Service
Service
Service

VR120/02/55/58
VR170/02/07/39/58
VR220/02/07/39/58
VR270B/02/07/39/58
VR270W/02/07/39/58
VR402/58
VR420/02/39/58
VR520/02/07/16/58
VR570/02/07/16/39/58
VR572/02/16
VR620/02/07/16/39/58
VR622/02/16
VR627/02/16
VR670B/02/07/16
VR670B/39/58
VR670W/02/07/16
VR670W/39/58
VR720/02/07/16/39/58
VR870CC/02/07/16
VR870CC/39/58
VR870L/02/07/16
VR870L/39/58
SB140/03/38
SB145/03/11
SB445/11/38
SB645/03/11/38
SB745/03/11/38
20DV30/39
45DV30/39
65DV30/39

AA

Service Manual

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Survey of versions:

/02/03	PAL B/G, VPS/PDC
/05	PAL I, UK
/07	PAL I, Ireland
/11	PAL B/G, Belgium
/13	PAL B/G, Nordic
/16	PAL B/G, Spain / Nordic
/38/39	SECAM L, L' & PAL B/G, I
/55	PAL B/G, I, PAL/SECAM D/K
/58/59	PAL/SECAM B/G, D/K
/60	PAL/SECAM D/K

Survey of remote controls:

VR220/02/07/39/58 **VR420**/02/39/58	**RT112/111**	8622 661 12111
VR870L/02/07/16/39/58 **VR870CC**/02/07/16/39/58	**RT114/111**	8622 661 14111
SB140/03 **SB145**/03/11 **SB445**/11 **SB645**/03/11 **SB745**/03/11	**RT116/201**	8622 661 16201
SB140/38 **SB445**/38 **SB645**/38 **SB745**/38 **65DV30**/39 **45DV30**/39 **20DV30**/39	**RT116/204**	8622 661 16204
VR120/02/16/55/58 **VR402**/58 **VR520**/02/07/16/58	**RT121/101**	8622 661 21101
VR170/07/39/58 **VR270W**/02/07/39/58 **VR570**/02/07/16/39/58 **VR572**/02/16 **VR670W**/02/07/16/39/58	**RT121/111**	8622 661 21111
VR270B/02/07/39/58 **VR670B**/02/07/16/39/58	**RT121/121**	8622 661 21121
VR620/02/07/16/39/58 **VR622**/02/16	**RT123/111**	8622 661 23111
VR627/02/16 **VR720**/02/07/16/39/58	**RT128/112**	8622 661 28112

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PHILIPS

Contents

Contents

1. List of PWBs, Features, Technical specifications

1.1 Survey of sets and PWB's with software versions

	SYSTEMS											All in One-(AIO) µP Pos. 7899			key print connector print			TAPE DECK			
	System off air						Rec/Pb standard					Mobo			chapter 7			chapter 10			
												µP-ID No.									
	PAL BG	PAL I	SECAM BG	SECAM L/L'	PAL/SECAM DK	SECAM K1	PAL	SECAM	MESECAM	Pb NTSC on PAL TV	Pb Black & White	31 AC3P1 - xU	32 AC3B1 - xU	37 AC3P7 - xU	ACP 35	AKP 35	AKP 36	A12T-P2/0	A12T-P2/0LP	AT-S4/0	AT-S4/2
VR120/02	✓						✓				✓	✓						✓			
VR120/55	✓	✓	✓		✓		✓		✓	✓	✓	✓						✓			
VR120/58	✓		✓		✓		✓		✓	✓	✓	✓							✓		
VR170/02	✓						✓				✓		✓					✓			
VR170/07		✓					✓			✓	✓		✓						✓		
VR170/39	✓	✓	✓	✓			✓	✓	✓		✓		✓					✓			
VR170/58	✓		✓		✓		✓		✓	✓	✓		✓						✓		
VR220/02	✓						✓				✓		✓					✓			
VR220/07		✓					✓			✓	✓		✓						✓		
VR220/39	✓	✓	✓	✓			✓	✓	✓		✓		✓					✓			
VR220/58	✓		✓		✓		✓		✓	✓	✓		✓						✓		
VR270B/02	✓						✓				✓	✓						✓			
VR270B/07		✓					✓				✓	✓						✓			
VR270B/39	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
VR270B/58	✓		✓		✓		✓		✓	✓	✓	✓						✓			
VR270W/02	✓						✓				✓	✓						✓			
VR270W/07		✓					✓				✓	✓						✓			
VR270W/39	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
VR270W/58	✓		✓		✓		✓		✓	✓	✓	✓						✓			
VR402/58	✓		✓		✓		✓		✓	✓	✓	✓								✓	
VR420/02	✓						✓			✓	✓		✓							✓	
VR420/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓							✓	
VR420/58	✓		✓		✓		✓		✓	✓	✓		✓							✓	
VR520/02	✓						✓				✓		✓								✓
VR520/07		✓					✓				✓		✓								✓
VR520/16	✓						✓				✓		✓								✓
VR520/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR570/02	✓						✓			✓	✓		✓								✓
VR570/07		✓					✓			✓	✓		✓								✓
VR570/16	✓						✓			✓	✓		✓								✓
VR570/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
VR570/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR572/02	✓						✓			✓	✓		✓								✓
VR572/16	✓						✓			✓	✓		✓								✓
VR620/02	✓						✓			✓	✓			✓							✓
VR620/07		✓					✓			✓	✓			✓							✓
VR620/16	✓						✓			✓	✓			✓							✓
VR620/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓							✓
VR620/58	✓		✓		✓		✓		✓	✓	✓			✓							✓
VR622/02	✓						✓			✓	✓			✓							✓
VR622/16	✓						✓			✓	✓			✓							✓

	SYSTEMS											All in One-(AIO) µP Pos. 7899			key print connector print			TAPE DECK			
	System off air						Rec/Pb standard					Mobo			chapter 7			chapter 10			
												µP-ID No.									
	PAL BG	PAL I	SECAM BG	SECAM L/L'	PAL/SECAM DK	SECAM K1	PAL	SECAM	MESECAM	Pb NTSC on PAL TV	Pb Black & White	31 AC3P1 - xU	32 AC3B1 - xU	37 AC3P7 - xU	ACP 35	AKP 35	AKP 36	A12T-P2/0	A12T-P2/0LP	AT-S4/0	AT-S4/2
VR627/02	✓						✓			✓	✓			✓							✓
VR627/16	✓						✓			✓	✓			✓							✓
VR670B/02	✓						✓			✓	✓		✓								✓
VR670B/07		✓					✓			✓	✓		✓								✓
VR670B/16	✓						✓			✓	✓		✓								✓
VR670B/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
VR670B/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR670W/02	✓						✓			✓	✓		✓								✓
VR670W/07		✓					✓			✓	✓		✓								✓
VR670W/16	✓						✓			✓	✓		✓								✓
VR670W/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
VR670W/58	✓		✓		✓		✓		✓	✓	✓		✓								✓
VR720/02	✓						✓			✓	✓			✓			✓				✓
VR720/07		✓					✓			✓	✓			✓			✓				✓
VR720/16	✓						✓			✓	✓			✓			✓				✓
VR720/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓			✓				✓
VR720/58	✓		✓		✓		✓		✓					✓			✓				✓
VR870CC/02	✓						✓			✓	✓			✓	✓	✓					✓
VR870CC/07		✓					✓			✓	✓			✓	✓	✓					✓
VR870CC/16	✓						✓			✓	✓			✓	✓	✓					✓
VR870CC/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓	✓	✓					✓
VR870CC/58	✓		✓		✓		✓		✓	✓	✓			✓	✓	✓					✓
VR870L/02	✓						✓			✓	✓			✓	✓	✓					✓
VR870L/07		✓					✓			✓	✓			✓	✓	✓					✓
VR870L/16	✓						✓			✓	✓			✓	✓	✓					✓
VR870L/39	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓	✓	✓					✓
VR870L/58	✓		✓		✓		✓		✓	✓	✓			✓	✓	✓					✓
SB140/03	✓						✓				✓	✓						✓			
SB140/38	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
SB145/03	✓						✓			✓	✓		✓					✓			
SB145/11	✓						✓			✓	✓		✓					✓			
SB445/11	✓						✓			✓	✓		✓							✓	
SB445/38	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓							✓	
SB645/03	✓						✓			✓	✓		✓								✓
SB645/11	✓						✓			✓	✓		✓								✓
SB645/38	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
SB745/03	✓						✓			✓	✓		✓								✓
SB745/11	✓						✓			✓	✓		✓								✓
SB745/38	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓
20DV30/39	✓	✓	✓	✓			✓	✓	✓		✓	✓						✓			
45DV30/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓							✓	
65DV30/39	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓								✓

1.2 Features

	VR120/02	VR120/55	VR120/58	VR170/02	VR170/07	VR170/39	VR170/58	VR220/02	VR220/07	VR220/39	VR220/58	VR270B/02	VR270B/07	VR270B/39	VR270B/58	VR270W/02	VR270W/07	VR270W/39	VR270W/58	VR402/58	VR420/02
General																					
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																					
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo																					
NICAM																					
Splitter						✓				✓				✓				✓			
Auto Seek					✓				✓				✓				✓				
Mechanism																					
Number of Video Heads	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4
FM audio heads for stereo																					
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	260	260	260	100	100	100	100	100	100	100	100	260	260	260	260	260	260	260	260	260	100
Rewind Time (E180) sec	170	170	170	100	100	100	100	100	100	100	100	170	170	170	170	170	170	170	170	170	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)				✓	✓	✓	✓	✓	✓	✓	✓										✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																					
Plug & Play				✓	✓	✓	✓	✓	✓	✓	✓										✓
On Screen Display (OSD)				✓	✓	✓	✓	✓	✓	✓	✓										✓
Welcome Screen				✓	✓	✓	✓	✓	✓	✓	✓										✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																					
Follow TV (analog)				✓	✓	✓	✓	✓	✓	✓	✓										✓
Direct Record				✓	✓	✓	✓	✓	✓	✓	✓										✓
16:9 (pin 8)								✓	✓	✓	✓										✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly				✓	✓	✓	✓	✓	✓	✓	✓										✓
Showview / VideoPlus+				✓	✓	✓	✓	✓	✓	✓	✓										✓
ShowView Mapping																					✓
VPS + PDC (VPD)				✓	✓	✓	✓	✓	✓	✓	✓										✓
PDC (Time/Date) download				✓	✓	✓	✓	✓	✓	✓	✓										✓
Net-name detection				✓	✓	✓	✓	✓	✓	✓	✓										✓
Record Link / Scart 2								✓	✓	✓	✓										✓
Sat control via Mouse																					
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2																					
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play			✓		✓		✓		✓		✓									✓	✓
Auto LP											✓										✓
Tape List																					
SMART Picture																					
Connectors																					
Number of Scart connectors	1	1	1	2	2	2	2	2	2	2	2	1	1	2	1	1	1	2	1	1	2
Audio out cinch rear																					
Audio/Video in cinch front																					

	VR420/39	VR420/58	VR520/02	VR520/07	VR520/16	VR520/58	VR570/02	VR570/07	VR570/16	VR570/39	VR570/58	VR572/02	VR572/16	VR620/02	VR620/07	VR620/16	VR620/39	VR620/58	VR622/02	VR622/16
General																				
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																				
Hyperband, VHF, UHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NICAM				✓	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓		✓
Splitter	✓									✓							✓			
Auto Seek				✓				✓							✓					
Mechanism																				
Number of Video Heads	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
FM audio heads for stereo			2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Rewind Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																				
Plug & Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
On Screen Display (OSD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Welcome Screen	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																				
Follow TV (analog)	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Direct Record	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16:9 (pin 8)	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Showview / VideoPlus+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ShowView Mapping	✓	✓												✓	✓	✓	✓	✓	✓	✓
VPS + PDC (VPD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDC (Time/Date) download	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Net-name detection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Record Link / Scart 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sat control via mouse																				
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2														✓	✓	✓	✓	✓	✓	✓
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto LP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape List														✓	✓	✓	✓	✓	✓	✓
SMART Picture																				
Connectors																				
Number of Scart connectors	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Audio out cinch rear			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Audio/Video in cinch front														✓	✓	✓	✓	✓	✓	✓

	VR627/02	VR627/16	VR670B/02	VR670B/07	VR670B/16	VR670B/39	VR670B/58	VR670W/02	VR670W/07	VR670W/16	VR670W/39	VR670W/58	VR720/02	VR720/07	VR720/16	VR720/39	VR720/58	VR870CC/02	VR870CC/07	VR870CC/16
General																				
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																				
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NICAM		✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
Splitter						✓					✓					✓				
Auto Seek				✓					✓					✓					✓	
Mechanism																				
Number of Video Heads	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
FM audio heads for stereo	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Rewind Time (E180) sec	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																				
Plug & Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
On Screen Display (OSD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Welcome Screen	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Easy link / NexTView Link (P50)																		✓	✓	✓
Follow TV (analog)	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
Direct Record	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
16:9 (pin 8)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Daily/Weekly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Showview / VideoPlus+	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ShowView Mapping	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
VPS + PDC (VPD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDC (Time/Date) download	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Net-name detection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Record Link / Scart 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sat control via mouse													✓	✓		✓				
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Auto LP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape List	✓	✓											✓	✓	✓	✓	✓			
SMART Picture	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓
Connectors																				
Number of Scart connectors	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Audio out cinch rear	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Audio/Video in cinch front	✓	✓											✓	✓	✓	✓	✓	✓	✓	✓

	VR870CC/39	VR870CC/58	VR870L/02	VR870L/07	VR870L/16	VR870L/39	VR870L/58	SB140/03	SB140/38	SB145/03	SB145/11	SB445/11	SB445/38	SB645/03	SB645/11	SB645/38	SB745/03	SB745/11	SB745/38	20DV30/39	45DV30/39	65DV30/39
General																						
Auto Standby On/Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Presets 1yr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backup Clock / Timer 3hrs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Events / month	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Low Power Standby Power Cons. [Watts]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tuning - presets (only channel input)	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Systems																						
Hyperband, UHF, VHF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mono	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
German Stereo	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓			✓
NICAM	✓	✓		✓	✓	✓	✓								✓	✓		✓	✓			✓
Splitter	✓					✓			✓				✓			✓			✓	✓	✓	✓
Auto Seek				✓																		
Mechanism																						
Number of Video Heads	4	4	4	4	4	4	4	2	2	2	2	4	4	4	4	4	4	4	4	2	4	4
FM audio heads for stereo	2	2	2	2	2	2	2							2	2	2	2	2	2			2
Head Cleaning Mode/automatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Winding Time (E180) sec	100	100	100	100	100	100	100	260	260	260	260	260	260	260	260	260	100	100	100	260	260	260
Rewind Time (E180) sec	100	100	100	100	100	100	100	170	170	170	170	170	170	170	170	170	100	100	100	170	170	170
Quick View	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter lin. Relative (h.m.s.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tape Counter Time Left (h.m)	✓	✓	✓	✓	✓	✓	✓										✓	✓	✓			
VISS: next/prev. index / blank tape search	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Features																						
Plug & Play	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
On Screen Display (OSD)	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Welcome Screen	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Auto Install/Search/Store/Tuning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
easy link / NexTView Link (P50)	✓	✓	✓	✓	✓	✓	✓															
Follow TV (analog)	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Direct Record	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
16:9 (pin 8)	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓			✓
Digital Studio Picture Control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial Skip	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Turbo Timer	✓	✓	✓	✓	✓	✓	✓															
Daily/Weekly	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Showview / VideoPlus+	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
ShowView Mapping	✓	✓	✓	✓	✓	✓	✓															
VPS + PDC (VPD)	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
PDC (Time/Date) download	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Net-name detection	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Record Link / Scart 2	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Sat control via mouse																						
Child Lock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCR1/VCR2	✓	✓	✓	✓	✓	✓	✓															
OTR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Long Play	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Auto LP	✓	✓	✓	✓	✓	✓	✓										✓	✓	✓			
Tape List																						
SMART Picture	✓	✓	✓	✓	✓	✓	✓															
Connectors																						
Number of Scart connectors	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Audio out cinch rear	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓			✓
Audio/Video in cinch front	✓	✓	✓	✓	✓	✓	✓										✓	✓	✓			

1.3 Technical specification

Mains voltage	:	220 - 240 V, +/- 10%
Mains frequency	:	45 - 65 Hz
Power consumption	:	mono 12.5 W during operation
	:	HiFi 16 W during operation
without Low Power Standby	:	mono 4 W during standby
	:	HiFi 4.4 W during standby
with Low Power Standby	:	< 4 W standby
Ambient temperature	:	+10°C to +35°C
Relative humidity	:	20 - 80 %
Dimensions	:	380 x 260 x 94 mm
Weight	:	3,7 kg
Fast forward/rewind time (turbo)	:	typ. 100s (E180 cass.)
Position of use	:	horizontally, max. 15°
Video resolution	:	≥240 lines
Audio SP: Linear Audio	:	80Hz - 10kHz (±6 dB)
Audio LP: Linear Audio	:	80Hz - 5kHz (±6 dB)
Stereo FM Audio	:	20Hz - 20kHz (±3dB)

Euroconnector (AV1) SCART plug 1
Connection to TV, monitor, projection TV ...

Pin 1	ARO (audio right out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 2	ARI (audio right in)	0,2 V_{rms} to 2V_{rms}	R_{in}	10 kOhm
Pin 3	ALO (audio left out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 6	ALI (audio left in)	0,2 V_{rms} to 2 V_{rms}	R_{in}	10 kOhm
Pin 7	Blue (out) **)			
Pin 8	Switching output:	(with R_{load} = 10kOhm, C_{load}<2nF) low: 2 V high: 9.5 V rise time: 5 ms		
Pin 11	Green (out) **)			
Pin 15	Red (out) **)			
Pin 16	Blanking (out) **)	loop through enabled during standby, view-mode		
Pin 19	CVBS II (video out)	1 V_{pp} +1/-2dB	R_{out}	75 Ohm
Pin 20	CVBS I (video in)	1 V_{pp} +3/-3dB	R_{in}	75 Ohm

**) passive loop through from AV2

Euroconnector (AV2) SCART plug 2
Connection to decoder, SAT tuner, video disc, 2nd VCR ...

Pin 1	ARO (audio right out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 2	ARI (audio right in)	0,2 V_{rms} to 2V_{rms}	R_{in}	10 kOhm
Pin 3	ALO (audio left out)	500 mV_{rms} +/- 3 dB	R_{out}	1 kOhm
Pin 6	ALI (audio left in)	0,2 V_{rms} to 2 V_{rms}	R_{in}	10 kOhm
Pin 7	Blue (out) **)			
Pin 8	Switching input only:	low: 2 V (low)	R_{in}	10 kOhm
		high: 4.5 V (high)	R_{in}	10 kOhm
Pin 11	Green (in) *)			
Pin 15	Red (in) *)			
Pin 16	Blanking (in) *)	loop through enabled during standby, view-mode		
Pin 19	CVBS II (video out)	1 V_{pp} +1/-2dB	R_{out}	75 Ohm
Pin 20	CVBS I (video in)	1 V_{pp} +3/-3dB	R_{in}	75 Ohm

*) passive loop through to Euroconnector AV1

Cinch Audio/Video input on front panel (OPTION)

Audio:

AINFR (audio right in) red	0.2 V_{rms} to 2 V_{rms}	typ. 500 mV_{rms}
AINFL (audio left in) white	0.2 V_{rms} to 2 V_{rms}	typ. 500 mV_{rms}
Input impedance	47 kOhm	

Video:

VFR yellow	1 Vpp + 3 / -3 dB
Input impedance	75 Ohm

Cinch Audio Out Rear (OPTION)

AOUT1R (audio right out) red	500 mV_{rms} +/- 3 dB R_{out} 1 kOhm
AOUT1L (audio left out) white	500 mV_{rms} +/- 3 dB R_{out} 1 kOhm

This outputs are in parallel with the corresponding outputs on Euroconnector 1.

TUMOD

Modulator:

Frequency range loop through		45 MHz - 860 MHz
Gain:	ANT IN - TV OUT	2 dB + 3 / -2 dB
	ANT IN - TUN OUT	2 dB + 3 / -2 dB
Switch for RF input attenuation		NO
Frequency range out (tuned by IIC bus)		Ch 21 - Ch55

Tuner:

Frequency range		43 MHz - 860 MHz
	for UK	450 MHz - 860MHz
Input voltage	max.	< 100 dBµV
	min.	> 60 dBµV

2. Safety instructions, Modifications

2.1 Safety instructions

- Safety regulations demand that the set be restored to its original condition and that components identical with the original types be used.
- Safety components are marked by the symbol ▲
- All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair may reduce life drastically. When repairing, make sure that you are conneted with the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools on the same potential.
- A set to be repaired should always be connected to the mains via a suitable isolating transformer.
- Never replace any modules or any other parts while the set is switched on.
- Use plastic instead of metal alignment tools. This in order to prelude short-circuit or to prevent a specific circuit from being rendered unstable.

2.1.1 Remarks

- The direct voltages and oscillograms ought to be measured relative to the set mass.
- The direct voltages and oscillograms mentioned in the diagrams ought to be measured with a colour bar signal and the picture carrier at 503.25 MHz (C25).
- The oscillograms and direct voltages have been measured in RECORD or PLAY mode.
- The semiconductors, which are mentioned in the circuit diagram and in the parts lists, are fully exchangeable per position with the semiconductors in the set, irrespective of the type designation of these semiconductors.

Engineer's remarks:

2.2 Modifications

2.2.1 Updating the service manual

All modifications and/or supplements to the Service Manual are published by means of Service Information bulletins.

Each Service Information is numbered:

A Service Information bulletin consists of a front page which, if needed, is followed by supplementary and/or replacement sheets.

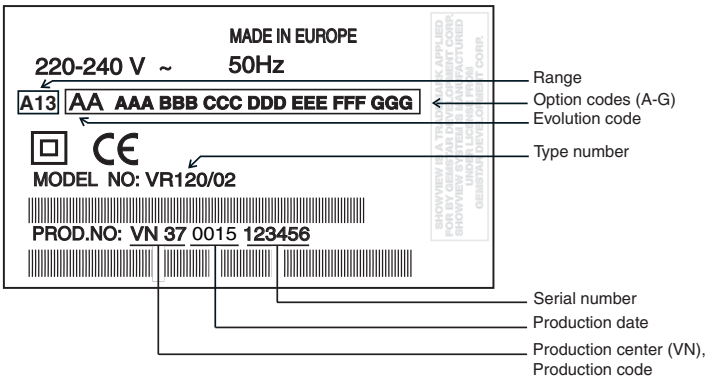
Replacement sheets should replace existing sheets in the Service Manual. These sheets are identified by an additional letter after the page number.
Example: Page 5-1a replaces page 5-1 in the Service Manual.

Supplementary sheets should be inserted between existing sheets in the Service Manual. These sheets are identified by an additional figure after the page number.
Example: Page 5-1-1 should be inserted after page 5-1.

2.2.2 Modifications in the set

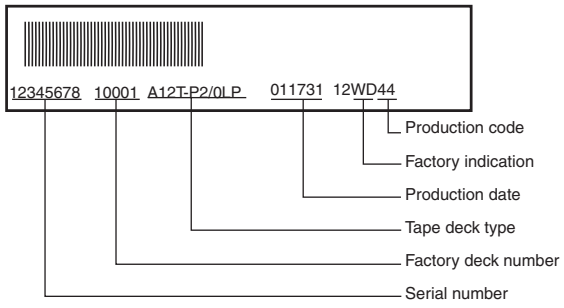
All important parts of the set (such as the tape deck, the printed circuits and modules) are equiped with a sticker. Those stickers provide a number of important information.

Type plate
The type plate is located on the back cover.



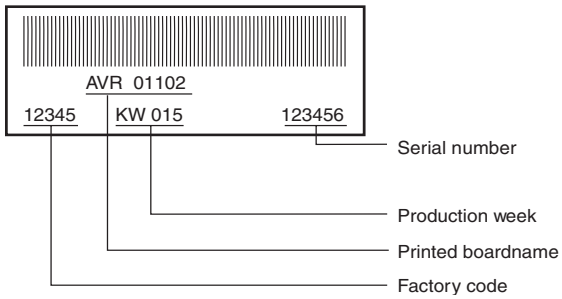
Note:
- In case of an important change in the set, the production code on the type plate is incremented: E.g. 37 becomes 38.
- In case of a major change in the set, the evolution code is incremented: E.g. AA becomes AB.

Tape deck



Note:
- The production code and the serial number on the tape deck do not correspond to the production code and the serial number on the type plate.

Printed circuits
The sticker is generally located on the copper side of the board.
Example:

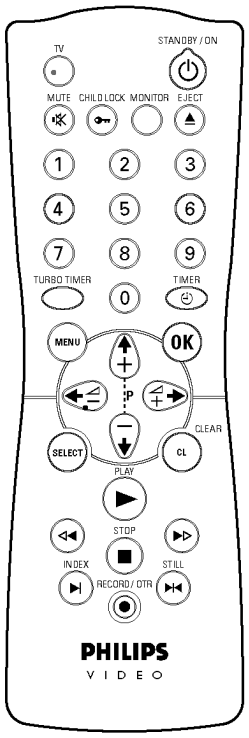


Note:
- The production code number might not always be mentioned.

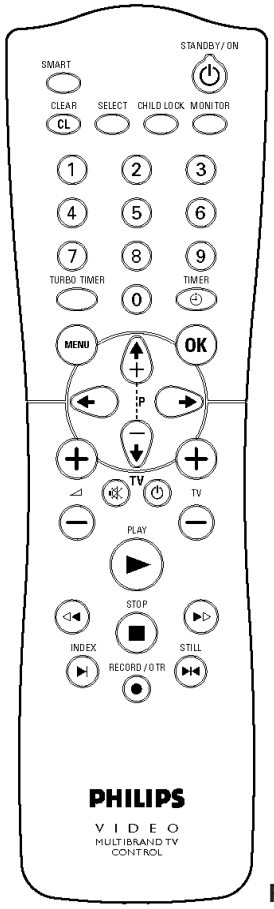
In case of an important modification, the last figure of the factory code number (point number) is increased by one: E.g. 8502.1 becomes 8502.2

3. Direction for use

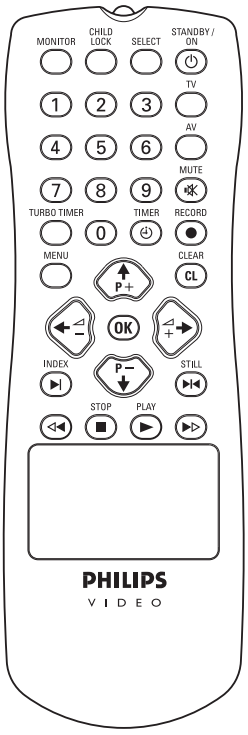
RT111
RT116



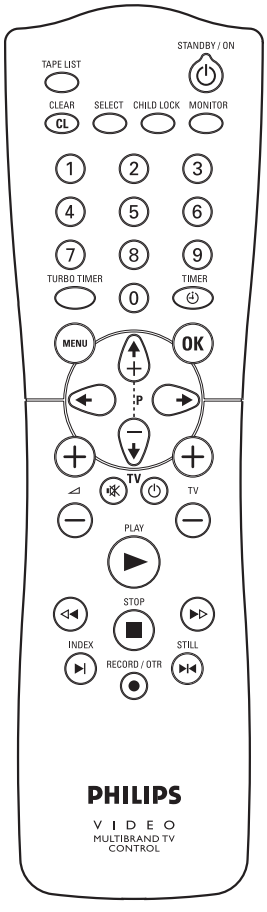
RT112



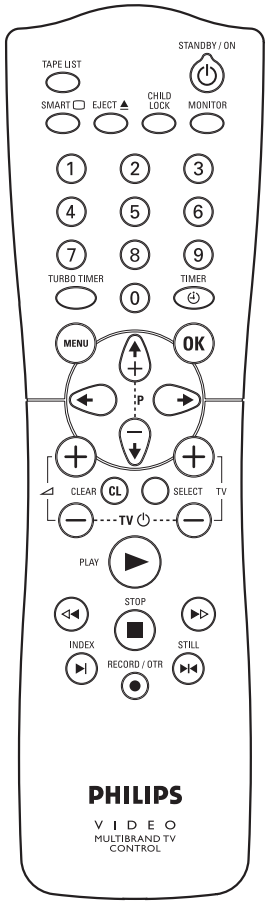
RT114



RT121



RT123



RT128

Remote control

SMART **SMART**: To adjust the picture setting during playback

STANDBY/ON ⏻ **Switch off** : To switch off set, interrupt menu function, interrupt a programmed recording (TIMER)

CLEAR (CL) **Delete** : To delete last entry/Clear programmed recording (TIMER)

SELECT **Select**: To select a function

CHILD LOCK **Child Lock** : To switch child lock on/off

MONITOR **TV monitor** : To switch between TV reception and VCR playback

0-9 **Number buttons**: 0 - 9

TURBO TIMER **TurboTimer**Aufnahmen programmieren mit der Funktion TurboTimer

TIMER ⏲ **TIMER**: To make a manual TIMER programming or to alter or clear a programmed TIMER

MENU **Menu** : To call up or end main menu

OK **Store/Confirm**: To store or confirm entry

← **Select**: Cursor left

→ **Select**: Cursor right

↑→+ **Select**: To select a programme number

−→↓ **Select**: To select a programme number

PLAY ▶ **Playback** : To play a recorded cassette

◁◀ **Rewind** : During STOP and STANDBY: rewind, during PLAYBACK: reverse scanning

STOP ■ **Pause/Stop**: To stop the tape, except while a TIMER-recording is being made

▶▷ **Forward wind**: During STOP and STANDBY: forward wind, during PLAYBACK: forward scanning

INDEX ▶I **Index search**: In combination with ◁◀/▶▷: to search for previous or next recording on the cassette.

RECORD ● **Record**: To record the programme selected

STILL ▶I◀ **Still picture** : To stop the tape and show a still picture

Additional TV functions

◿+ **TV volume**: TV volume up

◿− **TV volume**: TV volume down

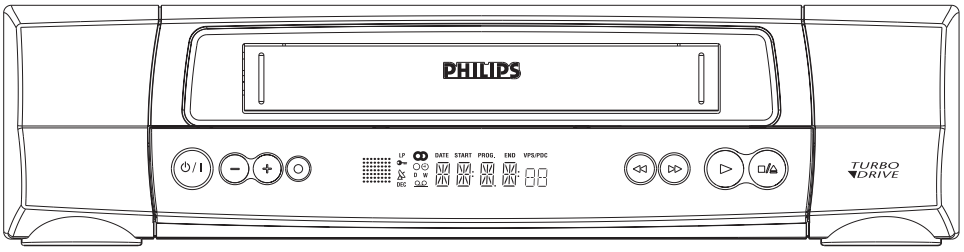
TV 🔇 **TV sound off** : To switch the sound on or off

TV ⏻ **Switch off** : To switch off the TV

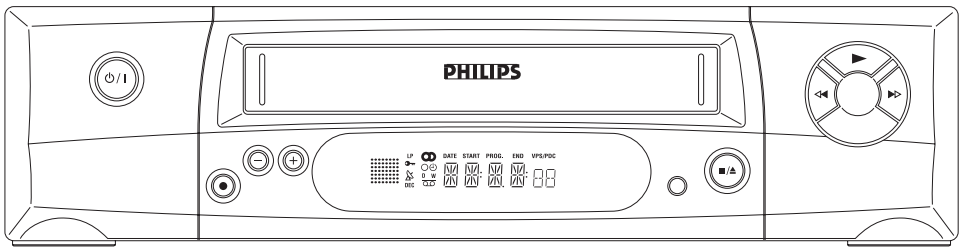
TV + **TV Programme number**: TV programme number up

TV − **TV Programme number**: TV programme number down

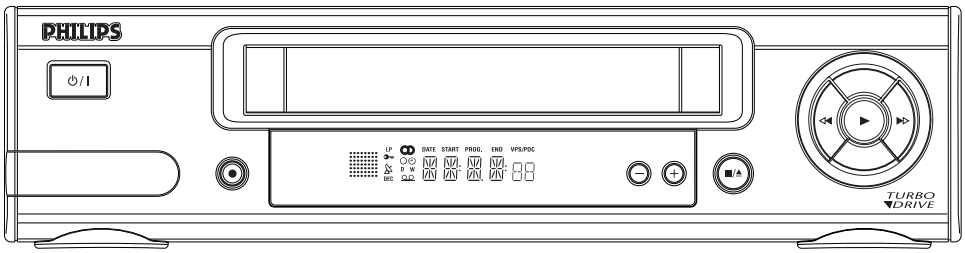
Set width 380 mm



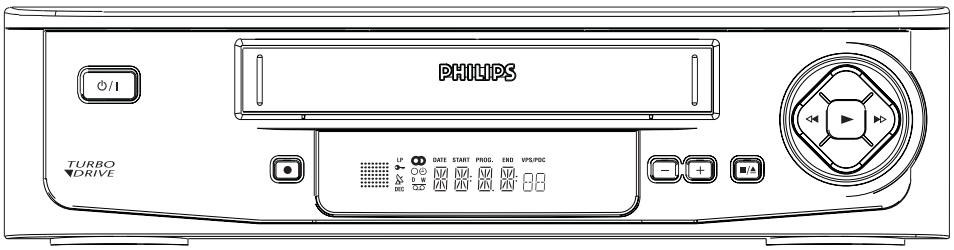
VR120
VR402
VR520



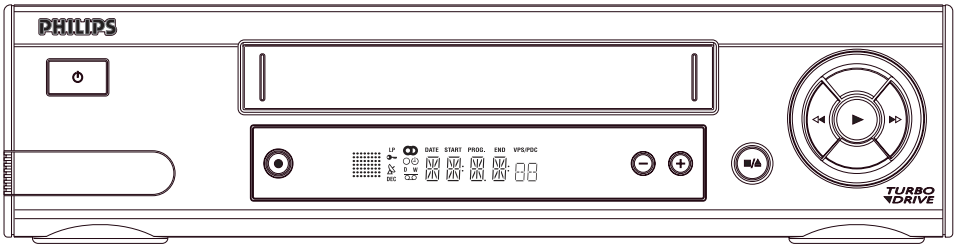
VR170
VR570
VR572



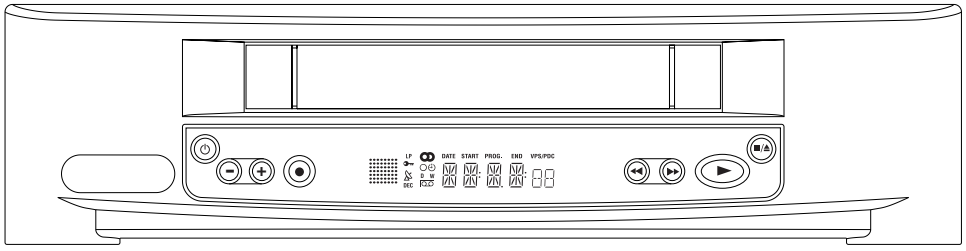
VR220
VR420



VR270B
VR270W
VR670B
VR670W

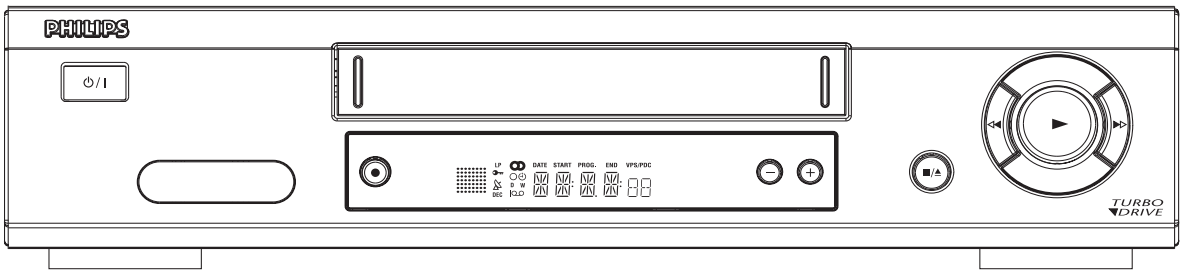


VR620
VR622
VR627

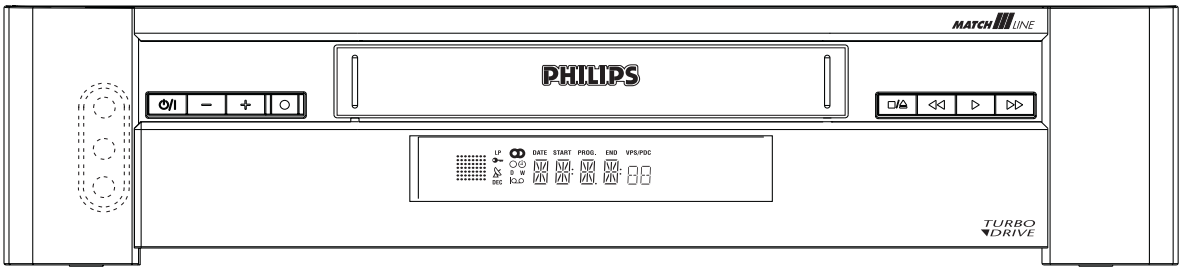


SB140
SB145
SB445
SB645
SB745
20DV30
45DV30
65DV30

Set width 435 mm



VR720



VR870L
VR870CC

STANDBY ⏻ **Standby** : To switch off or on, interrupt a function, interrupt a programmed recording (TIMER)

RECORD ● **Record**: To record the programme selected

AUDIO **Audio input socket left/right** : To connect a camera recorder or video recorder (programme number 'E3')

VIDEO **Video input socket** : To connect a camera recorder or video recorder ('E3')

PROGRAMME − **Select**: One line or programme number down.

PROGRAMME + **Select**: One line or programme number up.

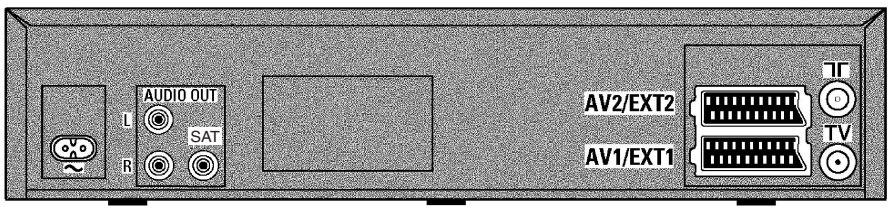
◁◀ **Rewind** : During STOP and STANDBY: rewind, during PLAYBACK: reverse scanning

PLAY ▶ **Playback** : To play a cassette

▶▷ **Forward wind**: During STOP and STANDBY: forward wind, during PLAYBACK: forward scanning

STOP/EJECT ■/⏏ **Pause/Stop, eject cassette**: To stop the tape and eject the cassette

Back of the set



~ **Mains socket**: To connect the mains cable

IR-SAT **Satmouse socket**: To connect a satmouse.

