panel switch.

The switched attenuator provides attenuation in 5dB steps from zero to 40dB. You set this so that the signal level is within the range of the meter's scale. For Astra in the north west of England the setting is typically 15 or 20dB.

Eight pretuned channels can be selected within the primary i.f. band via a rotary switch. Fine tuning is over

Table 1: Channel selection plan

Channel number	Pretuned frequency MHz	ECS-F1	Intelsat	Intelsat	Astra	TDF-1	TV-Sat	Telecom-1
1	990	987	—	—	—	—	997	—
2	1015	1008	1015	1010	—	—	—	—
3	1050	—	—	—	—	1054	—	1047
4	1081	1091	—	—	—	—	1073	1089
5	1152	—	1155	—	—	—	1150	—
6	1175	1175	—	1174	—	—	—	1173
7	1215	—	—	—	1214	1208	—	1215
8	1260	—	—	—	1258	—	—	1257

the range $\pm 10\text{MHz}$ from the preset centre frequency.

Automatic shut down – to prevent battery drain the instrument shuts itself down when no signal has been received for more than three minutes.

An internal circuit breaker prevents battery drain with shorted F connectors. To reset the circuit breaker, switch off and on again after the short-circuit has been removed.

The battery voltage level can be monitored on the meter.

Use

The procedure for using the instrument is as follows:

- (1) Connect a stub of cable between the LNB and the meter. There is no need to connect the polariser (some head units) for dish alignment.
- (2) Set the LNB power switch to "on".
- (3) For Astra, set the selector switch to channel 8 with a Marconi LNB or to channel 7 or 8 with an electromagnetic polariser (the Tatung and ITT-Nokia systems for example).
- (4) Peak the signal, then tighten the dish adjusters.

For future comparison or fault diagnosis an actual signal strength measurement can then be made by further adjustment of the fine tuning control. The actual signal level is given by the equation:

$$\text{Actual level} = \text{meter reading} + \text{attenuation value} + \text{cable loss.}$$

Cable loss is negligible when a short stub is used. A typical actual value obtained in the Merseyside area, using a 60cm Tatung dish and 1.5dB LNB tuned to channel eight on the meter, with no polariser current, is in the region of $75\text{dB}\mu$.

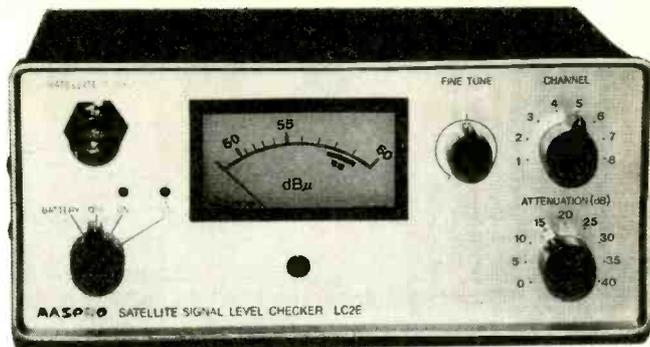
Live Tests

During a site survey a compass will give you a fairly accurate indication of the correct dish position. In some critical cases however, for example where a tower block may intercept the signal or where the dish must be clamped at or almost at right angles to the wall or stack, a compass may not be sufficiently accurate. In such cases a quick hook-up can be arranged with the Maspro meter slung around the neck and the dish hand held. This will enable the critical siting to be checked physically. With practice live tests of this type can be carried out very quickly. The mounting holes can then be drilled with confidence.

Diverting slightly, I've installed a lot of Tatung

Table 2: Maspro LC2E specification

Channels:	See Table 1
Frequency range:	975-1,275MHz
Input impedance:	75 Ω
Connector:	F type
Measuring level range:	50-100dB μ
Accuracy:	$\pm 3\text{dB}$ at C/N greater than 14dB
I.F. bandwidth:	400MHz, 27MHz
Image rejection:	Greater than 30dB
Temperature range:	0-40°C
Batteries:	Ten D-type 1.5V cells
Consumption:	100mA
Weight:	1.5kg net
Dimensions:	89mm H, 197mm W, 192mm D



The Maspro LC2E satellite TV signal level checker. The i.f. input F socket is at the top left of the front panel with the power switch at the bottom left.

Early Bird Astra systems with the 1.5dB LNB option. A point worth noting with these is that the outside unit cannot be bolted at right-angles to a wall or stack. Unless spacers are used, the dish bangs into the wall well before the right-angle is reached. Had the wall bracket projected a centimetre or two more the problem would not have arisen. A tip with these and the ITT-Nokia systems is to overwrap the feedhorn/polariser/LNB flange cracks neatly with self-amalgamating tape. With both these systems we've had a small but significant number of recalls due to water seeping in through the O rings between the feedhorn and the polariser. Where this has occurred, drying out with a hairdryer and sealing with self-amalgamating tape has provided a permanent cure.

Fault Diagnosis

The Maspro LC2E is also valuable for fault diagnosis, provided the "o.k." signal value for a particular system in the area is known. The output of a suspected faulty LNB can be measured at ground level. This is an advantage now that TV/video field service engineers are expected to be able to service satellite TV systems (apart from the LNB). In most cases failure is due to inadequate weatherproofing by the installation engineer and/or the manufacturer.

Summary

The comparatively low cost and ruggedness of the LC2E makes it ideal for either one per van or, more likely in practice, one per service department provision.

In conclusion the LC2E is well made and easy to use. Its pointer deflects smoothly, without any twitching. Thus spot-on alignment can be carried out in a very short time. You can detect very small differences in the output of LNBs of the same make.

The batteries are costly to replace but last a long time. Rechargeable cells can be used, but remember that these give only 1.25V per cell so that the total supply voltage will be just 12.5V. The readings will be consistent for comparison purposes but the accuracy of the absolute reading may be suspect.

The unit is well worth the asking price and my only criticism is of the restricted primary satellite i.f. band coverage, though this has not presented any problems to date. The meter is priced at £299 plus VAT and is available to trade customers from Micro-X, Unit 2, Drury Way Industrial Estate, Laxcon Close, London NW10 0TG.

Servicing in the Nineties

Eugene Trundle

The UK's brown goods servicing industry is going through a period of rapid and radical change. This change concerns technology, scale, economics and organisation. The technology used in the products we are expected to service gets more complex by the month. One effect of this is that unless a fault is a simple one, and the increased reliability of modern equipment means that there are fewer and fewer of this type, the difference between the cost of repairing a product and its initial cost is rapidly diminishing. Thus the limit on what is economically feasible in the way of repairs is drawing in. The rapidly increasing cost of skilled labour, and the competition amongst employers for qualified people, accentuates the problem.

Specialisation

These and other factors have resulted in a trend away from the traditional room behind the shop towards specialised servicing centres where optimum use can be made of the skills and sophisticated equipment available and advantage can be taken of the economics of scale, i.e. a high throughput of jobs. By serving a relatively large geographical area, or by concentrating on a limited product range, the throughput can be made large enough to justify the investment required and end up with a well deserved profit. Many smaller businesses have fallen by the wayside as a result of these trends, while others have seen the writing on the wall and have adjusted their operations to suit the new circumstances. At the present time many long-established servicing outfits are sitting on the fence or undergoing the often painful process of adapting to change.

Manufacturers' Attitudes

Another factor is the changing attitude of setmakers. Squeezed by the pared-to-the-bone profit margins on new products, their budgets leave little room for comprehensive service and spares divisions. Where once they would repair their own products, deal with their own spares orders and freely dispense technical advice to all and sundry, nowadays you are likely to be rebuffed altogether without that vital account number. Even with an account number, service – in every meaning of the word – can in some cases be woefully inadequate. Many, many years ago companies like Murphy set up exclusive dealer agencies, even going to the length of swearing their agents to secrecy and confidentiality with respect to service manuals! This sort of exclusiveness seems to be returning in some measure. A close relationship with manufacturers is increasingly necessary for retail servicing outfits. It works both ways, since an increasing number of manufacturers maintain minimal in-house repair facilities.

In recent years a number of firms have been set up to provide a spare parts service for those who do not have strong links with manufacturers. In some cases they have taken on the supply of manuals and technical advice as well: manufacturers are increasingly making use of this "third-party" system. A look at our annual spares guide

supplement shows how this system is growing. Despite this, close two-way communication with the manufacturer is important to both parties for successful and efficient servicing. But unless a repair shop is large or is attached to one or more sizeable retail outlets with lots of cheque-power it's difficult to establish a useful relationship with a manufacturer.

Efficiency

In view of all these things it's vital for servicing outfits to work at high efficiency, especially since the public will tolerate only charges that represent but a fraction of the going rate for the same (or lesser!) services in industry. See if a business computer firm will diagnose a faulty microcomputer chip and replace it for forty pounds, or a communications company will supply, fit and align a crystal in an aircraft radio system for thirty two pounds plus VAT!

Efficiency is a complex matter that relates to every aspect of what we do. Precious resources, human, economic and spatial, are easily wasted or misused, to everyone's disadvantage in the long term. What follows is a look at several aspects of workshop lifestyle, giving what I hope will be found to be constructive suggestions. In some respects it returns to the matters dealt with in David Botto's excellent article in the December 1988 issue of *Television*, though with some alternative views which you may or may not find more suitable. Much depends on the size and circumstances of the workshop and the attitudes of those who run it.

Background

To give you a bit of background into my own situation, the outfit of which I'm a part is totally independent economically of retail shops though it does work for five large ones owned by the parent company. It employs eleven people and carries out its trade at a rural base in the South East. The area we cover has two sizeable towns nearby and a large hinterland with small towns and villages. We don't make a fortune – I suspect that few in this industry do. But we survive and prosper modestly – for most of the time!

Field Servicing

The trend with us, and perhaps for many similar outfits, is away from service in the field, whose heyday was the time when TV sets used valves or modules and VCRs had mechanical control systems. If someone is capable of component-level fault diagnosis and repair, it follows that he is expensive and should be well supported with test gear and spares. Such resources are poorly used when an engineer spends much of his time driving around to clean heads and attend to "finger-trouble". We would put him in the workshop where his skills would be fully used all the time, and reward him accordingly.

Field servicing is now undertaken by those whose skills lie in dealing with customers; solving interfacing

problems between different equipment; tuning and setting up; identifying compatibility, interference and environmental problems; and carrying out quickly such first-line servicing jobs as tuner, switch and fuse replacement and manufacturers' safety modifications. These account for a very large percentage of home calls, leaving the true nasties to be dealt with in the better-equipped environment of the workshop.

Dealing with people and money and humping VCRs and TV sets to and fro are the main features of the field man's role. He's helped by the provision of a large and well-equipped van, radio control, a Telelift trolley and a constantly available back-up from base. Only in exceptional cases do we send a fully-equipped workshop engineer to a customer's home.

It's not hard to see why the outside job has changed so much. If you were to carry out full servicing on a wide product range in the field you'd need a large lorry to carry the service manuals, test equipment, spares and other paraphernalia, all of which would be under used, representing a poor investment. You'd be unable to deal with intermittent and sporadic faults, and at the mercy of such environmental factors as the family dog, limited access, the signal on site and the difficulty of working in many living-room situations. It's quite different with white goods.