AV2 EXT2 **Scart socket 2**: To connect a satellite receiver, decoder, video recorder, etc. (programme number 'E2')

AV1 EXT1 **Scart socket 1**: To connect the TV set (programme number 'E 1')

Aerial input socket: To connect the aerial cable

TV **Aerial output socket**: To connect the TV set

1 Introduction

Special functions of your new video recorder

Your PHILIPS video recorder is not just for recording and playing back VHS cassettes. It also has a whole range of special functions which will make the day-to-day use of your new video recorder much easier.

DIGITAL STUDIO PICTURE CONTROL

Philips has developed a system which produces the best possible playback quality. For old and often-used video cassettes, this system reduces interference. For new or high quality cassettes, it emphasises the details.

SMART PICTURE

This function allows you to save the playback settings that suit you best. Select your own personal settings for this type of film you are currently watching.

Plug and Play

When you connect your video recorder to your television and plug it into the wall socket, you will be welcomed with a screen menu. All you have to do is follow the instructions in the 'intelligent help line' for the next step. Enjoy the automatic TV channel search/save function and the automatic time setting.

Multibrand TV control

You can operate the main functions on your television using your video recorder remote control, even if your television is not a Philips.

Follow TV

This function automatically transfers all the television channel settings onto your video recorder.

Record Link

Recordings made on your video recorder can be controlled by an external satellite receiver.

Direct Record

Your video recorder can ascertain which channel is currently playing on your television and record from it at the touch of a button.

TURBO DRIVE

The precision tape drive from Philips provides short rewind times and automatic tape length recognition.

SHOWVIEW®

Simple programming system for video recorders. Makes programming as easy as making a telephone call. Simply enter the number code associated with your television programme. This number is located in your favourite television listings magazine.

So that you can identify your machine for service questions or in the event of theft, enter the serial number here. The serial number (PROD.NO.) is printed on the type plate fixed at the back of the device.

MODEL NO.	VR720/58	PHILIPS	PHILIPS
PROD. NO.	.....		

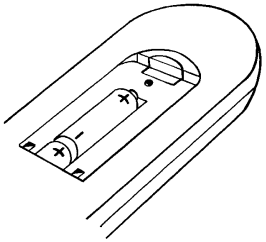
2 Connecting the video recorder

The symbols on your video recorder display

These symbols can light up on your video recorder display:

	This is where the current operating mode is shown as a symbol.
LP	When you have switched on the LP (Long Play) function or when you play a tape that has been recorded in LP (Long Play).
	When you have switched on the child lock.
	When a satellite recording has been programmed.
DEC	When a decoder has been allocated to the TV channel (currently selected programme number on the video recorder) you have currently selected on the video recorder.
	When you play a cassette that has been recorded with hifi sound, or when a hifi sound is transmitted.
	When you are making a recording.
	When you have programmed a recording or when a programmed recording is being made.
D	When you are programming daily recordings.
W	When you are programming weekly recordings.
	When you have put a cassette in the video recorder.
DATE	When the date of the programmed recording is shown.
START	When the start time of the programmed recording is shown.
PROG.	When the programme number of the programmed recording is shown.
END	When the end time of the programmed recording is shown.
VPS/PDC	Video Programming System / Programme Delivery Control: when a VPS or PDC code is being transmitted.
	Display of programme number of the TV channel / tape position / channel name / function.
	Tape position in seconds.

Preparing the remote control for operation



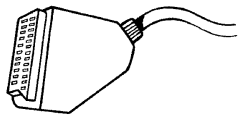
The remote control and its batteries are packed separately in the original video recorder packaging. You must install the batteries in the remote control before use - described in the following section.

1. Take the remote control and the enclosed batteries (2 batteries).
2. Open the remote control's battery compartment and place the batteries in it as shown in the picture and close the battery compartment.

The remote control is now ready to use. Its range is approximately 5 meters.

Connecting your video recorder to the TV set

The necessary cable connections must be made before you can record or playback TV programmes using your video recorder.
We recommend that you use a scart cable to connect your TV set and video recorder.



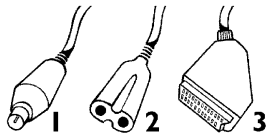
What is a scart cable?
The scart or Euro AV cable serves as the universal connector for picture, sound and control signals. With this type of connection, there is practically no loss of quality during the picture or sound transfer.

When you install your video recorder for the first time, select one of the following options:

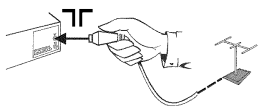
'Connecting with a scart cable'
If your TV set has a scart socket and you are using a scart cable.

'Connecting without a scart cable'
If you do **not** wish to use a scart cable.

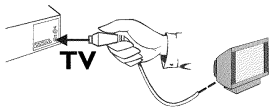
Connecting with a scart cable



Have the following cables ready:
an aerial cable (1, supplied), a mains cable (2, supplied), a scart cable (3).



1. Remove the aerial cable plug from your TV set. Insert it into the socket ⊓ at the back of the video recorder.



2. Insert one end of the supplied aerial cable into the socket ⓣⓥ at the back of the video recorder and the other end into the aerial input socket at the back of the TV set.

3. Plug one end of a scart cable into the scart socket **EXT.1 AV 1** at the back of the video recorder and the other end into the suitable scart socket on your TV set (see your TV's operating instructions).

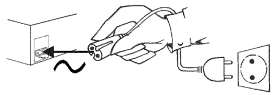
My TV set has several scart sockets. Which one should I use?

Select that scart socket which is suited for the video output as well as for the video input.

My TV offers me a selection menu for the scart socket.

Select 'TV' as a connection source of this scart socket.

4. Switch on the TV set.



5. Insert one end of the supplied mains cable into the mains socket ∼ at the back of the video recorder and the other end into the wall socket.

6. If the connection was properly made and your TV was **automatically switched** to the programme number for the scart socket, e.g. 'EXT', '0', 'AV', you will see the following picture:

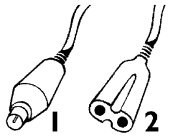
× My screen is empty

✓ Many TV sets are switched to the programme number for the scart socket by way of a control signal sent through the scart cable.

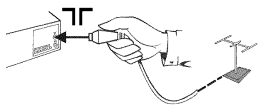
✓ If the TV set does not automatically switch to the scart socket programme number, manually change to the corresponding programme number on your TV set (see your TV's operating instructions).

Then, read the paragraph 'Initial installation' in the chapter 'Installing your video recorder'.

Connecting without a scart cable

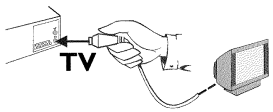


Have the following cables ready:
an aerial cable (1, supplied), a mains cable (2, supplied).

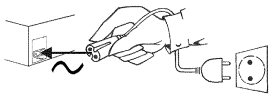


1. Switch off your TV set.

2. Remove the aerial cable plug from the aerial input socket of the TV set. Insert it into the socket ⊓ at the back of the video recorder.



3. Insert one end of the supplied aerial cable into the socket ⓣⓥ at the back of the video recorder and the other end into the aerial input socket at the back of the TV set.



4. Insert one end of the supplied mains cable into the mains socket ∼ at the back of the video recorder and the other end into the wall socket.

5. Switch on your TV set and select the programme number used for video playback on your TV set (see your TV's operating instructions).

Which programme number is used for video recorder operation?

To ensure the stability of the television picture during cassette playback (prevention of waves or streaks), special programme numbers have been set aside on the TV for the use of video recorders. This is usually the highest possible programme number, e.g. '12', '16', '99' or even programme number '0'. For more information, please see your TV's operating instructions.

6 Select this programme number and manually start the TV's channel search as if you wanted to save a new TV channel until the 'test image' appears.

× I do not see a 'test screen'
✓ Check the cable connections.
✓ The video recorder 'transmits' on the 591MHz frequency (channel 36) Repeat the channel search on your TV set.

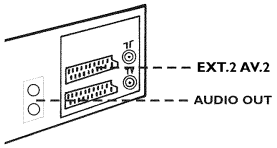
7 Save this programme number setting on your TV set for video recorder operation.

Programme number for video recorder operation
You have now saved a programme number for use by your video recorder as you would a regular TV channel. This programme number must now be used in future for video recorder playback ('video recorder' TV channel).

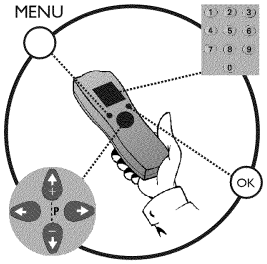
You can find more details in chapter 'Initial Installation'.

Connecting additional devices

You can connect additional devices such as decoders, satellite receivers, camcorders, etc. to the socket **EXT.2 AV 2** .
Two audio sockets **AUDO OUT L R** are located on the back of the video recorder (audio signal output left/right). These can be used to connect stereo systems.



3 Installing your video recording



Initial installation

This chapter shows you how to start the initial installation. The video recorder automatically seeks out and stores all available TV channels.

'Aim' correctly
In the following sections, you require the remote control for the first time. When using, always aim the front of the remote control at the video recorder and not at the TV set.

Connecting additional devices
After you have connected additional devices (satellite receiver, etc.) through the aerial cable, switch them on. The automatic channel search will recognise them and save them.

1 Confirm the image on the TV screen by pressing the **OK** button on the remote control.

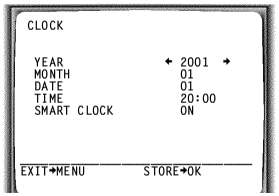
2 Select the desired language for the on-screen menu by pressing **P −↓** or **↑+ P** .

What is an on-screen menu?
The multi-language on-screen menu takes the mystery out of using your new video recorder. All settings and/or functions are displayed on your TV screen in the corresponding language.

3 Confirm with **OK** .

4 Select the country of your residence with **P −↓** or **↑+ P** .
If your country does not appear, select 'OTHERS'.
Confirm with **OK** .

× The video recorder does not find any TV channels during the search
✓ Select channel 1 on the TV set. Can you see the saved TV channel on the TV set?
If not, check the cable connection of the aerial (aerial socket), video recorder, TV set.
✓ Please have patience.
The video recorder searches the entire frequency range in order to find and save the largest possible number of TV channels. It is possible that the TV channels in your country are broadcast in a higher frequency range. As soon as this range is reached during the search, the video recorder will find the TV channels.



5 When the automatic TV channel search is complete, 'STORED' will briefly appear on the TV screen.
'YEAR', 'MONTH', 'DATE', 'TIME' will appear on the TV screen.

6 Check the year in line 'YEAR'. If required, please change the year with the number buttons **0-9** on the remote control.

7. Select the next line with ↑+P or P−↓.

8. Check if the displayed settings for 'MONTH', 'DATE' and 'TIME' are correct.

9. When all information is correct, save by pressing **OK**. 'STORED' will briefly flash in the video recorder display.

The initial installation is now complete.

Satellite receiver

If you are connecting a satellite receiver, please read the section 'Using the satellite receiver'.

Decoder

If you are connecting a decoder, you must install it as described in the next section.

× Sound disruptions can occur on several TV channels

✓ If sound disruptions should occur for several saved TV channels or there is no sound at all, it is possible that the incorrect TV system was saved for this TV channel. In the chapter 'Manual TV channel search' you will find the information on how to change the TV system.

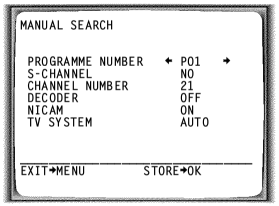
Decoder allocation

Some TV channels transmit encoded TV signals which can only be viewed with a commercially purchased or hired decoder without disturbances. You can connect such a decoder (descrambler) to this video recorder. The following function will automatically activate the connected decoder for the desired TV channel.

1. Switch the TV on. If applicable, select the programme number for the video recorder operation.

2. Use the buttons ↑+P, P−↓ on the video recorder or the number buttons **0-9** on the remote control to select the TV channel which you would like to allocate the decoder to.

3. Press the button **MENU** on the remote control. The main menu will appear.



4. Use the buttons ↑+P or P−↓ to select the line 'MANUAL SEARCH' and confirm with **OK**.

5. Use the buttons P−↓ or ↑+P to select the line 'DECODER'.

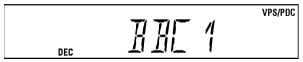
6. Use the buttons ← or → to select 'ON' (Decoder switched on).

How can I switch off the decoder?

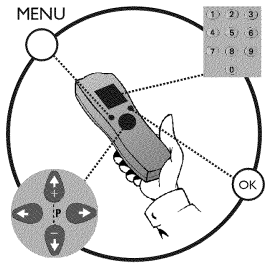
Use the button → on the screen to select 'OFF' (Decoder switched off).

7. Confirm with **OK**.

8. End with the button **MENU**.

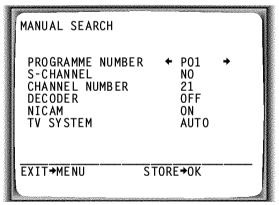


The decoder has now been allocated to this TV channel.
If this TV channel is chosen, the symbol 'DEC' will appear in the video recorder display.



Manual TV channel search

In some cases it could occur that all of the TV channels were not found and saved during the initial installation. In this case, the missing or coded TV channels must be searched for and stored manually.



1. Switch on the TV set. If required, select the programme number for the video recorder.

2. Press **MENU** on the remote control.
The main menu will appear.

3. Select line 'MANUAL SEARCH' using P−↓ or ↑+P and confirm with **OK**.

4. Select line 'PROGRAMME NUMBER' using P−↓ or ↑+P.

5. Using ← or →, select the desired programme number that you want to use for the TV channel, e.g. 'P01'.

6. In line 'S-CHANNEL', select the desired display using →.

What is hidden behind the settings?

'NO': Display/Entry of channels
'YES': Display/Entry of special channels

What is a special channel?

TV channels are transmitted in certain pre-defined frequency ranges. These ranges are divided into channels. A specific frequency/channel is assigned to each TV station. Certain frequency ranges are specified as special channels (hyperband channels).

❼ In line 'CHANNEL NUMBER', enter the channel of the desired TV station using the number buttons **0-9** .

× I don't know the channels for my TV stations

✓ In this case, press → in line 'CHANNEL NUMBER' to start the automatic channel search. A changing channel number will appear on the TV screen. Continue the automatic search until you have found the desired TV channel.

What is NICAM?

NICAM is a digital sound transmission system. Using NICAM, you can transmit either 1 stereo channel or 2 separate mono channels. However, if you experience poor reception resulting in sound disruptions, you can turn off NICAM.
In line 'NICAM', select 'OFF' using ← or → .

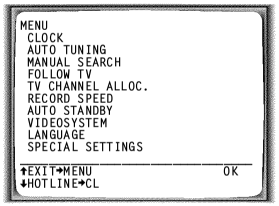
How can I change the TV transmission system of the TV channel?

In line 'TV SYSTEM', select the corresponding TV system using ← or → until the picture/sound disruptions are minimised.

❽ Save the TV channel with **OK** . 'STORED' will briefly appear on the TV screen.

❾ To search for other TV channels, begin again at step ❸ .

❿ To end, press **MENU** .



Using the satellite receiver

TV channels from a satellite receiver (connected to the scart socket **EXT.2 AV 2**) are received on the video recorder on programme number 'E2'.
To do this, select programme number 'E1' with **0** on the remote control and then select programme number 'E2' with **P −↓** .
You should select the TV channels to be received by the satellite receiver directly on the receiver itself.

Sorting TV channels automatically (Follow TV)

When the automatic channel search function is activated, the TV channels are saved in a specific order. This may vary from the order of TV channels on the TV set.
This function changes the order of TV channels saved in the video recorder to match that of the TV set.
This only works if the video recorder (socket **EXT.1 AV 1**) and the TV set **are connected with a scart cable**.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press the **MENU** button on the remote control. The main menu will appear.

❸ Select line 'FOLLOW TV' using **P −↓** or **↑+ P** and confirm with **OK** .

❹ Press the **OK** button. 'TV01' will appear in the video recorder display.

❺ Select programme number '1' **on the TV set**.

× I cannot switch my TV set to programme number 'I'

✓ If you have connected additional devices to socket **EXT.2 AV 2** , please disconnect these devices. Because of other connected devices, the TV set could switch to the programme number of the scart socket.

❻ Confirm with **OK** on the video recorder remote control. The video recorder compares the TV channels on the TV set and the video recorder.
If the video recorder finds the same TV channel as on the TV set, then it stores it at 'P01'.

× 'NOTV' will appear in the display. The video recorder is not receiving a video signal from the TV set.

✓ Check the plug on the scart cable.

✓ Check your TV's operating instructions to see which scart socket is used for video signals.

✓ If this does not help, it's not possible to use this function.
Please read the section 'Sorting TV channels manually'.

❼ Wait until the next number, e.g. 'TV02' appears in the display.

❽ Select the next programme number **on the TV set**, e.g. '2'.

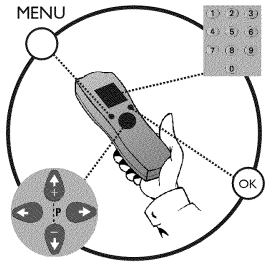
❾ Confirm with **OK** on the video recorder remote control.

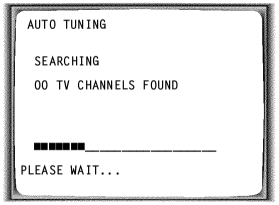
Deleting sorting

You can delete an incorrect TV channel sorting by pressing **CLEAR (CL)** .

❿ Repeat steps ❼ to ❾ until you have assigned a programme number to all TV channels.

⓫ To end, press **MENU** .





Automatic TV channel search

During installation, all available TV channels are searched for and saved. If the channel assignments of your cable or satellite TV provider change or if you are reinstalling the video recorder, e.g. after moving house, you can start this procedure again. This will replace the TV channels already saved with the new ones.

❶ Switch on the TV set. If required, select the programme number for the video recorder.

❷ Press the **MENU** button on the remote control. The main menu will appear.

❸ Select line 'AUTO TUNING' using **P −↓** or **↑+P** .

❹ Press **OK** .

❺ Select the country of your residence with **↑+P** or **P −↓** .
If your country doesn't appear, select 'OTHERS'.

❻ Press **OK** .

❼ The automatic TV channel search starts. This allows the video recorder to save all available TV channels. This procedure may take several minutes.

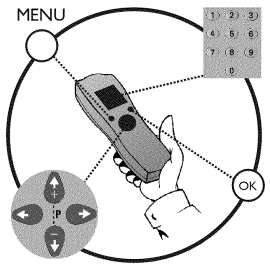
❽ When the TV channel search is complete, 'STORED' will briefly appear on the TV screen.

❾ To end, press **MENU** .

You can read about how to search for a TV channel manually in the section 'Manual TV channel search'.

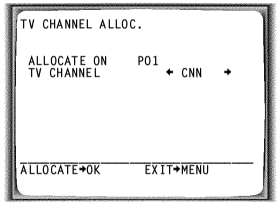
Monitor function

You can switch back and forth between the TV picture and video recorder picture with **MONITOR** . But this only works when you use a scart cable to connect the video recorder to your TV set and your TV set responds to this switch-over.



Sorting and clearing TV channels manually

After you have performed the automatic channel search you may not agree with the sequence in which the individual TV channels have been allocated to the programme positions (programme numbers) of the video recorder. You can use this function to individually sort the TV channels already saved or to delete unwanted TV channels or those with poor reception.



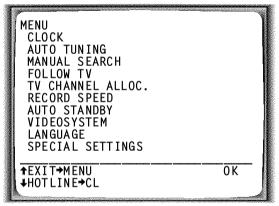
1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.
3. Select line 'TV CHANNEL ALLOC.' using **P −↓** or **↑+P**.
4. Confirm with **OK**.
5. Using ← or →, select the saved TV channel that you want to assign to the programme number 'P01'.
6. Confirm with **OK**. The following message will briefly appear on the TV screen: 'ALLOCATED ON P01'.
7. Then the sorting for the next highest programme number will appear on the screen, e.g. 'ALLOCATE ON P02'.
8. Using ← or →, select the saved TV channel that you want to assign to this programme number, e.g. 'P02'.

Deleting TV channels
Using **CLEAR (CL)** you can delete unwanted TV channels or those with poor reception.

9. Confirm with **OK**. The following message will briefly appear on the TV screen: 'STORED'.

× The main menu will appear on the screen
✓ After you have confirmed the last channel that can be sorted, you will automatically return to the main menu since no more TV channels can be assigned.

10. To assign other TV channels to a programme number, repeat steps 7 to 9.
11. Confirm the assignment of the TV channel with **MENU**.
12. To exit the main menu, press **MENU**.

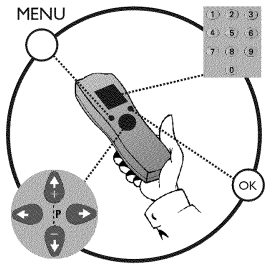


Setting on-screen menu language

You have the option of setting one of the displayed languages for the on-screen menu (OSD). However, the video recorder display will only display English text regardless of this setting.

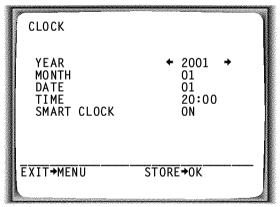
1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.
3. Select line 'LANGUAGE' and confirm with **OK**.
4. Select the desired language with **P −↓** or **↑+P** and confirm with **OK**.
   'STORED' will appear briefly on the screen.
5. To end, press **MENU**.

4 Important notes for operation



Setting the time and date

If the display shows an incorrect time or '--:--', the time and date must be reset manually.
If a TV channel which transmits TXT/PDC (teletext/PDC) is stored under programme number 'P01', time/date will automatically be taken from the TXT/PDC information. (SMART CLOCK)



1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.
3. Select line 'CLOCK' using **P−↓** or **↑+P** and confirm with **OK**.
4. Check the year in line 'YEAR'. If required, please change the year with the number buttons **0-9** on the remote control.
5. Select the next line with **↑+P** or **P−↓**.
6. Check 'MONTH', 'DATE' and 'TIME' in the same way.

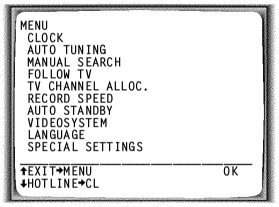
× Time/date is displayed incorrectly despite manual setting
✓ With Smart Clock, time/date is transferred from the TV channel saved on 'P01' and automatically corrected.
Switch off Smart Clock. In line 'SMART CLOCK', select 'OFF' using ← or →.
You can switch on 'SMART CLOCK' again when you select 'ON'.

7. Check the displayed settings and confirm with **OK**.
'STORED' will appear briefly on the screen.
8. To end, press **MENU**.

Switching on	You can switch on the video recorder with the **STANDBY/ON** ⏻ button, the number buttons **0-9** or by putting in a cassette.
Automatic switch-off	If the video recorder is not used for several minutes, it switches itself off automatically. This function can be deactivated (e.g. if you want to use the video recorder as a TV receiver). For more information, please read the section 'Automatic switch-off' in chapter 'Additional functions'.
Time in the display	If you have switched the video recorder off with **STANDBY/ON** ⏻, the time will show in the display, e.g. '18:00'. If the clock has not been set, '--:--' will appear. When the video recorder is switched off and the time isn't shown in the video recorder display, the clock display may be switched off. You will find more information in the chapter 'Additional functions' section 'Switch off the clock display'.
Energy consumption	The video recorder should always be connected to the mains so as not to affect the use of the TV or programmed recordings. Your video recorder uses less than 4W (with clock display switched off).
Power outage/no power	Channel information remains saved for up to 1 year, the time and timer information is saved for up to 3 hours.
Emergency exit	The video recorder and the remote control have the option of an 'Emergency exit'. You can use the **STANDBY/ON** ⏻ button to interrupt any function or step during use. You can operate your device without worry. There is no risk whatsoever of damaging the video recorder by performing user steps incorrectly.

Navigation in the screen menu

You can check/change many functions and settings of your video recorder via the screen menu. The individual functions are selected as follows:



Call up the menu: with **MENU**.

To select: with **P−↓** or **↑+P**.

To enter or change your selection: with the number buttons **0-9** or with ← or →.

To save or confirm: with **OK**.

To cancel: with **STANDBY/ON** ⏻.

To end: with **MENU**.

5 Tape List

General information

The 'Tape List is an integrated database in the video recorder that remembers all recordings made by this video recorder. The Tape List helps you keep track of which film is on which cassette. The 'Tape List' also gives you quick and easy access to recordings.
And: If desired, the video recorder will rewind to the beginning of the selected recording and automatically start playback.

Can I add cassettes that already have recordings on them to the Tape List?
Yes. Tape List can manage a maximum of 9 cassettes. However, there must be recordings on the cassettes in order to copy them to the Tape List database.

Adding a cassette to the Tape List

You can add any cassette to the 'Tape List'. Please note that the process for adding cassettes that already have recordings on them lasts longer than with new (blank) cassettes.

1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Label the cassette to be inserted with a number from 1 to 9.
3. Insert the cassette into the video recorder.
4. '*TAPE*' will appear in the display.
5. Enter the cassette number using the **0-9** number buttons on the remote control.
   The video recorder will briefly check the cassette inserted. 'CHECKING CASSETTE' appears on the TV screen.
   If the cassette is new (blank), no information will appear on the screen.

× I see a cassette number and an overview of all recordings on this cassette
✓ You have selected a number which has already been included in the Tape Manager and contains a recording.

On the screen after 'CHECKING CASSETTE' I see the message ''
There are already recordings on the cassette. This cassette is searched for recordings and added to the Tape List.

Why must I note the cassette number?
When searching for available recordings, you will need to insert the corresponding cassettes (cassette numbers).

How many cassettes can I save in the Tape List?
You can store up to 9 cassettes. You can store a maximum number of 50 titles in the Tape Manager.

Editing recording titles

In the Tape List, all recordings longer than 10 minutes are displayed with cassette number, recording title and length of recording. The TV channel, time and date are saved as a title. The title of this recording can only be changed after the recording has been completed.
To do this, the corresponding cassette does not have to be in the video recorder. In the following, you will read how to customise the titles to your wishes.

1. Press **TAPE LIST** on the remote control. An overview of all saved titles/cassettes from the Tape List appears on the screen.

× I can see the message 'TAPE LIST- MEMORY EMPTY'
✓ There are no recordings saved in the Tape List. Therefore, it is not possible to add or change a title.

2. Using **↑+P** or **P−↓** select the title to be edited and confirm with **→** .
3. Using **→** or **←** select the position where the letter/number/symbol is to be changed or re-entered.
4. Change the desired symbol using **↑+P** or **P−↓** .

Deleting symbols
To delete a symbol of a recording title, press **CLEAR (CL)** at the corresponding symbol position.

5. Repeat step 3 and step 4 until you have made the desired changes.
6. Save the new title with **OK** .
7. If you want to change more titles, repeat step 3 through step 7 .
8. To end, press **TAPE LIST** .

6 Playback

Searching for a title in the Tape List

This function can be used to quickly and easily find and play back a recording saved in the Tape List. The video recorder automatically rewinds to the beginning of the selected recording and automatically starts playback.

1. Press **TAPE LIST** on the remote control.
2. An overview of all recordings saved in Tape List appears on the screen.

What do the displays on the screen mean?

'CASS.' = Cassette number
'TITLE' = Title (TV channel, time, date)
'LENGTH' = Length of the recording

3. Select the title that you want to play back with **P −↓** or **↑+ P** .

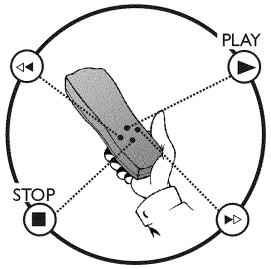
× I see the message 'INSERT CASSETTE X' on the screen.

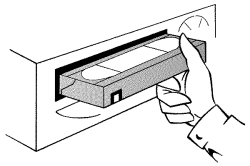
✓ The selected recording is located on the Tape List cassette with the displayed cassette number. Please insert the corresponding cassette. After a brief check, the video recorder will rewind to the beginning of the selected recording and start playback.

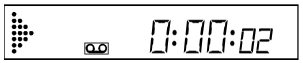
× I want to cancel the search

✓ If you want to cancel the search, press **MENU** .

4. Confirm with **OK** . The video recorder winds to the start of the selected recording and automatically starts playback.







Playing cassettes

You can use this video recorder to play back recorded VHS video cassettes. You can operate the video recorder using the remote control or the buttons on the front of the video recorder.

What does VHS mean?

'Video Home System' (VHS) has become the world-wide standard for the playback and recording of amateur video cassettes. This popular standard continues to be improved. Super VHS (S-VHS) provides a sharper picture and less noise. Digital VHS (D-VHS) only works with digital picture and sound signals. Your video recorder can only record and play standard VHS cassettes.

1. Put a cassette into the cassette slot.
The cassette is inserted automatically. ' ' will appear on the display.

× I see 'TAPE' in the display

✓ The video recorder is waiting for you to enter a cassette number from the 'Tape List'. You can find more information on the Tape List in the chapter 'Tape List'.

2. Press the Play button **PLAY ►** to view the tape.
This will, for example, appear in the display:

× Picture/ sound quality is poor

✓ When playing rental videos or older, poorer quality cassettes, it may not be possible to completely filter out picture and sound interference. This is not a fault in your machine.
Please read the section 'Selecting the picture settings (SMART PICTURE)', or the chapter 'Eliminating picture interference'.

✓ During playback the automatic TV system will switch-over automatically. If picture/sound interference occurs, attempt to fix the problem by manually switching the TV system. In that case, turn to chapter 'Additional functions' section 'Switching the video (color) system'.

3. To stop the playback, press **STOP ■** on the remote control or **STOP/EJECT ■/▲** on the video recorder.
4. To eject the cassette, press **STOP/EJECT ■/▲** on the video recorder when the video recorder stops the playback (STOP).
To eject a cassette, you can also use **EJECT ▲** on the remote control.

Automatic switch-off of special functions

Many functions (e.g. pause, still picture, search) switch themselves off automatically after a short time in order to protect the cassette and to save energy.

Do I need to change the playback speed when playing back LP recordings?

For playback, the correct recording speed 'SP' will automatically be selected. For more information, please read the section 'Selecting the recording speed (SP/LP)' in the chapter 'Manual recording'.

Playing back NTSC cassettes

Cassettes that have been recorded in the NTSC standard (for example, American cassettes) can be played back using this video recorder. However, this only works on PAL-television sets which are suitable for a picture frequency of 60Hz.
When you play an NTSC cassette '60HZ' will appear on the display.
Some special features (for example, still picture) are not possible while you are playing an NTSC cassette.

Displaying current tape position

The display shows the tape position in hours, minutes and seconds. In addition, by pressing **OK** you can show the present tape position on the TV screen.
The following information is displayed on the screen:
e.g.: 0:02:45 Shows the tape position in hours, minutes and seconds.
Moving/blinking arrow: This indicates the current tape position. The arrow moves in a line from left (tape start) to right (tape end).
'REMAIN 0:06': will show the actual amount of playing/recording time left on the tape in hours and minutes.
When you play an NTSC cassette, the video recorder will not show 'REMAIN 0:06'.

How can I set the counter to '0:00:00'?

You can set the counter to '0:00:00' using **CLEAR (CL)** .
When you put a cassette in the machine, the counter will automatically reset to 0:00:00'.

× The counter does not move

✓ This occurs when there are no recordings on a portion of a tape. Therefore, the video recorder cannot receive any information from the tape. This is not a fault in your machine.

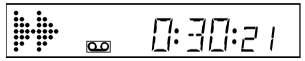
× The display/the screen shows '-0:01:20'

✓ If you rewind a cassette from the tape position '0:00:00', the counter will show for instance, '-0:01:20' (the cassette will be rewound to 1 minute and 20 seconds before '0:00:00').

× '-:--' is displayed in the 'REMAIN' counter

✓ This counter will automatically recognise the length of the tape. In addition, when you put in a cassette the video recorder must first calculate the time played. Therefore, '-:--' appears first and only after the tape has been running for a few seconds will the correct playing time be shown.

Searching for a tape position with picture (scanning)

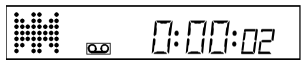


1. While a cassette is playing, press ◁◀ (reverse) or ▶▷ (forward) one or more times. This will, for example, appear in the display:
2. To stop at a certain place on the tape, press **PLAY** ► .

Decreased picture quality

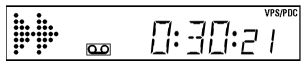
Scanning interferes with the picture quality. The sound is switched off. This is not a fault in your machine.

Still picture / slow motion



1. During playback, press **STILL** ▶|◀ to stop the tape and display a still picture. This will, for example, appear in the display:
2. Each time you press **STILL** ▶|◀ , the picture will advance one frame.
3. When you hold down the **STILL** ▶|◀ button, the tape will be played in slow motion.
4. When you press ▶▷ several times, you have a choice of several playback speeds for slow motion.
5. To continue playback, press **PLAY** ► .

Searching for tape position without picture (forward wind and rewind)



1. Stop the tape with **STOP** ■ .
2. Press ◁◀ (reverse) or ▶▷ (forward). This will, for example, appear in the display.
3. To stop at a certain place on the tape, press **STOP** ■ .

Instant View

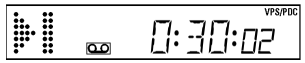
With this function you can switch to picture search during wind and rewind.

1. If you hold ◁◀ (rewind) or ▶▷ (wind) during wind or rewind, you will switch to picture search.
2. As soon as you release the button, the video recorder will automatically switch back to rewind or wind.

Automatic search for a tape position (index search)

Every time a tape is recorded an index marking is written on the tape. This marking can be compared with a bookmark. These marked positions can be found again quickly and easily later by pressing a button.

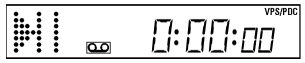
1. To search for the previous marking, press **INDEX** ▶| and then ◁◀ .



2. For the next marking, press **INDEX** ▶| and then ▶▷ . This will, for example, appear in the display for the next marking.
3. As soon as the video recorder finds this marking, it automatically switches to playback.

Automatic search for a blank space on the tape

You can search for space on the tape (at least 1 minute of blank tape) for a new recording, for example, after an existing recording on the tape.



1. Press **INDEX** ▶| . Then press **STOP** ■ . This will, for example, appear in the display:
2. As soon as the video recorder finds the corresponding tape position, it automatically switches to pause.

× The cassette is ejected
✓ The video recorder was unable to find any blank space on the tape inserted.

Selecting picture settings (SMART PICTURE)

Using **SMART** ▢ , you can display and set many stored picture settings for playback.

What types of picture settings are available to me?
'NATURAL': Natural picture (standard setting)
'DISTINCT': Emphasises details (quick movements, sports)
'SOFT': Suppression of interference (when using rental cassettes)
'SHARP': Increase in sharpness (e.g. for animated films)

1. During playback, press **SMART** ▢ . This will show the current picture setting.
   Press the **SMART** ▢ button several times to select the corresponding picture setting.
2. If the **SMART** ▢ button is not been pressed after a few seconds, the selected picture setting will be saved.
3. These picture settings will not change until you eject the cassette.

7 Eliminating picture interference

Optimising tracking

This video recorder has an automatic tracking function. In order for the video heads to optimally read the video track of the newly inserted video cassette, the tape speed is slightly corrected automatically.
In some cases however, interference will still occur.
The following section will explain how to manually adjust the tracking settings.

1. While a cassette is playing, hold **↑+P** until 'TRAC' (TRACking) appears in the display.
2. Hold down the buttons **↑+P** or **P−↓** until the playback quality is at its best.
3. Wait a few seconds, until 'TRAC' disappears from the display.

These selected picture settings will not change until you eject the cassette.

Optimising still picture

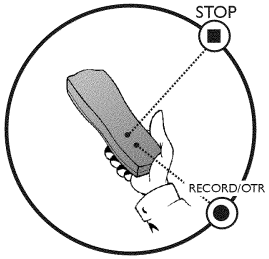
If the still picture vibrates vertically, you can improve the still picture as follows:

1. During still picture, hold **↑+P** or **P−↓** until the picture quality is at its best.
   'JITT' will appear in the display.
2. When you release the button, 'JITT' will disappear.

The video recorder will store these settings automatically.

× I cannot reach optimal quality for the still picture
✓ Interference which cannot be alleviated by this function can occur in cassettes of poor quality or camcorder cassettes .

8 Manual recording



General information

Use 'Manual Recording' to make a spontaneous recording (for example, a programme currently being shown).

If you want to start and stop a recording manually, read the section **'Recording without automatic switch-off'**.

If you want to start a recording manually but have it stopped automatically, read the section **'Recording with automatic switch-off'**. (e.g. not to record to the end of the tape)

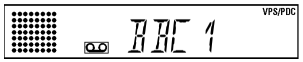
Read the section **'Direct record'** if you want to record a programme currently being shown.

Read the section **'Automatic recording from a satellite receiver'**, if you want a recording to be controlled automatically by a satellite receiver.

Recording without automatic switch-off

1. Insert a cassette.

Using 'Tape List'
To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

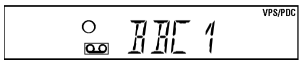


2. Use **↑+P** or **P−↓** to select the programme number you want to record, for example, 'P01'. This will appear on the display.

Station name
If a TV station transmits a station name, it will be shown in the display.

Programme numbers 'E1' 'E2'
This programme number is provided for recording from external sources (via the scart socket **EXT.1 AV 1**, **EXT.2 AV 2**).

Programme number 'E3'
This programme number is used for recording from the audio and video front sockets.



3. To start recording, press **RECORD/OTR ●** on the remote control or **RECORD ●** on the video recorder. This will, for example, appear in the display:

Displaying tape position
Using **OK** you can show the tape position in the display.

4 Stop recording with **STOP** ■ .

Recording with automatic switch-off (OTR One-Touch-Recording)

1 Insert a cassette.

Using 'Tape List'

To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control. The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

2 Use **↑+P** or **P−↓** to select the programme number you want to record.

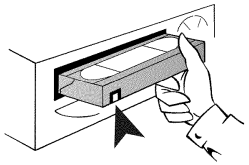
3 Press **RECORD/OTR** ● on the remote control.

4 Each time you press **RECORD/OTR** ● you will add 30 minutes to the recording time.

How can I clear the recording time just setted?

To delete an entry, press **CLEAR (CL)** while the display shows the recording time.

Preventing accidental erasing of cassettes



All cassettes (except for rental and store cassettes) have a security tab on the back of the cassette (see arrow).
To prevent recording over important recordings (erasing), you can remove this security tab or slide it to the left.
If you later decide to record on a protected cassette, simply cover the hole with adhesive tape or slide the tab to the right.

Lining up recordings (assemble cut)

When you add a further recording to a cassette, which already has a recording on it, a short blank (flicker) can appear between the old and the new recording or the picture itself can flicker. To help reduce these from occurring, proceed as follows:

1 Find the tape position of the old recording where you want to insert the new recording.

2 Look at the last minute of the old recording (playback).

3 Press **STOP** ■ on the remote control at the tape position where the new recording is to go. **II** ' will appear on the display.

4 Now start recording as usual by pressing **RECORD/OTR** ● on the remote control.

5 Stop recording with **STOP** ■ .

Selecting the recording speed (SP or LP)

You can reduce the recording speed by half. This makes it possible to record, for example, eight-hours instead of four-hours on an 'E240' (four-hour) cassette.
For playback, the correct recording speed will automatically be selected.

1 Switch on the TV set. If required, select the programme number for the video recorder.

2 Press **MENU** on the remote control. The main menu will appear.

3 Select line 'RECORD SPEED' using **P−↓** or **↑+P** and confirm with **OK** .

4 Select the required recording speed with ← or → .

'SP'/'LP' AUTO'

'SP': **S**tandard**P**lay (normal recording speed) offers the usual first-class picture quality.

'LP': **L**ong**P**lay (half recording speed, double recording time). 8 hours can be recorded on a 4 hour cassette (E240) with a somewhat reduced picture quality.

'AUTO': **AUTO**matic Long Play. If there is not enough space on the tape to record a programmed recording in standard speed, the recording will automatically be made in 'LP' (Longplay). Otherwise, the recording speed will be 'SP' (Standardplay).

5. Confirm with **OK**.

6. To end, press **MENU**.

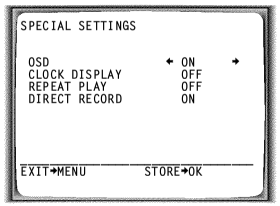
Automatic controlled recording from a satellite receiver (RECORD LINK)

This function automatically starts recording on the switched-off video recorder when a video signal is recognised through the connected scart cable. If your satellite receiver has a programming function, the recording will start automatically (as long as the satellite receiver is switched on).

1. Switch on the TV set. If required, select the programme number for the video recorder.

2. Press **MENU** on the remote control. The main menu will appear.

3. Select line 'SPECIAL SETTINGS' using **P −↓** or **↑+P** and confirm with **OK**.



4. Select line 'RECORD LINK' using **P −↓** or **↑+P**.

5. Select function 'ON' with ← or →.

Switching off 'Record Link'
To switch off the function, select 'OFF'.

6. Confirm with **OK**.

7. To end, press **MENU**.

8. Insert a cassette.

9. Use a scart cable to connect scart socket **EXT.2 AV 2** on the video recorder to the corresponding scart socket on the satellite receiver.

10. Programme the satellite receiver with the required information (programme number of the TV channel, start time, end time).
If necessary, please see the operating instructions for your satellite receiver.

11. Switch off the video recorder with **STANDBY/ON** ⏻.

The video recorder is now ready to record. The beginning and end of the recording is controlled via scart socket **EXT.2 AV 2**.
When this function is switched on, '🔕' will appear on the video recorder display.

'Direct Record'

Can you record the right TV channel in seconds when the video recorder is switched off? No problem. If recording is started manually, the **switched-off** video recorder uses the current TV channel setted on the TV set.
You will find more information on how to switch 'Direct record' on or off in the next section 'Direct record'.

How does Direct Record work?
The video recorder compares the TV channel selected on the TV set with its stored TV channels via the scart cable. If the same TV channel is found, it switches the video recorder to the corresponding programme number and starts recording.
Please do not change the TV channel on the TV set during the search so as not to affect the process.

1. On the TV set, select the programme number you want make the recording from.

2. Press **RECORD/OTR ●** with the video recorder **switched off**.

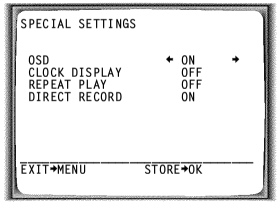
× A 'search symbol' appears in the display (a moving symbol)
✓ The video recorder is comparing its saved TV channels with those of the TV set. Please do not change the TV channel on the TV set as long as the 'search symbol' (a moving symbol) is being displayed.

× 'NOTV' appears in the display
✓ This TV channel could not be found in the video recorder's memory. Check that all TV channels saved on the TV set are available in the video recorder. If required, save any missing channels. Please read the section 'Manual TV channel search'.

3. Stop recording with **STOP ■**.

9 IR satellite control

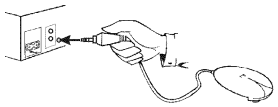
Switching 'Direct Record' on or off



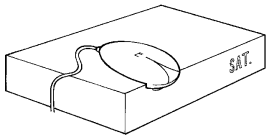
1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.
3. Select line 'SPECIAL SETTINGS' using **P −↓** or **↑+P** and confirm with **OK**.
4. In line 'DIRECT RECORD', select 'OFF' (Direct Record off) or 'ON' (Direct Record on) using ← or → .
5. Confirm with **OK**.
6. To end, press **MENU**.
7. Switch off with **STANDBY/ON** ⏻.

This auxiliary device allows you to change the TV channels (programme numbers) of a connected digital satellite receiver (Set Top Box) via the video recorder. This is necessary to programme recordings which can only be made via a Set Top Box. A list of controllable Set Top Boxes is printed at the end of this section.

Connecting the satellite control

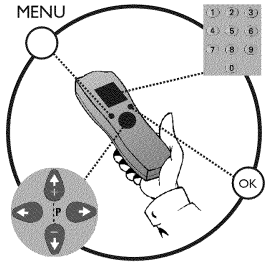


1. Connect the satellite control to the socket **IR SAT** on the back of the video recorder.

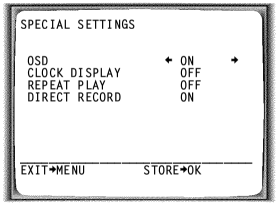


2. Position the satellite control on the Set Top Box so that the signal window on the bottom of the satellite control protrudes beyond the edge of the Set Top Box.
This allows the control signal (IR signal) to be transmitted and received by the Set Top Box without interference.

Preparing the satellite control



1. Switch on the Set Top Box and select programme number 1 on your Set Top Box.
2. Switch on your TV set and select the programme number that you have chosen for video playback.
3. Press the **MENU** button on the video recorder remote control. The main menu is displayed.
4. Select the line 'SPECIAL SETTINGS' with **P −↓** or **↑+P** and confirm with **OK**.



5. Select line 'SAT. IR-CODE NR.' with **P −↓** or **↑+P**.
6. Enter the IR-code number that corresponds to your Set Top Box, using the number buttons **0-9** on the remote control.
A list of all available IR-code numbers is printed in the back of this section.
7. After you have entered the last number, the Set Top Box will automatically switch to programme number 12.

× My Set Top Box does not switch to programme number 12

- ✓ Please check that you entered the correct code number. Repeat step 6 .
- ✓ Also try other code numbers.
- ✓ Please make sure that the IR electronic eye on the Set Top Box is not blocked.
- ✓ You may wish to reposition the SAT mouse (repeat steps 1 and 6).

8 Confirm the correct code number with **OK** .

9 Affix the satellite control to the Set Top Box using the adhesive strip on the bottom of the satellite control.

10 To end, press the **MENU** button.

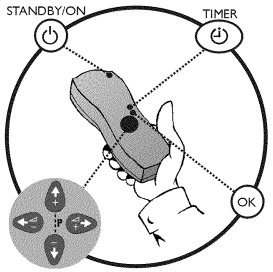
The satellite control has now been successfully installed.
Further information regarding the use of the satellite control for programmed recordings is included in chapter 'Programming a recording (TIMER)'.

IR-CODE table

Set Top Box	Provider	Country	code number
AMSTRAD DRX 100 Sky Digibox	Sky	UK	3
ASTON Xena 1500	Canal+	FR	13
CANAL+ Canalsatellite	Canal+	FR	1
ECHOSTAR D-2500-IP	Free-to-Air	D, FR, UK	11
GRUNDIG Digibox GDS200/1	Sky	UK	3
HUMAXF1-AVCI	Free-to-Air	D, FR, UK	2
NOKIA D-Box	Premiere World	D	5, 15
NOKIA 9200S	Free-to-Air	FR, UK	6
NOKIA 9850T	On Digital	UK	3
PACE DTR730-IM	On Digital	UK	12
PACE BSKYB 2200	Sky	UK	3
PANASONIC TU-DSB30	Sky	UK	3
PHILIPS DTX 6371	On Digital	UK	4
SAGEM ISD 3100	TPS	FR	14
SAGEM ISD 3200	TPS	FR	10
TPS Thomson	TPS	FR	10
TPS Sagem	TPS	FR	10
XCOM CDTV 2000	TPS	FR	7
XCOM CDTV 350	TPS	FR	9

The proper function of the satellite control can only be guaranteed for the listed combinations of Set Top Boxes and providers in the respective countries. Other combinations could influence the switching of the programme numbers or may not function properly.
Modifications of the technical specifications of the Set Top Boxes can cause the satellite control to malfunction.

10 Programming a recording (TIMER)



General information

Use programmed recording to automatically start and stop a recording at a later date. The video recorder will switch to the right programme number and begin recording at the correct time. With this video recorder, you can pre-programme up to six recordings within a period of one month.

To make a programmed recording, your video recorder needs to know:
* the date you want to make the recording
* the programme number of the TV channel
* the start and stop time of the recording
* VPS or PDC on or off

This information is saved in a 'TIMER block'.

What is 'VPS/PDC'?

'VPS' (Video Programming System)/ 'PDC' (Programme Delivery Control) are used to control the start and duration of TV channel recordings. If a TV programme starts earlier or ends later than was scheduled, the video recorder will then turn on and off and the correct time.

What do I need to know about 'VPS/PDC'?

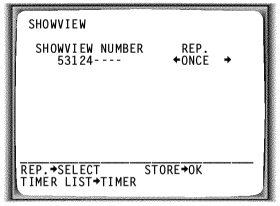
Usually the start time is the **same** as the VPS or PDC time. But if your TV guide gives a VPS or PDC time which is different from the programme's start time, e.g. '20.15 (VPS/PDC 20.14)', you must enter the **VPS/PDC time** '20.14' **exact to the minute** as the start time.
If you want to programme a time that is different from the VPS or PDC time, you must switch off VPS or PDC.

Only one TV program of a TV channel can be controlled using 'VPS/PDC' at a time. If you want to record two or more TV programmes on a TV channel using 'VPS/PDC', you will need to programme these as two separate recordings.

Programming a recording (with 'ShowView')

SHOWVIEW®

Thanks to this programming system, you no longer need to do tediously enter the date, programme number, start and end time. All the information needed for programming is contained in the ShowView-programming number. This 9-digit ShowView number is found in every TV listings magazine.

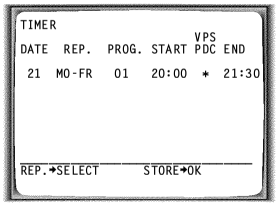


1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **TIMER** ⏻ on the remote control.
3. Enter the entire ShowView number. This number is up to 9 digits long and can be found next to the start time of the TV programme in your TV listings magazine.
   e.g. 5-312-4 or 5 312 4
   Enter 53124 for the ShowView-number.
   If you make a mistake, you can clear your instructions with **CLEAR (CL)** .

Selecting onetime/daily/weekly recordings

Using **SELECT** , select from the following options:
'ONCE': Recording once
'MO-FR': Repeated daily recordings (Monday to Friday)
'WEEK.': Repeated weekly recordings (every week on the same day)

4. Confirm with **OK** .



× **The following message appears on the screen:** 'SELECT PROG. NR.'
✓ The programme number of the TV channel has not yet been assigned to the ShowView number. Using the number buttons **0-9** on the remote control, select the corresponding programme number (name) of the TV channel and confirm with **OK** .

× **The following message appears on the screen:** 'SHOWVIEW NUMBER NOT VALID'
✓ The entered ShowView number is incorrect. Correct your instructions or end with **MENU** .
✓ Check the time/date (see chapter 'Installing your video', section 'Setting the time and date').

× **The following message appears on the screen:** 'MO-FR PROGRAMMING NOT POSSIBLE FOR WEEKEND'
✓ A daily recording was entered for the wrong day. Daily programming can only be used for recordings to be made from Monday to Friday.

5. The decoded data appears after confirmation. You can go back at any time to change the data.

Switching on 'VPS/PDC' in the 'START' input field

Select the 'START' input field using **TIMER** ⏻ . Using **SELECT** switch on 'VPS/PDC' ('*' lights up). If you press **SELECT** again, you will switch 'VPS/PDC' off ('*' goes out).

6. When all information is displayed correctly, confirm with **OK** . The programming information is stored in a TIMER block.
7. Insert a cassette with an intact security tab (unprotected).

Using 'Tape List'

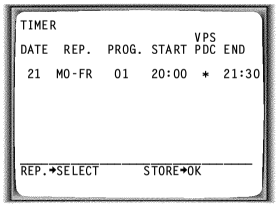
To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

8. Switch off with **STANDBY/ON** ⏻ .
   The programmed recording will only function when the video recorder is **switched off** with **STANDBY/ON** ⏻ .
   If any of the TIMER blocks are in use, ' ⏻ ' will light up on the video recorder display.

Problems and solutions for programmed recordings

PROBLEM	SOLUTION
The video recorder will not operate	✓While a programmed recording is being made, you cannot operate your video recorder manually. If you want to cancel the programmed recording, press **STANDBY/ON** ⏻ .
'SWITCH TO STANDBY- TIMER RECORDING' flashes on the TV screen	✓The video recorder was switched on several minutes before the start of a programmed recording. Switch off the video recorder with **STANDBY/ON** ⏻ . A programmed recording (timer) will only function if the video recorder is switched off.
Cassette is ejected during recording	✓The end of the tape was reached during recording.
Error message: 'NO CASSETTE' ⏲ ' will flash in the video recorder display	✓No cassette was inserted. Insert a cassette and switch off the video recorder using **STANDBY/ON** ⏻ .
Cassette was ejected as soon as the OK button was pressed	✓A cassette was inserted with the security tab removed. Undo the erase protection (chapter 'Manual Recording', section 'Preventing accidental erasing of cassettes') or insert a different cassette.
Error message: 'ALL TIMERS OCCUPIED'	✓If this error message appears after pressing **TIMER** ⏲ , then all TIMER blocks are already programmed. No more recordings can be programmed. If you want to clear a programmed recording (TIMER block), select it with **↑+P** or **P−↓** and then press **CLEAR (CL)** .

Programming a recording (without ShowView)



1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **TIMER** ⏲ on the remote control **twice** . A free TIMER block will be highlighted.
3. Press **TIMER** ⏲ . The information will appear on the screen.
4. With **TIMER** ⏲ , → or ← you can select 'DATE' (date), 'PROG.' (programme number), 'START' (start time) and 'END' (end time). Enter or change your information with **↑+P** or **P−↓** , or with the number buttons **0-9** on the remote control.

Selecting onetime/daily/weekly recordings

In 'DATE' use **SELECT** to select from the following options:
'ONCE': Recording once
'MO-FR': Repeated daily recordings from Monday to Friday
'WEEK.': Repeated weekly recordings (every week on the same day)

Programme numbers of the 'EXT 1' and 'EXT 2' scart socket

You can also programme recordings from external sources via scart socket **EXT.1 AV 1** ('EXT 1') or **EXT.2 AV 2** ('EXT 2').

'Switching on 'VPS/PDC' in the 'START' input field

Select the 'START' input field using **TIMER** ⏲ . Using **SELECT** switch on 'VPS/PDC' ('*' lights up). If you press **SELECT** again, you will switch 'VPS/PDC' off ('*' goes out).

5. When all information is displayed correctly, confirm with **OK** . The programming information is stored in a TIMER block.
6. Insert a cassette with an intact security tab (unprotected).

Using 'Tape List'

To save a recording in the 'Tape List' or to use a 'Tape List' cassette, enter the cassette number using the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

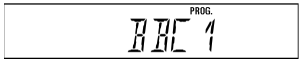
7 Switch off with **STANDBY/ON** ⏻ .
The programmed recording will only function when the video recorder is **switched off** with **STANDBY/ON** ⏻ .
If any of the TIMER blocks are in use, '⏲' will light up on the video recorder display.

Problem solving for programmed recordings

PROBLEM	SOLUTION
The video recorder does not react	✓While a programmed recording is being made, you cannot operate your video recorder manually. If you want to cancel the programmed recording, press **STANDBY/ON** ⏻ .
'SWITCH TO STANDBY- TIMER RECORDING' flashes on the TV screen	✓The video recorder was switched on several minutes before the start of a programmed recording. Switch off the video recorder with **STANDBY/ON** ⏻ . A programmed recording (timer) will only function if the video recorder is switched off.
A cassette was automatically ejected during recording	✓The end of the tape was reached during recording.
Error message: 'NO CASSETTE' '⏲' will flash in the video recorder display	✓No cassette was inserted. Insert a cassette and switch off the video recorder using **STANDBY/ON** ⏻ .
The 'PROTECTED CASSETTE' error message appears briefly on the screen then the cassette is ejected.	✓A cassette was inserted with the security tab removed. Undo the erase protection (chapter 'Manual Recording', section 'Preventing accidental erasing of cassettes') or insert a different cassette.
Error message: 'ALL TIMERS OCCUPIED'	✓If this error message appears after pressing **TIMER** ⏲ , then all TIMER blocks are already programmed. No more recordings can be programmed. If you want to clear or check a programmed recording (TIMER block), select it with **↑+P** or **P−↓** .
The 'DATA ERROR' message appears on the screen.	✓The data for the recording could not be transferred. Please check date, start time and end time of the programmed recording.

Programming a recording with 'TURBO TIMER'

With this function, programming a recording that takes place within the next 24 hours, will be quick and easy. The following pre-set information will appear in the display when you programme a recording using 'TURBO TIMER'.
Programme number = the programme number currently selected (TV channel)
Start time = current time
End time = current time +2 hours

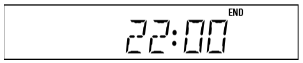


1 Press **TURBO TIMER** on the remote control.
The current set programme number will appear in the display, for instance, 'PROG. 01'. If required, you can change this using **↑+P** or **P−↓** .

× **'CLK' will flash in the video recorder display**
✓ This display means that the video recorder clock is not set correctly. Please read the section 'Setting the time and date' in chapter 'Installing your video recorder'

Controlling the satellite receiver (IR-Sat control)
Using **SELECT** , you can change the input for a satellite TV channel.
'S- - -' will appear in the display. Enter the programme number for the satellite TV channel using the number buttons **0-9** on the remote control.
Attention: For this to work, the IR-Sat control must be installed correctly (chapter 'IR Sat control', 'Connecting the Sat control'.

2 Press **TURBO TIMER** .
The current time (= start time) will appear in the display, for instance, 'START 20:00'. If required, you can change this using **↑+P** or **P−↓** .



3 Press **TURBO TIMER** .
The end time will appear in the display, for instance, 'END 22:00'. 'END 22:00'. If required, you can change this using **↑+P** or **P−↓** .

4 Press **TURBO TIMER** .
'OK' will briefly appear in the video recorder display. Programming is now complete.

5 Insert a cassette with an intact security tab (unprotected).

Using Tape List

Enter the cassette number with the number buttons **0-9** .
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

6 Switch off with **STANDBY/ON** ⏻ .
The programmed recording will only function when the video recorder is **switched off** with **STANDBY/ON** ⏻ .
If any of the TIMER blocks are in use, '⏻' will light up on the video recorder display.

Problems and solutions for programmed recordings

PROBLEM	SOLUTION
The video recorder does not react	✓While a programmed recording is being made, you cannot operate your video recorder manually. If you want to cancel the programmed recording, press **STANDBY/ON** ⏻ .
'⏻' will flash in the video recorder display	✓The video recorder was switched on several minutes before the start of a programmed recording. Switch off the video recorder with **STANDBY/ON** ⏻ . A programmed recording (timer) will only function if the video recorder is switched off. ✓No cassette was inserted. Insert a cassette and switch off the video recorder using **STANDBY/ON** ⏻ .
Cassette is ejected during recording.	✓The end of the tape was reached during recording.
The 'PROT' error message appears briefly in the display then the cassette is ejected.	✓A cassette was inserted with the security tab removed. Undo the erase protection (chapter 'Manual Recording', section 'Preventing accidental erasing of cassettes') or insert a different cassette.
Error message: 'FULL'	✓If this error message appears after pressing **TIMER** ⏻ , then all TIMER blocks are already programmed. No more recordings can be programmed. If you want to clear or check a programmed recording (TIMER block), select it with **↑+P** or **P−↓** .

How to check, change or delete a programmed recording (TIMER)

1 Switch on the TV set. If required, select the programme number for the video recorder.

2 Press **TIMER** ⏻ on the remote control **twice** .

3 Select the programmed recording (TIMER) you want to check, change or delete with **P−↓** or **↑+P** .

Delete programmed recording

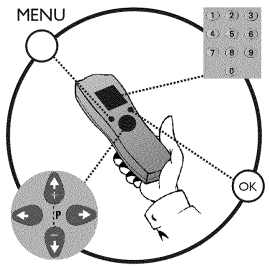
Press **CLEAR (CL)** .
'–-' appears rather than the displayed values
To end, press **MENU** .

4 Press **TIMER** ⏻ .
Select the input field with ← or → .
If required, change the information with **↑+P** , **P−↓** or the number buttons **0-9** .

5 Confirm with **OK** .

6 Switch off with **STANDBY/ON** ⏻ .

11 Other functions

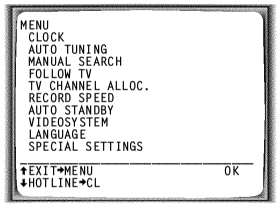


Changing the video (colour) system

If you playback recordings made on other video recorders or you want to record from external sources (via the scart socket), the automatic video (colour) system switch-over may lead to colour distortion.
You can switch off the automatic TV system switch-over as follows.

Video (colour) systems

Other countries, other video (colour) systems:
In central Europe transmissions are broadcast in the PAL system (Phase Alternation Line) standard. France uses SECAM (Séquentiel à mémoire). In some countries (USA and Japan), TV viewers receive their programmes as an NTSC signal (National Television System Committee).

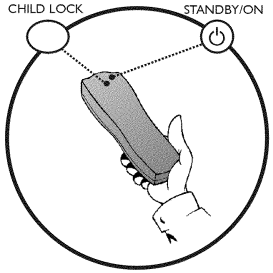


1. Press **MENU** on the remote control **before you start recording** or **during playback**. The main menu will appear.
2. Select line 'VIDEOSYSTEM' using **P −↓** or **↑+ P** and confirm with **OK**.
3. Select the TV (colour) system with the least disruptions using → or ← .
   If colour interference still occurs, you can switch to 'B/W' (black and white).
4. Confirm with **OK**.
5. To end, press **MENU**.

How can I change back to 'Automatic Switch-over'?

If you change the programme number, the video (colour) system for recording will switch itself back to 'AUTO' (automatic switch-over).

If you eject the cassette, the video (colour) system for playback will switch itself back to 'AUTO' (automatic switch-over).



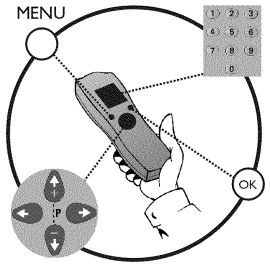
Child lock

You can prevent unauthorised use of your video recorder with this function. When the child lock is active, the buttons on the front of the device are blocked (will not function). You can make programmed recordings while the child lock is on.

1. With the video recorder switched on, press **CHILD LOCK** on the remote control for **five seconds**. 'ơ' will appear on the video recorder display.
2. Put away the remote control somewhere out of reach of children.
3. If you want to switch off the child lock, press **CHILD LOCK** again for **five seconds**, with the video recorder switched on. 'ơ' will disappear from the video recorder display.

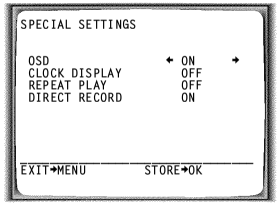
× 'ơ' will flash in the video recorder display

✓ This symbol flashes when a button is pressed when the child lock is active.



Switching the on-screen display (OSD) off or on

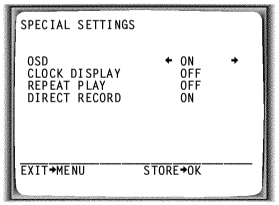
Along with the on screen menu, the OSD (On Screen Display) also displays information on the current operating status (counter, playback, recording, TV channel, etc.) on the TV screen. You can switch off the information about the operating status so that the on screen display (OSD) is not recorded when copying video cassettes.



1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.
3. Select line 'SPECIAL SETTINGS' using **P −↓** or **↑+P** and confirm with **OK**.
4. In the line 'OSD', select the desired setting with → .

Which settings can I choose?
'ON': Shows the OSD for a few seconds only.
'OFF': Switches off the OSD.

5. Confirm with **OK**.
6. To end, press **MENU**.



Switch off the clock display

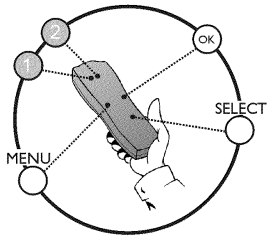
To save energy, you can switch off the clock display on the video recorder. Programmed (TIMER) recordings will still take place.

1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.
3. Select the line 'SPECIAL SETTINGS' with **P −↓** or **↑+P** and confirm with **OK**.
4. To switch off the time display on the video recorder, select in the line 'CLOCK DISPLAY' with → 'OFF'.

How can I switch on the clock display?
Select with ← 'ON' (time display switched on).

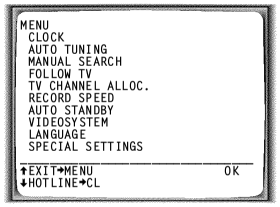
5. Confirm with **OK**.
'STORED' will briefly appear on the TV screen.
6. To end, press **MENU**.

Switching the remote control command



If you use a second video recorder that reacts to the same remote control command (stop, play, record, etc.) as this video recorder, then you can change the remote control and this video recorder.

1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.



3. Press the **SELECT** button on the remote control. In addition, press the number button **2** to change the remote control to 'VCR2'.
4. Confirm with **OK**.
   The main menu will disappear. If you have switched the remote control and the video recorder to 'VCR2', 'RESPONDS TO VCR2' will appear on the TV screen.

What do I need to pay attention to when changing the remote control and video recorder?

You must always change both video recorder and remote control to the same setting, e.g. video recorder **and** remote control to 'VCR1' or 'VCR2'.

After you change the batteries in the remote control, it will switch back to 'VCR1'.

How can I change back to 'VCR1'?

- Press **MENU**. The main menu will appear.
- Press the **SELECT** button on the remote control. Then press the number button **1** to change the remote control to 'VCR1'.
- Confirm with **OK** on the remote control. The main menu will disappear. This picture will appear on the screen: 'RESPONDS TO VCR1'

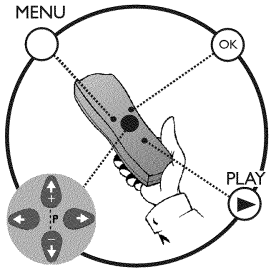
× **The main menu will not disappear and no message appears.**

✓ The remote control command was not recognised by the video recorder. Repeat step 3.

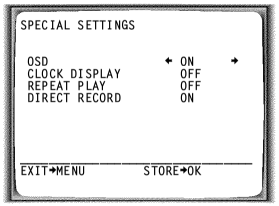
× **This will, for example, appear in the display:** 'VCR2'

✓ Remote control and video recorder were not both changed. If you press a button for a long time, the video recorder settings appear in the display. In this case 'VCR2'. You need to also change the remote to 'VCR2' (button **SELECT** and **2**).

Continuous playback



This function can be used to play a cassette over and over again. When the end of the cassette is reached, the video recorder will rewind and start from the beginning again. This function is activated or deactivated as follows.

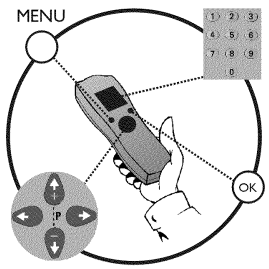


1. Press **MENU** on the remote control. The main menu will appear.
2. Select line 'SPECIAL SETTINGS' using ↑+P or P−↓ and confirm with **OK**.
3. Select line 'REPEAT PLAY' using ↑+P or P−↓.
4. Select function 'ON' with ← or →.
   If you select 'OFF', continuous playback will be switched off.
5. Confirm with **OK**.
   'STORED' will appear briefly on the screen.
6. To end, press **MENU**.
7. Insert a cassette.

Using 'Tape List'

Enter the 'Tape List' cassette number with the number buttons **0-9** on the remote control.
The cassette is being checked. You can find more information on the 'Tape List' in the chapter 'Tape List'.

8. Start the continuous playback with the **PLAY ►** playback button.



Automatic switch-off

If you haven't used the video recorder for a few minutes in certain modes (e.g.: STOP), it will switch to standby automatically. You can cancel this function to use the video recorder as a television receiver.

1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** on the remote control. The main menu will appear.
3. Select line 'AUTO STANDBY' using **P −↓** or **↑+P** .
4. Select 'OFF' (no automatic switch-off) or 'ON' (automatic switch-off) with the menu buttons → or ← .
5. Confirm with **OK** . 'STORED' will briefly appear on the TV screen.
6. To end, press **MENU** .

Using your video recorder remote control with your TV set

With the enclosed multicode remote control you can control the main functions of your TV set. To do this, you must first enter a code number that corresponds to the make of your TV set. You will find a summary of all available remote control commands on the last page of this manual.

1. Hold down the ◿− button.
2. Using the number buttons **0-9** , enter the code number that corresponds to the make (manufacturer) of your TV set. When you have entered the code number correctly, the TV set will switch off.

× My TV set will not switch off.

✓ Also try to enter code numbers of other manufacturers.

✓ In some cases, it is possible that your TV set will not react to the selected code numbers. If this is the case, you unfortunately cannot use this function.

By using the **TV** buttons on the panel in the middle of the control, you can::

+◿	increase the TV volume
◿**−**	decrease the TV volume
+TV	next programme number
TV−	previous programme number

To switch off the TV (**TV** ⏻), press ◿− and **TV −** at the same time.

12 Suppressing interference

Selecting the sound channel

You can select the desired sound channel during playback or while receiving TV channels via the video recorder. This allows you to select a desired language for multi-language transmissions.

1. Press **SELECT** . This will show the current sound setting.

What goes on behind the settings?

'STEREO':
Left and right stereo (HIFI) sound tracks can be heard.
'LEFT':
The left stereo (HIFI) sound track can be heard.
'RIGHT':
The right stereo (HIFI) sound track can be heard.
'MONO':
The mono (linear) sound track can be heard.
'MIXED':
The mono (linear) sound track can be heard at the same time as the stereo (HIFI) sound tracks.

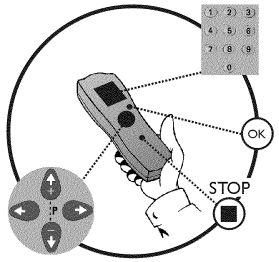
2. Keep pressing **SELECT** until the desired setting appears in the display.

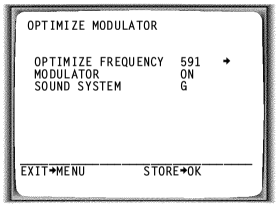
Automatic switch to 'MONO'

If a TV channel does not transmit a stereo signal or if there is no stereo signal recorded on the video cassette, the video recorder will automatically switch to 'MONO'. You will not be able to select any other settings.

Playing back an audio dubbing

When dubbing video recordings, the mono (linear) sound track is recorded with a new sound signal. The stereo (HIFI) sound track is kept. To hear the dubbed section, you must select either 'MONO' or 'MIXED'.





Optimising the modulator

In some reception locations it is possible that a TV channel will be sent on the same or similar frequency as the video recorder.
Result: As soon as the video recorder is switched on, the reception quality for this or several other TV channels will decreased.
The following steps will show you how to change the pre-set 'transmission' (modulator) frequency on the video recorder.

What is a modulator?

This electronic component in the video recorder allows the device to transmit audio and video signals via the aerial cable. These signals can be received TV set just like TV channels.

What is an modulator frequency?

This frequency or channel indicates the frequency or channel on which the audio or video signal is transmitted.

1. Switch on the TV set. Select the programme number used for video recorder playback (see TV operating instructions).
2. Press **STOP/EJECT ■/▲** to eject any cassette that might be in the device.
3. Press the **STOP ■** button on the remote control. Then press **STOP/EJECT ■/▲** until, e.g. 'M59' appears in the display.

   The video recorder will now transmit a test image on UHF channel 36/Frequency 591MHz.
4. Select line 'OPTIMIZE FREQUENCY' using **↑+P** or **P−↓** . Enter the new modulator frequency with the number buttons **0-9** .
5. Tune in the TV set to the new modulator frequency (channel 21 - 69) shown in the video recorder display.

× Sound interference occurs

✓ The wrong sound system could have been selected.
In line 'SOUND SYSTEM', select the TV system with the least sound disruptions using → or ← . 'G' (TV system PAL-B,G) or 'K' (TV system SECAM-D,K).

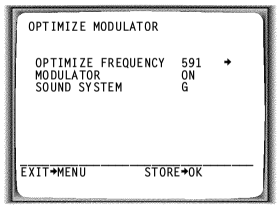
6. Confirm with **OK** .
   'STORED' will appear briefly on the screen.

Optimising the modulator is now complete.

13 Before you call an engineer

Switching the modulator on / off

If you cannot clear picture or sound interference despite optimisation, you can switch off the built-in modulator.
Warning:
this is only possible if you have connected the video recorder to the TV set with a scart cable. Without a scart cable you will not receive a picture from the video recorder on the TV set when the modulator is switched off.



1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **STOP/EJECT ■/⏏** to eject any cassette that might be in the device.
3. Press the **STOP ■** button on the remote control. Then press **STOP/EJECT ■/⏏** until, e.g. '591' appears in the display.
4. Select the line 'MODULATOR' on the TV screen or 'MOD+' in the display with **↑+P** or **P−↓** .
5. On the screen select 'OFF' or in the display 'MOD-' (modulator off) with ← .

How can I switch the modulator back on?
In the display, select 'MOD+' (modulator on) with ← .

6. Confirm with **OK** .
7. To end, press **MENU** .

If, contrary to expectation, you have any problems using this video recorder, it may be caused by the following reasons.
You will find the phone number in the enclosed guarantee leaflet.
The telephone numbers can be found on the back of this instruction manual. Have the model number (MODEL NO) and the production number (PROD.NO.) of your video recorder ready.

HOTLINE telephone numbers

The telephone numbers for after-sales service (HOTLINE) are also saved in your video recorder. To call them up, proceed as follows:

1. Switch on the TV set. If required, select the programme number for the video recorder.
2. Press **MENU** . The main menu appears.
3. Press **CLEAR (CL)** . The after-sales service telephone numbers will appear on the screen.
4. Using **OK** , you can select more telephone numbers.
5. To end, press **MENU** .

PROBLEM	SOLUTION
Your video recorder does not respond to any button being pressed:	✓There is no power supply: check the power supply. ✓A programmed recording is currently being made: if desired, cancel the programmed recording with **STANDBY/ON** ⏻ . ✓Child lock active: switch the child lock off. ✓There is a technical problem: disconnect from the mains power supply for 30 seconds, then connect again. If this doesn't help, you could reset your video recorder to the default factory settings.
Resetting devices to default factory settings	✓**Attention:** All the information stored (TV channels, time and date, TIMER) will be cleared. 1. Disconnect from the mains power supply. 2. Press and hold the **STANDBY/ON** ⏻ button on the device and reconnect to the mains power supply. 3. Release the button when 'OSD' appears in the video recorder display.
Cassette is jammed in the video recorder:	✓Don't use force. Pull out the mains plug for a moment.
Remote control does not work:	✓Remote control not pointed toward the video recorder: point it at the video recorder. ✓There is a technical problem: Take out the batteries, wait for 10 seconds and place them back. ✓Batteries have run out: change the batteries. ✓You have given the wrong remote control command: read 'Switching remote control command' in chapter 'Additional functions'.

PROBLEM	SOLUTION
No picture when you play a cassette:	✓There is no recording on the cassette: change the cassette. ✓You have selected the wrong programme number on the TV for playing cassette: on the TV, select the correct programme number for the video recorder. ✓The cable connecting the TV set and the video recorder has come loose: check the cable.
Poor picture quality when you play a cassette:	✓Your TV set is not properly adjusted. ✓The cassette is badly worn or of poor quality: use new cassette. ✓Tracking is not properly adjusted: turn to chapter 'Eliminating picture interference' and read the section 'Optimising tracking'. ✓Read the section 'Selecting the picture settings (SMART PICTURE)' in the chapter 'Playback'. ✓You haven't selected the correct video (colour) system for playback: Turn to chapter 'Additional functions' section 'Changing the video (colour) system'.
No recording possible:	✓The TV channel you want to record is not stored or you selected the wrong programme number: check TV channels stored. ✓A cassette was inserted that does not have the security tab (cannot be used to record): Insert a cassette with an intact security tab or change cassette. For more information, please see the section 'Preventing accidental erasing of cassettes' in chapter 'Manual Recording'. ✓'VPS/PDC' switched on but 'VPS/PDCtime' wrong: 'enter 'VPS/PDCtime exactly to the minute. Have your aerial checked.
Programmed recording does not work:	✓You have programmed the wrong time or date: check time and date. ✓Check time and date. If time and date are wrong despite manual setting, you can switch 'SMART CLOCK' off. Please read the section 'Setting the time and date' in the chapter 'Installing your video recorder'. ✓You have not set the TIMER properly: Check the programmed recordings (TIMER block). ✓You have put in a cassette that cannot be recorded on: undo the erase protection on the cassette.
The wrong TV channel was decoded (entered) after you programmed a recording using ShowView	✓1. Enter the ShowView programming number of the desired TV channel. 2. Confirm with **OK**. 3. Check the programme number/channel name in the 'PROG.' input field 4. If this does not correspond to the desired TV channel, select the input field and change the programme number/channel name. 5. Confirm with **TIMER** ⏻.
There is picture or sound interference on TV reception:	✓Turn to chapter 'Suppressing interference' and read 'Optimising the modulator' and 'Switching on/off the modulator'. ✓Have your aerial checked. ✓You will find information on how to switch the TV system in chapter 'Installing your video recorder' section 'Manual TV channel search'.