The Bench Engineer

In the workshop it's increasingly important to utilise each technician's skills fully. With anything larger than a one-man-band some degree of specialisation is necessary. Typically an engineer will concentrate on one type of product such as TV, audio/CD, VCRs or camcorders and have a second string to his bow, maybe satellite TV or home computers but usually one of the others. This latter arrangement takes care of the holiday problem and provides a degree of insurance against the sudden departure of a key person. It also helps with the training situation.

The larger or more specialised the outfit, the more the available skills and test gear can be concentrated on the job. The situation could well eventually arise where technical skill is so rare and expensive that a good engineer will spend all his time on diagnosis while others deal with peripheral jobs such as testing, spares ordering, customer liaison and maybe even the physical repair itself. With so few new recruits entering the trade this is a real possibility. The person playing the "queen-bee" role would be well rewarded and find the work fulfilling – most engineers who are good at diagnosis enjoy it.

Customer Liaison

Ability to deal with the customer is also very important. Sometimes serving the customer can be more important than servicing the product. Those with a helpful, caring and above all honest and sincere attitude can turn even a bounce situation or a major (expensive!) problem to advantage in cementing or enhancing the relationship with the customer. Some of our best people in this respect can leave the recipient of a three-figure estimate or a beyond-repair report full of appreciation and praise. Others seem to have problems in their dealings with the public. Two golden rules are (1) never be shameful or apologetic about charges and (2) don't use "technospeak" that is quite unintelligible to the

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customer. Say picture tube rather than c.r.t., "control brainbox" rather than syscon, and "the silicon chip that deals with the colour" rather than the TDA3562 i.c.

Training

Training is a difficult problem nowadays. With so many high-technology products coming from so many manufacturers and changing so quickly an engineer could spend his whole time on training courses. In view of the cost of travelling, accommodation and "downtime", very careful selection of training courses is necessary. Make sure that the product is one you're likely to see a lot of or uses principles and techniques that have wide application, i.e. will be found in other makes of equipment. If not, there's a good chance that the knowledge gained will be largely forgotten by the time it's needed.

These days training courses can seldom go into matters in great detail. This is a contrast to the situation fifteen or more years ago when two, three or more days might be spent on a particular TV chassis and the knowledge would be well used thereafter. It's important that whoever attends is suitable in terms of his existing knowledge and his role in the workshop. We generally send one engineer who, on his return, is expected to pass on to others information on the equipment with the help of the training notes and an example of the product. Manufacturers' service courses are in general well designed and well targeted but suffer because of limited time and the ever-increasing complexity of the product.

Other sources of information – apart from this

magazine! – are becoming rarer. Low demand seems to have reduced the number of courses at many colleges, while those that are run seem to fall behind the times from the technological point of view. We find that with many potential recruits from college there's a huge gulf between the knowledge they have acquired there and that necessary to service the latest products. The setmakers themselves, once so helpful, are now mostly based half a world away, while the chip and component manufacturers have virtually no facilities for retail service engineers. Nearly all the design work is nowadays done by those who speak a different language, and much of the information that does filter through suffers badly from translation problems. I remember with affection the Mullard Educational Service, with its magic-lantern slide shows and talk of germanium and silicon . . .

Managing the Money

Finance is perhaps the most crucial aspect of service management. Our current charge is £20 per workshop hour, £22 for a call out, both exclusive of VAT and both flexible to a degree depending on circumstances. An engineer's ability to earn money for us is, we find, almost as dependent on his communication skills as on his technical ability.

We cannot give free estimates, and find that the system of agreeing on a "go ahead up to £X" basis can lead to suspicion and distrust, even (especially?) when the bill has been artificially reduced so as to come within the customer's ceiling. Instead we take a £10 (inclusive of VAT) non-returnable deposit for which we give a quote or estimate as appropriate – we do not release a detailed fault diagnosis. If the estimate is accepted, the deposit is deducted from the final bill. This, at a single stroke, removes many of the punter problems: time-wasters and hawkers-around are deterred; low-value "no-hopers" go back out of the door; diagnostic time (which after all is the main cost with many repairs) and price-check phone calls are at least partially paid for; and the customer has a stake in the job. For an estimate where a home call or collection and delivery are involved the non-returnable charge is £22 inclusive.

When making an estimate it's important to check and report on the equipment as a whole in addition to the specific fault complained about: this applies in particular to TV tubes and VCR heads and motors, whose possibly poor condition may render a repair elsewhere pointless. This prognosis forms part of the report and assessment our customer gets for his tenner.

Bounce jobs are always a bone of contention. If it's a genuine bounce it's fair to rework the job at reduced or zero cost – but not to bear the cost of the components required. Where the new fault is totally unconnected with the previous repair, even in those tricky situations where the symptom is similar, sympathy rather than a handout is appropriate. Be straight, be honest, and don't let the customer browbeat you – a guilt complex is an expensive thing in our business, and if the problem is not your fault why should you pay for it?

The subject of manufacturers' guarantee claim back charges is also an emotive one. Those in the service industry declare that the charges are totally inadequate, and manufacturers agree in private, saying that the profit from the original sale (small though that is) should cover in-guarantee work. Once again this is a symptom of the current state of the industry, whose general policy

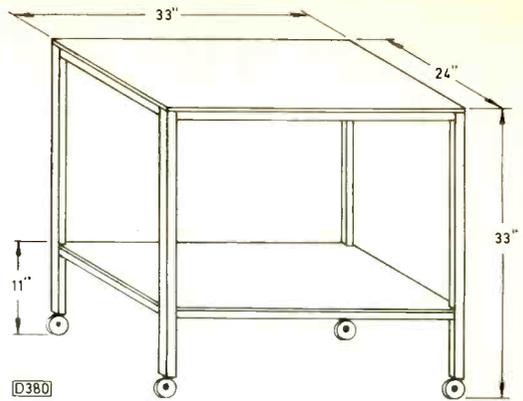


Fig. 1: Construction of a multi-purpose service trolley, with suggested dimensions.

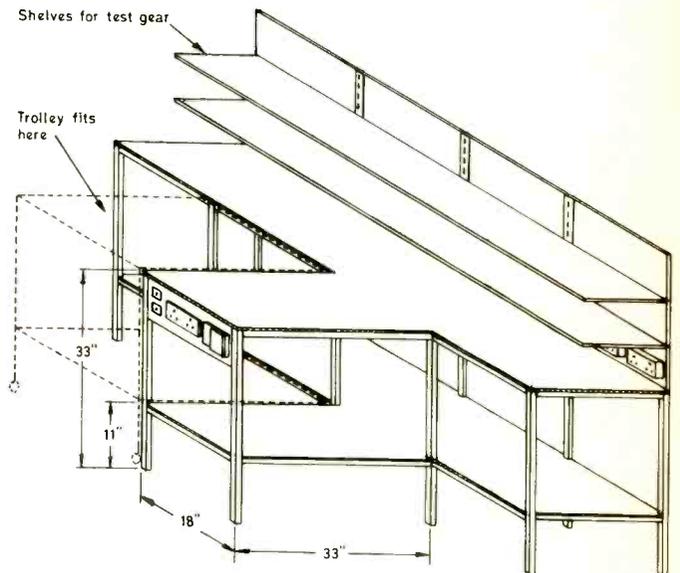


Fig. 2: Bench console into which the trolley docks. This one is designed for a right-handed technician.



Fig. 3 (left): Mobile mirror. Easily pushed aside and with a pivot action to cater for different screen sizes. The back can be used to mount test and colour charts or focus patterns for camcorder servicing.

Fig. 4 (right): Fold-away, roll-away trolley. The large board can be fixed at any angle. The lower tray can be used to hold tools and/or test equipment.

seems to be largely to stack 'em high and make ninence on each.

In few cases can a purely service outfit make ends

meet with manufacturers' in-guarantee reimbursements. One group of shops we deal with pays us an agreed small percentage of its turnover to supplement the claim back money. Another dealer prefers us to bill him realistically for under-guarantee work, claim on his behalf and pass to him the proceeds from the manufacturer.

It's important to claim for all in-guarantee work even though the system, with its complicated and demanding claim forms and the way in which they are dealt with, seems to be designed to put every possible hurdle in the way of the claimant. One can almost imagine a manufacturer's trouble-seeker triumphantly shouting "got you there, one digit wrong in the part number, ha!" and trapping you once again between the non-paying customer and the non-paying manufacturer. Try getting the customer to pay for head cleans, retuning, batteries and all the other things not covered by the guarantee and retain his goodwill! But goodwill doesn't pay the wages and the electricity bill.

Fortunately the overwhelming pressure from dealers and service departments (we do have a collective voice, it seems) appears to be moving manufacturers away from crazy extended guarantee schemes with peanut reimbursement to other methods of sales promotion.

Workshop Management

So much then for politics and financial matters. On to the more tangible side of the service operation – the layout, facilities and organisation of the workplace.

An advantage with the larger organisation is minimisation of the interruption workshop engineers face. There's nothing more exasperating to the man changing a surface-mounted resistor on a microscopic camcorder PCB, or trying to interpret a scope waveform, than having to stop and explain to Mrs. Jenkins why she's got co-channel interference on her tennis picture. With an efficient and courteous filtering system much of this can be prevented. We always try to recruit doctor's receptionists to man our front office!

The Bench

An alternative to David Botto's trolley suggestion (Fig. 1, page 99, December 1988 issue) is shown in Fig. 1 here. The trolley is a double-decker whose lower deck can take the back cover, case and accessories of the set being serviced, or a second TV set while the top one is on soak test away from the bench. It uses Dexion Speedframe construction throughout (1in. square-section steel, finished in black) and heavy casters from the same company, which has an extensive range of fixings and brackets for this sort of job. The trolley matches up with a workbench "peninsula" as shown in Fig. 2. The engineer sits at this peninsula, with a bench and shelves to his right, all made of Speedframe with sheets of laminate-finished chipboard as the working surfaces.

A double 13A switched mains socket and Safebloc connector, all fed from an isolating transformer, are arranged at the outer end of the peninsula along with two aerial sockets, one connected to the off-air u.h.f. distribution system and the other to a pattern generator on the shelves to the right. This latter arrangement saves having leads draped across the working area. We find that a left-handed engineer needs a "reversed" bench for full convenience.

The advantages of this form of construction are that

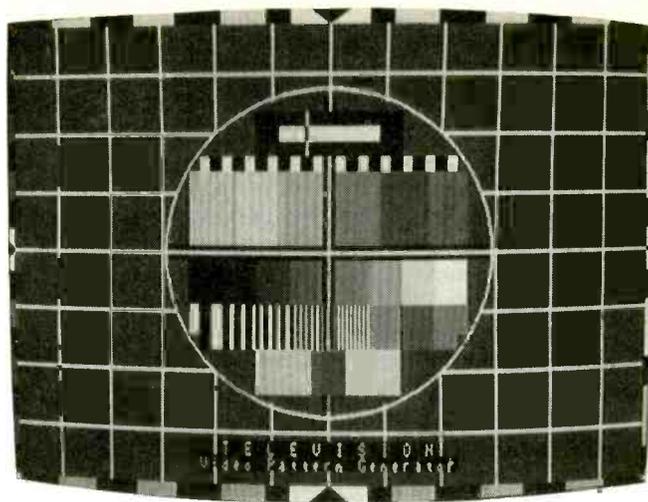


Fig. 5: We pipe this comprehensive, electronically-generated test pattern around the workshop on a ch. 44 carrier.

easy access is provided to three sides of the TV set or VCR under repair and that the equipment can stay on the trolley from the moment it comes off the van or the customer's car to the moment it goes back in, throughout repair, soak testing and transportation (quiet) around the place. These trolleys are strong enough, with the braced double-deck construction, to stand "rough shunting" and to travel fully-loaded up to our first floor workshop in our specially designed electric lift whose floor consists of a couple of U-channel steel bars.