Remote control codes

Acura 02
Adyson 05, 20
Akai 33,18
Akura 21, 25
Alba 02, 21, 07
Allorgan 28
Amplivision 20
Amstrad 02
Anitech 02
Arcam 20
Asuka 21
Audiosonic 15

BPL 26
BSR 28
BTC 21
Basic Line 02, 21
Baur 33,03
Beko 35
Binatone 20
Blaupunkt 17
Blue Sky 21
Blue Star 26
Bondstec 23
Boots 20
Brandt 15
Bush 21, 02, 07, 26, 28, 36, 42

CGE 23
CTC 23
Carrefour 07
Cascade 02
Cimline 02
Clatronic 23, 35
Condor 30, 35
Contec 02, 07
Crown 35, 02, 38
Cybertron 21

Daewoo 36, 02
Dainichi 21
Dayton 02
De Graaf 18
Decca 10
Dixi 02
Dual 42

Elite 21, 30
Elta 02
Emerson 33

Ferguson 15
Fidelity 33
Finlandia 32, 18
Finlux 32, 13, 10
Firstline 31, 02, 20, 23, 28
Fisher 20, 18, 35
Flint 40
Formenti 30
Frontech 23, 25
Fujitsu 10
Funai 28, 25

GEC 10, 20
GPM 21
Geloso 02
Genexxa 21
GoldStar 20, 15, 27
Goodmans 10, 07, 20, 29, 36
Gorenje 35
Graetz 33
Granada 10, 18, 20
Grandin 26
Grundig 17

HCM 02, 26
Hanseatic 33, 30, 01
Hinari 02, 07, 21
Hisawa 26, 40
Hitachi 22, 15, 08, 05, 20, 07, 13
Huanyu 36
Hypson 25, 26

ICE 20, 25
ICeS 21
ITT 33
Imperial 23, 38, 35
Inno Hit 10
Interfunk 33, 23
Intervision 12, 20, 25
Isukai 21

JVC 09, 07

Kaisui 21, 20, 02, 26
Kathrein 01
Koyoda 02

Leyco 10, 25, 28
Lloytron 05
Luxor 33

M Electronic . 32,13,20,02,15,36,41
Magnadyne 12, 23
Magnafon 12
Manesth 30, 20, 25
Marantz 01
Matsui .. 02,39,18,20,04,06,07,10,28
Memorex 02
Metz 34
Mitsubishi 07, 14, 16
Mivar 27
Multitech 02, 12

Neckermann 01
Nikkai 06, 21, 05, 10, 25
Nobliko 12
Nokia 41, 33
Nordmende 15

Oceanic 33
Orion 28, 30, 31, 39
Osaki 05, 10, 20, 21, 25
Oso 21
Osume 05, 10
Otake 29
Otto Versand 03, 07, 20, 30, 01

Palladium 35, 38
Panama 20, 25
Panasonic 24, 34
Pathe Cinema 30
Pausa 02
Perdio 30
Phase 05
Philco 23
Philips 01, 36
Pioneer 15
Profex 02, 33
Proline 31
Protech 12, 02, 20, 23, 25, 38

Quelle 03, 04, 33
Questa 07

Rank Arena 07
Rediffusion 33
Rex 25
Roadstar 02, 25, 21, 38

SEG 20, 07, 25
SEI 12, 03, 28
Saba 15
Saisho 04, 02, 25
Salora 33
Sambers 12
Samsung 20, 25, 27, 35, 02, 01
Sanyo 07, 18, 04, 10
Schaub Lorenz 33
Schneider 21, 23
Sentra 06
Sharp 11, 07
Shorai 28
Siarem 12
Siemens 17
Silver 07
Sinudyne 12, 03, 28
Solavox 05
Sonitron 18
Sonoko 02
Sonolor 18
Sony 04, 03, 07
Soundwave 38
Standard 20, 21, 02
Sunkai 28, 31
Susumu 21

Tandy 21, 10, 20
Tashiko 07, 20
Tatung 10, 20
Tec 20, 23
Technema 30
Technics 24
Telefunken 15
Telemeister 30
Teletech 07, 20
Teleton 20
Tensai 21, 28, 29, 30
Texet 21
Thomson 15
Thorn 06, 10, 33
Tomashi 26
Toshiba 06, 07

Uher 30
Ultravox 12
Universum 13, 32, 25, 35

Videosat 23
Videotechnic 20
Vision 30

Waltham 20
Watson 30
Watt Radio 12
Wega 07
White Westinghouse 30

Yoko 20, 25

4. Dismantling instructions

4.1 Dismantling instructions

General guidelines for dismantling housing components, electronic parts and the drive mechanism

Always disconnect from mains before dismantling or assembly.

Due to the supply voltages (hot circuit) on the primary side of the switched-mode power supply, an isolating transformer is required for the operation of the device.

The drive or the drive/motherboard unit must not be pulled out by the cross struts!

Components placed below the tape deck has to be inserted exactly.

The use of a regulating isolating transformer is recommended for detecting faults around the power supply.

All screws of the video recorder can be removed or tightened with a 10* torx screwdriver .

1. Housing cover (Figure 4-1)
- Remove the four screws (A).
- Push catch (S) inwards, lifting lid at the same time to move out of groove.
- Slide housing cover back by approx. 1 cm.
- Push centre of housing cover sides on underside approx. 1 cm outwards and lift up the housing cover.

Assembly
Assemble in reverse order.

2. Base plate (Figure 4-2)
The base plate may not be removed from the frame!

3. Front panel (Figure 4-2)

Preparation
Dismantle the housing lid as described in section 1.

- Position the device with the base plate facing upwards.
- Undo the six catches (S) one after the other, starting from the left or the right.
- Remove the front panel by pulling it forwards.
- For devices with shuttle print or socket print, disconnect the cabling to the motherboard.

Assembly
Assemble in reverse order (device in operational position).

Important
- The lift flap lever should be connected to the lift flap guide.
- Check that all catches are engaged.

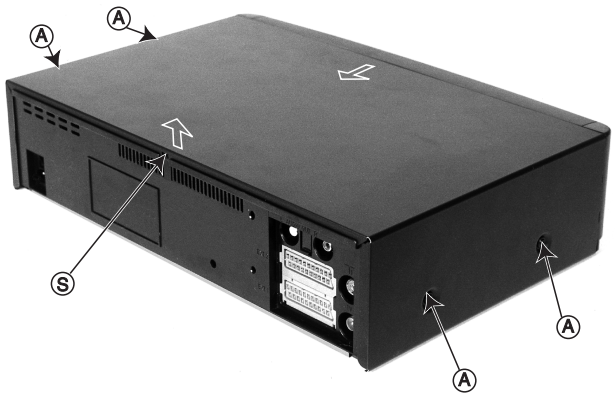


Figure 4-1

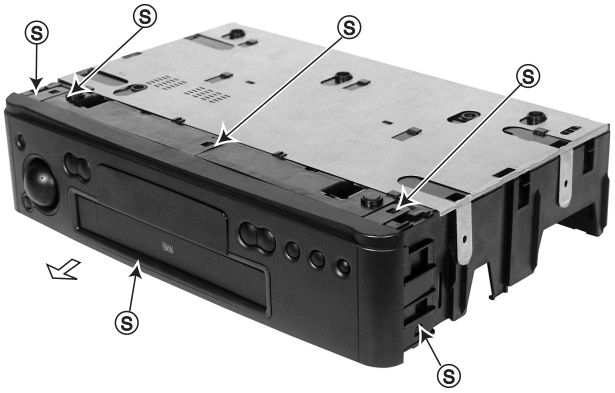
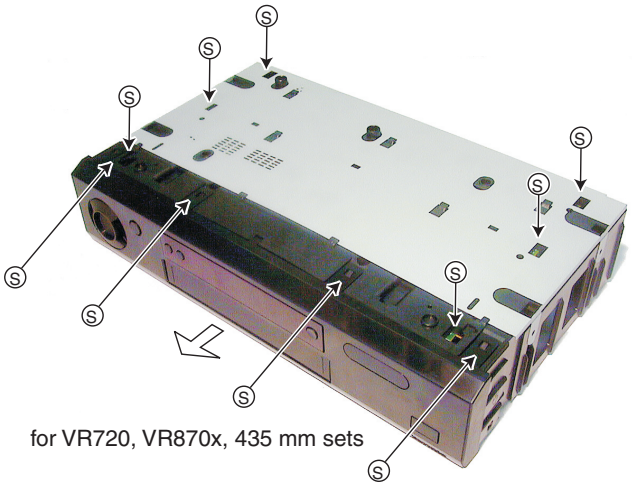


Figure 4-2



for VR720, VR870x, 435 mm sets

4.2 Dismantling of the motherboard/drive combination (Figure 4-3 and 4-4)

Preparation
Remove the housing cover as described in section 1.
Remove the front panel as described in section 3.

- Move device into operational position (Figure 4-3).
- Undo the two screws (B) of the stay and pull it up to remove it.
- Push back the lift by 5 cm after releasing both lift stops.
- Undo and remove the four fastening screws (C) of the drive.
- Detach the Cinch socket cable (K) and ground cable (M) from the socket print (if present).
- Remove the cables (K1; K2; K3) from the guides on the rear of the frame.
- Pull the Cinch socket holder with the socket and print up and out of the frame (if present).
- Position the device with the base plate facing up.
- Undo the 8 catches (S) from the rear right to the rear front and then from the rear left to the front left.
- After the weight of the motherboard/drive unit has released it from the frame, the catch (S) at the mains socket has to be released for a second time.
- The frame can be removed by lifting it off.
- Turn the motherboard/drive unit and move it into the service position (Figure 4-6), if necessary.
- The device is operational in this position

"Eject" must NOT be used !!!

Caution:
Adjustments can not be made in the service position.
"Eject" must NOT be used !!!

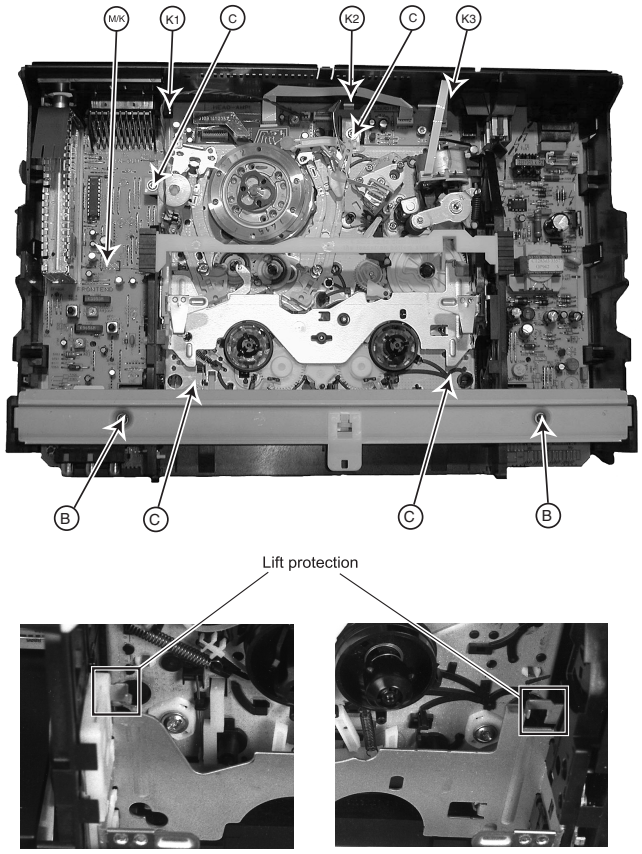


Figure 4-3

Assembly
- Position the frame with the top open onto a level surface.
- Hold the drive on the side at the lift and insert the motherboard/drive unit into the frame, pushing it down lightly. Observe that the power Supply and Scart sockets are positioned in openings.
- Check that all 8 catches (S) are engaged.
- Secure the drive with the four holding screws (C).
- Move the lift into the "Eject" position.
- Push the stay onto the frame with the chamfered side facing to the rear and secure with both screws (B).
- Insert the Cinch socket into the opening and ensure that it engages.
- Connect the Cinch socket and the ground cable (K ; M) (if present).

- **Insert the cables (K1; K2; K3) into the supports provided in the frame.**

- Replace the front panel and the housing cover.

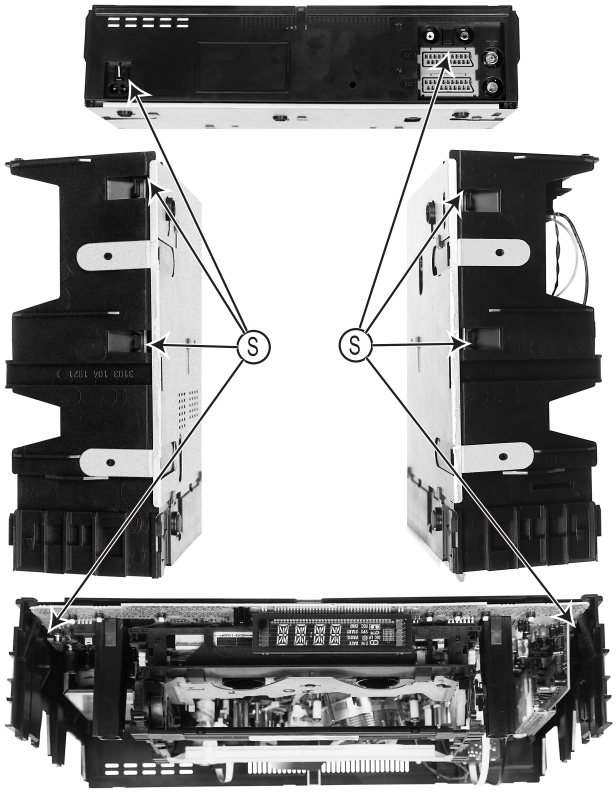


Figure 4-4

4.3 Dismantling the drive (Figure 4-3, 4-5 and 4-6)

Preparation
Remove the housing cover as described in section 1.
Remove the front panel as described in section 3.

- Undo the two screws (B) of the stay and pull it up to remove it.
- Push back lift by 5 cm after releasing both lift stops.
- Undo and remove the four fastening screws (C) of the drive.
- Undo and remove the ground screw (D) at the rear.
- (For this purpose, insert the screwdriver through the hole in the back panel).
- Remove the cables from the drive.
- Bend back the guard of the scanner cable.
- Remove the scanner cable from the socket.
- Return the lift into the "Eject" position.
- Slightly lift the left rear side of the drive to undo the connector to the capstan motor.
- Press both catches (S) together with fine pliers and lift the drive around the snapholders.
- The drive may be separated from the motherboard.

Assembly
Assemble in reverse order.

Important
Observe that the cables (K1; K2; K3) are positioned in the supports on the rear of the frame and that the ground screw (D) is screwed in!

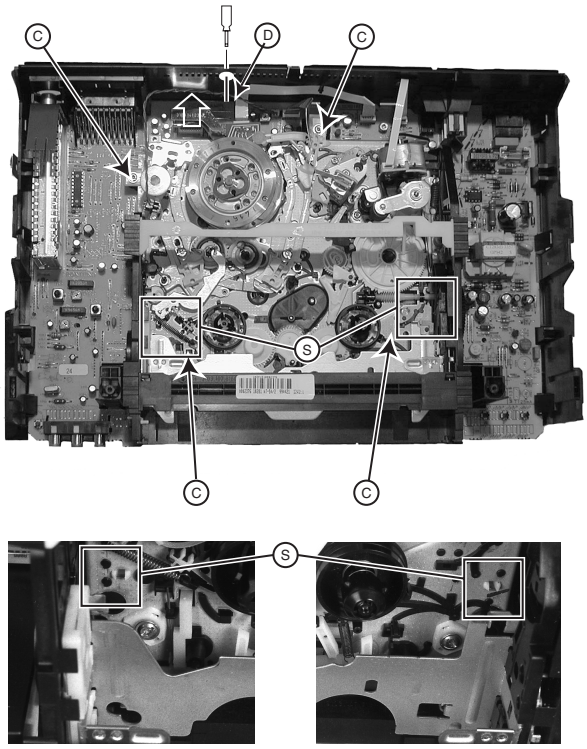
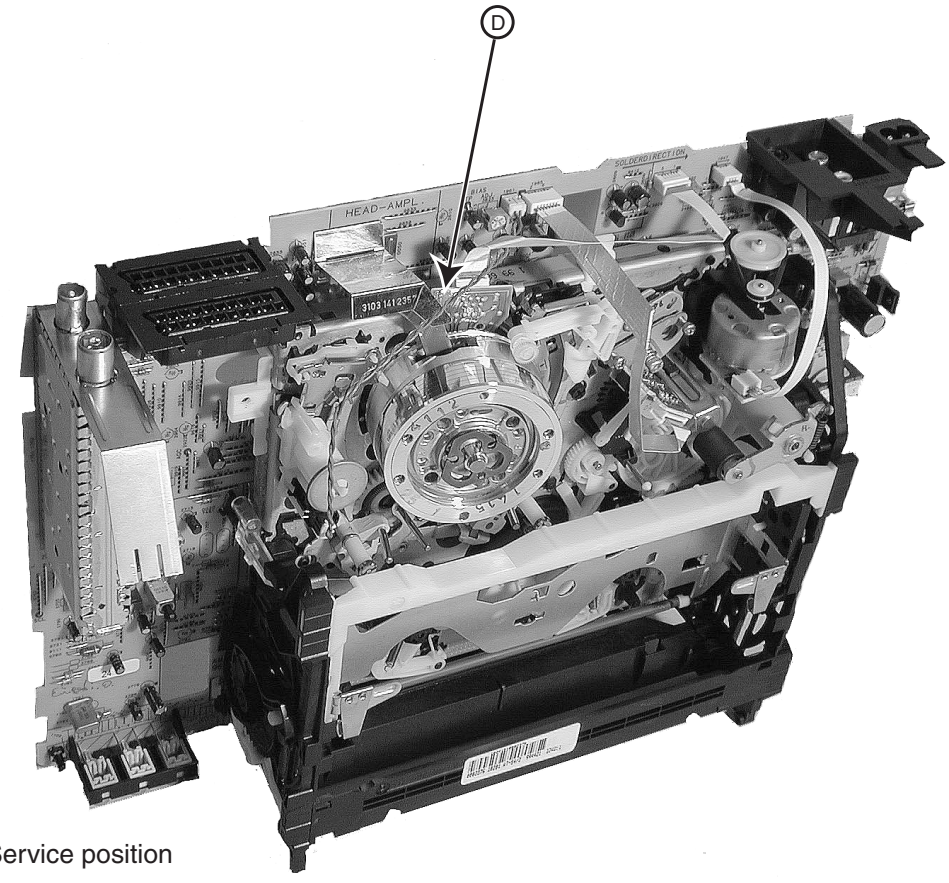


Figure 4-5



Service position

Figure 4-6

5. Service modes, Repair tips

5.1 Special functions

5.1.1 Erasing the EEPROM

– Disconnect from mains
– Push and hold down the Standby key, reconnect to mains and keep the Standby key depressed for a further 3 sec.

All EEPROM data will then be erased and initialised (timer and transmitter channels). The internal processor RAM will also be erased, but the option codes, deck parameters and adjustment values are maintained.

5.1.2 After changing the EEPROM or Motherboard the following steps must be carried out:

Step 40: Option code input
Step 51: Gap position adjustment
Step 52: Studio Picture control‘ adjustment
Step 53: Input of clock correction
Step 62: Adjustment of Audio Linear Playback Level
Step 99: Clock frequency output

5.2 Service test program

5.2.1 Introduction

The software program for the control, deck and operating microprocessors includes a service test program. It was divided into the following steps, with the following ‘modes‘:

Step 00: Display of mask version number
Step 01: Check of the drive positions
Step 02: Display of the deck - error codes
Step 03: Deck - sensors and manual tracking
Step 04: Display of operating hours counter
Step 05: Display of the IIC-Bus Communication
Step 10: Operation without drive - dummy mode
Step 40: Option code input

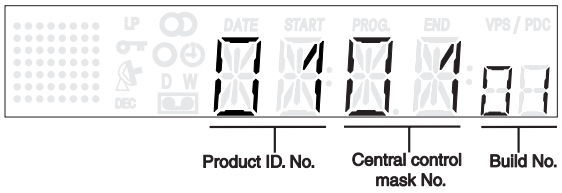
Adjustment Steps in the service test program:
Step 51: Gap position adjustment
Step 52: ‘Studio Picture control‘ adjustment
Step 53: Input of clock correction
Step 62: Adjustment of Audio Linear Playback Level
Step 98: Display test
Step 99: Clock frequency output

In the service test program, all drive functions apart from the channel search and channel change mode can be carried out. The program position set before entering the service test program is maintained.

5.2.2 Activating the service test program

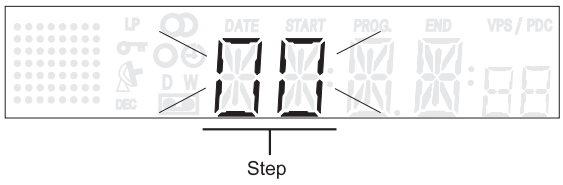
Press and hold down the STOP key on the remote control. Then press the PLAY key on the recorder and keep it depressed for at least 5 sec. The STOP key on the remote control may be released whilst the PLAY key on the recorder is pressed.
The service test program can be selected in any operating mode apart from the channel search, install, clock set-up and cassette length calculation mode. The recorder and all drive functions are fully operational in the service mode.

The display shows, for instance:

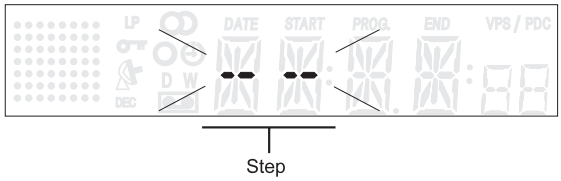


Prod. ID No. ident. No. for A 13 (31, 32, 37)
Centr. Contr. Mask No. µP mask No.
Build No. continually state No.(software)

By pressing the SELECT key on the remote control, all step modes may be left and the currently selected step number appears and flashes.



Other service steps are selected with the UP and DOWN keys or the numerical remote control keys. By pressing the SELECT key on the remote control whilst the Step is flashing, the respective mode can be entered or left.
If a step is selected to which no mode is assigned, the displays shows - - and flashes.

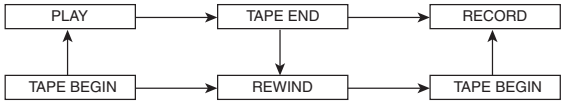


To leave the service program, press the STAND-BY key or disconnect recorder from mains.

5.2.3 Service mode functions

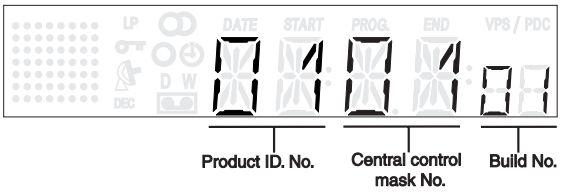
Endurance test
In the service test program, the recorder can be endurance tested. For this purpose, use a cassette and activate “PLAY” or “REC”. The functions are then repeated continuously. In RECORD, the recorder does not move to EJECT at the tape end, but to REWIND, after which it starts to RECORD again. This test serves to detect intermittent faults. The last error is stored in the EEPROM. (The fault remains stored even after a power failure).

The endurance test is ended by pressing STOP or leaving the service test program.

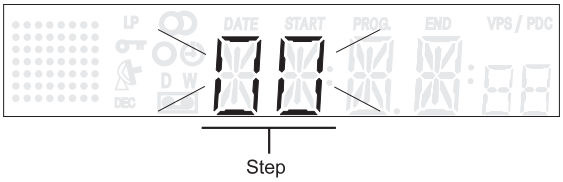


5.2.4 Description of steps with modes:

Step 00: Display of mask version number
After activating the service test program, step 00 and the mask version number are automatically displayed.



The mode can be left again by pressing the SELECT key on the remote control. The currently selected position number appears and flashes on the display.



A step between 00 and 99 can now be selected

Step 01: Checking the drive positions
By pressing the SELECT key whilst Step 01 is flashing, the drive position appears on the display.
The FTA signal from the photoelectric barriers which controls the revolutions of the loading motor is used to check the drive condition.
The drive position is shown as a 3-digit decimal number by counting the FTA pulses on the display.

(e.g. 213 = Play)

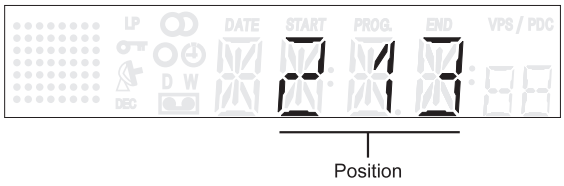
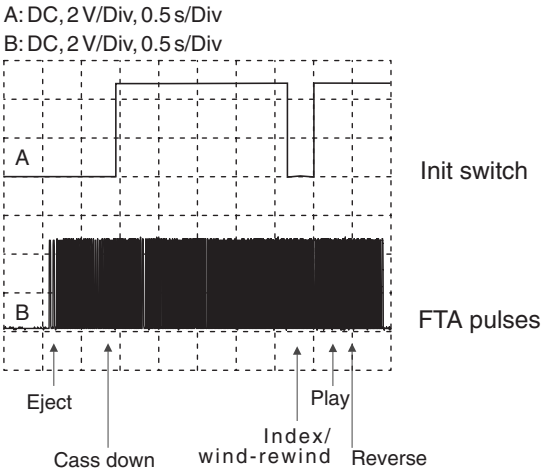


Table of drive positions:

Status	Position (FTA dec)
Eject	007 +2/-2
Index	191 +0/-2
Stop	200 +4/-4
Play	213 +4/-4
Reverse	237 +2/-0

Function of the Init switch:
The diagram shows the function of the Init switch, depending on the position of the deck. The number of FTA pulses is important for the position of the drive.



Step 02: Display of the deck error codes
By pressing the SELECT key whilst Step 02 is flashing, the deck error code is shown on the display.

Checking the drive function Loading and unloading time
The signal (FTA) of the photoelectric barrier which controls the revolutions of the loading motor is used as a reference for the loading and unloading time.

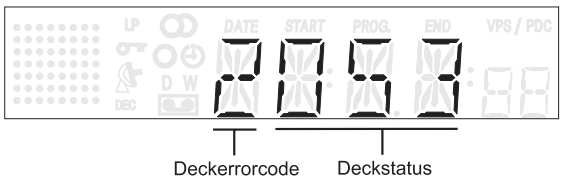
Stopping of supply or take-up reels
The tacho signals of the left (WTL) and right (WTR) winding disks are used as control reference.

Stopping of head drum motor
This is monitored with the PG/FG signal. The signal is discharged from the e.m.f. of the non-conducting spools of the head cylinder motor, showing the position of the head cylinder.

Capstan motor fault
This is monitored with the FGD signal.
If one of the above sensor signals is not available, the recorder tries to put the lift into the “EJECT” position.

Explanation of deck error codes and deck error status
The last error code is stored and remains in the EEPROM, even if the recorder is disconnected from the mains.
The error code can be erased by pushing the CLEAR button on the remote control.

The display shows, for instance:



The left digit shows the error:
(e.g.: Error 2 = Capstan error)

Error table:

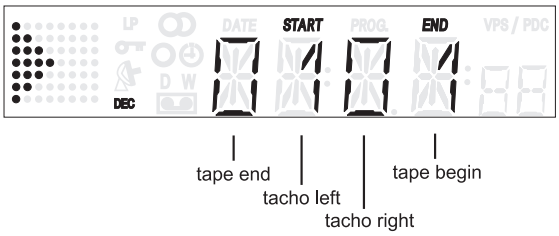
0	no error
1	threading error
2	no capstan pulses
3	tape broken
4	no pulses left reel
5	no pulses right reel
6	head motor error

The 3 digits on the right represent the deck error condition:
(e.g.: 053 = during Play)
The error code can be reset in this step with the CLEAR key.

Functiontable:

012	Standby	114	VISS write	211/491	Slowmotion	1/24
014	Autotracking	115	Viss erase	212/492	" "	1/14
031	Play-3	125	Tuner - Stopout	215/495	" "	1/7
034	Slow_reverse	126	Auto Remain Funct.	216/496	" "	1/2
041	Still Picture	130/410	ATTS Function	217/497	" "	-1/24
042	Fast	168/448	Frame+	218/498	" "	-1/14
044	Play-9	169/449	Frame-	219/499	" "	-1/7
045	Eject	170/450	Play-11	220/500	" "	-1/2
046	Play9	171/451	Play-7	222/502	Edit Record	
047	Play-1	172/452	Play-5	223/503	Align of Gap	
048	Pause	173/453	Play5	238/518	Pause	
050	Rewind	174/454	Play7	239/519	SPC align	
052	Wind	175/455	Play11	246/526	Edit Pause	
053	Play	196/456	Tuner - Eject	247/527	Slow motion	1/10
054	Stop out	197/457	Standby Eject	248/528	" "	1/18
055	Record	199/459	Audio Dubbing	249/529	" "	-1/10
112	Index next	202/482	Audio Dubb. Pause	250/530	" "	-1/18
113	Index previous	206/486	Reset Tapecounter	253/533	Key Released	

Step 03: Deck sensors and manual tracking
By pressing the SELECT key whilst step 03 is flashing, the deck sensors will be displayed in one digit as either 1 or 0.



■ ● ◄ ► are used to display the deck status
START init switch (INIT)
END record protection (RECP)
DEC Loading pulses (FTA)

In the service test program, the tracking is always in the centre position.
Only in this step can the value for the required tape running setting be changed, manually in the PLAY function with the UP / DOWN keys. After leaving the mode with the SELECT key, the tracking value always resets itself to the centre position and cannot be changed.

Step 04: Display of the operating hours counter:
By pressing the SELECT key whilst step 04 is flashing, the operating hours counter shows how many hours the head disk has turned. The hours are displayed as a 4-digit decimal number.

Step 05: Display of the IIC - Bus Communication:
By pressing the SELECT key whilst step 05 is flashing, the available IIC- components will be displayed with symbols.

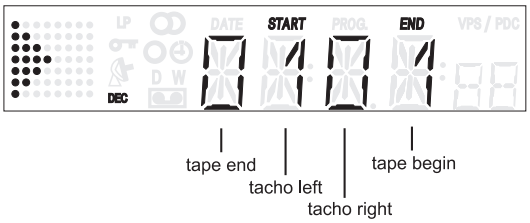
Symbol	Description	Component	Position
	VPS or VPO IC	SDA5650 or SDA5652	7502
DEC	FM ST / NIC IC	MSP 3415D	7761
	FM St IC	TDA 9873	7760
W	Video switch IC	STV 6401	7904
D	FM Audio IC	TDA 9605H	7650
	Tuner Philips	TP9xx	1701
O	Tuner Alps	TMRxx/TCBZ4	1701
	Modulator Phil	TP9xx	1701
LP	Modulator Alps	TMRxx/TCBZ4	1701
	Signal electr. IC	LA71595M	7004

The following errors are visible in the display when the start up routine of the set isn't working properly.

E000 **IIC-Data** line is low
E001 **IIC-Clock** line is low
E002 **EEPROM** give no acknowledgement

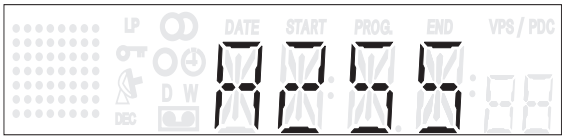
Step 10: Operation without drive - dummy mode
Before activating this mode with the SELECT key, the recorder must be in the EJECT position.

Enter the mode by pressing the SELECT key. The motors are then switched off and the sensors will be ignored by the deck microprocessor. The drive can now be dismantled from the motherboard (see dismantling instructions). **Only install drive if recorder is disconnected from mains.** For signal tracking, the recorder can be set to all drive conditions, i.e. signal electronics, audio and IO processing are switched to the respective operating mode.

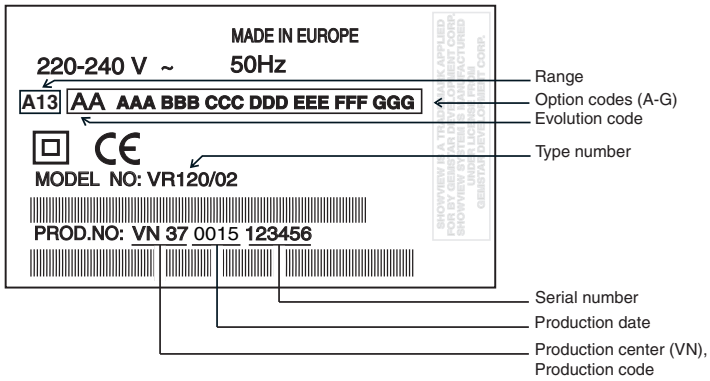


■ ● ◄ ►	are used to display the deck status
START	init switch (INIT)
END	record protection (RECP)
DEC	Loading pulses (FTA)

Step 40: Option code input
If a new EEPROM is installed in the course of repairs, it must be initialised.
By pressing the SELECT key whilst step 40 is flashing, the decimal option A appears in the display.



By entering a 3-digit decimal code, the correct features are set.



These codes are shown on the type-plate of the recorder.
After pressing the OK key on the remote control, the entered code is saved. The display shows OK for approx. 3 sec. and then the stored value in decimal format.

By pressing the UP and DOWN keys, the available options (A to G) can be selected. The display shows the last stored value in decimal format.

In case of an invalid entry (value >255) the activation of the OK key causes the content of the last stored option to be displayed and OK does not appear in the display.

Depending on the model, some bits are software or default protected and cannot be changed by an entry. In this case, the display shows OK, but the display returns to the default value.

Step 98: Display Test
By pressing the SELECT key whilst step 98 is flashing, all segments of the display are illuminated.

The step is exited by pressing SELECT again.

5.3 Repair tips

5.3.1 Replacement procedure for leadless components (chip)

The following procedures are recommended for replacing leadless components used in this unit.

1. Preparation for replacement

a. Soldering iron
Use a pencil-type soldering iron that uses less than 30W
b. Solder
Use Eutectic solder (Tin 63%, Lead 37%)
c. Soldering time
Maximum 4 seconds.

Note:
- Leadless components must not be re-used after removal.
- Excessive mechanical stress and rubbing of the component electrode must be avoided.

2. Removing the leadless components

Grasp the leadless component body with tweezers and alternately apply heat to both electrodes. When the solder on both electrodes has melted, remove leadless component with a twisting motion.

Note:
- Do not attempt to lift the component off the board until the component is completely disconnected from the board with a twisting motion.
- Be careful not to break the copper foil on the printed circuit board.

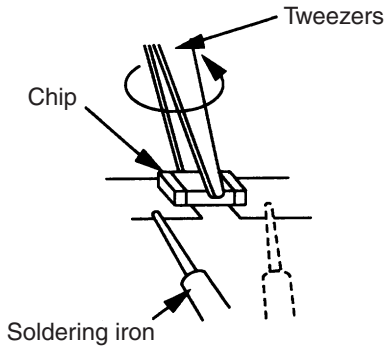
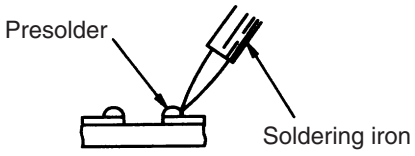


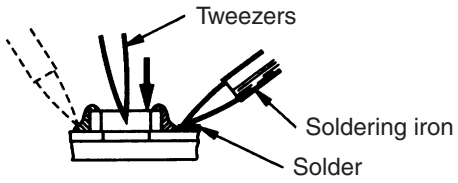
Figure 5-1

3. Installation of leadless components

a. Presolder the contact points on the circuit board



b. Using tweezers press down the part and solder both electrodes as shown below.



Note:
Do not glue the replacement component to the circuit board.

5.3.2 How to remove/install the Flat Pack IC

How to remove the Flat Pack IC

- **Using a hot air Flat Pack IC unsoldering equipment**

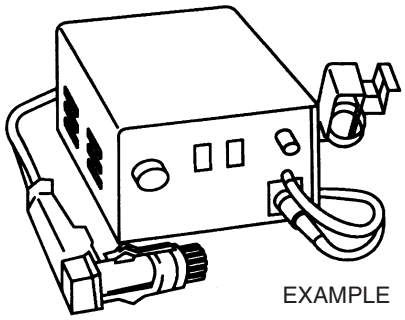


Figure 5-2

a. Prepare the hot air Flat Pack IC unsoldering equipment. Then apply hot air to Flat Pack IC for 5 - 8 seconds.

b. Remove the Flat Pack IC with tweezers while applying the hot air.

CAUTION:
To avoid damage, do not apply the hot air to the chip parts around the Flat Pack IC for long periods.

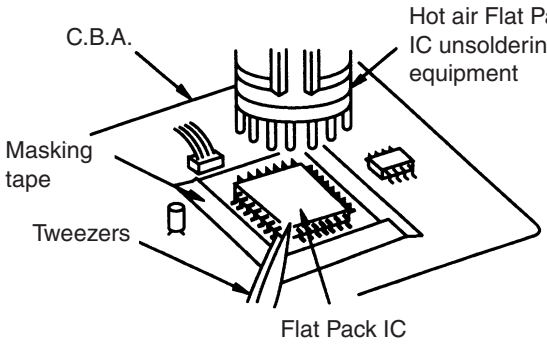


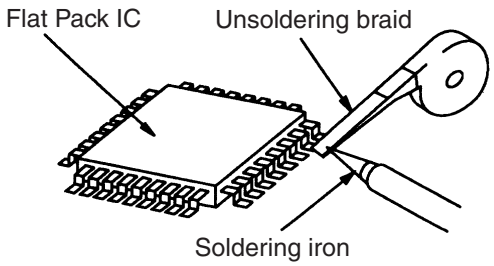
Figure 5-3

Put masking tape around the Flat Pack IC to protect adjacent parts.

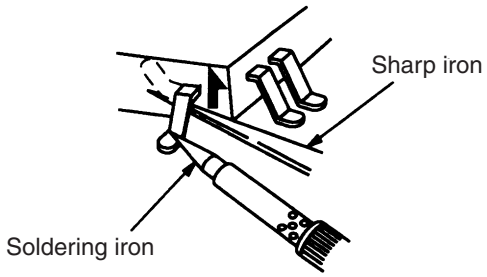
The Flat Pack IC is fixed to the P.C.B. with glue; therefore take care not to break or damage any foil under the IC or on each pin when removing it.

- **Using a soldering iron**

a. Use unsoldering braid to remove the solder from all pins of the Flat Pack IC. Apply solder flux to all pins of the Flat Pack IC, to allow easy removal.



b. Lift up each lead of the Flat Pack IC individually, using a sharp pin or non-solder wire (iron wire), while heating the pins using a fine tip soldering iron or a hot air blower.



- **Using iron wire**

a. Use unsoldering braid to remove the solder from all pins of the Flat Pack IC. Apply solder flux to all pins of the Flat Pack IC, to allow easy removal.

b. Affix the wire to workbench or solid mounting point (see figure 5-3)

c. Pull up the wire as the solder melts in order to lift the IC lead from the P.C.B. contact pad, while heating the pins using a fine-tip soldering iron or hot air blower.

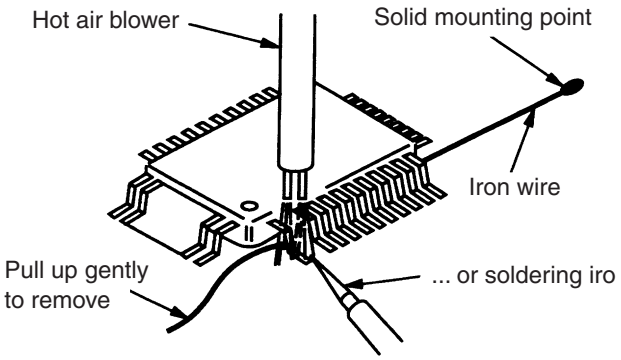


Figure 5-4

Note:
When using a soldering iron care must be taken to ensure that the Flat Pack IC is not held by glue or the P.C.B. may be damaged if force is used.
If the IC is glued, heat the IC with hot air to loosen the glue.