A mirror is needed for TV servicing. Again this can be mobile. The rolling, pivoting type we use is shown in Fig. 3. It can be pushed aside for more room at the front or when servicing VCRs etc. and is again made of Dexion Speedframe.

It's always difficult to accommodate large manuals and circuit diagrams on the bench, and no matter where they go they seem to be in the way. Once more wheels provide the answer. The trolley-mounted board shown in Fig. 4 can be easily made from a redundant TV trolley and/or from Speedframe and takes the toolbox on the lower deck. The top is made of quarter-inch oil-bound hardboard braced with wooden battens and will even take a Sanyo 7118 circuit diagram. Its mobility is a great boon.

For bench lighting we favour the large circular fluorescent type with a central magnifier and an articulated cantilever arm. These are now widely available, run cool and are convenient. A tiny plastic torch powered by internal batteries or via a lead from a mains transformer is best for very local lighting in the depths of a TV set or a VCR.

Before leaving the subject of bench organisation a word on screw management. When dismantling something, put the fixing screws into a segmented tray or similar arrangement with the compartments marked top case, bottom case, back, PCB, deck, etc.; or leave them in a progressive line as you remove them. This avoids losing them or misplacing them during reassembly. If the product has to be stored in dismantled form, e.g. when awaiting spares or an estimate acceptance, scoop them and any small, loose treasures into marked "seal-easy" polythene bags of the type in which you often receive components.

Our signal distribution arrangements are as follows.

The terrestrial off-air signal distribution system feeds the aerial socket at each bench plus a number of wall sockets for set soak testing on the trolleys. The satellite TV system has two outlets, one at a repair bench and the other at an adjacent soak-test shelf. The output from the workshop's test pattern generator, whose display is shown in Fig. 5, is spliced into the u.h.f. distribution amplifier's input. This display is a boon for servicing and setting up TV sets and we'd be lost without it. We distribute it at around ch. 44, with a 1kHz test tone on the sound channel. This tone is invaluable for setting intercarrier sound senders and receivers and particularly for adjusting the sound levels (E-E, recording and playback) with VCRs. The pattern generator is based on the design published in the May to September 1984 issues of *Television* (the PCBs and programmed memory chips are unfortunately no longer available).

Test Equipment

Mention of the test pattern brings us to test gear. David Botto's article provided an excellent run-down which is recommended reading. It's perhaps worth adding that with a large workshop several items can be shared, for example the frequency counter, e.h.t. meter, variac and tube tester. This is particularly relevant with oscilloscopes. For maybe 90 per cent of the time a 10MHz or 20MHz dual-beam scope is perfectly adequate. Now and again you need a 60MHz job with hold-off, sweep delay, X-Y crossknockery and all the other bells and whistles. So long as there's one in the workshop, assigned for example to the CD or camcorder bench, it can be put on a trolley and made accessible to all the engineers for their use as necessary. The same goes for such gear as the fancy 15V/4A power supply with digital V/I LED flashers used when the home-brewed 12V/1A PSU runs out of steam. Similarly the test pattern generators assigned to each bench need not be exotic ones so long as one all-singing, all-dancing machine is available. The Philips PM5518 TXI perhaps represents the current pinnacle: 70 patterns, every world standard, teletext, dual-channel and stereo (not Nicam) sound and carriers from 32-900MHz. What an instrument!

Analogue Meter Tricks

At the other end of the scale, don't forget the tricks you can play with the humble analogue multimeter. Its resistance ranges permit a quick "ballistic" capacitance test on the one hand and enough current to test run a VCR motor on the other, while providing enough voltage to forward bias a semiconductor junction. It avoids the fruit-machine display you get from a DMM in certain circumstances and is, unlike some DMM designs, immune to the effects of interference radiated by TV receiver power supplies and timebases. It offers a fixed, known resistance between handy prods on each voltage range, different between the a.c. and d.c. settings. This is useful for substitution checks where the current won't overload the movement. And it will show wildly fluctuating quantities better than a digital type. It certainly deserves its place alongside the DMM!

Safety

Although live-chassis TV sets are fast becoming a thing of the past, the power supply section of each and

every set is still very much alive. Thus the shock hazard is little diminished. So we still need a 250W or 500W isolating transformer at each bench, slow-fused at 1.5A or 2.5A respectively. For safety reasons we also like to keep our engineers in the same room or at least within shouting distance of each other. Generally the audio engineer requires most noise insulation, for the mutual good, though one of our men overcomes this problem by using a pair of large, ear-enveloping headphones! The biggest shock hazard - and possible problem with intruders - is when one man is working alone in the building, perhaps on overtime. We are happier to have two in together.

Spares

How the spares situation has changed over the last decade or two! Once we had hundreds of valves, resistors, capacitors and fuses, dozens of line output transformers and several picture tubes. The requirement is now much smaller. No picture tubes: they are seldom worth fitting nowadays. Few LOPTs: the variety is now enormous, and they don't fail so often. And few triplers: the universal type is suitable for most sets that don't have a diode-split line output transformer.

The bulk of the money invested in an efficient stores section will these days probably be spent on semiconductor devices, i.e. the most common transistors and i.c.s. Apart from these, resistors, a wide but shallow range of capacitors, mains switches, and perhaps a selection of tuners form an appropriate stock, along with the many troublesome mechanical bits for the VCR decks you handle. Most other spares are "specials".

From being lucky to turn over the cost of the spares stock once a year in the old days it should now be possible to do this several times a year. The stores can get out of hand if you have a persuasive rep or if individual engineers go ordering spares hand-over-fist. It's best to have one person in charge of general components, with one-off specials for particular jobs being ordered by the technician concerned. Specialist suppliers provide a very quick turn-round these days - provided they've got the bits in stock!

Viewdata Ordering

I don't myself believe that using Prestel for spares ordering etc. is a good thing, though others would no doubt disagree with this. What's for sure is that if the setmakers got their acts together and provided as good a (verbal) phone ordering system as companies such as SEME and HRS there would be little need for computer-link ordering.

Key to Profitability

The key to profitable servicing is fast and certain fault diagnosis. If you start with this in mind, many of the other problems of running a service business are minimised. Quick, accurate diagnoses are achieved through a good working knowledge of the equipment concerned, the availability of service manuals and circuit descriptions, accurate and adequate test equipment and jigs, good layout and organisation of the working environment, and full two-way communications with the manufacturer and customer. Given these, servicing can even today be more profitable than selling.