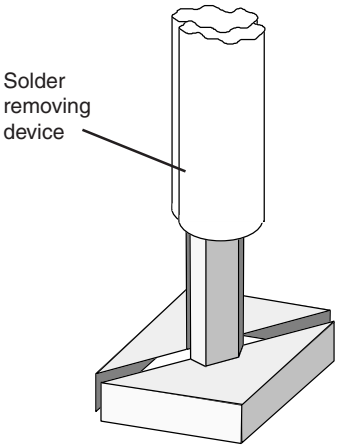
- **Using a special removal device**

a. Apply extra tin-lead solder onto the pins

b. Heat the IC to melt the glue which has been used to affix it

c. Use a solder removing device with a special punch which matches the contours of the IC to remove the IC.

At the other corners there are printed conductors which may be damaged!



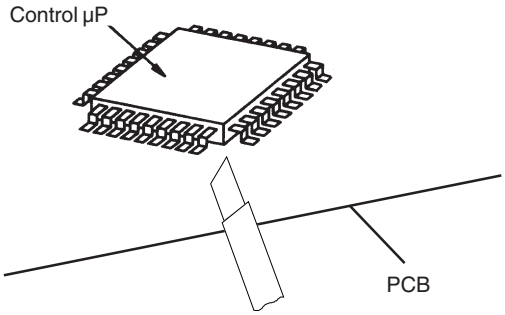
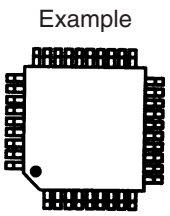


Figure 5-5

How to install the Flat Pack IC

a. Use unsoldering braid to remove the solder from the foil of each pin of the Flat Pack IC on the P.C.B. in order to install the replacement Flat Pack IC more easily.

b. The “dot” mark on the Flat Pack IC indicates pin 1. Make sure this mark matches the 1 on the P.C.B. when positioning for installation. Then pre-solder the four corners of the d. Flat Pack IC. (see figure 5-5).



Pin 1 on Flat Pack IC is market by a "●".

Figure 5-6

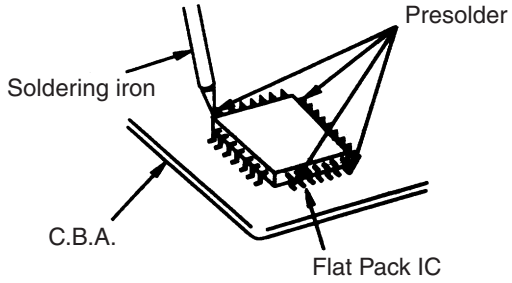


Figure 5-7

c. Solder all pins of the Flat Pack IC. Make sure that none of the pins have solder bridges between pins on the Flat Pack IC.

5.4 Note

All integrated circuits and many other semiconductor devices are electrostatically sensitive and therefore require the special handling techniques described in the “SAFETY INSTRUCTIONS” section of this manual.

5.5 Voltage measurements

Color bar signal in SP REC and PB modes.

Note:
Voltage indications for the REC. and PB mode on the schematic diagrams are shown below:

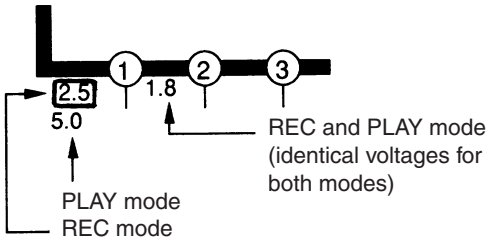


Figure 5-8

5.6 How to read wave forms

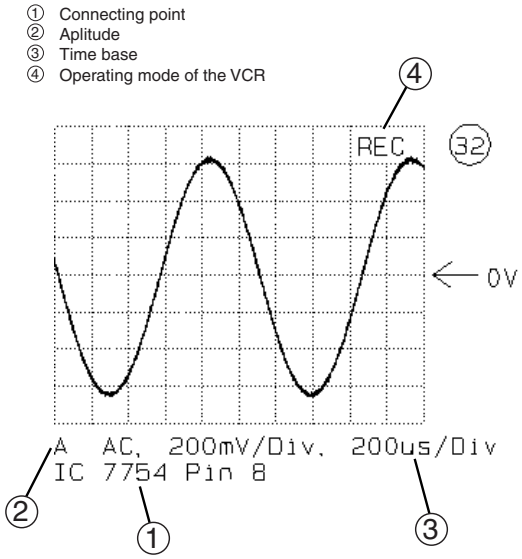


Figure 5-9

5.7 Voltage indication of Zener diodes

The Zener voltage of Zener diodes is indicated as such on schematic diagrams:
Example: BZX79C20.....Zener voltage: 20 Volts

5.8 How to identify connectors on schematic diagrams

Each connector is labeled with a connector number and a pin number indicating to what component it is connected; in other words, its counterpart.

Use the Connecting Wiring Diagram to find the connections between associated connectors.

Example:
The connections between C.B.A.s are shown below:

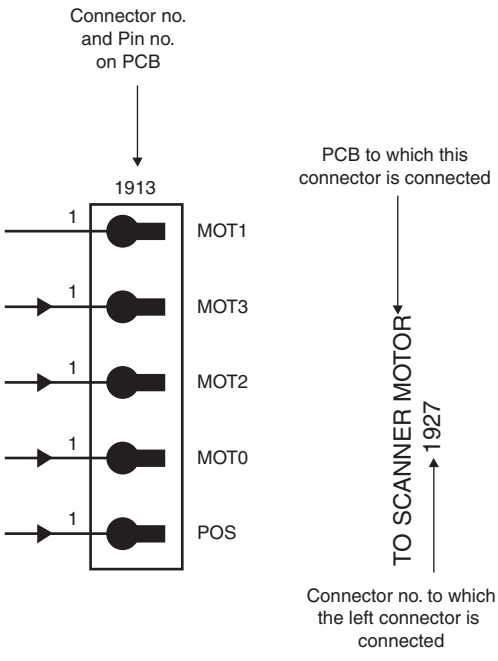
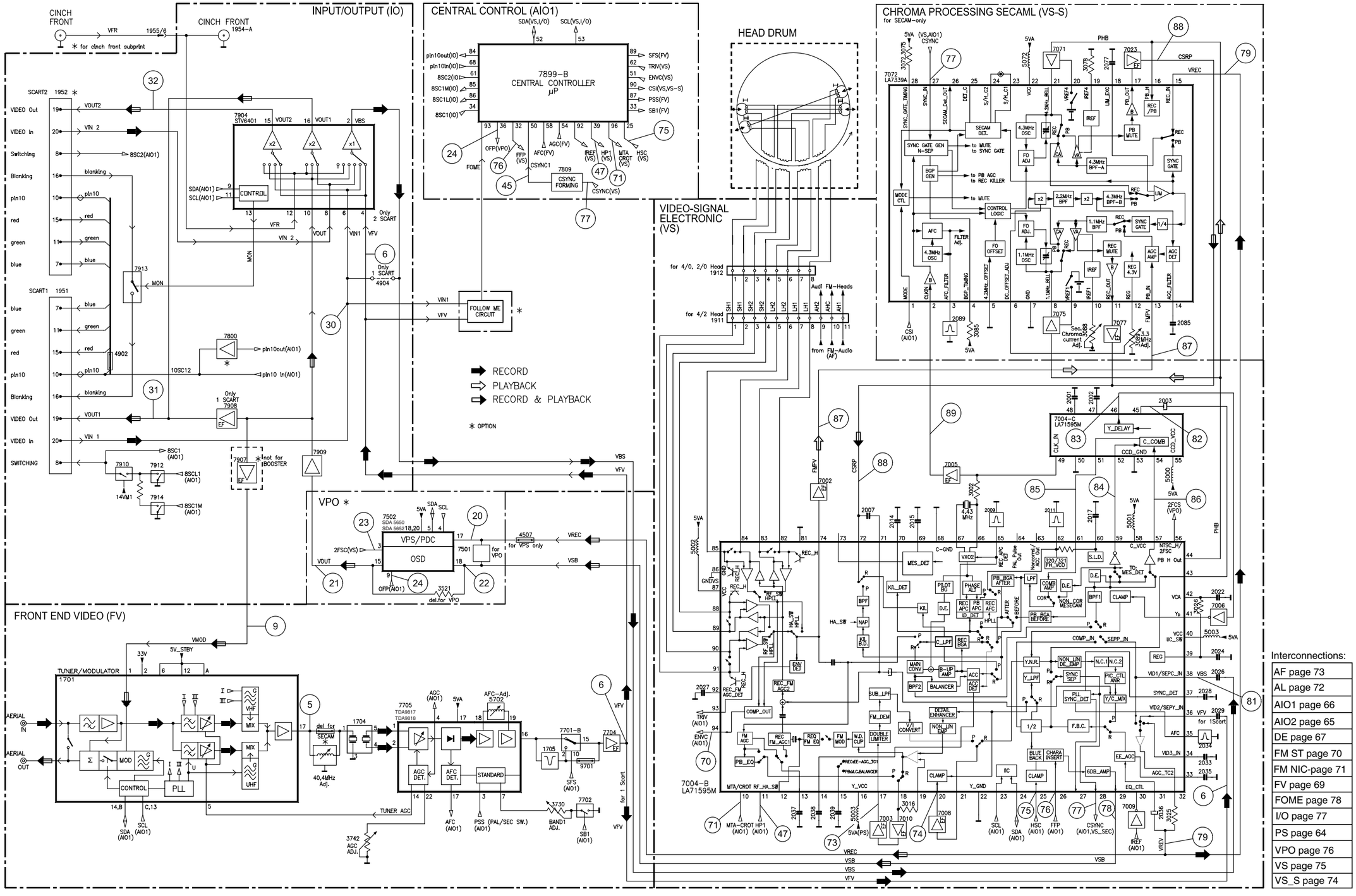


Figure 5-10

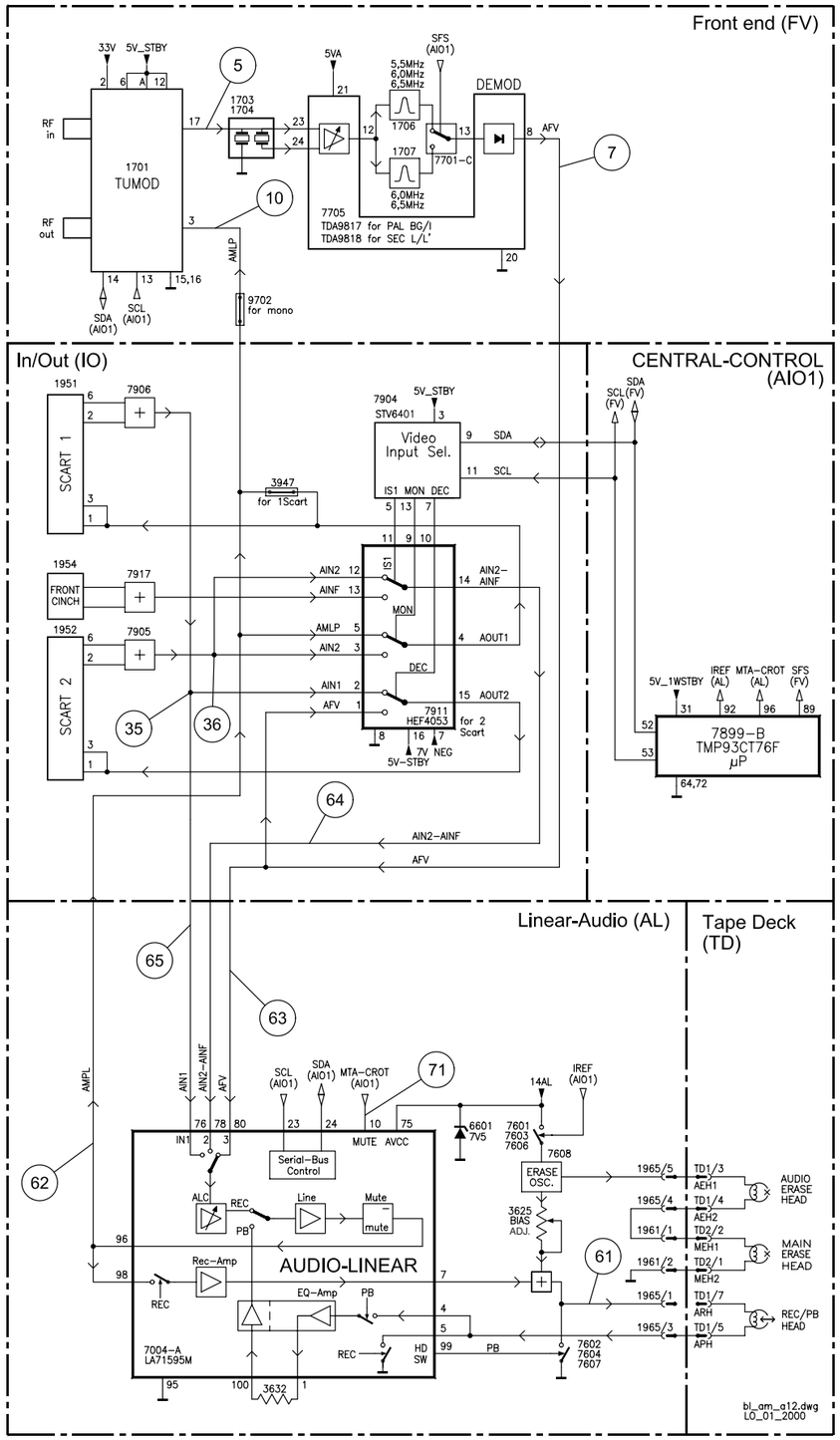
Engineer's remarks:

6. Block diagrams, Waveforms

6.1 Block diagram Video



6.2 Block diagram Audio Mono

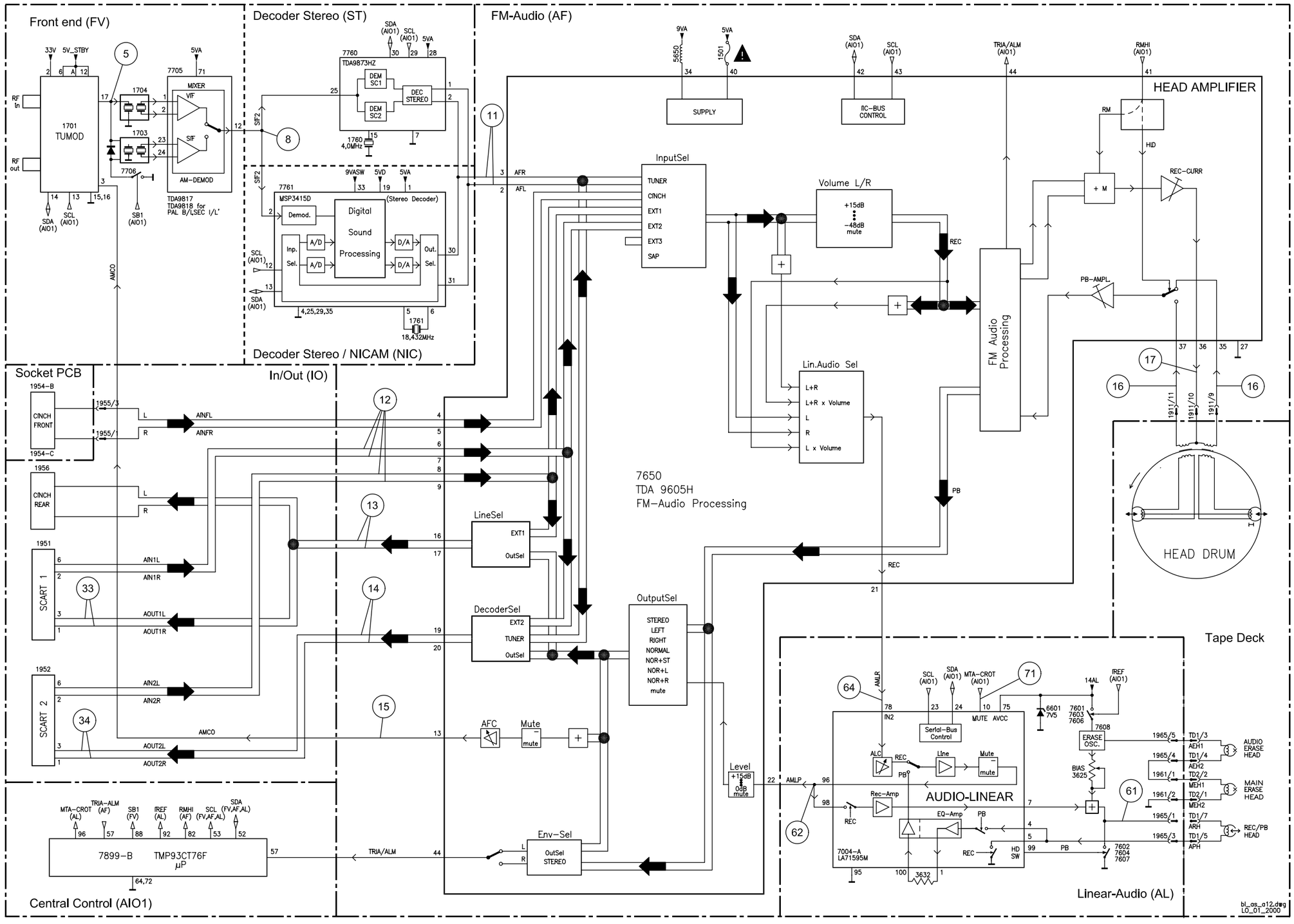


Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

Engineer's remarks:

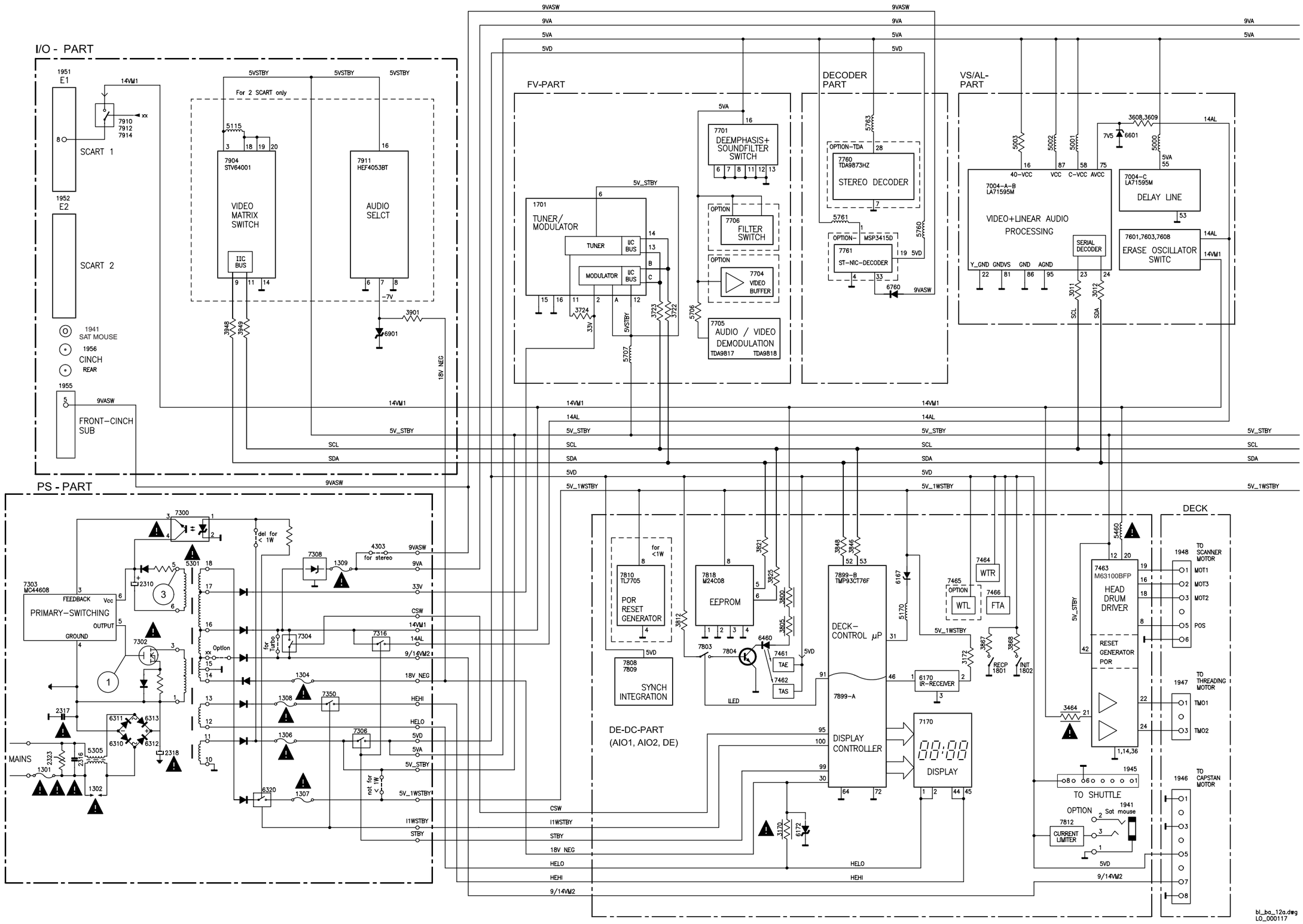
6.3 Block diagram Audio Stereo



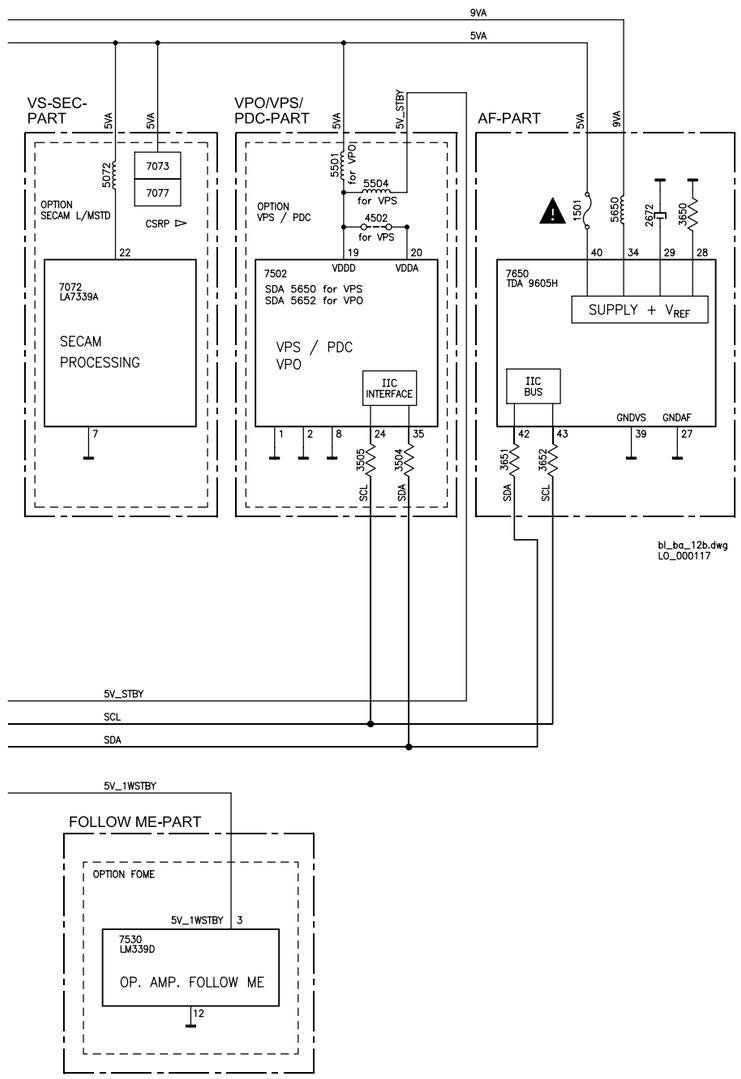
Interconnections:

AF page 73
AL page 72
AIO1 page 66
AIO2 page 65
DE page 67
FM ST page 70
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

6.4 Supply voltages and Bus diagram



6.5 Supply voltages and Bus diagram



Interconnections:

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AIO1 page 66
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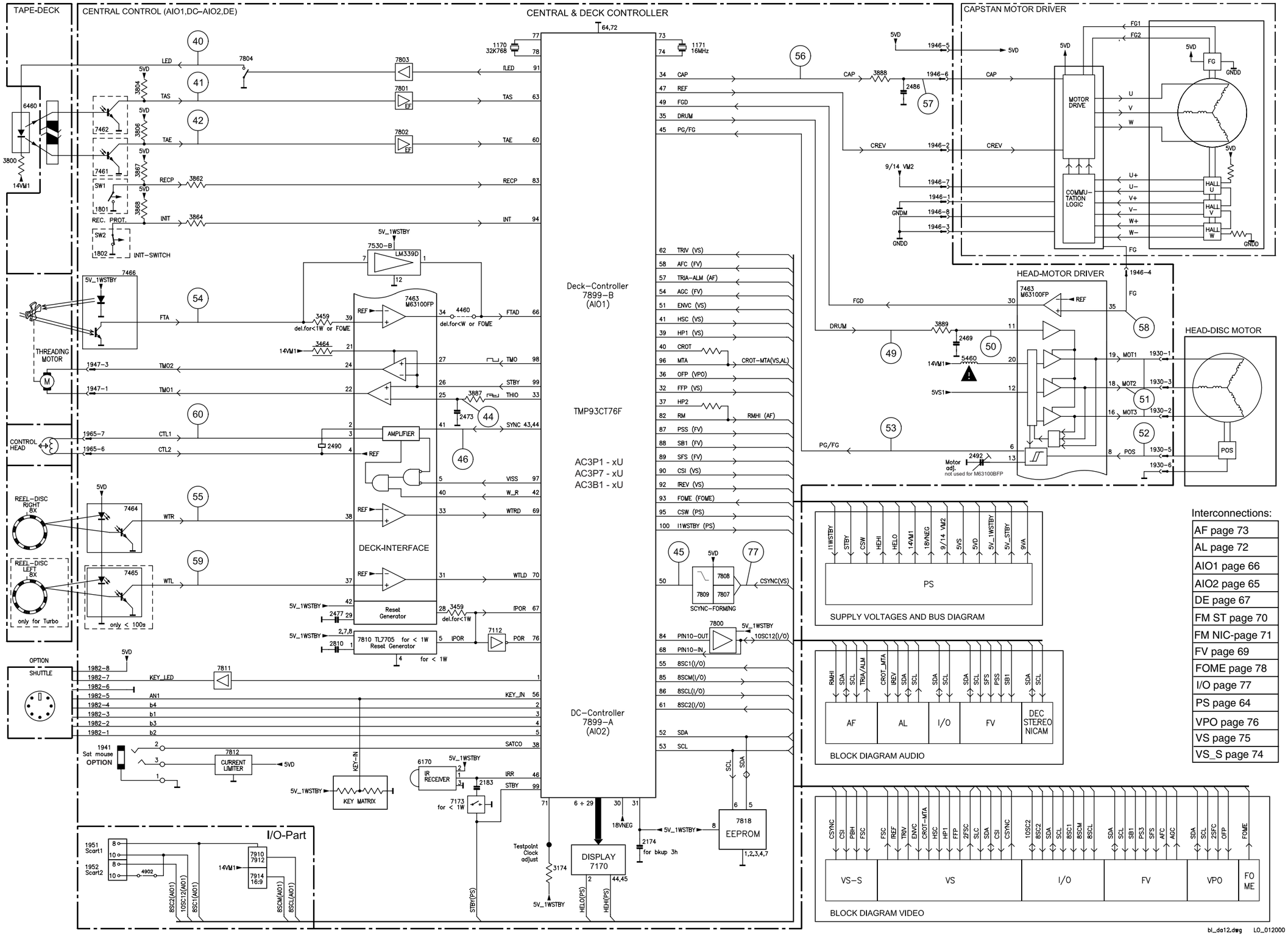
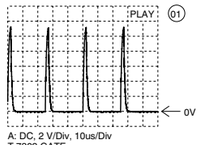
FM NIC-page 71
FV page 69
FOME page 78
I/O page 77
PS page 64
VPO page 76
VS page 75
VS_S page 74

Engineer's remarks:

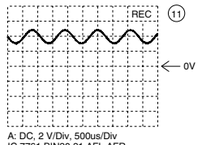
6.6 Block diagram Central Control (AIO1, AIO2)



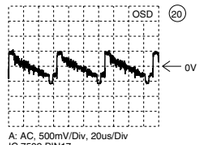
6.7 Waveforms



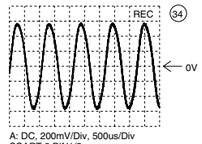
A: DC, 2 V/Div, 10us/Div
T 7302 GATE



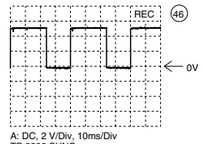
A: DC, 2 V/Div, 500us/Div
IC 7761 PIN30,31 AFL,AFR



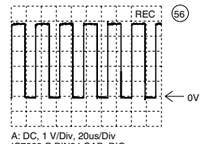
A: AC, 500mV/Div, 20us/Div
IC 7502 PIN17



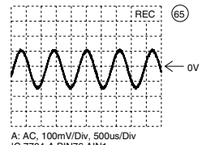
A: DC, 200mV/Div, 500us/Div
SCART 2 PIN1/3



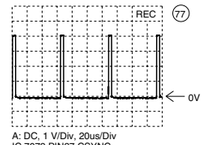
A: DC, 2 V/Div, 10ms/Div
TP 9802 SYNC



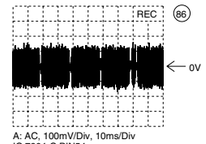
A: DC, 1 V/Div, 20us/Div
IC7899-B PIN34 CAP_DIG



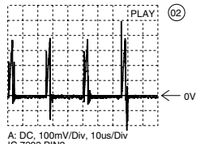
A: AC, 100mV/Div, 500us/Div
IC 7704-A PIN76 AIN1



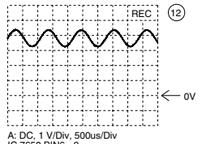
A: DC, 1 V/Div, 20us/Div
IC 7072 PIN27 CSYNC



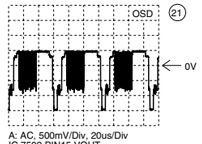
A: AC, 100mV/Div, 10ms/Div
IC 7004-C PIN54



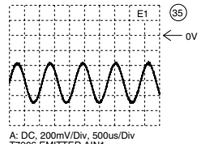
A: DC, 100mV/Div, 10us/Div
IC 7303 PIN2



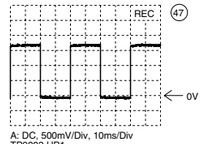
A: DC, 1 V/Div, 500us/Div
IC 7650 PIN6 - 9



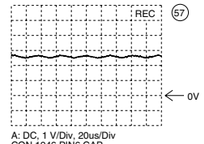
A: AC, 500mV/Div, 20us/Div
IC 7502 PIN15 VOUT



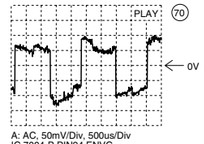
A: DC, 200mV/Div, 500us/Div
T7906 EMITTER AIN1



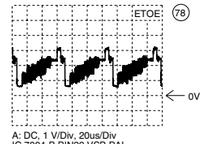
A: DC, 500mV/Div, 10ms/Div
TP9803 HP1



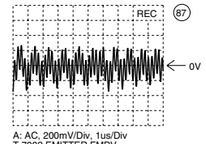
A: DC, 1 V/Div, 20us/Div
CON 1946 PIN6 CAP



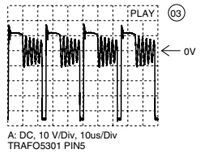
A: AC, 50mV/Div, 500us/Div
IC 7004-B PIN94 ENVC



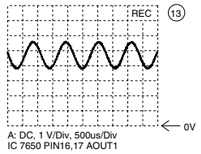
A: DC, 1 V/Div, 20us/Div
IC 7004-B PIN29 VSB PAL



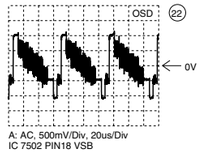
A: AC, 200mV/Div, 1us/Div
T 7002 EMITTER FMPV



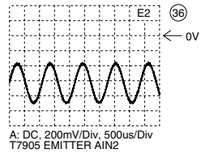
A: DC, 10 V/Div, 10us/Div
TRAFO5301 PIN5



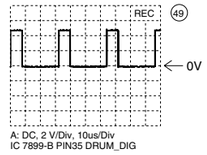
A: DC, 1 V/Div, 500us/Div
IC 7650 PIN16,17 AOUT1



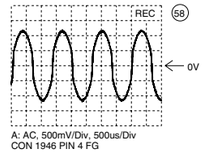
A: AC, 500mV/Div, 20us/Div
IC 7502 PIN18 VSB



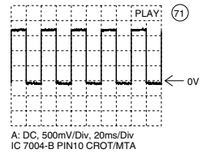
A: DC, 200mV/Div, 500us/Div
T7905 EMITTER AIN2



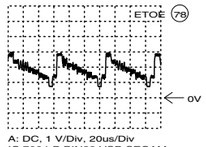
A: DC, 2 V/Div, 10us/Div
IC 7899-B PIN35 DRUM_DIG



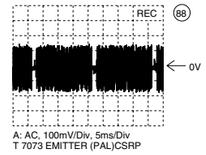
A: AC, 500mV/Div, 500us/Div
CON 1946 PIN 4 FG



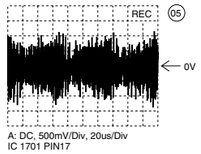
A: DC, 500mV/Div, 20ms/Div
IC 7004-B PIN10 CROT/MTA



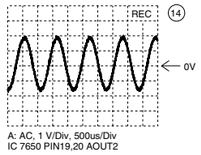
A: DC, 1 V/Div, 20us/Div
IC 7004-B PIN29 VSB SECAM



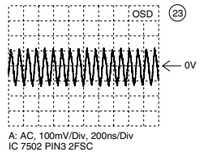
A: AC, 100mV/Div, 5ms/Div
T 7073 EMITTER (PAL)CSRP



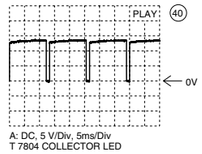
A: DC, 500mV/Div, 20us/Div
IC 1701 PIN17



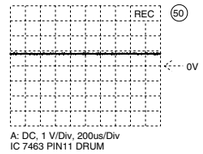
A: AC, 1 V/Div, 500us/Div
IC 7650 PIN19,20 AOUT2



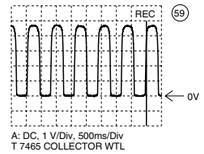
A: AC, 100mV/Div, 200ns/Div
IC 7502 PIN3 2FSC



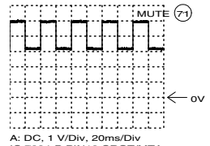
A: DC, 5 V/Div, 5ms/Div
T 7804 COLLECTOR LED



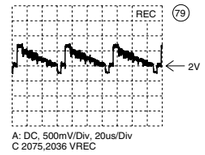
A: DC, 1 V/Div, 200us/Div
IC 7463 PIN11 DRUM



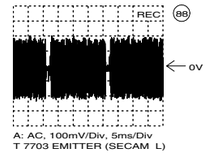
A: DC, 1 V/Div, 500ms/Div
T 7465 COLLECTOR WTL



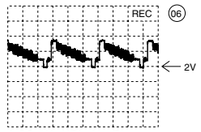
A: DC, 1 V/Div, 20ms/Div
IC 7004-B PIN10 CROT/MTA



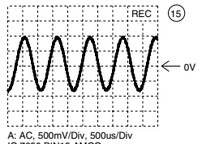
A: DC, 500mV/Div, 20us/Div
C 2075,2036 VREC



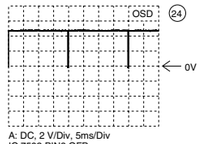
A: AC, 100mV/Div, 5ms/Div
T 7703 EMITTER (SECAM L)



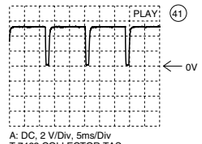
A: DC, 500mV/Div, 20us/Div
T7704 EMITTER VFV



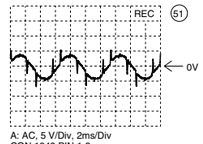
A: AC, 500mV/Div, 500us/Div
IC 7650 PIN15 AMCO



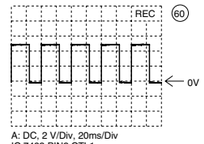
A: DC, 2 V/Div, 5ms/Div
IC 7502 PIN9 OFP



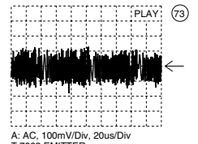
A: DC, 2 V/Div, 5ms/Div
T 7462 COLLECTOR TAS



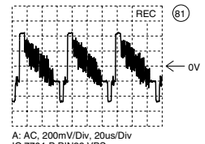
A: AC, 5 V/Div, 2ms/Div
CON 1948 PIN 1-3



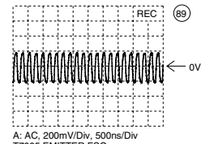
A: DC, 2 V/Div, 20ms/Div
IC 7463 PIN3 CTL1



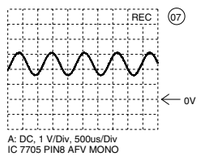
A: AC, 100mV/Div, 20us/Div
T 7003 EMITTER



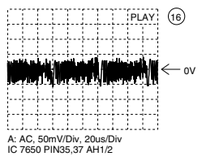
A: AC, 200mV/Div, 20us/Div
IC 7704-B PIN38 VBS



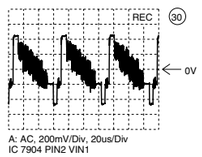
A: AC, 200mV/Div, 500ns/Div
T7005 EMITTER FSC



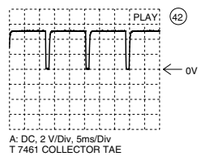
A: DC, 1 V/Div, 500us/Div
IC 7705 PIN8 AFV MONO



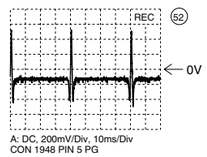
A: AC, 50mV/Div, 20us/Div
IC 7650 PIN35,37 AH1/2



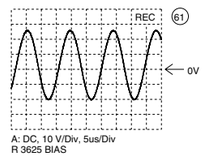
A: AC, 200mV/Div, 20us/Div
IC 7904 PIN2 VIN1



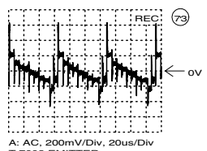
A: DC, 2 V/Div, 5ms/Div
T 7461 COLLECTOR TAE



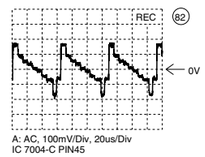
A: DC, 200mV/Div, 10ms/Div
CON 1948 PIN 5 PG