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17074	9.30	25C1826	0.67	AN241	0.46	BC215	0.10	BDY21	1.87	BU207	1.85	HA13432	2.95	MC1357P	2.15	SAS590	1.33	STR453	8.16	TC2706	2.18	TD4461D	8.15
17085	3.40	25C1829	0.67	AN242	5.09	BC216	0.10	BDY22	1.12	BU208	1.12	HA13456	1.25	MC1358P	1.12	SAS600	1.33	STR454	5.52	TC2707	2.18	TD4462D	7.45
17127	2.50	25C1875	4.50	AN253	1.80	BC230	0.10	BF117	0.66	BU20802	2.35	HA14453P	2.85	MC14453P	5.50	SAS610	1.33	STR454	5.52	TC2708	2.18	TD4463D	7.45
17376	1.50	25C1893	3.02	AN260	3.85	BC238B	0.08	BF118	0.67	BU208A	1.12	HA13467	1.75	MC14454P	2.15	SAS670	1.33	STR620	6.96	TC2709	2.24	TD4507D	2.75
1N4001	0.04	25C1906	0.98	AN272	7.92	BC239B	0.25	BF121	0.25	BU2208D	1.43	HA1368R	2.95	MC14487	5.94	SAS6710	2.21	TR029V	7.98	TC2710	2.24	TD4720S	2.25
1N4002	0.06	25C1921	1.37	AN295	7.63	BC251A	0.31	BF123	0.13	BU209	1.75	HA1368	2.95	MC14510BCL	3.75	SBA750	1.91	TR035V	0.73	TC2711	2.24	TD4720S	3.32
1N4003	0.06	25C1923	0.90	AN301	2.45	BC252	0.50	BF124	0.13	BU226	2.55	HA1370	2.75	MC14518BCL	3.10	SBA820S	1.66	TR036	0.67	TC2712	2.24	TD4720S	3.70
1N4004	0.06	25C1929	2.25	AN302	3.89	BC253	0.29	BC000	0.29	BU226A	0.99	HA1374	1.80	MC1568BCL	2.15	SBA944	1.95	TR037	2.11	TC2713	2.24	TD4720S	2.92
1N4005	0.06	25C1942	1.98	AN305	8.88	BC301	0.34	BF153	0.58	BU40E	1.49	AA117	1.9	MC1712	3.88	SDA200E	17.10	TR044V	0.97	TC2714	2.24	TD4720S	2.92
1N4006	0.06	25C1956	0.20	AN305	2.46	BC302	0.53	BF154	0.26	BU406D	1.04	HA1377	1.95	MC192	19.50	SDA2112Z	9.20	TR045	1.20	TC2715	2.24	TD4720S	2.92
1N4007	0.07	25C1957	0.95	AN316	4.95	BC303	0.48	BF157	0.48	BU407	0.63	HA1389P	2.05	MC7724CP	4.29	SG264A	5.26	TR046	1.45	TC2716	2.24	TD4720S	2.92
1N4148	0.03	25C1959	1.93	AN318	9.38	BC304	0.06	BF158	0.18	BU412	5.29	HA1389	2.05	MC780E-5/6	1.23	SG613	10.71	TR052V	0.87	TC2717	2.24	TD4720S	2.92
1N4448	0.05	25C1962	1.93	AN320	5.47	BC306A	0.11	BF159	0.28	BU426A	1.67	HA1392	2.22	MC8270Z	2.28	SG629	8.27	TR058	3.08	TC2718	2.24	TD4720S	0.80
1N5403	0.11	25C1969	1.78	AN321	2.25	BC309	0.17	BF160	0.31	BU500	1.53	HA1394	1.47	ME011V	0.75	SG633S	9.00	TR059	4.22	TC2719	2.24	TD4720S	0.80
1N5402	0.13	25C1983	3.28	AN322	6.78	BC317A	0.13	BF167	0.38	BU506A	1.50	HA1397	2.25	ME002	0.26	SI125H	7.90	TR060V	1.25	TC2720	2.24	TD4720S	0.80
1N5403	0.18	25C1985	1.55	AN337	5.37	BC327	0.18	BF173	0.34	BU536	1.65	HA1398	2.75	ME012	0.28	SI1630HD	20.50	TR065V	2.38	TC2721	2.24	TD4720S	0.80
1N5404	0.10	25C2009	0.34	AN340P	1.53	BC328	0.11	BF177	0.55	BU608	1.85	HA1406	2.07	ME001	0.34	SKE2F104	1.39	TR071V	1.40	TC2722	2.24	TD4720S	0.80
1N5404	0.10	25C2029	2.33	AN355	2.95	BC337	0.09	BF178	0.40	BU705	2.50	HA14152	0.85	ME011	0.75	SKE2G304	0.85	TR073V	3.95	TC2723	2.24	TD4720S	0.80
1N5418	0.04	25C2028	2.11	AN362	1.50	BC338	0.12	BF179	0.36	BU806	1.03	HD3902-42	2.00	MC12501	3.70	SKE4F106	0.20	TR074V	2.42	TC2724	2.24	TD4720S	0.80
1S1555	0.31	25C2066	0.89	AN370	3.95	BC368	0.18	BF180	0.36	BU801	1.46	HA1404	1.59	MC1404	1.96	SI1310	3.14	TR075V	1.82	TC2725	2.24	TD4720S	0.80
1S44	0.10	25C2078	2.39	AN511	3.43	BC440	0.69	BF181	0.32	BU825A	1.95	H038750A3-7	7.25	MJ481	1.53	SKE4Z206	0.80	TR079V	1.98	TC2726	2.24	TD4720S	0.80
1S221	0.10	25C2078	1.54	AN5120N	4.50	BC441	0.46	BF182	0.34	BUW84A	0.66	H038750A4-7	7.25	MJ2955	3.30	SKE4Z210	1.33	TR094V	1.45	TC2727	2.24	TD4720S	0.80
2N2119A	0.37	25C2085-D	1.65	AN532	4.42	BC454	0.36	BF183	0.43	BUX84	0.99	HD3880A50	14.09	MJ2055	1.25	SKE4Z202	0.96	TR095V	6.85	TC2728	2.24	TD4720S	0.80
2N3053	0.35	25C2091	1.30	AN590	4.42	BC460	0.42	BF184	0.42	BUX85	0.69	HD4080A05	12.50	MJ2340	0.49	SKE5F310	1.36	TR0951	7.70	TC2729	2.24	TD4720S	0.80
2N3054	0.99	25C2141	2.44	AN5610	4.74	BC461	0.47	BF185	0.39	BF195	0.39	HI10110	14.00	MJ2520	0.49	SKE5F310	1.36	TR096V	6.43	TC2730	2.24	TD4720S	0.80
2N3055	0.66	25C2166	0.67	AN5612	2.20	BC462	0.47	BF186	0.14	BF177	0.14	HI10104	14.00	MJ2721	0.49	SKE5F310	1.36	TR097V	6.43	TC2731	2.24	TD4720S	0.80
2N3442	1.16	25C2216	0.69	AN5613	4.20	BC463	0.30	BF185	0.14	BY133	0.10	HI10102	14.00	MJ2238	0.31	SK114301	2.15	TR098V	6.43	TC2732	2.24	TD4720S	0.80
2N3702	0.14	25C2233	1.20	AN5630	3.95	BC478	0.32	BF196	0.17	BY164	0.44	HM6231	9.50	MJ2378	1.95	SL414	3.89	TR0964	4.20	TC2733	2.24	TD4720S	0.80
2N3703	0.18	25C2236	1.69	AN5701N	1.66	BC479	0.41	BF197	0.24	BY176	0.52	HM6232	7.20	ML238	5.77	SL432A	3.44	TR0974	4.80	TC2734	2.24	TD4720S	0.80
2N3705	0.16	25C2274	1.14	AN6290	1.75	BC532	0.22	BF198	0.17	BY179	1.42	HM6251	5.89	ML233	3.10	SL431	4.28	TR0964	5.74	TC2735	2.24	TD4720S	0.80
2N3706	0.14	25C2274	0.87	AN6300	4.40	BC536	0.17	BF199	0.17	BY179	1.05	HM7103	4.69	ML236	3.58	SL471	2.13	TR0951	1.74	TC2736	2.24	TD4720S	0.80
2N3707	0.16	25C2274	0.87	AN6310	4.40	BC538	0.17	BF200	0.17	BY181	0.87	HM7103	4.69	ML236	3.58	SL471	2.13	TR0951	1.74	TC2737	2.24	TD4720S	0.80
2N3711	1.56	25C2261	1.94	AN6341	2.22	BC549	0.10	BF224	0.17	BY188	1.62	HM7912	1.76	ML239	3.22	SL492A	2.37	TR0960AP	0.71	TC2738	2.24	TD4720S	0.80
2N3712	1.56	25C2570	1.80	AN6363	16.00	BC550	0.10	BF237	0.05	BY207	2.02	HT207	10.25	MMS368N	2.01	SL181A	0.87	TR0969	3.13	TC2739	2.24	TD4720S	0.80
2N3713	1.95	25C2571	1.80	AN6363	16.00	BC550	0.10	BF237	0.05	BY208	1.15	HT208	10.25	MMS368N	2.01	SL181A	0.87	TR0969	3.13	TC2740	2.24	TD4720S	0.80
2N3819	0.40	25C2578	6.75	AN6501	0.50	BC557	0.10	BF241	0.17	BY210	4.00	KA201	1.70	MM5841N	6.64	SN16862AN	2.95	TR0972V	2.57	TC2741	2.24	TD4720S	0.80
2N3823	1.17	25C2571	0.90	AN6522	0.68	BC558	0.10	BF245	0.10	BY215	6.00	KA210	1.70	MM5841N	6.64	SN16862AN	2.95	TR0972V	2.57	TC2742	2.24	TD4720S	0.80
2N3824	0.15	25C288A	1.85	AN6510	1.63	BC559	0.10	BF245B	0.49	BY210-800	0.19	K0328C	4.85	MM5841N	6.64	SN16862AN	2.95	TR0972V	2.57	TC2743	2.24	TD4720S	0.80
2N3908	0.62	25C3153	1.50	AN7111	1.25	BC560C	0.14	BF246A	2.52	BY223	1.25	L20CV	1.69	MM1435XV	9.50	SN29715N	3.66	TR0989P	3.10	TC2744	2.24	TD4720S	0.80
2N4101	1.33	25C372	0.30	AN7115	2.52	BC635	0.34	BF256	0.34	BY224-600	2.60	LA1201	0.75	MM192	5.07	SN29715N	3.66	TR0989P	3.10	TC2745	2.24	TD4720S	0.80
2N4240	1.95	25C383	1.16	AN7145	2.00	BC636	0.20	BF256	0.20	BY226	1.15	LA1210	1.56	MM192	5.07	SN29715N	3.66	TR0989P	3.10	TC2746	2.24	TD4720S	0.80
2N4444	1.66	25C393	1.33	AN7146	3.90	BC637	0.24	BF257	0.24	BY227	0.20	LA1210	1.56	MM192	5.07	SN29715N	3.66	TR0989P	3.10	TC2747	2.24	TD4720S	0.80
2N5293	0.50	25C388	1.27	AN7151	2.37	BC638	0.17	BF258	0.17	BY228	0.60	LA1210	1.56	MM192	5.07	SN29715N	3.66	TR0989P	3.10	TC2748	2.24	TD4720S	0.80
2N5294	0.50	25C388	1.27	AN7151	2.37	BC638	0.17	BF258	0.17	BY228	0.60	LA1210	1.56	MM192	5.07	SN29715N	3.66	TR0989P	3.10	TC2749	2.24	TD4720S	0.80
2N5296	0.50	25C403C	0.80	AN7158	2.10	BCX34	0.55	BF262	0.54	BY229-1000	0.24	LA1210	1.56	MM192	5.07	SN29715N	3.66	TR0989P	3.10	TC2750	2.24	TD4720S	0.80
2N5297	0.50	25C458	0.34	AN7218	1.80	BD115	0.36	BF263	0.57	BY255	0.51	LA1364	3.02	MPS6570	0.48	SN29718N	5.75	TR124P	2.34	TC2751	2.24	TD4720S	0.80
2N5298	0.61	25C495	0.92	AN7223	4.55	BD116	0.70	BF271	0.70	BF271	0.70	LA1365J	1.45	MPS642	0.15	SN29718N	5.75	TR124P	2.34	TC2752	2.24	TD4720S	0.80
2N6139	1.58	25C5155	1.85	AN107	6.77	BD124	0.14	BF273	0.14	BF273	0.14	LA1385											

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VHS X

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VHS C

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Steve Byatt and C.E. East

Sony CDPM20S

The job ticket said "no sound". Although the player ran up all right and elapsed time was displayed there was not a hint of sound. A scope check at pin 79 of the CXD1135 digital signal processor chip showed that there was no data output. Everything else was present, so a new chip was ordered. Fitting this made no difference – there was still no data output at pin 79. Further scope checks revealed very large variations in the level and shape of the waveforms into and out of the LC3516AML-15 RAM chip. A quick talk to those awfully nice people at Sony confirmed my suspicions – the RAM was duff. Apparently this is becoming a common fault.

The fault could be misleading since the symptom suggests that the player is in the mute state. As a result I spent some time chasing around in the system control section. **M.L.**

Turntable Motor Problems

The fault report with a **Yamaha CD400** that came in recently was "intermittent failure to play". Sure enough, occasionally the disc wouldn't rotate. To cut a long story short, we noticed that the disc wouldn't rotate when its label was in a certain position after selecting the stop mode. Obviously the turntable motor had a poor spot. Out it came, after I'd made a small mark on the turntable spindle in order to make setting up easier with respect to turntable height. I stripped down the motor, cleaned and oiled it and retightened the connections. Then back it went, the spindle being carefully fitted to the turntable using the mark I'd made as a guide. After full reassembly perfect results were obtained.

An older machine, a **Pioneer PD1**, also had a turntable motor fault. This is one of those machines with a hinged front door that makes you think the disc will be bent in half while being loaded. The trouble was that the player would eject the disc while it was attempting to read the TOC. Each time that play was selected you could see the disc turn a quarter of a revolution before it was ejected. The problem was due to the turntable motor: a very small drop of oil down the top bearing provided a complete cure. **M.L.**

Denon DCD500 etc.

No TOC readout is becoming a common problem with Denon CD players. Quite often the cause is the loading belt, which is normally underneath the tray assembly. Usually the fault symptom is no disc rotation when the tray has been closed. When you change the loading belt it's always worthwhile cleaning the leaf switches underneath the deck. If the tray-in switch makes poor contact it will produce the same fault symptom as a stretched loading belt. Also check the clamp mechanism. On some players part of the clamp locates into the tray when loading has been completed. If the tray hasn't been located properly the clamp can't lock into the tray: the result is no TOC readout as the mechanism isn't fully loaded.

Some early Denon players suffer from skipping and

jumping. A modification kit consisting of a new tray, bracket and washers is available from Denon to provide a cure. The purpose of this modification kit is to ensure that the laser's movement across the disc is smooth. Basically what seems to happen is that the feed motor assembly gets so far then sticks and sometimes jumps too far. The modification kit cures most skipping and jumping problems with early Denon players. **M.L.**

JVC XL-E300

The note attached to this machine read "drawer won't open and display shows 'no disc'". Its front panel had obviously received a good clout, possibly in a fit of temper. I removed the top cover and front panel (not easy when the tray doesn't open) and once the pressure had been released from the front display board the tray opened normally. Three or four of the front panel function switches were permanently pressed in: removing the front cover released them. This however was just the beginning of a fault-tracing exercise that involved much head scratching.