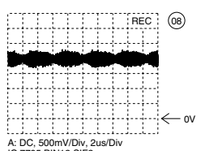
A: DC, 10 V/Div, 5us/Div
R 3625 BIAS



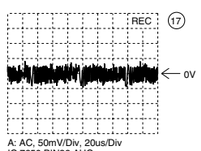
A: AC, 200mV/Div, 20us/Div
T 7003 EMITTER



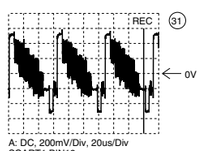
A: AC, 100mV/Div, 20us/Div
IC 7004-C PIN45



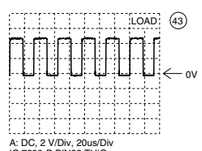
A: DC, 500mV/Div, 2us/Div
IC 7705 PIN12 SIF2



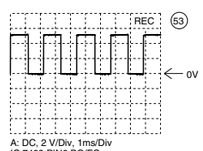
A: AC, 50mV/Div, 20us/Div
IC 7650 PIN36 AHC



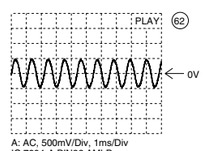
A: DC, 200mV/Div, 20us/Div
SCART1 PIN19



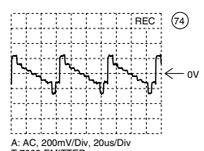
A: DC, 2 V/Div, 20us/Div
IC 7899-B PIN33 THIO



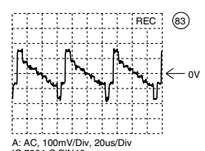
A: DC, 2 V/Div, 1ms/Div
IC 7463 PIN6 PG/FG



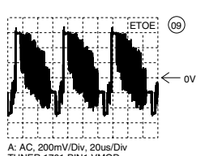
A: AC, 500mV/Div, 1ms/Div
IC 7004-A PIN96 AMLP



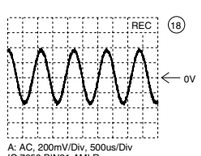
A: AC, 200mV/Div, 20us/Div
T 7008 EMITTER



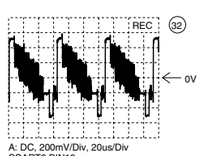
A: AC, 100mV/Div, 20us/Div
IC 7004-C PIN46



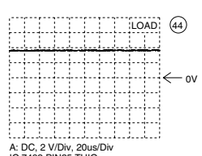
A: AC, 200mV/Div, 20us/Div
TUNER 1701 PIN1 VMOD



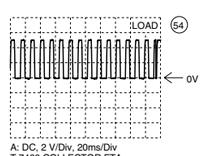
A: AC, 200mV/Div, 500us/Div
IC 7650 PIN21 AMLR



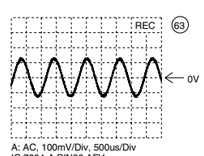
A: DC, 200mV/Div, 20us/Div
SCART2 PIN19



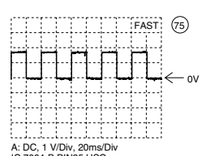
A: DC, 2 V/Div, 20us/Div
IC 7463 PIN25 THIO



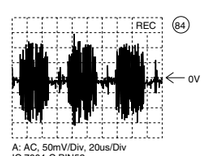
A: DC, 2 V/Div, 20ms/Div
T 7466 COLLECTOR FTA



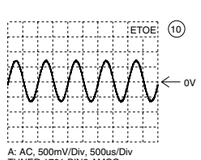
A: AC, 100mV/Div, 500us/Div
IC 7004-A PIN80 AFV



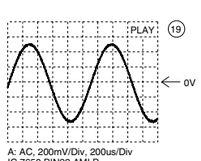
A: DC, 1 V/Div, 20ms/Div
IC 7004-B PIN25 HSC



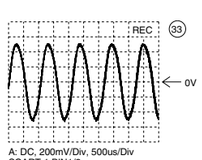
A: AC, 50mV/Div, 20us/Div
IC 7004-C PIN52



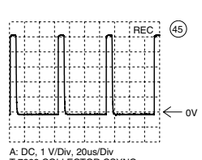
A: AC, 500mV/Div, 500us/Div
TUNER 1701 PIN3 AMCO



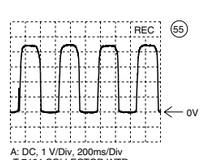
A: AC, 200mV/Div, 200us/Div
IC 7650 PIN22 AMLP



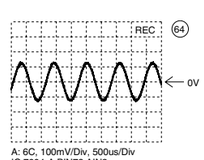
A: DC, 200mV/Div, 500us/Div
SCART 1 PIN1/3



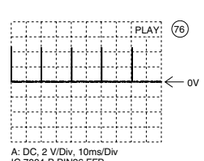
A: DC, 1 V/Div, 20us/Div
T 7809 COLLECTOR CSYNC



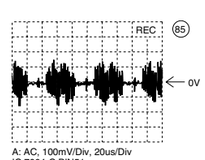
A: DC, 1 V/Div, 200ms/Div
T 7464 COLLECTOR WTR



A: 6C, 100mV/Div, 500us/Div
IC 7004-A PIN78 AIN2



A: DC, 2 V/Div, 10ms/Div
IC 7004-B PIN26 FFP

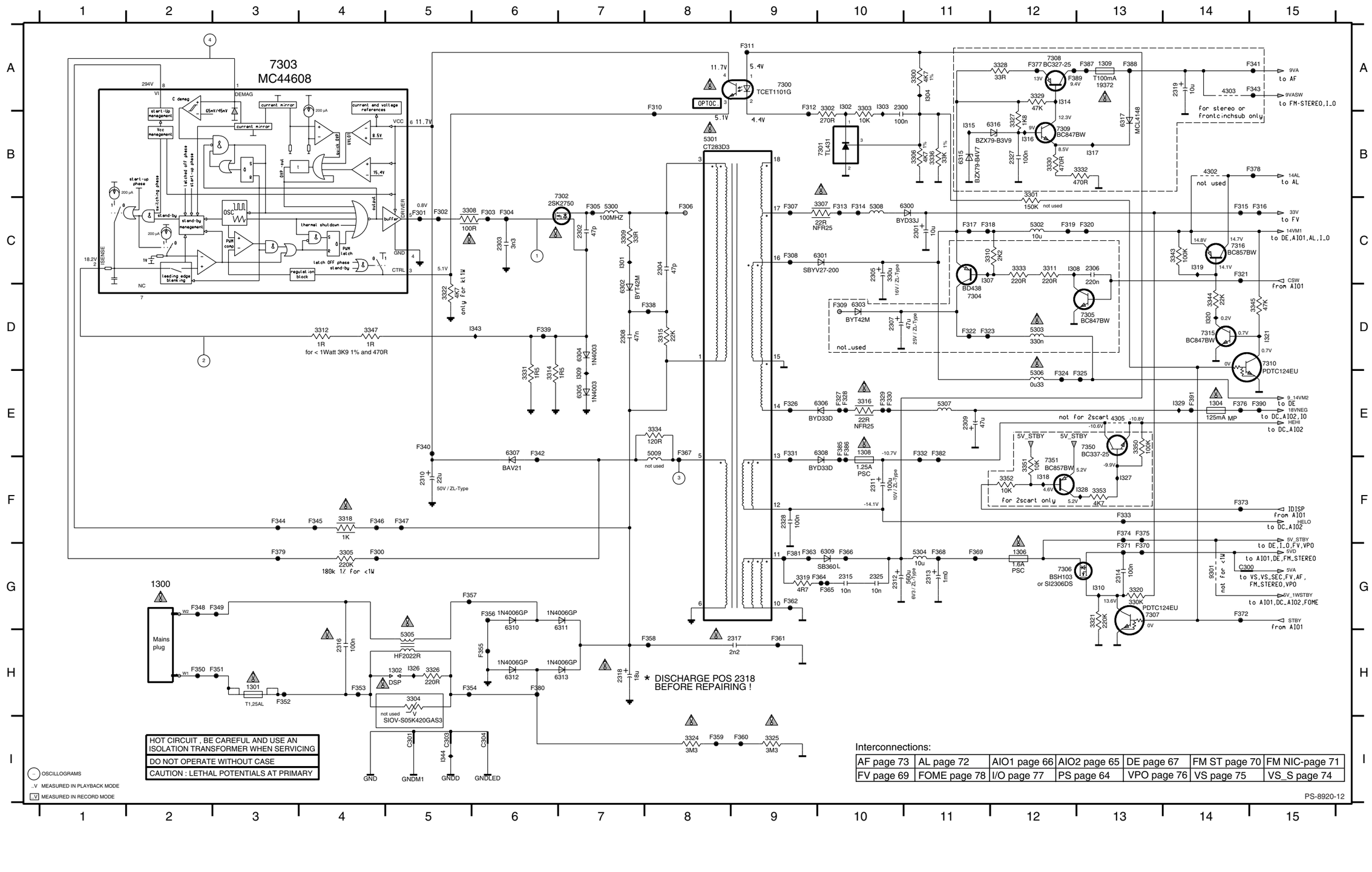


A: AC, 100mV/Div, 20us/Div
IC 7004-C PIN51

7. Circuit diagrams and PWB layouts, Wiring diagram

7.1 Power supply (PS)

0040 B5 1309 A13 2306 C13 2313 G11 2325 G10 3304 H5 3311 C12 3320 G13 3328 A12 3336 B11 3352 F12 5301 B8 5308 C10 6306 E10 6313 H7 7303 A3 7310 D15 9002 H1 C300 G14 F303 C6 F310 A8 F317 C11 F324 E12 F331 E9 F342 E6 F349 G3 F356 G6 F363 G9 F370 G13 F377 A12 F386 E10 I302 A10 I314 A12 I321 D15
1300 G2 2300 A10 2307 D10 2314 G13 2327 B12 3305 G4 3312 D4 3321 G13 3329 A12 3343 C14 3345 D15 4303 A14 5304 G11 5306 E14 6300 C7 6307 E6 6315 B11 7304 D11 7315 D14 9003 H1 C301 I5 F304 C6 F311 A9 F318 C11 F325 E13 F332 E11 F343 A15 F350 H2 F357 G5 F364 G10 F371 G13 F378 B15 F387 A13 I303 A10 I315 B11 I326 H5
1301 H3 2301 C11 2308 D7 2315 G10 2328 F9 3306 B11 3314 E6 3322 D5 3330 B12 3344 D14 4302 B14 5303 D12 6301 C10 6308 E10 6316 B12 7305 D13 7316 C14 9004 H1 C303 I5 F305 C7 F312 A9 F319 C12 F326 E9 F333 F13 F344 F3 F351 H3 F358 H8 F365 G10 F372 G14 F379 G3 F388 A13 I304 A11 I316 B12 I327 F13
1302 H5 2302 C7 2309 E11 2316 H4 3300 A11 3307 C10 3315 D8 3324 I8 3331 E6 3345 D15 4303 A14 5304 G11 6302 D7 6309 G10 6317 B13 7306 G12 7350 E13 9005 I1 C304 I6 F306 C8 F313 C10 F320 C13 F327 E10 F338 D8 F345 F4 F352 H3 F359 I8 F366 G10 F373 F14 F380 H6 F389 A12 I307 C11 I317 B13 I328 F13
1304 E14 2303 C6 2310 F5 2317 H9 3301 B12 3308 C5 3316 E10 3325 I9 3332 B13 3347 D4 4305 E13 5305 H5 6303 D10 6310 G6 7300 A9 7307 G13 7351 F12 9006 I1 F300 G4 F307 C9 F314 C10 F321 C14 F328 E10 F339 D6 F346 F4 F353 H4 F360 I9 F367 E8 F374 F13 F381 G9 F390 E15 I308 C12 I318 F12 I329 E14
1306 G12 2304 C8 2311 F10 2318 H7 3302 A10 3309 C7 3318 F4 3326 H5 3333 C12 3350 E13 5009 E8 5306 E12 6304 D7 6311 G7 7301 B10 7308 A12 9000 H1 9007 I1 F301 C5 F308 C9 F315 C14 F322 D11 F329 E10 F340 A8 F347 C11 F354 E12 F361 E9 F368 G11 F375 F13 F382 E11 F389 A13 I309 E7 I319 C14 I343 D6
1308 E10 2305 C10 2312 G10 2319 A14 3303 A10 3310 C11 3319 G9 3327 B12 3334 E8 3351 F12 5300 C7 5307 E11 6305 E7 6312 H6 7302 C7 7309 B12 9001 H1 9301 G14 F302 C5 F309 D10 F316 C15 F323 D11 F330 E10 F341 A15 F348 G2 F355 H6 F362 G9 F369 G11 F376 E14 F385 E10 I301 C7 I310 G13 I320 D14 I344 I5

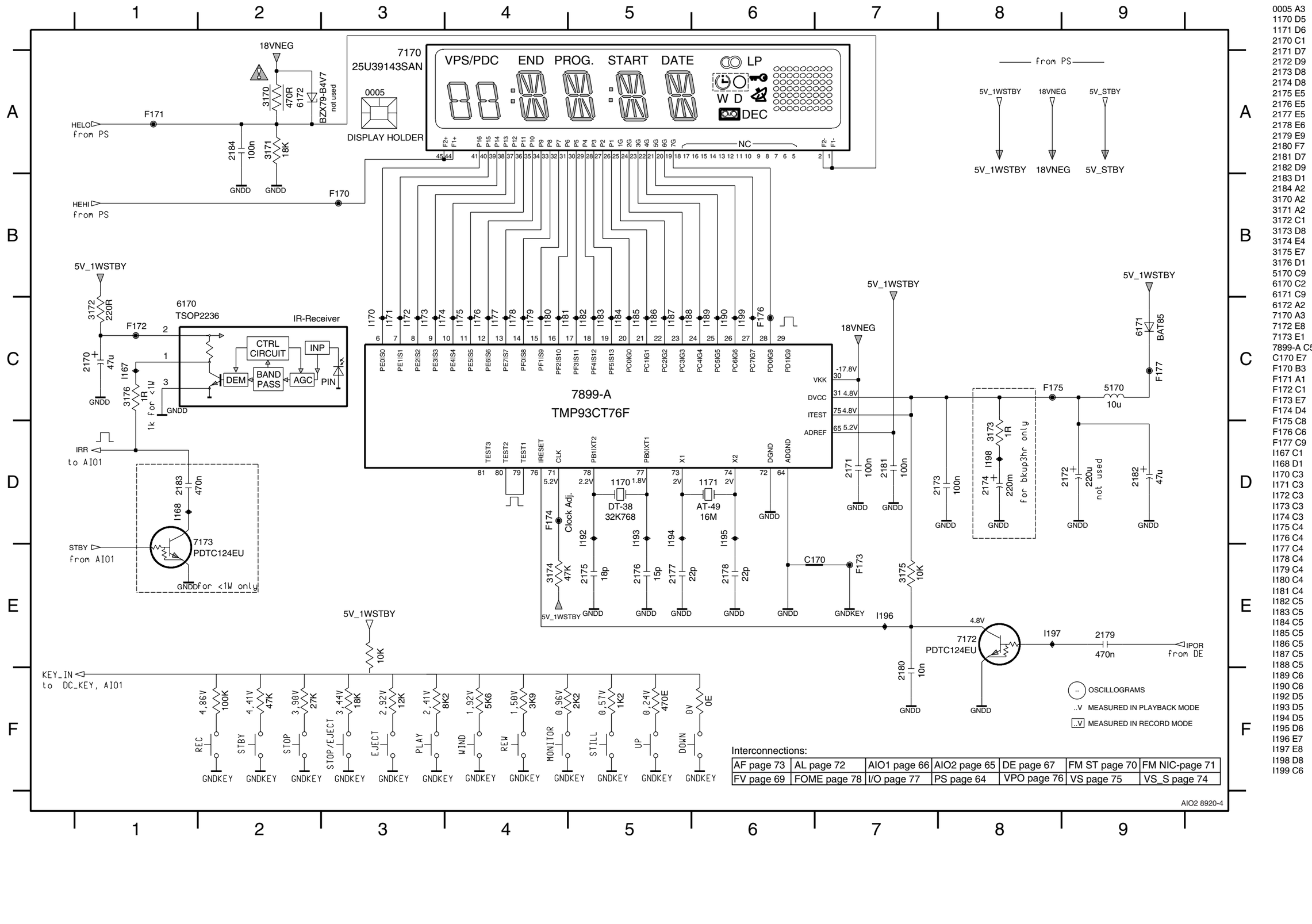


Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

PS-8920-12

7.2 Display control (AIO2)

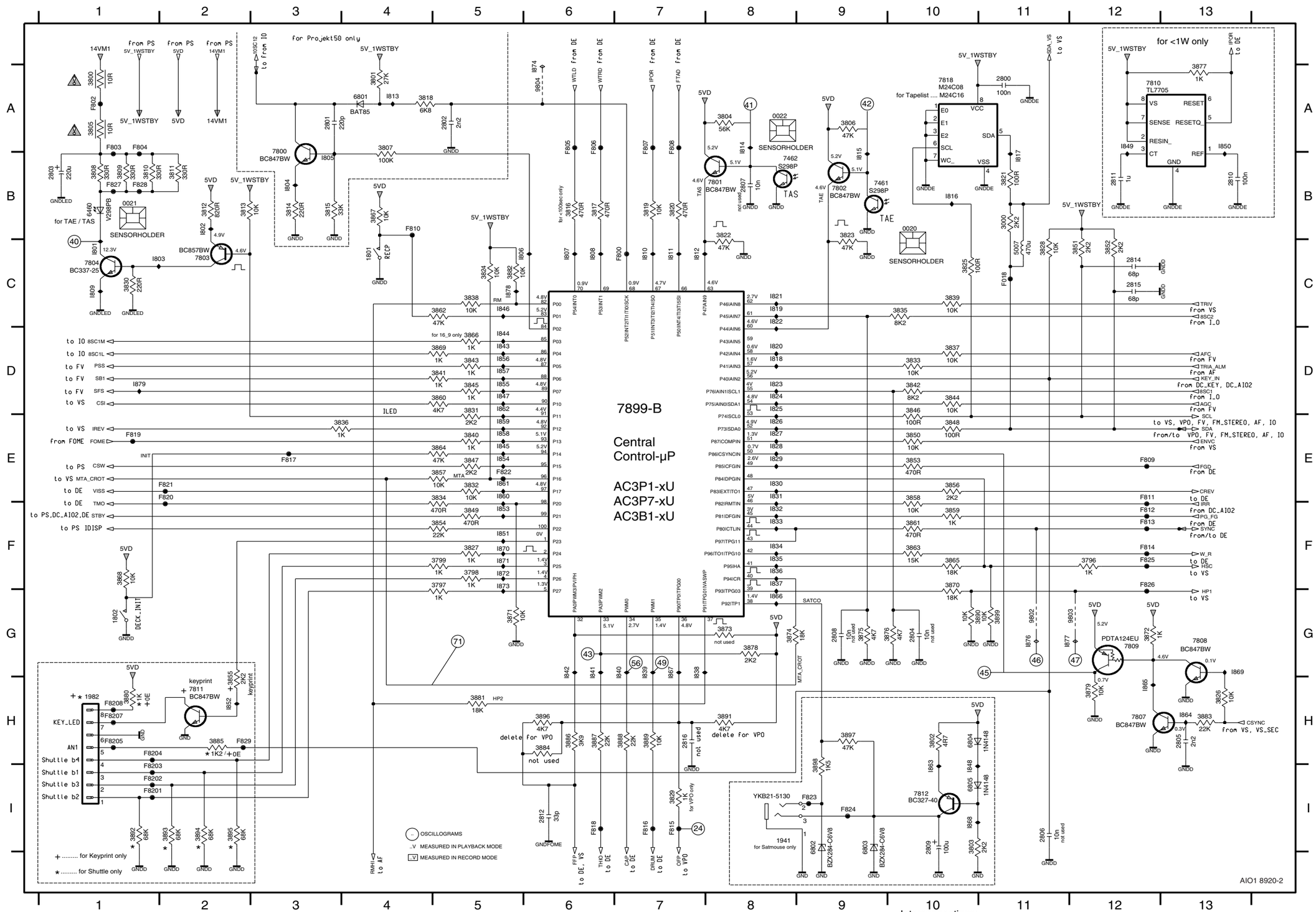


Interconnections:

AF page 73	AL page 72	AIO1 page 66	AIO2 page 65	DE page 67	FM ST page 70	FM NIC-page 71
FV page 69	FOME page 78	I/O page 77	PS page 64	VPO page 76	VS page 75	VS_S page 74

0005 A3
1170 D5
1171 D6
2170 C1
2171 D7
2172 D9
2173 D8
2174 D8
2175 E5
2176 E5
2177 E5
2178 E6
2179 E9
2180 F7
2181 D7
2182 D9
2183 D1
2184 A2
3170 A2
3171 A2
3172 C1
3173 D8
3174 E4
3175 E7
3176 D1
5170 C9
6170 C2
6171 C9
6172 A2
7170 A3
7172 E8
7173 E1
7899-A C5
C170 E7
F170 B3
F171 A1
F172 C1
F173 E7
F174 D4
F175 C8
F176 C6
F177 C9
I167 C1
I168 D1
I170 C3
I171 C3
I172 C3
I173 C3
I174 C3
I175 C4
I176 C4
I177 C4
I178 C4
I179 C4
I180 C4
I181 C4
I182 C5
I183 C5
I184 C5
I185 C5
I186 C5
I187 C5
I188 C5
I189 C6
I190 C6
I192 D5
I193 D5
I194 D5
I195 D6
I196 E7
I197 E8
I198 D8
I199 C6

7.3 Central control (AIO1)



0020 B10
0021 B1
0022 A8
0030 I13
0031 I13
0060 H12
0061 I12
0062 I12
1801 C4
1802 G1
1941 I8
1982 H1
2800 A11
2801 A3
2802 A5
2803 B1
2804 G10
2805 H13
2806 I11
2807 B8
2808 G9
2809 I10
2810 B13
2811 B12
2812 I6
2814 C12
2815 C12
2816 H7
3000 B11
3796 F12
3797 F5
3798 F5
3799 F5
3800 A1
3801 A4
3802 H10
3803 I10
3804 A8
3805 A1
3806 A9
3807 A4
3808 B1
3809 B1
3810 B1
3811 B2
3812 B2
3813 B2
3814 B3
3815 B3
3816 B6
3817 B6
3818 A4
3819 B7
3820 B7
3821 B11
3822 B8
3823 B9
3824 C5
3825 C10
3826 H13
3827 F5
3828 C11
3829 I7
3830 C1
3831 D5
3832 E5
3833 D10
3834 E5
3835 C10
3836 E3
3837 D10
3838 C5
3839 C10
3840 E5
3841 D5
3842 D10
3843 D5
3844 D10
3845 D5
3846 D10
3847 E5
3848 E10
3849 F5
3850 E10
3851 C12
3852 C12
3853 E10
3854 F5
3855 H2
3856 E10
3857 E5
3858 E10
3859 F10
3860 D5
3861 F10
3862 C5
3863 F10
3864 E5
3865 F10
3866 D5
3867 B4
3868 F1
3869 D5
3870 F10
3871 G5
3872 G12
3873 G8
3874 G8
3875 G9
3876 G10
3877 A13
3878 G8
3879 H12
3880 H1
3881 H5
3882 C5
3883 H13
3884 H6
3885 H2
3886 H6
3887 H6
3888 H7
3889 H7
3890 G10
3891 H8
3892 I1
3893 I2
3894 I2
3895 I2
3896 H6
3897 H9
3898 I9
3899 G11
5007 C11
6460 B1
6801 A4
6802 I9
6803 I9
6804 H10
6805 I10
7461 B10
7462 B9
7800 B3
7801 B8
7802 B9
7803 C2
7804 C1
7807 H12
7808 G13
7809 G12
7810 A12
7811 H2
7812 I10
7818 A10
7899-B E7
9802 G11
9803 G12
9804 A6
F018 C11
F800 C7
F802 A1
F803 A1
F804 A1
F805 A6
F806 A6
F807 A7
F808 A7
F809 E12
F810 B4
F811 E12
F812 F12
F813 F12
F814 F12
F815 I7
F816 I7
F817 E3
F818 I6
F819 E1
F820 E2
F8201 I1
F8202 I1
F8203 I1
F8204 H1
F8205 H1
F8207 H1
F821 E2
F822 E5
F823 I9
F824 I9
F825 F12
F826 F12
F827 B1
F828 B1
F829 H2
I801 C1
I802 B2
I803 C1
I804 B3
I805 B3
I806 C5
I807 C6
I808 C6
I809 C1
I810 C7
I811 C7
I812 C7
I813 A4
I814 A8
I815 B9
I816 B10
I817 B11
I818 D8
I819 C8
I820 D8
I821 C8
I822 C8
I823 D8
I824 D8
I825 D8
I826 E8
I827 E8
I828 E8
I829 E8
I830 E8
I831 E8
I832 F8
I833 F8
I834 F8
I835 F8
I836 F8
I837 F8
I838 G7
I839 G7
I840 G7
I841 G6
I842 G6
I843 D5
I844 D5
I845 E5
I846 C5
I847 D5
I848 I10
I849 A12
I850 A13
I851 F5
I852 H2
I853 F5
I854 E5
I855 D5
I856 D5
I857 D5
I858 E5
I859 E5
I860 E5
I861 E5
I862 D5
I863 I10
I864 H13
I865 H12
I866 G8
I867 G7
I868 I10
I869 G13
I870 F5
I871 F5
I872 F5
I873 F5
I874 A6
I876 G11
I877 G11
I878 C5
I879 D1

Interconnections:

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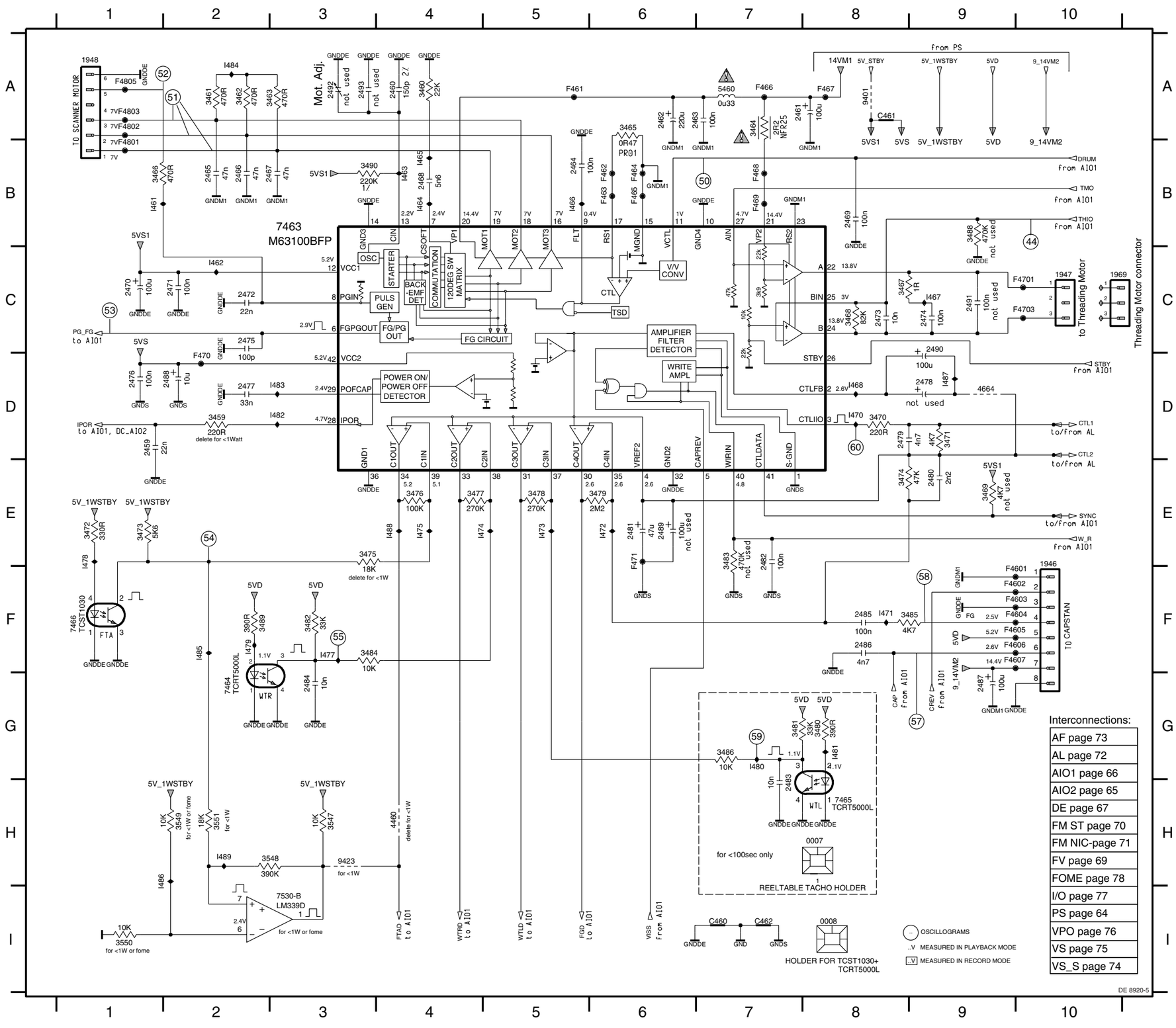
7.4 Deck control (DE)



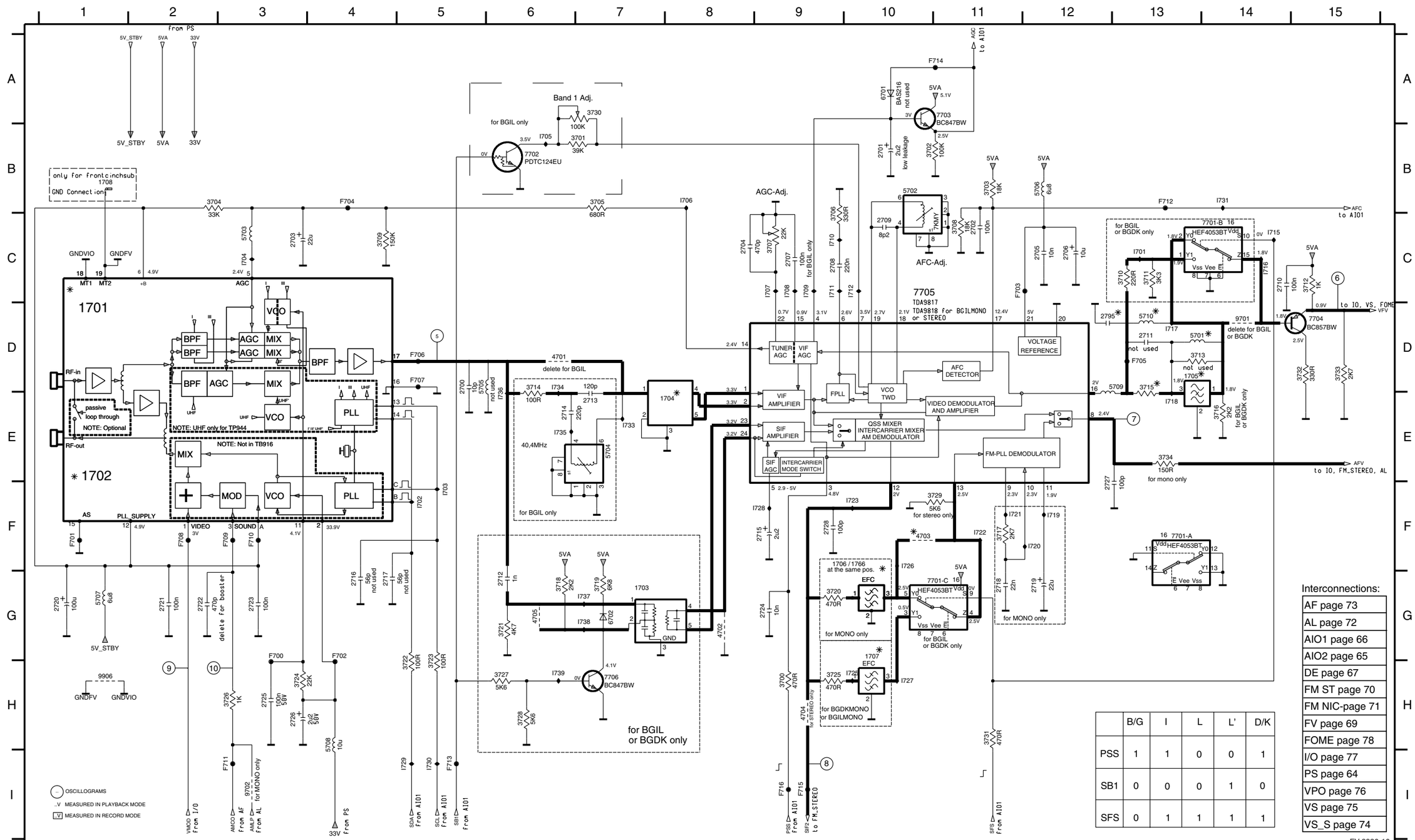
0007 H8
0008 I8
0011 H9
1946 F10
1947 C10
1948 A1
1969 H8
2459 D1
2460 A4
2461 A7
2462 A6
2463 A7
2464 B5
2465 B2
2466 B2
2467 B3
2468 B4
2469 B8
2470 C1
2471 C2
2472 C2
2473 C8
2474 C9
2475 C2
2476 D1
2477 D2
2478 D9
2479 D8
2480 E9
2481 E6
2482 E7
2483 H7
2484 G3
2485 F8
2486 F8
2487 G9
2488 D2
2489 E6
2490 C9
2491 C9
2492 A3
2493 A3
3459 D2
3460 A4
3461 A2
3462 A2
3463 A3
3464 A7
3465 A6
3466 B1
3467 C8
3468 C8
3469 E9
3470 D8
3471 D9
3472 E1
3473 E1
3474 E8
3475 E3
3476 E4
3477 E4
3478 E5
3479 E6
3480 G8
3481 G7
3482 F3
3483 E7
3484 F3
3485 F9
3486 G7
3488 B9
3489 F2
3490 B3
3547 H3
3548 H3
3549 H2
3550 I1
3551 H2
4460 H4
4664 D9
5460 A7
7463 B3
7464 G2
7465 H8
7466 F1
7530-B I3
9401 A8
9423 H3
C460 I7
C461 A8
C462 I7
F4601 F10
F4602 F9
F4603 F10
F4604 F10
F4605 F9
F4606 F9
F4607 F9
F461 A5
F462 B6
F463 B6
F464 B6
F465 B6
F466 A7
F467 A8
F468 B7
F469 B7
F470 D2
F4701 C10
F4703 C10
F471 E6
F4801 B1
F4802 A1
F4803 A1
F4805 A1
I028 H8
I029 H8
I030 H8
I461 B1
I462 C2
I463 B4
I464 B4
I465 B4
I466 B5
I467 C9
I468 D8
I470 D8
I471 F8
I472 E6
I473 E5
I474 E4
I475 E4
I477 F3
I478 E1
I479 F2
I480 G7
I481 G8
I482 D3
I483 D3
I484 A2
I485 F2
I486 H1
I487 D9
I488 E4
I489 H2