A disc was inserted. It started to rotate, but only very slowly. Then 'no disc' appeared on the front display. I tried again. This time the disc rotated at a greater speed before 'no disc' again appeared. Eventually, after five attempts, the machine worked perfectly. I stopped it after track four of 'Buster' and put in another disc. The same problem again: slow disc rotation followed by 'no disc'. Clearly the machine wasn't reading the disc's table of contents. This was because the feed motor didn't return the laser assembly to the centre of the disc when the open button was pressed. In fact the feed motor returned the laser assembly very slowly after the tray had been closed. Hence the problem of the disc rotating slowly. The laser was reading information from the outside of the disc instead of the inside.

My attention was drawn to the VC4090S servo signal processor chip IC502 which provides the feed motor plus and minus signals. Comparative voltage checks were made with a similar, working machine (we all cheat sometimes!) after which I decided to replace the chip. This made no difference. I studied the circuit for a good twenty minutes before I noticed the s-stop line to pin 22 of the chip. This pin detects the position of the laser for TOC reading: if necessary, the laser is returned to the centre of the disc. A switch initiates this action. It

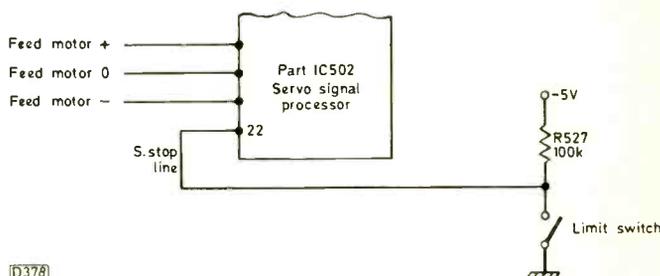


Fig. 1: Connections to pin 22 of the servo signal processor chip IC502 in the JVC Model XL-E300.

normally earths pin 22 (see Fig. 1). When the switch is open $-5V$ is applied to pin 22 via R527. The problem was that R527 had never been fitted! The machine must have been new, because it could never have worked without R527. Fitting a $100k\Omega$ resistor in this position cured the fault. M.L.

Fisher AD823

All the usual problems with this one, i.e. won't play some discs, can't select tracks properly, etc., etc. The sound reproduction would deteriorate slowly, then the machine would start to jump and skip. Slight pressure on the clamp eased the problem but didn't clear it completely. The cause of the trouble was mechanical: the disc wasn't being fully lowered on to the turntable. This operation is achieved by part of the clamp assembly pushing down on to the two lever hold assemblies under the loading tray. These two assemblies weren't being properly engaged. I couldn't see any adjustment to put this right so I had to use a bit of initiative: a dab with the soldering iron on the part of the clamp that locates the lever hold into position during loading provided a cure.

During the following two weeks I had similar faults with Denon and JVC machines, though Denon supply a modification kit for machines that constantly skip and jump. M.L.

JVC XL-V250

This player came to us from another dealer with a report that simply said "not working". It was almost in kit form! Someone had looked at it and come to the conclusion that the laser was faulty. It wouldn't read the TOC though it tried hard. There was a substantial amount of resoldering around the YM3815 signal processor chip and it looked as though all the potentiometers had been twiddled.

This particular player uses the JVC Optima-3 laser assembly, which is a vast improvement on the earlier types used in the XLV22 series of machines. I had a feeling that the laser was o.k. Just to be sure I swapped it over with the one in a JVC XLE3 that had come in with a different problem. As this had no effect on the fault I turned my attention to the resoldering around the YM3815 chip. Several of the pins must have been making poor or no contact while others were shorting to adjacent ones. It was a big task, and at the end of the day I had to order a new chip. The replacement got the machine working, but not very well as I had to set up the machine due to the phantom twiddler's efforts.

The YM3815 costs around £41 from JVC. I wonder why? Sony chips that, though different, perform very similar functions are half the price. With engineer's time and VAT it makes the cost of some repairs add up to almost the price of a new machine. M.L.

Fidelity CD202

The fault report on the ticket said intermittent play. We ran the machine up and it worked fine for twenty minutes. A thump was then heard from the speaker and the machine shut down in the stop mode. It then started up again and finally stopped. "Oh dear", we muttered, "send it back to the manufacturer." "You can't" said a knowledgeable chap who was fighting with a stand under the bench, "they don't exist any more." So we had to get out the circuit and do our best.

We found that with the top cover removed the fault could be induced by applying slight pressure at roughly the centre of the main PCB. When the board was removed we saw a tiny blob of solder across two pins of IC403 (TC9200F). Resoldering and a quick scrape and clean up in this area cured the fault.

A word of warning when servicing these players. Ensure that you make good earth connections when running the player with the main board removed. The panel is earthed to the chassis at four or five different points where the self-tapping screws fix it in position. If any of these earthing points are poorly made or open-circuit the player won't work properly. M.L.

Denon DCD300

During the first few minutes of play from cold this player would skip very badly. It happened with almost any disc that was inserted. We tried cleaning and setting up but got nowhere. A new laser cured the problem. These lasers are available direct from Denon, part no. 9960008101, in exchange for a lot of money! M.L.

Sony CDP102

This machine would read only some discs. When working it played fine, but with some discs the turntable speed would increase at TOC and eventually the system control would initiate the stop mode.

This type of fault is quite often due to a faulty laser optical unit. This time the laser lens just needed cleaning. In addition, a small dab of grease on the tray guide rods improved disc loading significantly.

The general performance of these machines is excellent. A linear motor is used as the laser feed motor, making the access time from the first to the last track approximately one second. M.L.

Philips CD100

The problem with this player was that the sound would drop out and the track indicator would flicker at the same time. A scope used to monitor the eye pattern showed that there were bursts of h.f. interference on the otherwise satisfactory waveform. The source of this interference was traced back to a noisy guard diode in the photodiode array. A small piece of Sellotape over the guard diode connection at the end of the flexible lead from the photodiode array cured the problem by removing the guard diode connection. The player has worked perfectly ever since this modification was carried out, saving the cost of a new laser diode assembly. S.B.

Sony HSTD3CD/CDFM20S

A wiring fault in the Sony main amplifier type HSTD3CD resulted in twice the correct voltage being presented to the power regulators in the CDFM20S compact disc player. The wiring from the mains transformer to the a.c. output socket was found to be brown to the left-hand pin, grey to the centre pin and green to the right-hand pin. The brown lead should go to the centre pin. Because the centre tap was misplaced, voltage doubling took place, giving 16V, 0V, $-16V$ across the main reservoir capacitors instead of 8V, 0V, $-8V$. Check this if the CD player stops after some minutes. C.E.E.

Service Bureau

Note: the Query Service has now ended.

SIEMENS FF3077

The BU326 transistor (TR3) and 1A fuse fail instantly at switch on. Disconnecting the h.t. rails doesn't have any delaying effect and no short can be detected in the circuitry associated with the BU326. As the fault occurs instantly no voltage checks can be made.

First ensure that all four secondary rectifier diodes are neither short-circuit nor leaky. Fit a new thyristor in the D8 position since the BU326 generally damages this when it blows. Replace C20 and check TR2 and every diode in the power supply. If all these are in order, suspect C22 which must be replaced with an electrically and physically similar type.

SONY KV2216U2

The problem is no teletext colour. The only way in which colour can be seen is in the mix mode, when the text appears in black.

This symptom indicates that only the luminance and/or blanking outputs from the TROM chip in the teletext decoder are reaching the colour decoder chip. Make sure that transistors Q5, Q6 and Q7 on the text panel have 5V at their collectors and that the links from the text panel V5 to board A are secure. If so the SAA5050 TROM chip IC4 is suspect.

QUESTAR V200R

The fault is horizontal displacement at the bottom of the picture, over an area of about three quarters to an inch. It's not accompanied by noise, there's just a clean horizontal displacement of the verticals to the right. The rest of the picture is perfect.

Displacement of this type at the bottom of the picture is usually caused by incorrect back-tension setting at the supply reel. 30-40g/cm is normally correct. If the tear line is as high as you suggest, adjustment of the head-switching point in the servo circuit will be necessary.

SOLAVOX 22T09TX

This set uses the ITT CVC1210 chassis. The problem is that the 1A fuse in the chopper circuit blows. I've replaced the BU508A chopper transistor, removed the other transistors in the circuit to test them and checked all the other components in situ.

First check the 150kΩ resistor R716. If this, rectifier diodes D732 and D733 and the BU208 line output transistor are all o.k. the chopper transformer TR711 is suspect. Before condemning it, check for shorts or leakage in L701 and C701, though the likelihood of this is slight.

SONY KV2212UB

This set shuts down intermittently - it could be an hour, a week or a month between shut downs. Once off, it can take a minute to an hour before power is restored by using the on/off switch. When the fault is present the

mains input to the power supply is o.k. but there's no output. A check for dry-joints and use of freezer and a hairdryer has failed to establish the cause of the fault.

If you are sure that there are no dry-joints in the power supply - check particularly around Q602 and T603 - replace C612, R607 and R618. If the fault returns, IC601 (TDA4600) is suspect.

FERGUSON 3V35

Playback, rewind and fast forward work fine but if rewind search is selected at the beginning of the tape it starts to crease at the top edge near the entry guide. The tape rides up the guide, creasing as it returns to the cassette. Fast forward search is fine and after the first quarter inch of tape has passed rewind search is all right. The tape path has been cleaned and the loading belt replaced.

We suggest that you check the supply guide pole height, the supply reel disc height, the tension brake pressure and the freedom to rotate of the reel discs. If necessary check the pressure of the pinch roller against the capstan: it should be about 2.5kg.

PHILIPS CF1 CHASSIS

This set came in dead due to a fault in the power supply. After putting this right we found that there are sparks/arcing inside the tube's neck. We can't find any faults on the c.r.t. base panel and disconnecting the RGB input socket makes no difference.

Sparking inside the neck of a tube usually indicates that it's soft, i.e. has lost its vacuum. A simple test is to apply 6V to the heater pins (4 and 5). If the heaters glow, the tube is o.k. If you are sure that the tube is intact, suspect excessive e.h.t. So long as the h.t. voltage is correct - 185V at C2311 - the main possibility for this is that the tuning capacitor C2560 at pin 10 of the line output transformer is open-circuit.

TOSHIBA V83B

This machine will record for a while then switch off. The recording time can be anything from a few minutes to an hour before switch off occurs. After resetting, the recording may be completed without further ado. The same problem occurs on playback.

This problem is sometimes caused by a faulty mode switch. Unfortunately the reel motor is far more often responsible.

SAISHO 1400

The set works for one-two hours after which the sound and picture go off. If the set is then switched off and on again a minute or so later, it works for five-ten minutes before going off. After this it will remain on for only a couple of minutes at a time. I've noticed that line lock is sometimes lost as the set shuts down. When the set is running the voltage at pin 5 of the LA7820 chip IC401 is zero. It rises to 1V when the set shuts itself off. Replacing this chip has made no difference.

The set has a shut-down circuit that operates via pin 5 of IC401. It's coming into operation to produce the symptoms described. If the picture expands in size before collapsing, suspect a rise in the h.t. voltage. Check IC601 etc. If not, check C408 and C409 in the shut-down circuit. The shut-down process can be overridden by earthing pin 5 of IC401 - beware of fireworks or blow-ups if you resort to this action.

SONY SLC9

The eject LED starts to flash a couple of seconds after power is applied and the standby button is switched on.

The flashing eject LED indicates that the machine has attempted eject and failed. This is usually due to excessive friction in the front-loading mechanism. Confirm that power is being applied to the motor during the cassette load/unload phase, then check the gear C assembly etc.

TEST CASE

327

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.

Like all sections of a TV set the tuning department has steadily evolved over the years. Time was when you pressed a selector button then turned it to tune in the programme you wanted. The presets next disappeared behind a flap, as a row of twiddlers corresponding with the row of channel-selection buttons. Next you got to change channels from the armchair, closing an electronic switch to select each pre-twiddled twiddler. Finally came frequency-synthesis tuning.

Frequency-synthesis tuning is a fine thing, but it may not be so regarded by the serviceman when it gives trouble. Joe had a problem of this sort. He approached Workshop Sage with a troubled look on his face and a circuit diagram in his hand, then poured out the trouble he was having with the Luxor SX9 series TV set that sat defiantly on his bench.

At the outset the problem had seemed simple enough. Some alcoholic liquid had been spilt into the set and had found its way on to the PCB in the region of the i.f. department. The sticky gunge had got into the vision demodulator and a.f.c. coils, under the TDA4427 i.f./detector chip, and around various other bits in this area. The 18-pin chip had been removed and refitted after a clean up, the two coils had been replaced, and the sticky deposits had been scrubbed from the PCB. When the set was tested however it was soon plain that there was still a problem. Though the set would come on and respond to commands from the remote control handset, the tuning didn't work correctly. With the sweep tuning activated there would be a flash of picture as each active channel was passed. A check was made on the tuning voltage applied to the tuner, with the sweep tuning off. It was seen to be varying – almost hunting.

As a second check a variable voltage from an external low-impedance source was applied to the tuning pin. This exonerated the tuner: careful adjustment of the voltage produced a steady picture. So the problem

plainly lay in the tuning voltage source. The control arrangement consists of an SAB3035 CITAC chip, an MAB8440 microcomputer chip and a PCD8571 memory chip. Quite a jungle to sort out! Where do you start with this lot?

Joe started by changing the CITAC chip. The results were the same as before but Joe found – it could also have been the case with the original chip fitted – that if he cancelled the a.f.c. action via the handset the tuning could be done correctly – for a few seconds, until the set reverted automatically to a.f.c. operation. To investigate this further he disconnected the a.f.c. line from the CITAC chip, at RC02. The set could now be tuned!

So it was back to the a.f.c. department, to recheck for conductive deposits on the board. There weren't any. Next the TDA4427 vision i.f./demodulator chip IM03 was replaced. Again there was no change in the symptoms. A check on this chip's a.f.c. output, at pin 12, showed that it was active: each time the sweep tuning passed a station it would "pulse".

Sage got Joe to set up the external tuning supply again. As Joe varied the tuning slightly around the correct tuning point Sage checked with a scope (a meter could have been used just as well) and soon got to the bottom of the trouble. Have you any idea what it was? You don't need a circuit diagram for the SX9 chassis. See next month for the answer.

ANSWER TO TEST CASE 326 – page 308 last month –

Our last saga culminated in the seemingly worn-out upper drum assembly in a hi-fi VCR being reinstalled in the machine despite a new one curing the problem of dodgy hi-fi audio recordings. After carrying out an adjustment the old assembly continued to run satisfactorily for a long period, during which time the new one was stashed away ready for fitting when required.

Hi-fi stereo recordings are made using a depth-multiplex technique. The helically-scanning audio head creates a dense, deep magnetic pattern in the tape's oxide layer. A moment later the upper part of this pattern is erased by the writing action of the video head, which lays down a shallow video recording on the surface of the tape's magnetic coating. The video head's writing current is crucial to this process.

With the original, considerably worn upper drum refitted, Sage carefully adjusted the luminance writing current to the level specified in the service manual. The potentiometer had to be backed off some way to achieve this. An improvement in both the vision and hi-fi sound performance was immediately apparent. Because the refitted heads were worn, the potentiometer was then set for a still lower level, whereupon the results fell little short of those produced with the new drum. The black streaking and "worms" effect on the playback picture with self-made recordings also disappeared. The moral is to check for excessive luminance recording current when you have to investigate hi-fi recording problems in a VCR!

Published on approximately the 22nd of each month by IPC Magazines Limited, King's Reach Tower, Stamford Street, London SE1 9LS. Filmsetting by Trutape Setting Systems, 220-228 Northdown Road, Margate, Kent. Printed in England by the The Riverside Press Ltd., Thanet Way Whitstable, Kent. Sole Agents for Australia and New Zealand – Gordon and Gotch (A/sia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions: Inland £20, overseas (surface mail) £24 per annum, payable to Quadrant Subscription Services Ltd., Oakfield House, Perymount Road, Haywards Heath, Sussex RH16 3DH. "Television" is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever. ISSN 0032-647X.

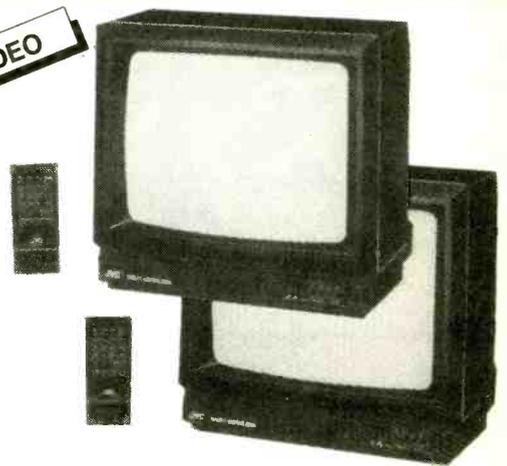
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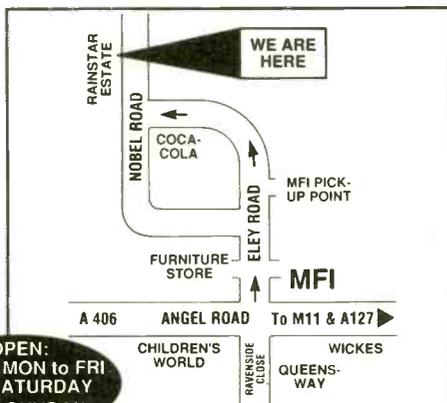
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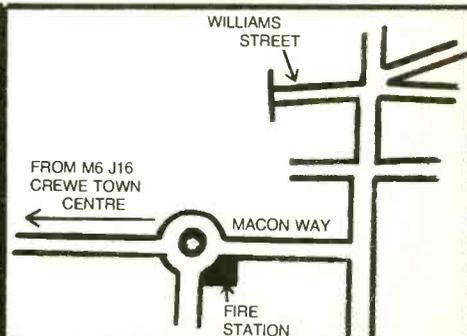
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ALL STOCK ITEMS ARE DESPATCHED BY RETURN OF POST

VIDEO HEADS

REPLACEMENTS

All our replacement heads are brand new precision Japanese heads not refurbished.

Panasonic	
3HSS(N).....	£16.00
Fits model numbers:	
NV2000, NV2010, NV7000, NV7200, NV333, NV8600, NV8610	
3HSS-U(N).....	£19.90
Fits model numbers: NV370 & Philips VR6460	
3HSS(4N).....	£38.50
Fits model number: NV366	
3HSS(4NB).....	£38.50
Fits model number: NV730	
Ferguson	
3HSS(V).....	£16.00
Fits model numbers: 3V00, 3V16, 3V22, 3V29, 3V30, 3V31, 3V35, 3V36, 3V38, 3V39, HR2200, HR3300, HR3330, HR3360, HR7200, HR7300, HRD120, HRD130	
3HSS4VB.....	£44.50
Fits model numbers: 3V32	
Sharp	
3HSS(SP).....	£26.50
Fits model numbers: VC9100, VC9300, VC9500, VC9700, VC381, VC383, VC386, VC388, VC482	
Toshiba	
PS3B(T).....	£26.50
Fits model numbers: V9600, V31B, V33B	
Hitachi	
3HSS(H).....	£26.50
Fits model numbers: VT8000, VT9300 etc.	
Sony	
PS3B(S).....	£19.95
Fits model numbers: SLC5, SLC6, SLC7, SL3000 also various NEC models	
P84B(2S).....	£26.50
Fits model numbers: SLC20, SLC30, SLC40, SLF1	
PS5B(3S).....	£44.20
Fits model numbers: SLC9, SLT50, SLC8, SLF60	
Amstrad/Saisho	
3HSS(F).....	£28.50
Fits model numbers: VCR7000 and all models using Orion chassis	
3HSS(F).....	£28.50
Fits model numbers: VCR4500, VCR5200, VCR9000 etc.	
Fisher/Fidelity	
3HSS(SF).....	£29.90
Fits model numbers: FVHP615, FVHP710, V1000	

GENUINE HEADS

Panasonic	
NV2000, NV2010.....	£44.00
NV7000, NV7200.....	£44.00
NV333, NV370.....	£44.00
NV366.....	£64.50
NV688, NV777, NV788.....	£64.50
NV730.....	£67.50
All others available P.O.A.	
Ferguson	
3V00, 3V16, 3V22.....	£59.90
3V29, 3V30.....	£59.90
3V32.....	£66.90
3V35, 3V36, 3V38, 3V39.....	£59.90
Sharp	
VC7300, VC7700, VC7750.....	£69.90
VC8300.....	£69.90
VC9300, VC9500, VC9700.....	£62.00
VC381, VC383, VC386.....	£62.00
VC482.....	£62.00
All others available P.O.A.	
Sanyo	
VTC5000, VTC5150.....	£39.90
VTC5300, VTC5400.....	£39.90
VTC9300.....	£39.90
Sony	
SLC5, SLC6, SLC7.....	£49.50
SL8000, SL8080.....	£49.50
SLC20, SLC30.....	£54.50
SLC9.....	£54.50
Toshiba	
V9600.....	£59.90
V8600.....	£69.90
V31, V33.....	£59.90
V55, V56.....	£59.90
Hitachi	
VT5000, VT5500.....	£49.50
VT6500, VT8000, VT8300.....	£49.50
VT8500, VT8700.....	£49.50
VT9300, VT9500, VT9700.....	£49.50
VT11E, VT14E.....	£45.50
VT17E, VT19E.....	£54.60
VT33E.....	£49.50
Philips	
VR6460.....	£44.00
VR6462, VR6467.....	£42.90

Please call if your model is not listed.