7.5 Variant List Frontend (FV)

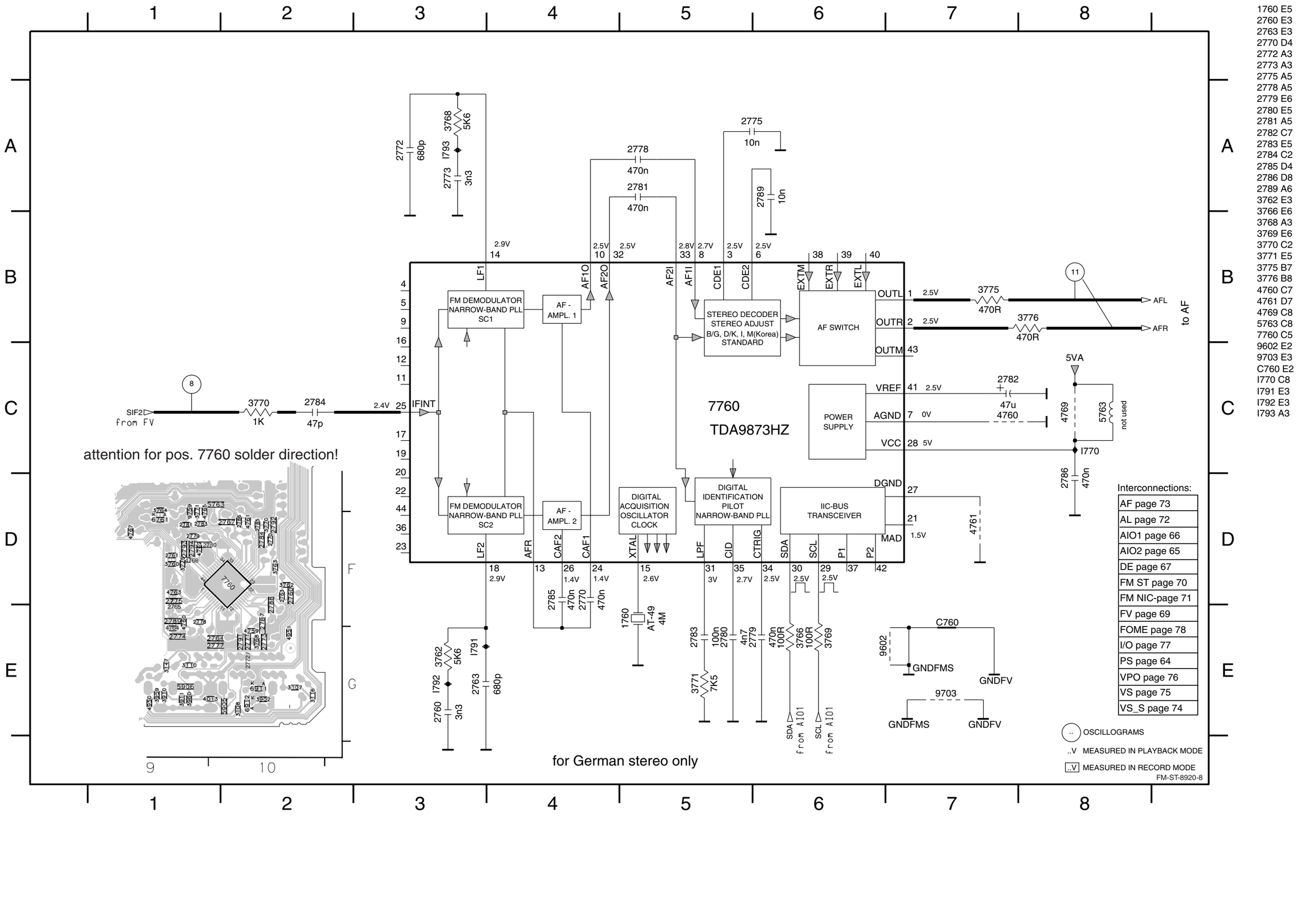
	MONO								STEREO						
	PAL BG	PAL I UHF only	PAL I fullband	PAL, BG/I, SEC L/L'	PAL, SEC BG/I/DK	PAL, SEC, BG/DK	PAL,SEC DK (K1)	PAL, BG/I/DK, SEC L/L'	PAL BG	PAL I fullband	PAL BG	PAL, SEC BG/I/DK, L/L'	PAL,SEC BG/DK	PAL,SEC DK (K1)	
	/02	/05	/07	/39	/55	/58	/60	prepared	/02	/07	/13, /16	/39	/58	/60	
Pos.	FM Interc.	FM Interc.	FM Interc.	FM, AM QSS	FM QSS	FM QSS	FM Interc.	FM, AM QSS	FM Interc.	FM, NICAM QSS	FM, NICAM QSS	FM, AM, NICAM QSS	FM, NICAM QSS	FM, NICAM QSS	FUNCTION
1701	TP916MKII	TP944MKII	-	TP926MKII	-	-	TP926MKII	TP926MKII	TP916MKII	-	TP916MKII	TP926MKII	-	TP926MKII	TUMOD PHILIPS
1701	TMRG1-108A	TMRB1-102A	TMRG1-110A	TMRG2-104A	TMRG1-203A	TMRG1-203A	TMRG2-104A	TMRG2-104A	TMRG1-108A	TMRG1-110A	TMRG1-108A	TMRG2-104A	TMRG1-203A	TMRG2-104A	TUMOD ALPS old
1701	TCBZ4-002A	TCBB1-001A	TCBZ4-002A	TCBZ4-004A	TCBZ4-002A	TCBZ4-002A	TCBZ4-004A	TCBZ4-004A	TCBZ4-002A	TCBZ4-002A	TCBZ4-002A	TCBZ4-004A	TCBZ4-002A	TCBZ4-004A	TUMOD ALPS new
1703	-	-	-	K9656M	K9656M	K9656M	-	K9656M	-	K9656M	K9656M	K9656M	K9656M	K9656M	QSS Sound OFW
1704	G1961M	J1980M	J1980M	K3953M	G3956M	G3956M	K2955M	K3953M	G1984M	K3953M	G3956M	K3953M	G3956M	G3956M	2. QSS Video OFW
1705	TPS 5,5	double TRAP TPW6,0/6,5	double TRAP TPW6,0/6,5	TPS 5,5	TPS 5,5	TPS 5,5	TPS 6,5	TPS 5,5	TPS 5,5	double TRAP TPW6,0/6,5	TPS 5,5	TPS 5,5	TPS 5,5	TPS 6,5	Video-TRAP
1706	EFC 5,5	EFC 6,0	EFC 6,0	EFC 5,5	EFC 5,5	EFC 5,5	EFC 6,5	EFC 5,5	-	-	-	-	-	-	1. Sound-Filter
1766					EFC 6,5			EFC 6,5							1'. Sound filter DK
1707	-	-	-	EFC 6,0	EFC 6,0	EFC 6,5	-	EFC 6,0	-	-	-	-	-	-	2. Sound-Filter
2707	-	-	-	100n	-	-	-	100n	-	-	-	100n	-	-	VIF AGC TDA 9818T only
2712	-	-	-	1n	1n	1n	-	1n	-	1n	1n	1n	1n	1n	QSS Sound OFW coupling
2713	-	-	-	120p	-	-	-	120p	-	-	-	120p	-	-	40,4 trap
2714	-	-	-	220p	-	-	-	220p	-	-	-	220p	-	-	40,4 trap
2718	22n	22n	22n	22n	22n	22n	22n	22n	-	-	-	-	-	-	Deemphasis MONO
2719	22u	22u	22u	22u	22u	22u	22u	22u	-	-	-	-	-	-	FM PLL Demodulator
2722	470p	470p	470p	-	470p	470p		-	470p	470p	470p	-	470p		sieve Audio Modulator IN
2795	-	-	-	-	-	-	-	-	15p	-	-	-	-	-	Video Trap widen
3710	-	-	-	220E	220E	220E	-	220E	-	-	-	220E	220E	-	Video Trap Bypass
3711	-	-	-	3k3	3k3	3k3	-	3k3	-	-	-	3k3	3k3	-	Video-Amplitude Multistdt.
3714	-	-	-	100E	-	-	-	100E	-	-	-	100E	-	-	40,4 trap
3715	330E	220E	220E	220E	220E	220E	270E	220E	330E	220E	330E	220E	220E	270E	Video Trap resistor
3716	-	-	-	2k2	2k2	2k2	-	2k2	-	-	-	2k2	2k2	-	Video Trap resistor
3717	2k7	2k7	2k7	2k7	2k7	2k7	2k7	2k7	-	-	-	-	-	-	Deemphasis MONO
3718	-	-	-	2k2	-	-	-	2k2	-	-	-	2k2	-	-	Sound OFW switch
3719	-	-	-	6k8	-	-	-	6k8	-	-	-	6k8	-	-	Sound OFW switch
3720	470E	470E	470E	470E	470E	470E	470E	470E	-	-	-	-	-	-	EFC resistor
3721	-	-	-	4k7	-	-	-	4k7	-	-	-	4k7	-	-	Sound OFW switch
3725	-	-	-	470E	470E	470E	-	470E	-	-	-	-	-	-	2. EFC resistor
3726	1k	1k	1k	-	1k	1k	1k	-	1k	1k	1k	-	1k	1k	Audio IN Modulator
3727	-	-	-	5k6	-	-	-	5k6	-	-	-	5k6	-	-	Sound OFW switch
3728	-	-	-	5k6	-	-	-	5k6	-	-	-	5k6	-	-	Sound OFW switch
3729	-	-	-	-	-	-	-	-	5k6	5k6	5k6	5k6	5k6	5k6	Mute FM Demodulator
3701	-	-	-	39k	-	-	-	39k	-	-	-	39k	-	-	SEC band 1 Adj.
3730	-	-	-	100k	-	-	-	100k	-	-	-	100k	-	-	SEC band 1 Adj.
4701	0E	0E	0E	-	0E	0E	0E	-	0E	0E	0E	-	0E	0E	40,4 Falle Bypass
4702	0E	0E	0E	-	-	-	0E	-	0E	-	-	-	-	-	Intercarier switch
4703	0E	0E	0E	-	-	-	0E	-	-	-	-	-	-	-	4053 Bypass
4704	-	-	-	-	-	-	-	-	0E	0E	0E	0E	0E	0E	SIF to MSP
4705	-	-	-	-	0E	0E	-	-	-	0E	0E	-	0E	0E	QSS OFW BG/I/DK select
5701	15uH	10uH	10uH	10uH	10uH	10uH	15uH	10uH	15uH	10uH	15uH	10uH	10uH	15uH	Video trap coil
5704	-	-	-	41645	-	-	-	41645	-	-	-	41645	-	-	40,4 trap
5710	-	-	-	-	-	-	-	-	39u	-	-	-	-	-	Video trap widen
6702	-	-	-	BA792	-	-	-	BA792	-	-	-	BA792	-	-	Sound OFW switch
7701	-	-	-	HEF4053	HEF4053	HEF4053	-	HEF4053	-	-	-	HEF4053	HEF4053	-	EFC / TRAP switch
7702	-	-	-	PDTC124EU	-	-	-	PDTC124EU	-	-	-	PDTC124EU	-	-	AFC L'
7705	TDA 9817 T	TDA 9817 T	TDA 9817 T	TDA 9818 T	TDA 9817 T	TDA 9817 T	TDA 9817 T	TDA 9818 T	TDA 9817 T	TDA 9817 T	TDA 9817 T	TDA 9818 T	TDA 9817 T	TDA 9817 T	AV Demodulator
7706	-	-	-	BC847BW	-	-	-	BC847BW	-	-	-	BC847BW	-	-	Sound OFW switch
9701	0E	0E	0E	-	-	-	0E	-	0E	0E	0E	-	-	0E	4053 Bypass
9702	0E	0E	0E	0E	0E	0E	0E	0E	-	-	-	-	-	-	MONO Audio to Modulator

7.6 Frontend (FV)

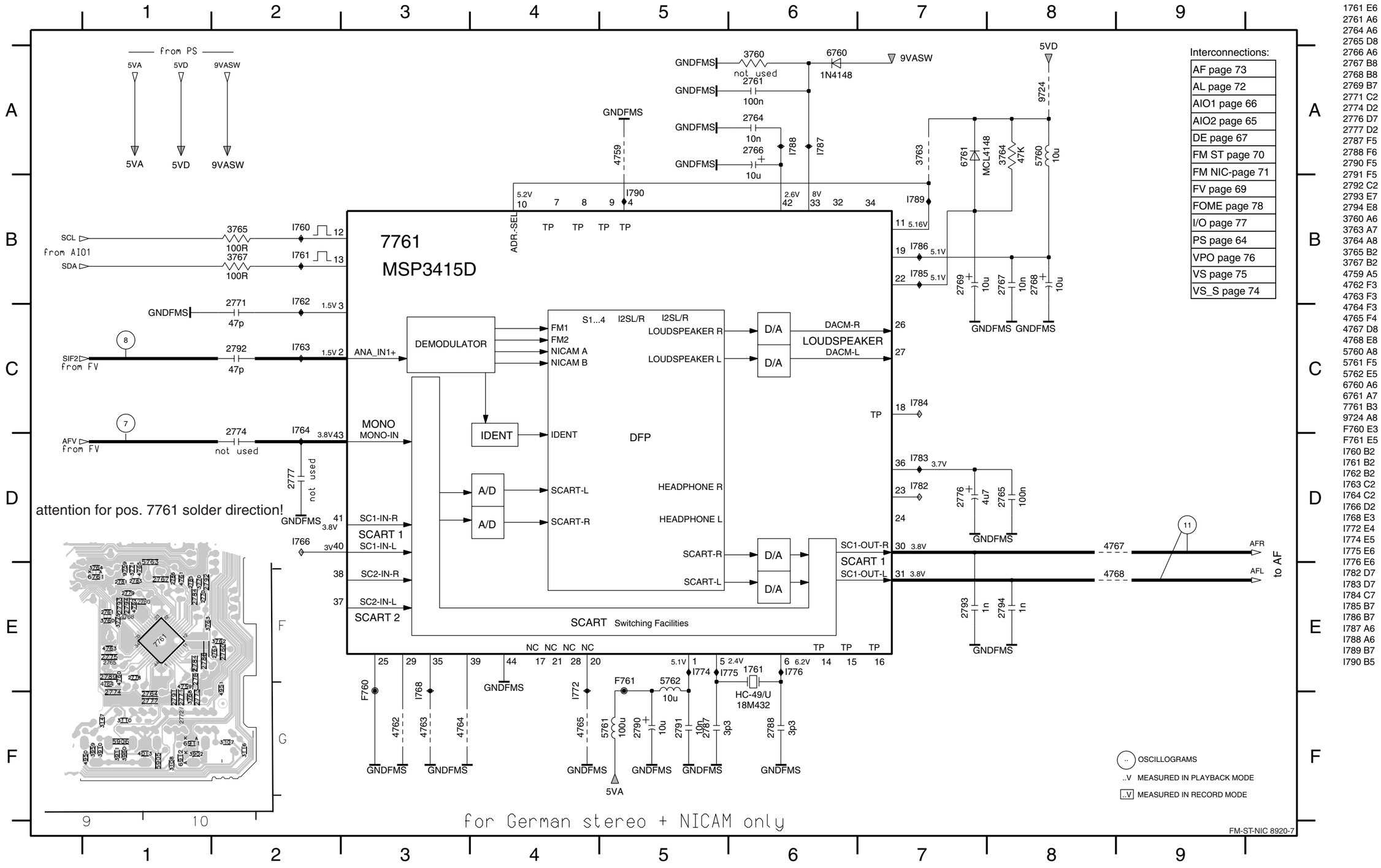
1701 D1 1702 E1 1703 G7 1704 E7 1705 D13 1706 G10 1707 G10 1708 C1 2700 D5 2701 B10 2702 C11 2703 C3 2704 C8 2705 C12 2706 C12 2707 C9 2708 C9 2709 C10 2710 C14 2711 D13 2712 G6 2713 E7 2714 E6 2715 F9 2716 G4 2717 G4 2718 G11 2719 G12 2720 G1 2721 G2 2722 G2 2723 G3 2724 G9 2725 H3 2726 H3 2727 F12 2728 F9 2795 D12 3700 H9 3701 B7 3702 B10 3703 B11 3704 B2 3705 B7 3706 C9 3707 C9 3708 C11 3709 C4 3710 C13 3711 C13 3712 C15 3713 D13 3714 D6 3715 D13 3716 E14 3717 F11 3718 G6 3719 G7 3720 G9 3721 G6 3722 H5 3723 H5 3724 H3 3725 H9 3726 H3 3727 H6 3728 H6 3729 F11 3730 A7 3731 H11 3732 D15 3733 D15 3734 E13 4701 D6 4702 G8 4703 F10 4704 H9 4705 G6 5701 D13 5702 B10 5703 C3 5704 E7 5705 D5 5706 B12 5707 G1 5708 B10 5709 D12 5710 D13 6701 A10 6702 G7 7701-A F13 7701-B C14 7701-C G11 7702 B6 7703 A11 7704 D15 7705 C10 7706 H7 9701 D14 9702 I3 9906 H1 F700 G3 F701 F1 F702 G4 F703 C11 F704 B4 F705 D13 F706 D5 F707 D5 F708 F2 F709 F3 F710 F3 F711 I3 F712 B13 F713 I5 F714 A11 F715 I9 F716 I9 I701 C13 I702 F5 I703 F5 I704 C3 I705 B6 I706 B8 I707 C9 I708 C9 I709 C9 I710 C9 I711 C9 I712 C10 I715 C14 I716 C14 I717 D13 I718 E13 I719 F12 I720 F12 I721 F11 I722 F11 I723 F10 I724 G10 I725 H10 I726 F10 I727 H10 I728 F9 I729 I5 I730 I5 I731 B14 I733 E7 I734 D6 I735 E6 I736 E6 I737 G7 I738 G7 I739 H6



7.7 FM stereo (FM-ST)



7.8 FM Stereo + Nicam (FM-ST-NIC)



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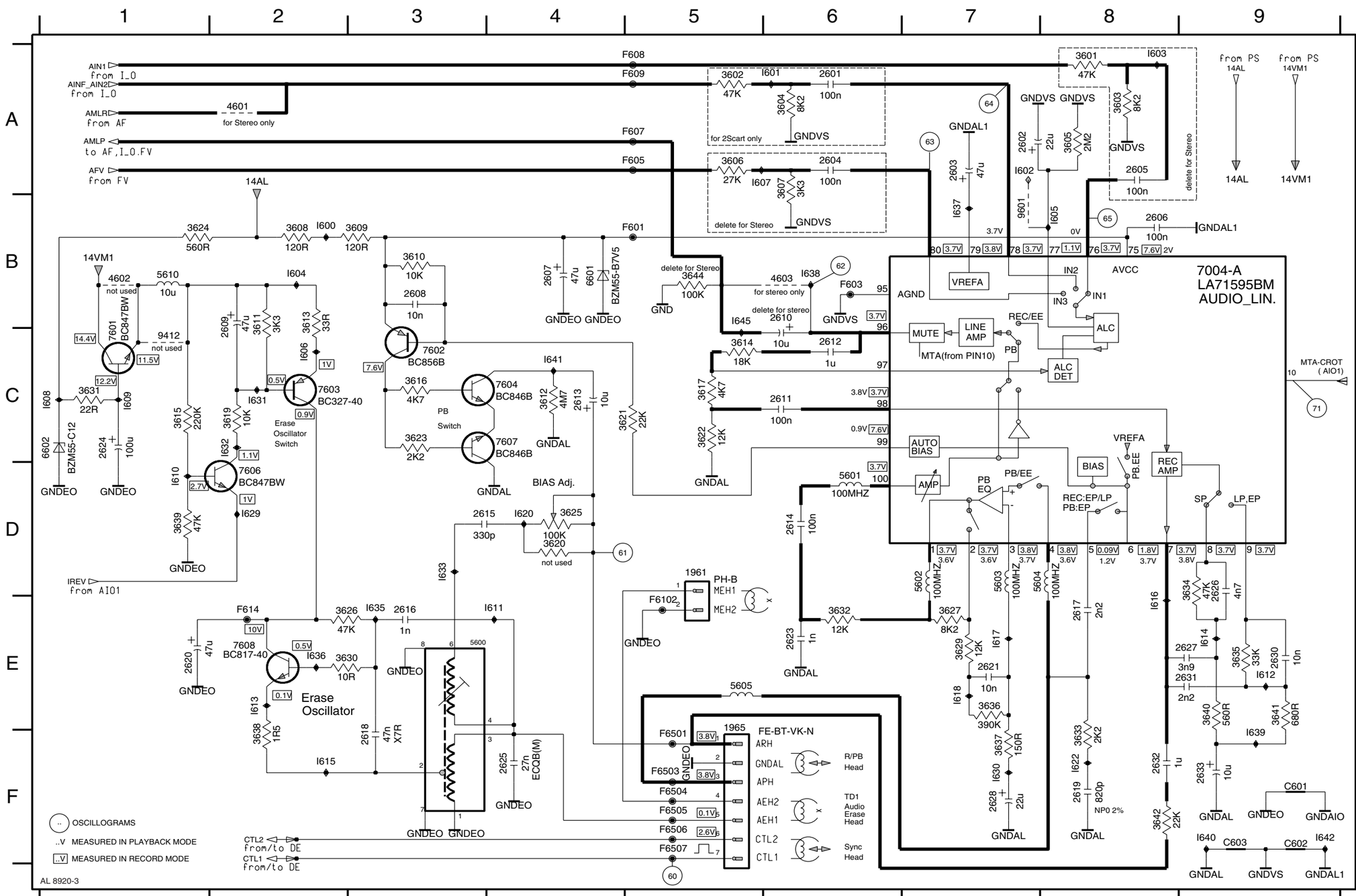
7.9 Audio Linear (AL)



0010 E1	4602 B1
0200 F2	4603 B6
1961 D5	5600 E3
1965 F5	5601 D6
2601 A6	5602 D7
2602 A7	5603 D7
2603 A7	5604 D8
2604 A6	5605 E5
2605 A8	5610 B1
2606 B8	6601 B4
2607 B4	6602 C1
2608 B3	7004-A B9
2609 B2	7601 C1
2610 B6	7602 C3
2611 C6	7603 C2
2612 C6	7604 C4
2613 C4	7606 D2
2614 D6	7607 C4
2615 D3	7608 E2
2616 E3	9412 C1
2617 E8	9601 B7
2618 F3	C601 F9
2619 F8	C602 F9
2620 E1	C603 F9
2621 E7	F601 B5
2623 E6	F603 B6
2624 C1	F605 A5
2625 F4	F607 A5
2626 D9	F608 A5
2627 E9	F609 A5
2628 F7	F6102 E5
2630 E9	F614 E2
2631 E9	F6501 F5
2632 F8	F6503 F5
2633 F9	F6504 F5
3601 A8	F6505 F5
3602 A5	F6506 F5
3603 A8	F6507 F5
3604 A6	I600 B2
3605 A8	I601 A6
3606 A5	I602 A7
3607 A6	I603 A8
3608 B2	I604 B2
3609 B3	I605 B8
3610 B3	I606 C2
3611 B2	I607 A5
3612 C4	I608 C1
3613 B2	I609 C1
3614 C5	I610 D1
3615 C1	I611 E4
3616 C3	I612 E9
3617 C5	I613 E2
3619 C2	I614 E9
3620 D4	I615 F2
3621 C5	I616 E8
3622 C5	I617 E7
3623 C3	I618 E7
3624 B1	I620 D4
3625 D4	I622 F8
3626 E2	I629 D2
3627 E7	I630 F7
3629 E7	I631 C2
3630 E2	I632 C2
3631 C1	I633 D3
3632 E6	I635 E3
3633 F8	I636 E2
3634 D9	I637 B7
3635 E9	I638 B6
3636 E7	I639 F9
3637 F7	I640 F9
3638 F2	I641 C4
3639 D1	I642 F9
3640 E9	I645 B5
3641 E9	
3642 F8	
3644 B5	
4601 A2	

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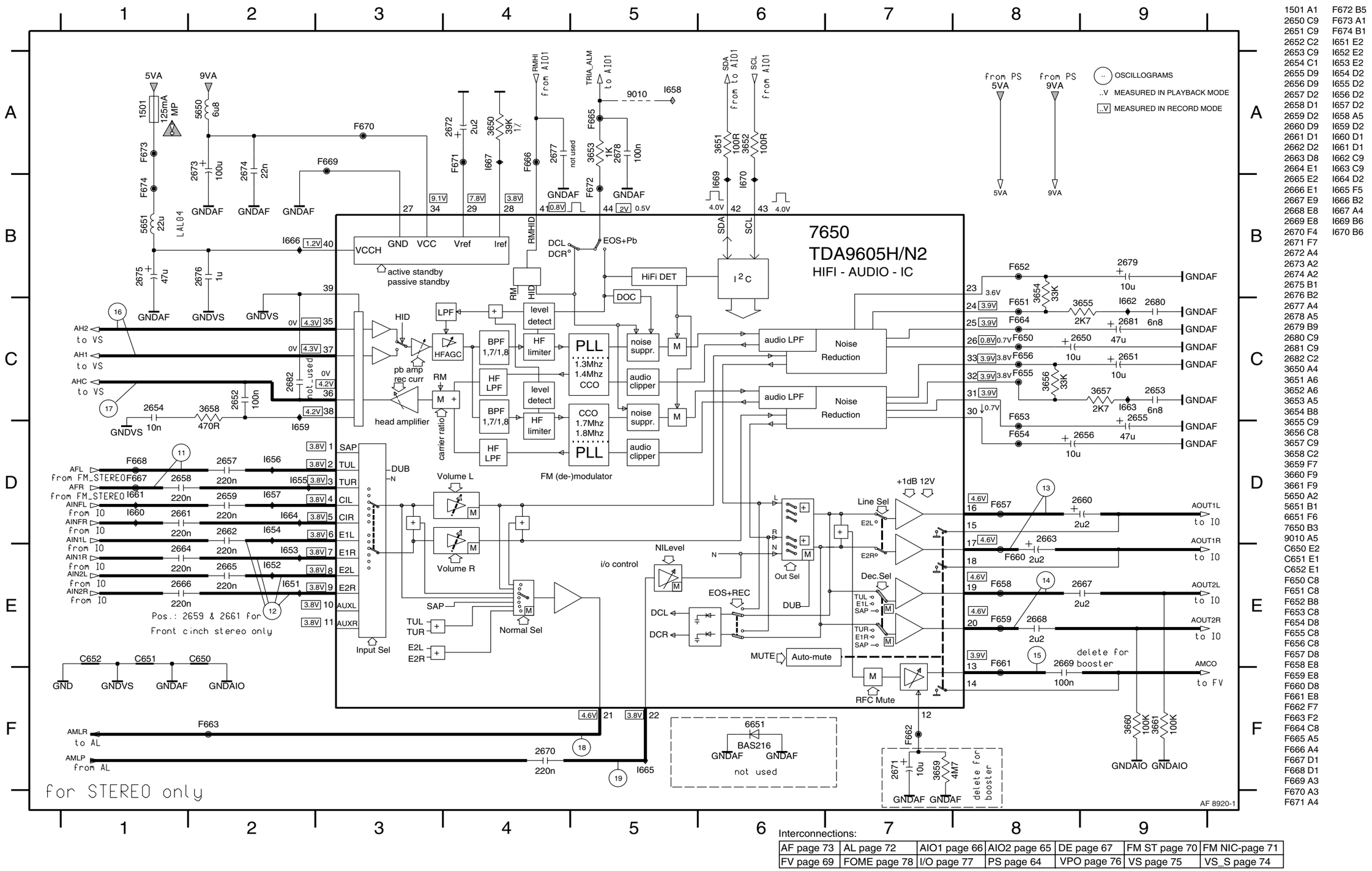
7.10 FM - Audio (AF)



1501 A1	F672 B5
2650 C9	F673 A1
2651 C9	F674 B1
2652 C2	I651 E2
2653 C9	I652 E2
2654 C1	I653 E2
2655 D9	I654 D2
2656 D9	I655 D2
2657 D2	I656 D2
2658 D1	I657 D2
2659 D2	I658 A5
2660 D9	I659 D2
2661 D1	I660 D1
2662 D2	I661 D1
2663 D8	I662 C9
2664 E1	I663 C9
2665 E2	I664 D2
2666 E1	I665 F5
2667 E9	I666 B2
2668 E8	I667 A4
2669 E8	I669 B6
2670 F4	I670 B6
2671 F7	
2672 A4	
2673 A2	
2674 A2	
2675 B1	
2676 B2	
2677 A4	
2678 A5	
2679 B9	
2680 C9	
2681 C9	
2682 C2	
3650 A4	
3651 A6	
3652 A6	
3653 A5	
3654 B8	
3655 C9	
3656 C8	
3657 C9	
3658 C2	
3659 F7	
3660 F9	
3661 F9	
5650 A2	
5651 B1	
6651 F6	
7650 B3	
9010 A5	
C650 E2	
C651 E1	
C652 E1	
F650 C8	
F651 C8	
F652 B8	
F653 C8	
F654 D8	
F655 C8	
F656 C8	
F657 D8	
F658 E8	
F659 E8	
F660 D8	
F661 E8	
F662 F7	
F663 F2	
F664 C8	
F665 A5	
F666 A4	
F667 D1	
F668 D1	
F669 A3	
F670 A3	
F671 A4	

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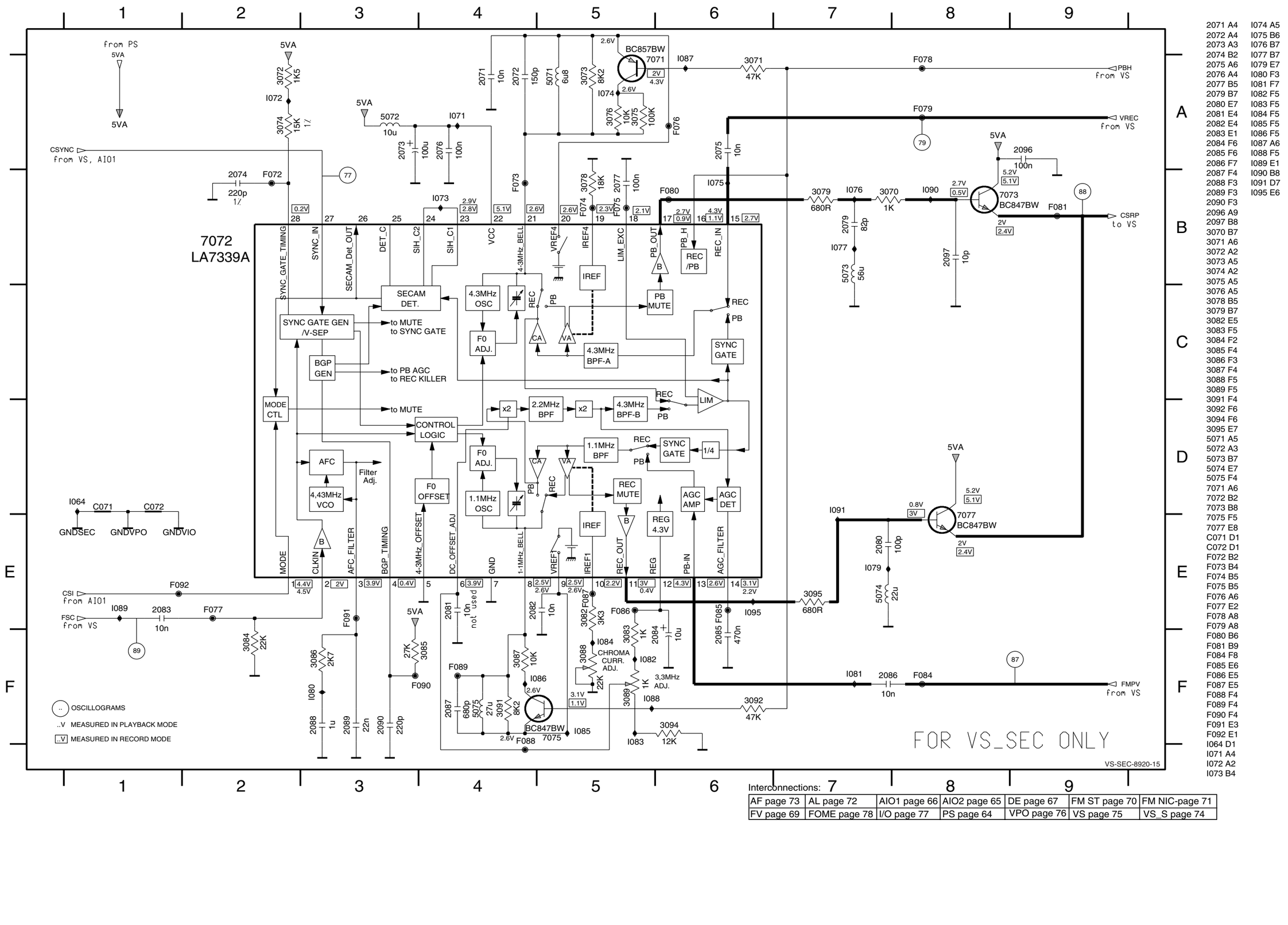
7.11 Video Signal Processing - SECAM (VS-SEC)



2071 A4	I074 A5	3085 F5	5072 A3
2072 A4	I075 B6	3086 A5	5073 B7
2073 A3	I076 B7	3078 B5	5074 E7
2074 B2	I077 B7	3079 B7	5075 F4
2075 A6	I079 E7	3082 E5	7071 A6
2076 A4	I080 F3	3083 F5	7072 B2
2077 B5	I081 F7	3084 F2	7073 B8
2079 B7	I082 F5	3085 F4	7075 F5
2080 E7	I083 F5	3086 F3	7077 E8
2081 E4	I084 F5	3087 F4	C071 D1
2082 E4	I085 F5	3088 F5	C072 D1
2083 E1	I086 F5	3089 F5	F072 B2
2084 F6	I087 A6	3091 F4	F073 B4
2085 F6	I088 F5	3092 F6	F074 B5
2086 F7	I089 E1	3094 F6	F075 B5
2087 F4	I090 B8	3095 E7	F076 A6
2088 F3	I091 D7	5071 A5	F077 E2
2089 F3	I095 E6		F078 A8
2090 F3			F079 A8
2096 A9			F080 B6
2097 B8			F081 B9
3070 B7			F084 F8
3071 A6			F085 E6
3072 A2			F086 E5
3073 A5			F087 E5
3074 A2			F088 F4
3075 A5			F089 F4
3076 A5			F090 F4
3078 B5			F091 E3
3079 B7			F092 E1
3082 E5			I064 D1
3083 F5			I071 A4
3084 F2			I072 A2
			I073 B4

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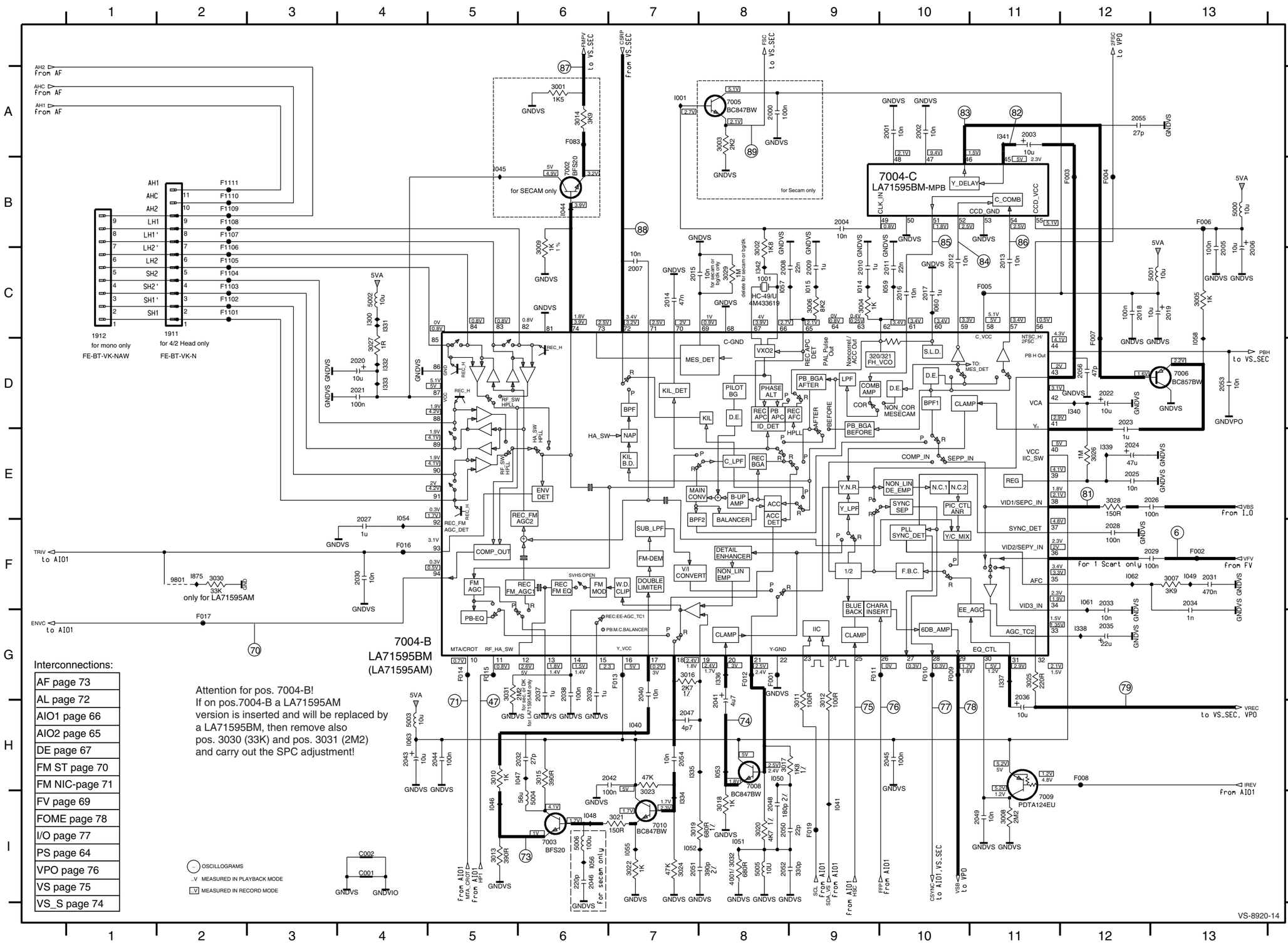
7.12 Video Signal Processing (VS)



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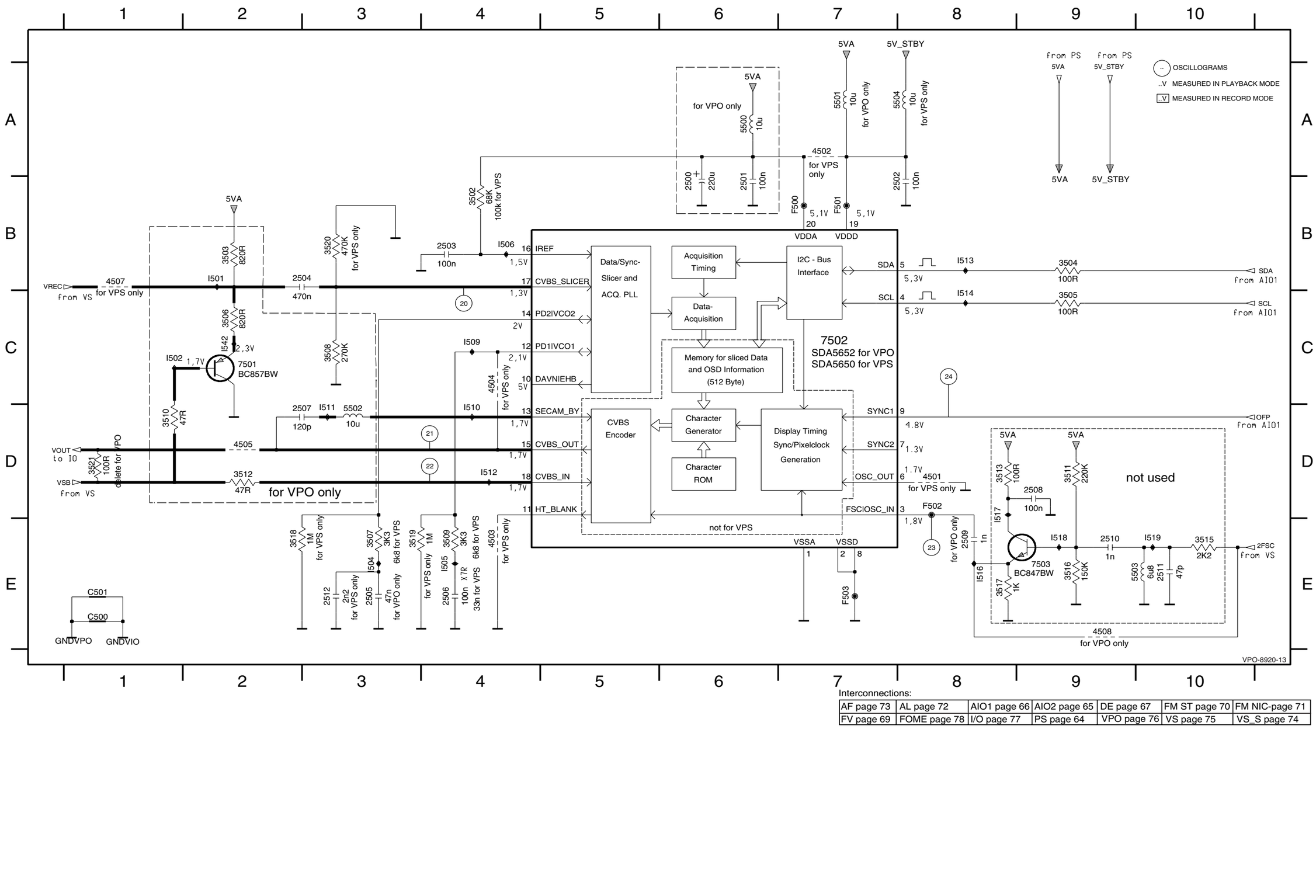
7.13 VPS/PDC & OSD Part (VPO)