GENUINE

Panasonic	
NV2000, NV2010.....	£6.50
NV7000, NV7200.....	£6.50
NV333, NV366.....	£6.50
NV370, NV830, NV850.....	£2.80
NV688.....	£6.50
NV777, NV788.....	£4.70
NV8600, NV8610.....	£6.50
NV730.....	£1.90
NV230, NV430, NV870.....	£3.20
NV870, NV810.....	£2.80
Ferguson	
3V00, 3V16, 3V22.....	£6.50
3V23.....	£3.90
3V29, 3V30.....	£4.90
3V35, 3V36, 3V38, 3V39.....	£3.90
Sanyo	
VTC5000, VTC5150.....	£1.99
VTC5300, VTC5400.....	£4.50
VTC9300.....	£6.50
Sony	
SLC5, SLC7.....	£6.50
SLC6.....	£7.50
SL8000, SL8080.....	£6.50
Sharp	
VC7300, VC7700, VC7750.....	£6.50
VC8300.....	£6.50
VC9100, VC9300, VC9500.....	£6.50
VC381, VC383, VC386.....	£6.50
Hitachi	
VT5000, VT5500.....	£6.50
VT8000, VT8300, VT8500.....	£2.90
VT9300, VT9500, VT9700.....	£3.30
VT11E, VT14E, VT17E, VT19.....	£6.50
VT33E.....	£6.50
Akai	
VS9700.....	£6.50
VS2, VS3, VS4, VS5.....	£4.90
VS9300, VS9500, VS9700.....	£6.50

Many others available

BELT KITS

REPLACEMENTS

Panasonic	
NV2000, NV2010.....	£3.50
NV7000, NV7200.....	£3.00
NV333, NV366.....	£3.00
NV8600, NV8610.....	£3.95
Ferguson	
3V00, 3V16, 3V22.....	£3.50
3V23.....	£2.90
3V29, 3V30.....	£3.50
3V35, 3V36, 3V38, 3V39.....	£2.90
Sanyo	
VTC5000, VTC5150.....	£1.00
VTC5300, VTC5400.....	£2.50
VTC9300.....	£4.25
Sony	
SLC5, SLC7.....	£3.60
SLC6.....	£4.95
SL8000, SL8080.....	£4.25
Sharp	
VC7300, VC7700, VC7780.....	£3.50
VC8300.....	£3.90
VC9100, VC9300, VC9500.....	£3.90
VC381, VC383, VC386.....	£3.90
Hitachi	
VT5000, VT5500.....	£4.50
VT8000, VT8300, VT8500.....	£1.50
VT9300, VT9500, VT9700.....	£1.50
VT11E, VT14E, VT17E, VT19.....	£3.90
VT33E.....	£3.90
Akai	
VS9700.....	£3.90
VS2, VS3, VS4, VS5.....	£3.95
VS9300, VS9500, VS9800.....	£3.50

Many others available

SENSOR LAMPS

All Panasonic.....	£1.80
All Ferguson/JVC.....	£0.65
Sharp VC9300 etc.....	£2.90
Sharp VC7300 etc.....	£1.80
Amstrad 7000.....	£2.30
All Hitachi.....	£1.80
SENSOR L.E.D.'s	
All Panasonic.....	£2.90
All Ferguson/JVC.....	£2.90
All Hitachi.....	£5.75

END SENSORS

Hitachi VT64E.....	£1.20 each
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REEL MOTORS

Sharp VC9300, VC381 etc.....	£18.20
Amstrad/Saisho etc.....	£18.20
Panasonic NV333, NV366.....	£16.80
Sanyo VTC5000, 5300, 5400.....	£9.90
Panasonic NV7000, 7200.....	£19.80

DRUM MOTORS

Ferguson/JVC 3V00, 3V22, etc.....	£29.90
Sharp VC7300, VC7700.....	£26.40
Sharp VC8300.....	£26.40
Hitachi VT5000.....	£25.80

CAPSTAN MOTORS

Sharp VC8300.....	£39.90
Sharp VC7300, VC7700.....	£29.30
Ferguson/JVC 3V00, 3V16, 3V22.....	£24.75
Ferguson/JVC 3V29, 3V30.....	£34.50
Ferguson/JVC 3V35, 3V36, etc.....	£25.80
Hitachi VT5000.....	£25.80
Hitachi VT8000, 8500, etc.....	£34.50
Hitachi VT9300, 9500, etc.....	£34.50
Hitachi VT11, VT14, VT17.....	£28.80
Sony C5, C7.....	£42.90
Akai VS1-VS5.....	£29.90

Many, many more!

IDLER WHEELS

Panasonic	
NV2000, NV2010..... (Genuine).....	£2.90
NV7000, NV7200..... (Genuine).....	£2.90
NV333, NV366..... (Genuine).....	£2.90
NV370, NV230, NV430..... (Genuine).....	£4.50
NV777, NV788..... (Genuine).....	£4.50
NV730..... (Genuine).....	£4.50
Ferguson/JVC	
3V00, 3V16, 3V22 (Large clutch).....	£5.95
3V00, 3V16, 3V22 (Small clutch).....	£6.95
3V29, 3V30, HR7200, HR7300.....	£3.90
3V35, 3V36, 3V38, 3V39, HRD120.....	£3.90
Sanyo	
VTC9100, VTC9300.....	£1.90
VTC5000 Reel drive pulley.....	£6.50
VTM10 Reel drive pulley.....	£9.90
Sony	
SLC5, SLC7..... Rewind kit.....	£4.95
SLC6..... Rewind kit.....	£4.95
Sharp	
VC9100, VC9300, VC9500 (Genuine).....	£3.90
VC381, VC383, VC386 (Genuine).....	£3.90
VC482, VC483, VC581 (also Saisho) (Genuine).....	£3.90
VC482 etc. (Equivalent).....	£2.98
VC9300, 381 etc. (Equivalent).....	£2.98
Hitachi	
VT8000, VT8300, VT8500.....	£4.72
VT9300, VT9500, VT9700.....	£4.75
VT11E, VT14E, VT17E, VT19.....	£3.96
VT33, VT63, VT64, VT65.....	£3.96
Akai	
VS2, VS3, VS4, VS5.....	£5.20

We also carry all play idlers and clutches etc. for models listed plus many more.

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3V29 - 3V30 - 3V31

3V35 - 3V36 - 3V38 etc

3HSS (N) PANASONIC

NV2000 - NV2010 - NV3000

NV7000 - NV7200 - NV333

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FOR NON-STOCK ITEMS

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Panasonic	
NV2000, NV2010, NV7000, NV7200.....	£4.95
NV333, NV366, NV370, NV430.....	£4.95
NV730.....	£7.95
Ferguson/JVC	
3V00, 3V16, 3V22, 3V23, 3V24.....	£4.95
HR3300, HR3360, HR3660, HR2200.....	£4.95
3V29, 3V30, HR7200, HR7300.....	£4.95
3V35, 3V36, 3V38, 3V39, HRD120.....	£4.95
Sanyo	
VTC9100, VTC9300.....	£4.95
VTC5000, VTC5150, VTC5300, VTC5400.....	£4.95
Sony	
SLC5, SLC7.....	£5.95
SLC6.....	£5.95
SL8000, SL8080.....	£5.95
Sharp	
VC7300, VC7700, VC7750.....	£4.95
VC8300.....	£4.95
VC9100, VC9300, VC9500.....	£4.95
VC381, VC383, VC386.....	£4.95
VC651 etc.....	£4.95
Hitachi	
VT5000, VT5500.....	£5.95
VT8000, VT8300, VT8500.....	£4.95
VT9300, VT9500, VT9700.....	£4.95
VT11E, VT14E, VT17E, VT19.....	£4.95
VT33E.....	£5.95
Akai	
VS9700.....	£6.95
VS2, VS3, VS4, VS5.....	£6.95
VS9300, VS9500, VS9700.....	£4.95

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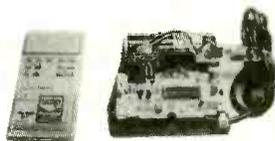


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3V23 Handset	£11.07
3V45/8947 Original	£15.00
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8500/600/700 Non Text	£10.50
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GRUNDIG

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RC5429/5300/5301 etc	£11.00
RC5325/5320	£11.00
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RC5525 Philips Original	£10.50

AND MANY MANY MORE TYPES . . . ASK FOR LISTS

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AKAI

VS1/2/3/5/10 etc	£12.75
all models 3HSS-V	

AMSTRAD

4500/5200/9000/PSF1	£18.90
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FERGUSON

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3V29/30 etc 3HSS-V	£12.75
3V16/23/24-3HSS-VL	£12.75
3V31/35/6/8-3HSS-VL	£12.75
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HITACHI

VT11/14/33-3HSSHB	£17.85
VT61/63-3HSSHB	£17.85
VT3000-3HSS-V	£12.75
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VT6500/7000-3HSSHA	£17.85
VT8000/8300-3HSSHA	£17.85
VT8500/8700-3HSSHA	£17.85
VT9300/9500-3HSSHA	£17.85
VT9700-3HSSHA	£17.85

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VR3605/95-3HSSVL	£12.75
VR3833/3906-3HSSV	£12.75
and other models	

JVC

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PANASONIC

NV2000 types 3HSS-N	£12.75
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3 Head types	
NV366 etc 3HSS4NA	£31.00

SANYO

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VHR1300 etc 3HSSSY	£27.00
VTC5000 etc PS3BSF	£24.30
VTC9300 etc PS4BSF	£31.30

SHARP

VC105 etc 3HSSSP	£20.25
VC205 etc 3HSSSPB	£20.25

SONY

SL5000 etc PS3BS1	£15.55
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SLC20 etc PS4B2S	£20.00
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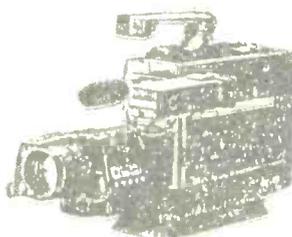
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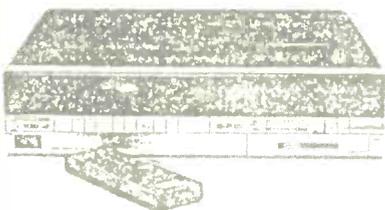
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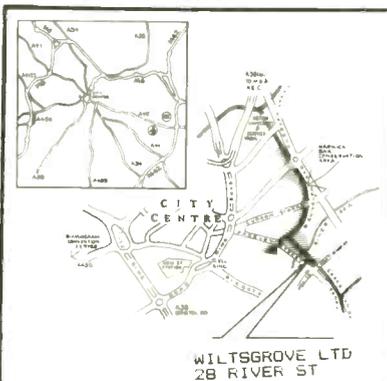
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TDA2020	UPC1185H2	LA4183	STK043	STK4152	STK561F
TDA2030	UPC1188H	LA4190	STK056	STK4152H	STK563
TDA2040	UPC1291	LA4251	STK077	STK4152H	STK563
TDA2170	UPC1263	LA4422	STK077G	STK4161H	STK563
TDA2320	UPC1278H	LA4440	STK078	STK4171H	STK5632
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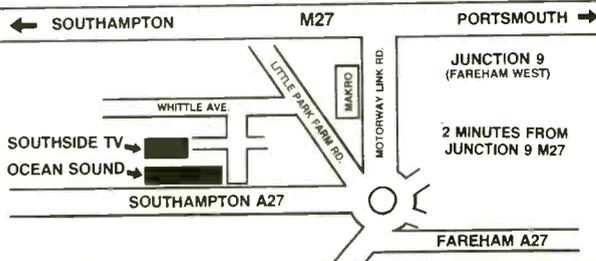
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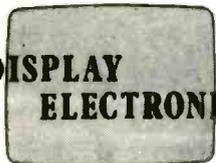
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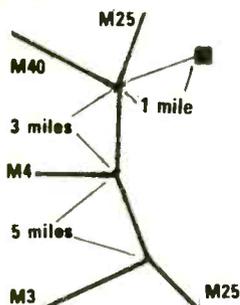
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Fisher FVHP510, 520, 530, 615, 710 etc	£21.00	
Fisher VBS7000, 9000 etc	£33.75	
Goldstar 8000	£23.00	
Goldstar Universal	£23.00	
Hinan VXL2, 4, 35	£20.00	
Hinan VXL5, 20H	£20.00	
Hinan VXL20H	£23.00	
Mitsubishi HS303, 304, 320, 700, 310	£35.00	
Saisho VR100, 605, 705, 805, 905	£23.00	
Samsung Universal 2 Head	£24.25	
Toshiba V71, 81, etc	£25.50	
Toshiba V93	£25.50	

ASK FOR VIDEO HEADS NOT LISTED

The above heads are replacements.
For originals please ask for quotations.

TRANSISTORS

BC107B	£0.10	BU407	£0.50
BC108B	£0.10	BU426A	£0.75
BC147A	£0.07	BU500	£0.95
BC172C	£0.07	BU508A	£0.75
BC214A	£0.07	BU508D	£0.95
BC214B	£0.07	BU536	£1.75
BC237	£0.07	BU806	£0.75
BC238	£0.07	BU807	£0.75
BC308B	£0.07	BUT11	£0.75
BC327-25	£0.07	BUX84	£0.60
BC328	£0.07	TIP29	£0.30
BC337	£0.07	TIP31	£0.30
BC547A	£0.07	TIP32	£0.30
BC548	£0.07	TIP41	£0.27
BC549	£0.07	TIP42	£0.25
BC559B	£0.07	TIP42C	£0.40
BD137	£0.30	TIP112	£0.45
BD2037	£0.22	2SA1102	£1.90
BD238	£0.22	2SB1016	£1.50
BD243C	£0.30	2SC1413A	£2.50
BD244	£0.30	2SC2027	£4.50
BD244C	£0.30	2SC2331	£1.00
BF195	£0.07	2SD2577	£1.40
BF196	£0.15	2SC2958	£2.50
BF197	£0.15	2SC3153	£3.40
BF198	£0.07	2SC3678	£2.75
BF259	£0.22	2SD0639	£0.35
BF458	£0.22	2SD869	£3.00
BF459	£0.22	2SD898B	£2.75
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BF472	£0.25	2SD1275	£1.30
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BU126	£0.70	2SD1398	£2.25
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BU208A	£0.75	2SD1497	£2.60
BU208D	£0.75	2SD1497-02	£5.95
BU208 (Toshiba)	£0.85	2SD1497-06	£5.95
BU326A	£0.75	Ask for Transistors not listed	

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AN6326	£4.00	TBA530	£1.00
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AN6344	£6.50	TBA820M	£0.45
AN6346	£4.50	TBA920S	£1.00
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AN6362	£4.25	TCA650	£3.95
AN6671K	£5.50	TCA660B	£3.50
AN6677	£5.25	TD1010A	£1.30
AN7169	£3.50	TD1013A	£1.30
BA718	£1.80	TD1022P	£4.50
BA728	£1.10	TD1035	£1.90
BA5102	£2.45	TD1035T	£1.90
BA5406	£2.50	TD1044	£2.50
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BA6238A	£1.95	TD1170S	£1.20
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BA6305	£1.75	TD141510	£4.50
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HA11714	£3.50	TD1515A	£2.00
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STK3525	£9.50	TD3653	£1.50
STK3531	£6.00	TD3654	£2.80
STK3532	£3.50	TD3610	£2.80
STK3533	£9.00	TD3950	£3.00
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STK5361	£6.25	TD44501	£4.00
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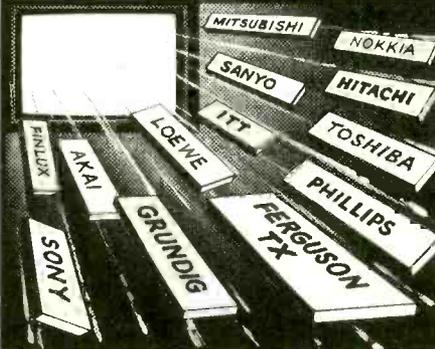
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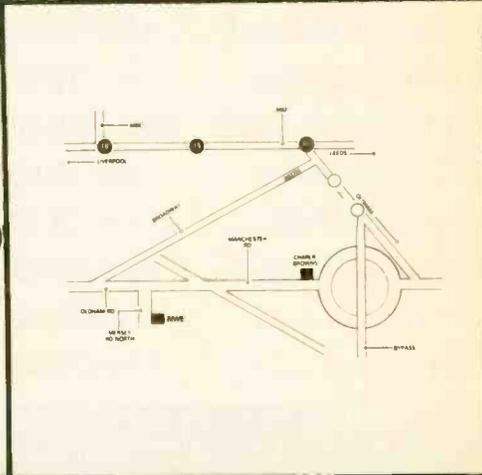
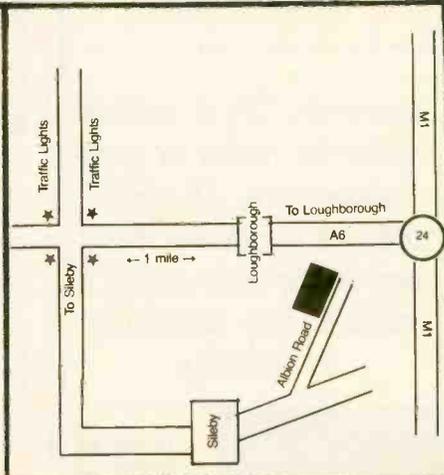
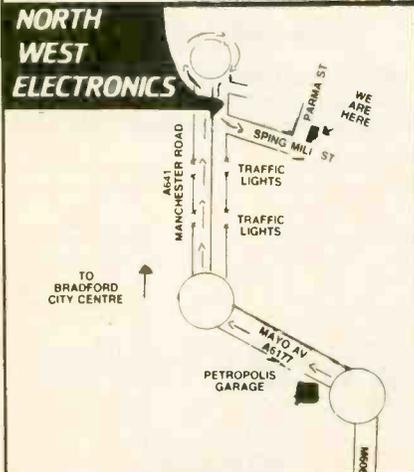
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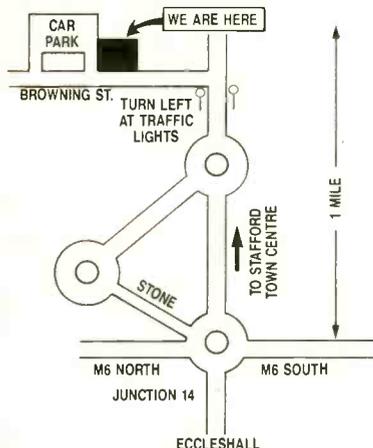
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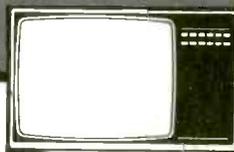
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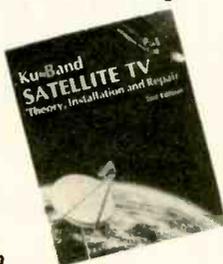
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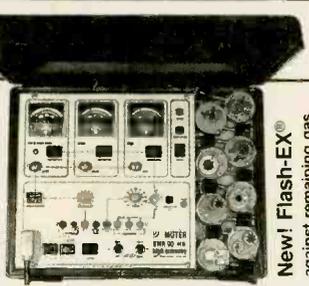
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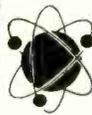
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ITT 2,800 mains remote switch 50p	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer 20v/2.25A; 20v/1.5A; 17.5A; 19.5A; 28.05A £3	12v DC Relay 1 1/2 x 1 1/2 x 2 print type 10 amp D.P. Changeover £1	Philips Solar Scientific SBC1730 Calculator £12 15v-0.15v 1 Amp Transformers £1
NEW 2110 GEC Sound O/P Panel £1	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer 20v/2.25A; 20v/1.5A; 17.5A; 19.5A; 28.05A £3	12v DC Relay 1 1/2 x 1 1/2 x 2 print type 10 amp D.P. Changeover £1	Philips Solar Scientific SBC1730 Calculator £12 15v-0.15v 1 Amp Transformers £1
2110 GEC L.O.P.T. Panel £6	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer 20v/2.25A; 20v/1.5A; 17.5A; 19.5A; 28.05A £3	12v DC Relay 1 1/2 x 1 1/2 x 2 print type 10 amp D.P. Changeover £1	Philips Solar Scientific SBC1730 Calculator £12 15v-0.15v 1 Amp Transformers £1
2110 GEC Power Panel £5	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer 20v/2.25A; 20v/1.5A; 17.5A; 19.5A; 28.05A £3	12v DC Relay 1 1/2 x 1 1/2 x 2 print type 10 amp D.P. Changeover £1	Philips Solar Scientific SBC1730 Calculator £12 15v-0.15v 1 Amp Transformers £1
Line op frame panels GEC 20AX £10.00	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer 20v/2.25A; 20v/1.5A; 17.5A; 19.5A; 28.05A £3	12v DC Relay 1 1/2 x 1 1/2 x 2 print type 10 amp D.P. Changeover £1	Philips Solar Scientific SBC1730 Calculator £12 15v-0.15v 1 Amp Transformers £1
ITT CVC40 Push Button Unit & Mains Switch £12	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer 20v/2.25A; 20v/1.5A; 17.5A; 19.5A; 28.05A £3	12v DC Relay 1 1/2 x 1 1/2 x 2 print type 10 amp D.P. Changeover £1	Philips Solar Scientific SBC1730 Calculator £12 15v-0.15v 1 Amp Transformers £1
Tuner & IF Panel. Complete 6 button and preset IF with s/wave filter and tuner. Mullard M342 5" x 6 1/2" £6.00	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer 20v/2.25A; 20v/1.5A; 17.5A; 19.5A; 28.05A £3	12v DC Relay 1 1/2 x 1 1/2 x 2 print type 10 amp D.P. Changeover £1	Philips Solar Scientific SBC1730 Calculator £12 15v-0.15v 1 Amp Transformers £1
POTS BA 301 £1 TA 4127 £1 HD 3884 2A23 £3 TA 4184 £1 TA 2125 £1 TA 4190 £1 TA 4138 £1 TA 4196 £1 TA 4174 £1 TA 4139 £1 TA 4198 £1 TA 4167 £1 TA 4199 £1 BA 546 £1 BA 328 £1 TA 4176 £1 TA 4145 £1 TA 4191 £1 HA 11710 £1 TA 4188 £1 TA 4197 £1 TA 4183 £1 TA 4197 £1 TA 4183 £1 TA 4195 £1 TA 4175 £1 TA 4177 £1 TA 4192 £1 TA 4146 £1 TA 7265 £3 TA 7699P £3	R 2010b 1.00 R 2029 50p R 2210 60p R 2257 60p R 2265 50p R 2305 50p R 2306 30p R 2322/2323 pair 80p R 2323 15p R 2396 50p R 2461 80p R 2030 50p R 2443=BD124 30p R 2540 1.00 R 2737 40p R 2775=TTP41 30p R 2738=TTP41 30p R 3129=TTP41c 40p R 4050 1.00 S 2008b 80p S 2008b 80p 25D898B 1.00 25C1942 1.00	PHILIPS METERS 4T5003-SBC 851 Analogue Multimeter £22.00	Computer Transformer		