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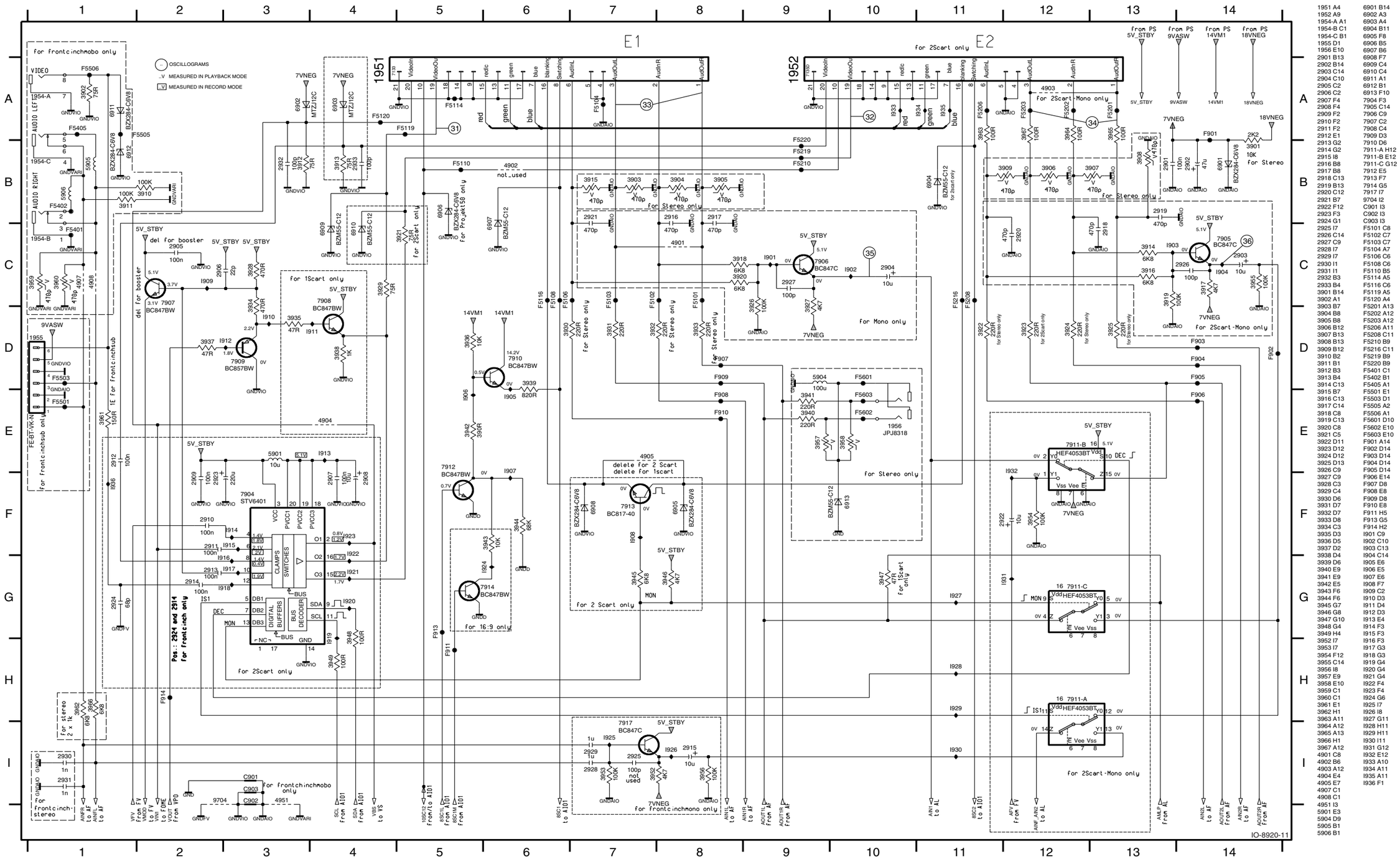
7.14 In/Out Part (IO)



1951 A4 6901 B14
1952 A9 6902 A3
1954-A A1 6903 A4
1954-B C1 6904 B11
1954-C B1 6905 F8
1955 D1 6906 B5
1956 E10 6907 B6
2901 B13 6908 F7
2902 B14 6909 C4
2903 C14 6910 C4
2904 C10 6911 A1
2905 C2 6912 B1
2906 C2 6913 F10
2907 F4 7904 F3
2908 F4 7905 C14
2909 F2 7906 C9
2910 F2 7907 C2
2911 F2 7908 C4
2912 E1 7909 D3
2913 G2 7910 D6
2914 G2 7911-A H12
2915 I8 7911-B E12
2916 B8 7911-C G12
2917 B8 7912 E5
2918 C13 7913 F7
2919 B13 7914 G5
2920 C12 7917 I7
2921 B7 9704 I2
2922 F12 C901 I3
2923 F3 C902 I3
2924 G1 C903 I3
2925 I7 F5101 C8
2926 C14 F5102 C7
2927 C9 F5103 C7
2928 I7 F5104 A7
2929 I7 F5106 C6
2930 I1 F5108 C6
2931 I1 F5110 B5
2932 B3 F5114 A5
2933 B4 F5116 C6
3901 B14 F5119 A5
3902 A1 F5120 A4
3903 B7 F5201 A13
3904 B8 F5202 A12
3905 B8 F5203 A12
3906 B12 F5206 A11
3907 B13 F5208 C11
3908 B13 F5210 B9
3909 B12 F5216 C11
3910 B2 F5219 B9
3911 B1 F5220 B9
3912 B3 F5401 C1
3913 B4 F5402 B1
3914 C13 F5405 A1
3915 B7 F5501 E1
3916 C13 F5503 D1
3917 C14 F5505 A2
3918 C8 F5506 A1
3919 C13 F5601 D10
3920 C8 F5602 E10
3921 C5 F5603 E10
3922 D11 F901 A14
3923 D12 F902 D14
3924 D12 F903 D14
3925 D13 F904 D14
3926 C9 F905 D14
3927 C9 F906 E14
3928 C3 F907 D8
3929 C4 F908 E8
3930 D6 F909 D8
3931 D7 F910 E8
3932 D7 F911 H5
3933 D8 F913 G5
3934 C3 F914 H2
3935 D3 I901 C9
3936 D5 I902 C10
3937 D2 I903 C13
3938 D4 I904 C14
3939 D6 I905 E6
3940 E9 I906 E5
3941 E9 I907 E6
3942 E5 I908 F7
3943 F6 I909 C2
3944 F6 I910 D3
3945 G7 I911 D4
3946 G8 I912 D3
3947 G10 I913 E4
3948 G4 I914 F3
3949 H4 I915 F3
3952 I7 I916 F3
3953 I7 I917 G3
3954 F12 I918 G3
3955 C14 I919 G4
3956 I8 I920 G4
3957 E9 I921 G4
3958 E10 I922 F4
3959 C1 I923 F4
3960 C1 I924 G6
3961 E1 I925 I7
3962 H1 I926 I8
3963 A11 I927 G11
3964 A12 I928 H11
3965 A13 I929 H11
3966 H1 I930 I11
3967 A12 I931 G12
4901 C8 I932 E12
4902 B6 I933 A10
4903 A12 I934 A11
4904 E4 I935 A11
4905 E7 I936 F1
4907 C1
4908 C1
4951 I3
5901 E3
5904 D9
5905 B1
5906 B1

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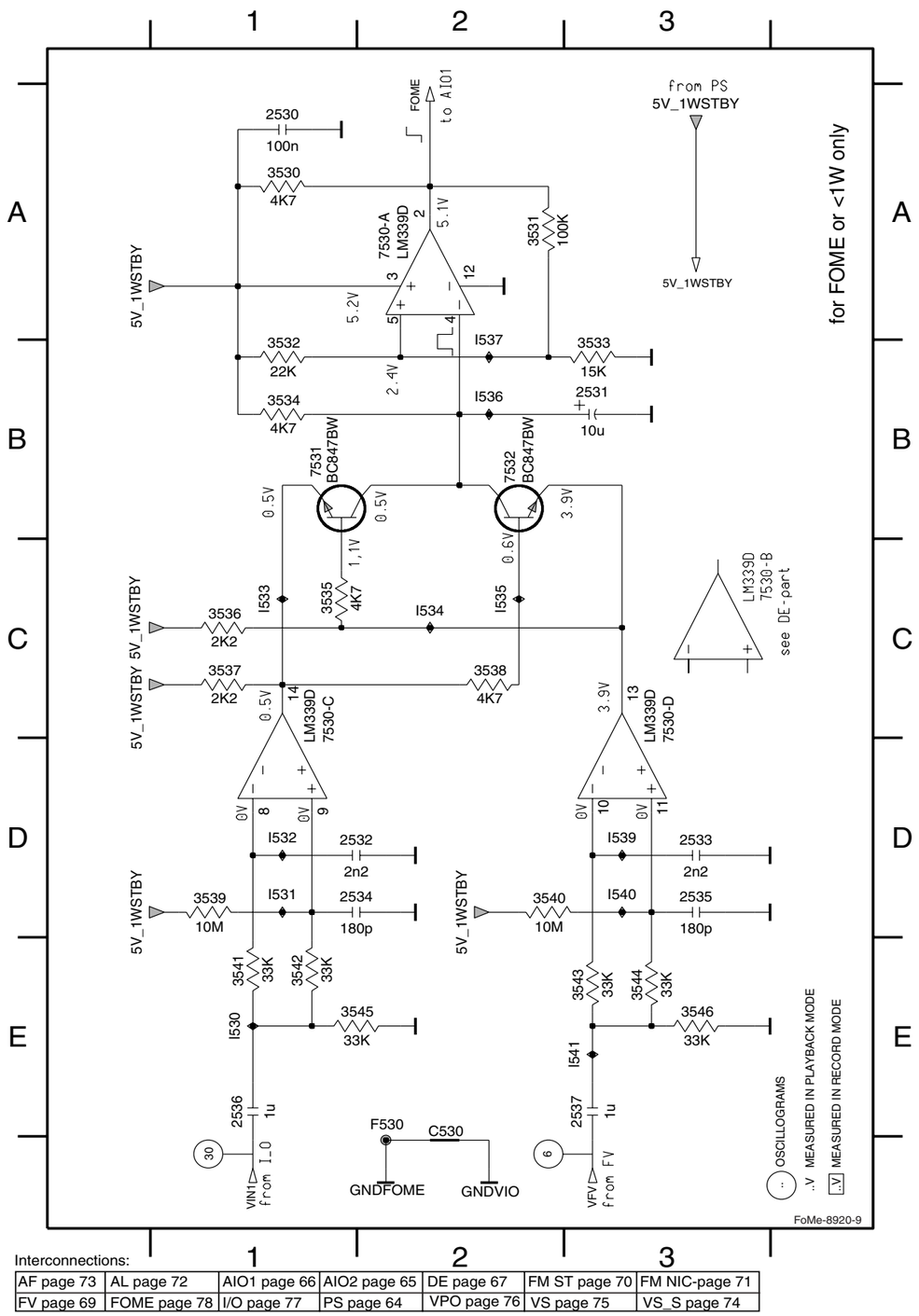
7.15 FOLLOW ME Part (FOME)



2530 A1
2531 B3
2532 D1
2533 D3
2534 D1
2535 D3
2536 E1
2537 E3
3530 A1
3531 A2
3532 B1
3533 B3
3534 B1
3535 C1
3536 C1
3537 C1
3538 C2
3539 D1
3540 D2
3541 E1
3542 E1
3543 E3
3544 E3
3545 E2
3546 E3
7530-A A2
7530-C D1
7530-D D3
7531 B1
7532 B2
C530 E2
F530 E2
I530 E1
I531 D1
I532 D1
I533 C1
I534 C2
I535 C2
I536 B2
I537 A2
I539 D3
I540 D3
I541 E3

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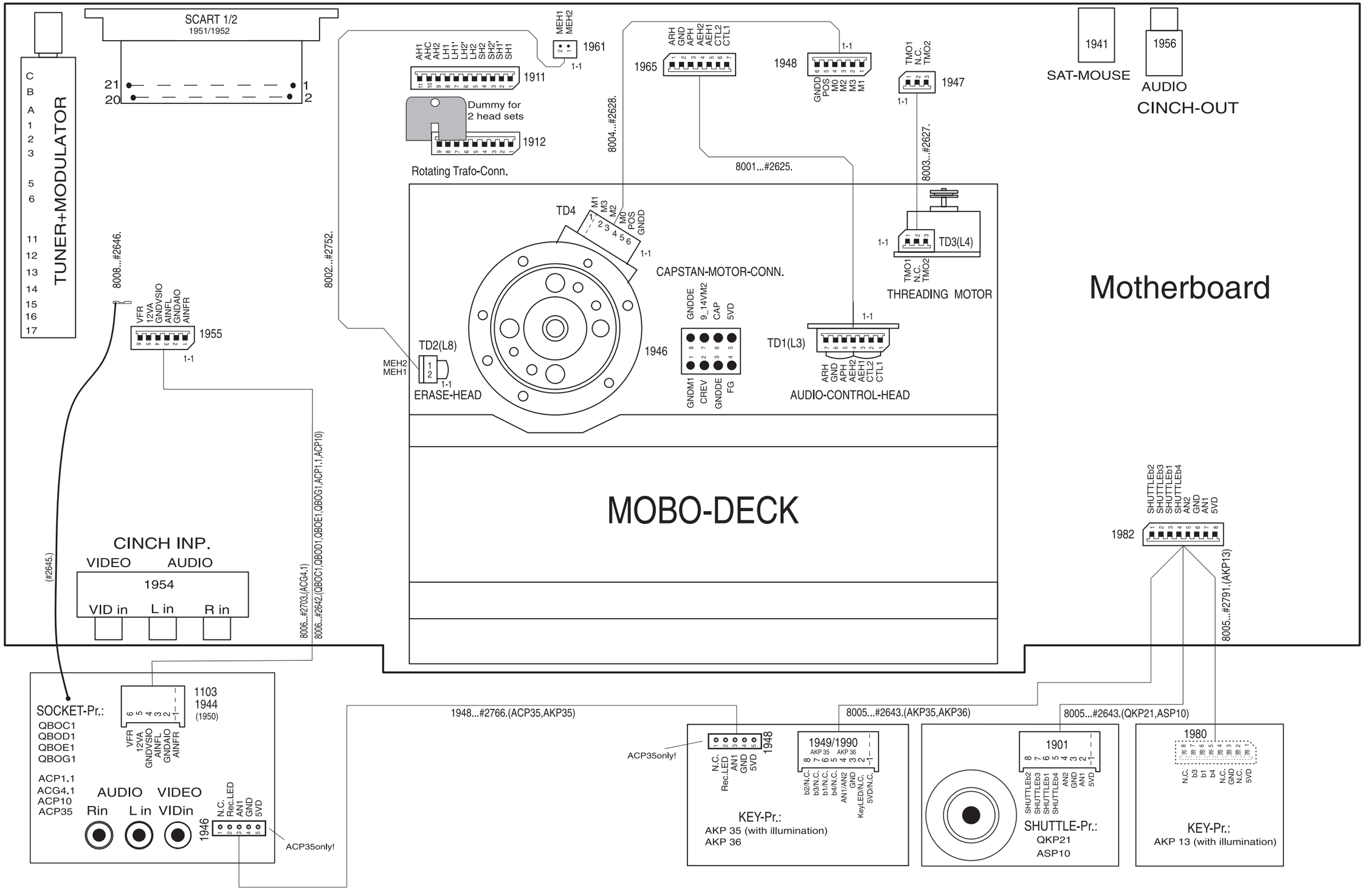
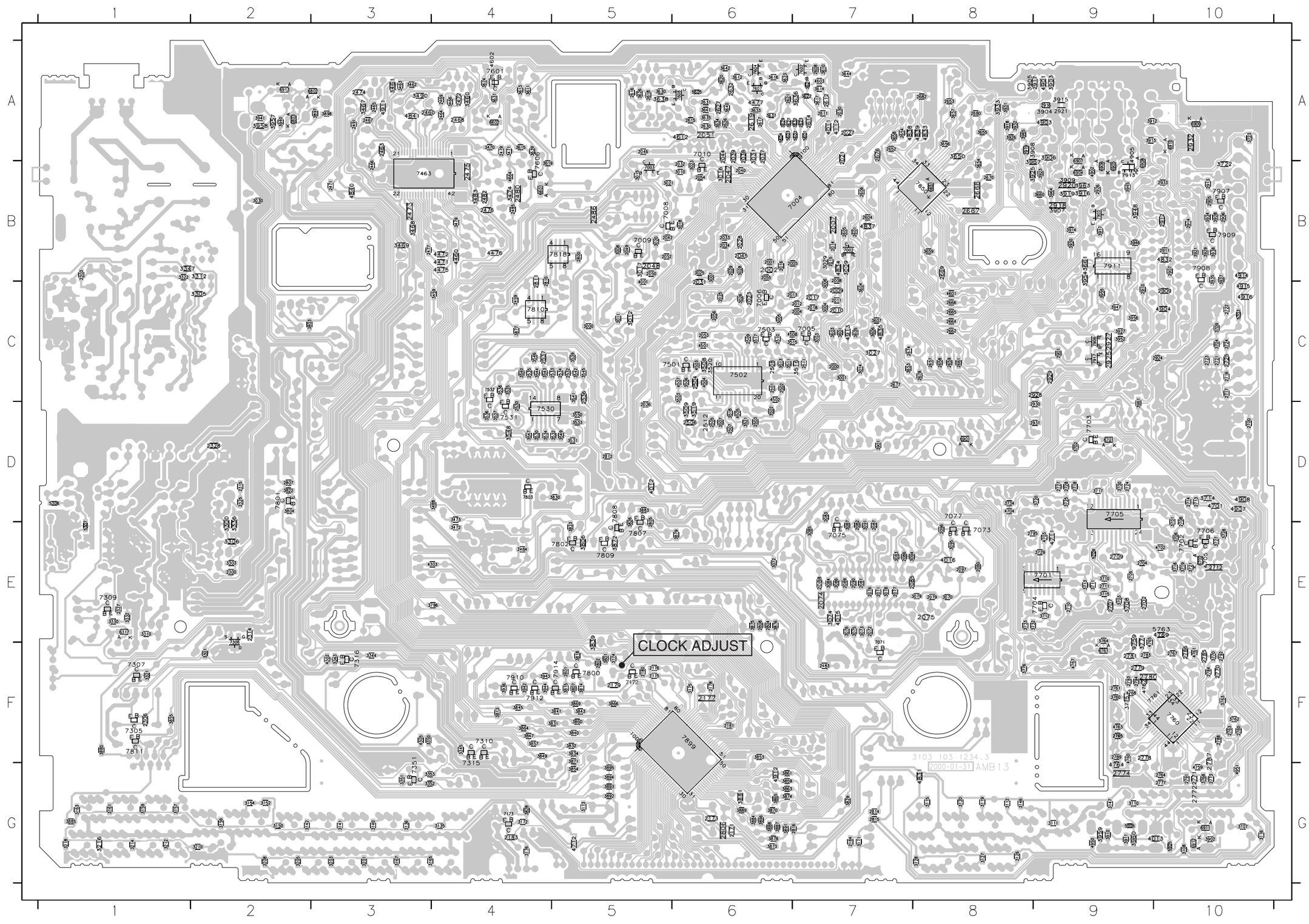
Engineer's remarks:

7.16 Wiring Diagram



7.17 Mother board - solder side



2000 C7
2001 B6
2002 B6
2004 C7
2005 B7
2007 B7
2008 B7
2009 C7
2010 C7
2011 C7
2012 C7
2013 C6
2014 B7
2015 B7
2016 B6
2017 C7
2018 C7
2021 A7
2023 C6
2025 C6
2026 D5
2027 A7
2028 B6
2029 B6
2030 A7
2031 C6
2032 B6
2033 B6
2034 B6
2037 A6
2038 A6
2039 A6
2040 B6
2042 B5
2044 A6
2045 B6
2046 A5
2047 B6
2048 B5
2049 B5
2050 B5
2051 A6
2052 B5
2053 C6
2054 B7
2055 B6
2056 C6
2071 E7
2072 E7
2074 E7
2075 E8
2076 E7
2077 E7
2079 E8
2080 E8
2081 E7
2082 E7
2083 E7
2084 E7
2085 E7
2086 E7
2087 E7
2088 E7
2089 E7
2090 E7
2096 E8
2097 E8
2171 G6
2173 G6
2175 F5
2176 F5
2177 F5
2178 F6
2179 F5
2180 F5
2181 F6
2183 G4
2184 G7
2300 E2
2303 B1
2306 B1
2313 F1
2314 E2
2315 D2
2325 D2
2327 E1
2328 D2
2459 C4
2460 A3
2463 A3
2464 A4
2465 A3
2466 B3
2467 A3
2468 A4
2469 A4
2471 B3
2472 A4
2473 B3
2474 A3
2475 B4
2476 B4
2477 B3
2479 A4
2480 B4
2482 B4
2483 F7
2484 E4
2485 B4
2486 B5
2491 A3
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2503 D6
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2505 D6
2506 D6
2507 D6
2508 C6
2509 C6
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2623 A7
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2627 A6
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2661 C8
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2664 C8
2665 C8
2666 C8
2667 B8
2668 B8
2669 B8
2670 B8
2674 C7
2676 A7
2677 C7
2678 C8
2680 A8
2682 A8
2700 D10
2702 E9
2704 E9
2705 E9
2707 E9
2708 D10
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2710 E9
2711 E9
2712 E10
2713 E10
2714 D10
2716 C10
2717 C10
2718 D9
2721 C10
2722 C10
2723 C10
2724 D9
2725 C10
2727 D9
2728 D9
2760 F10
2761 F9
2763 F10
2764 G10
2765 F9
2767 F10
2770 F10
2771 G10
2772 G10
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2774 G9
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2777 G10
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2781 F9
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2784 F10
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2786 F10
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2792 F10
2793 F9
2794 F9
2795 E8
2800 B5
2801 F5
2802 F5
2804 F6
2805 E5
2806 G6
2807 D2
2808 E6
2810 C4
2811 C4
2812 D5
2814 C7
2815 C7
2816 G7
2901 C9
2905 B10
2906 B10
2907 B10
2909 C10
2910 C9
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2912 B10
2913 B10
2914 B10
2916 A9
2917 A9
2918 B9
2919 A8
2920 B9
2921 A9
2924 C10
2925 C9
2926 B9
2927 C9
2928 C9
2929 C9
2930 D9
2931 D9
2932 A10
2933 B10
3000 C5
3001 C7
3003 C7
3004 C7
3005 C6
3006 C7
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3009 B7
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3017 B5
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Engineer's remarks:

Engineer's remarks:

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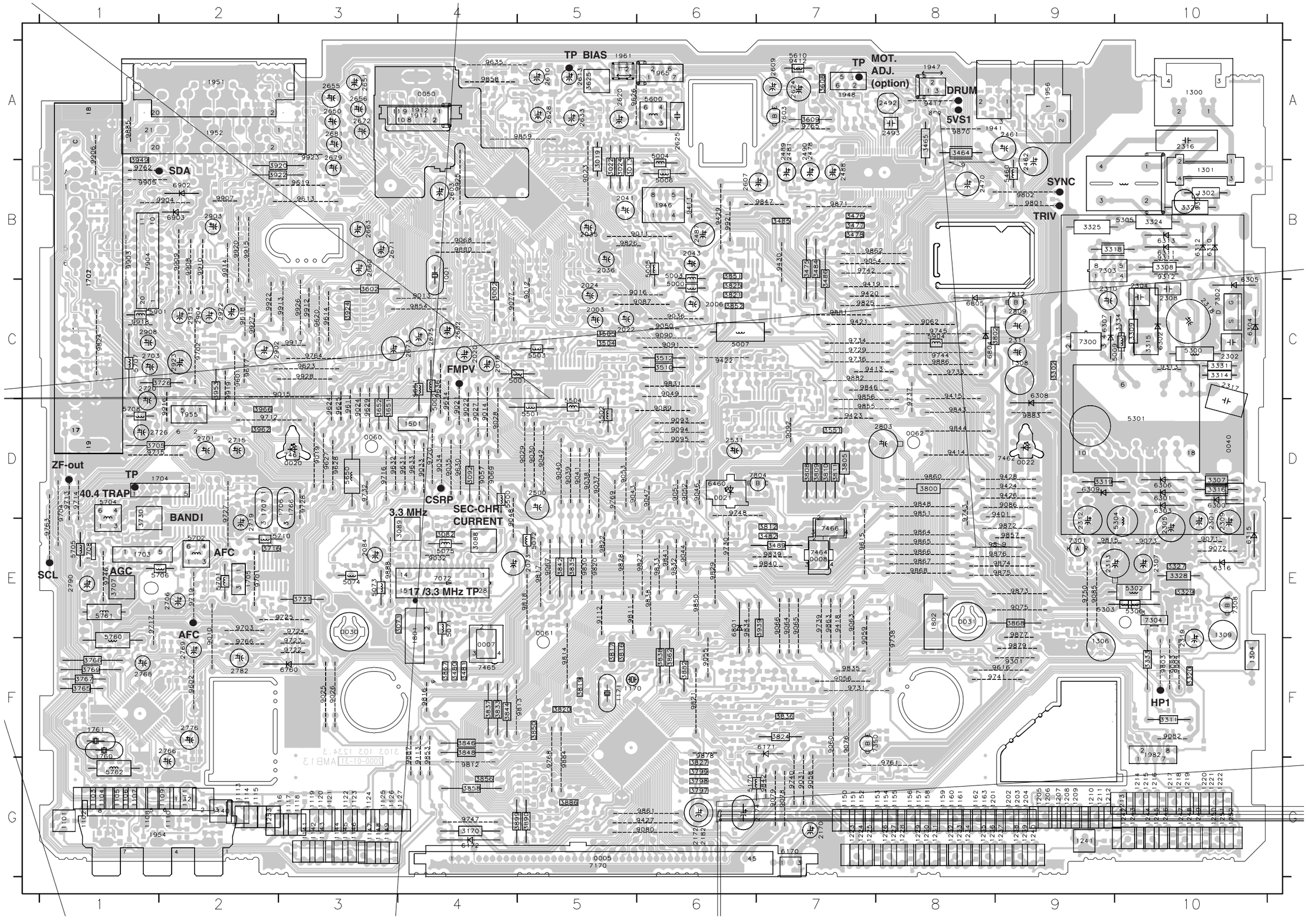
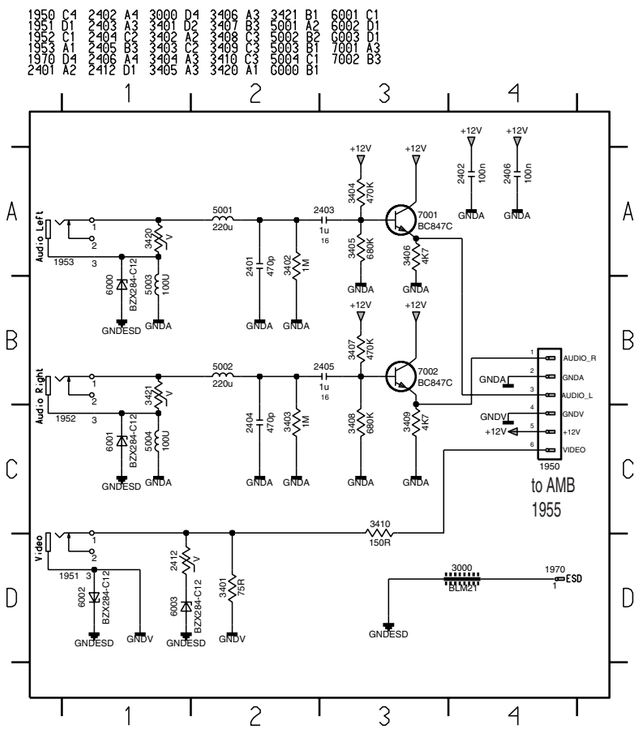
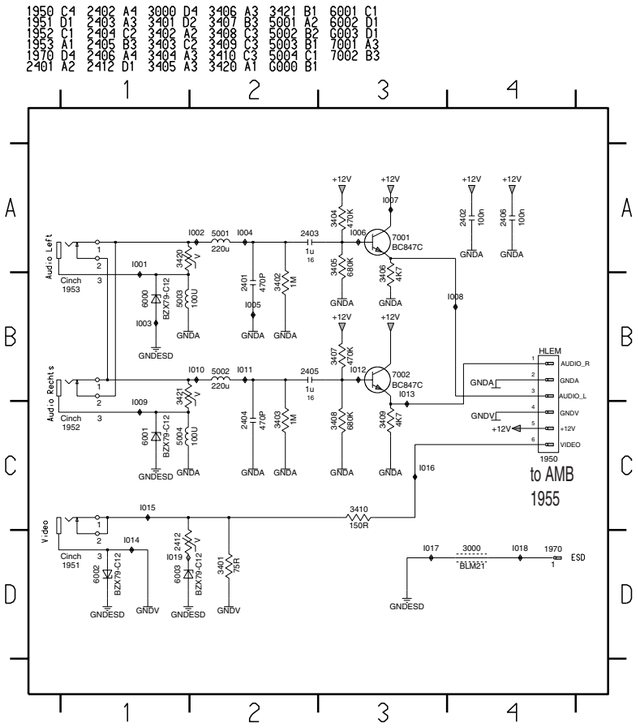
7.18 Mother board - component side



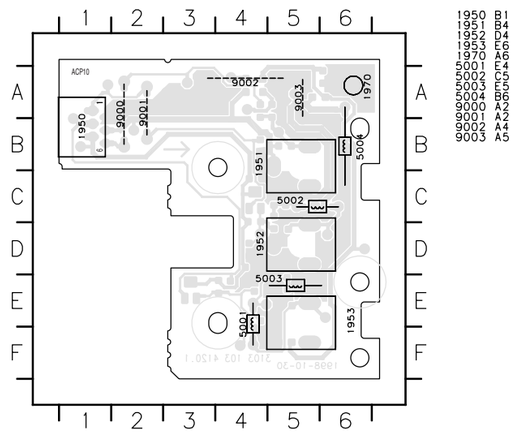
7.19 Connector print (ACP10)

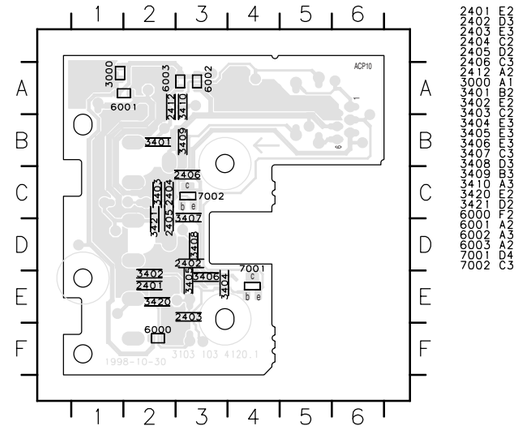


7.20 Connector print (ACP1)

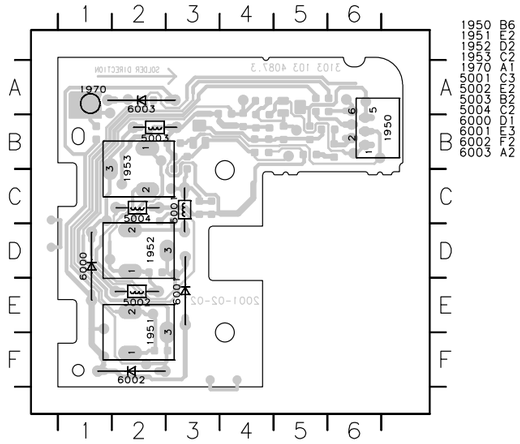


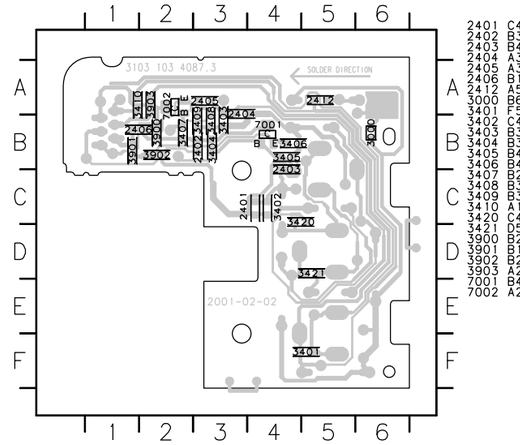
7.21 Connector print lay out (ACP10)



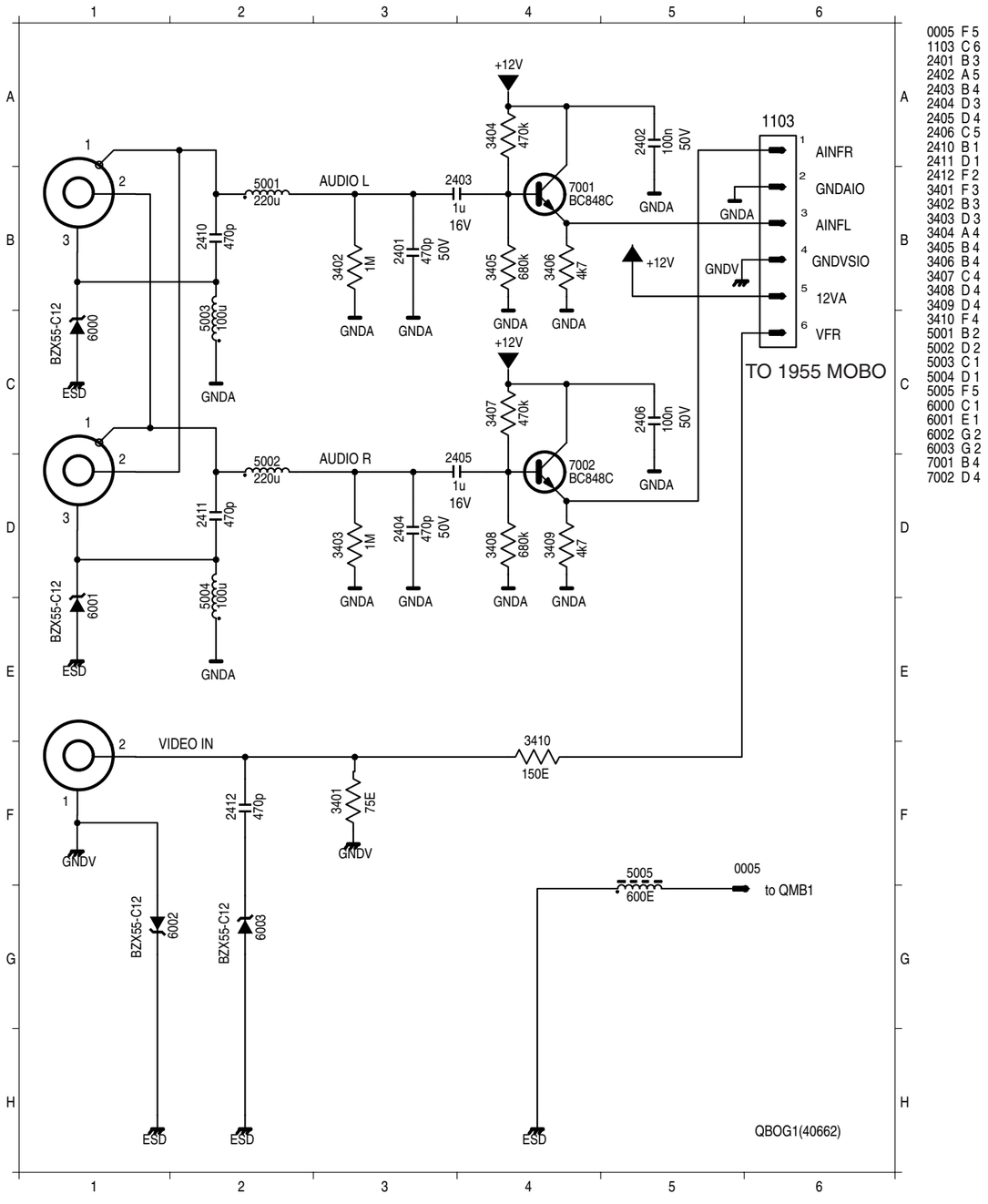


7.22 Connector print lay out (ACP1)

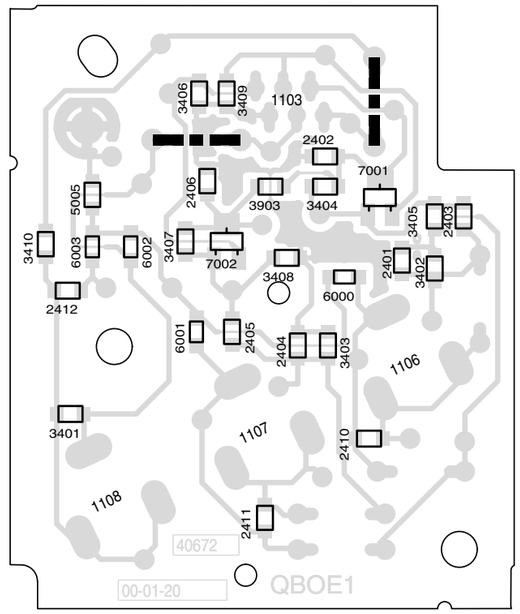


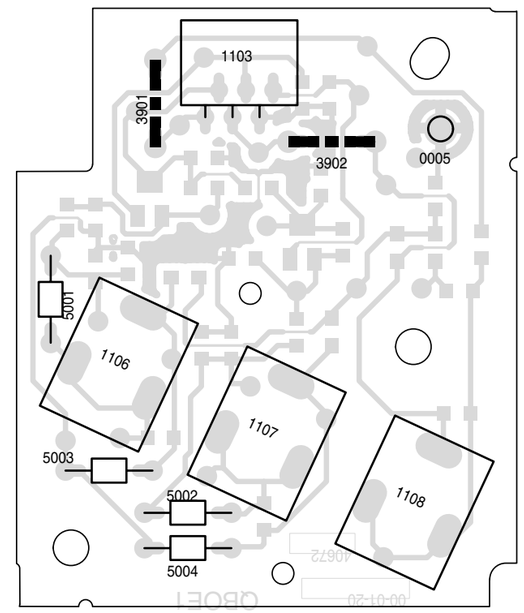


7.23 Connector print (QBOE1, QBOG1)

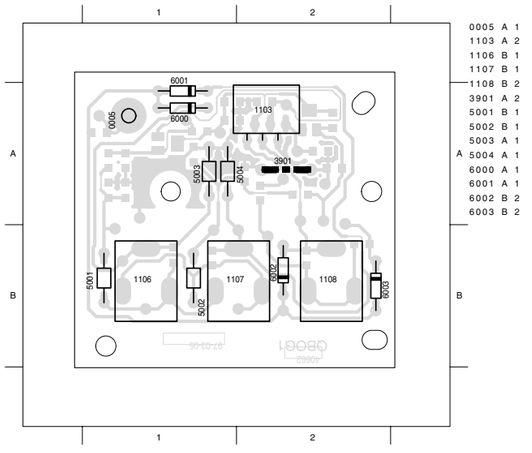


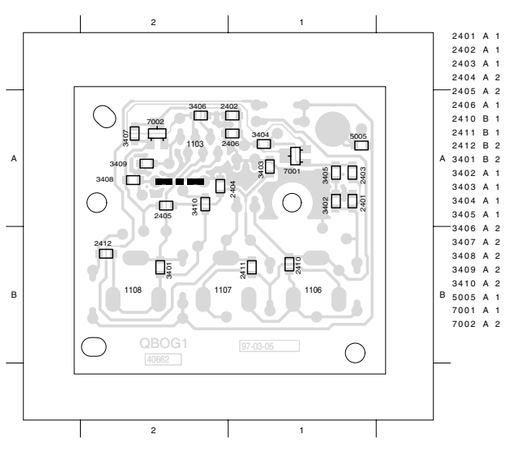
7.24 Connector print (QBOE1)





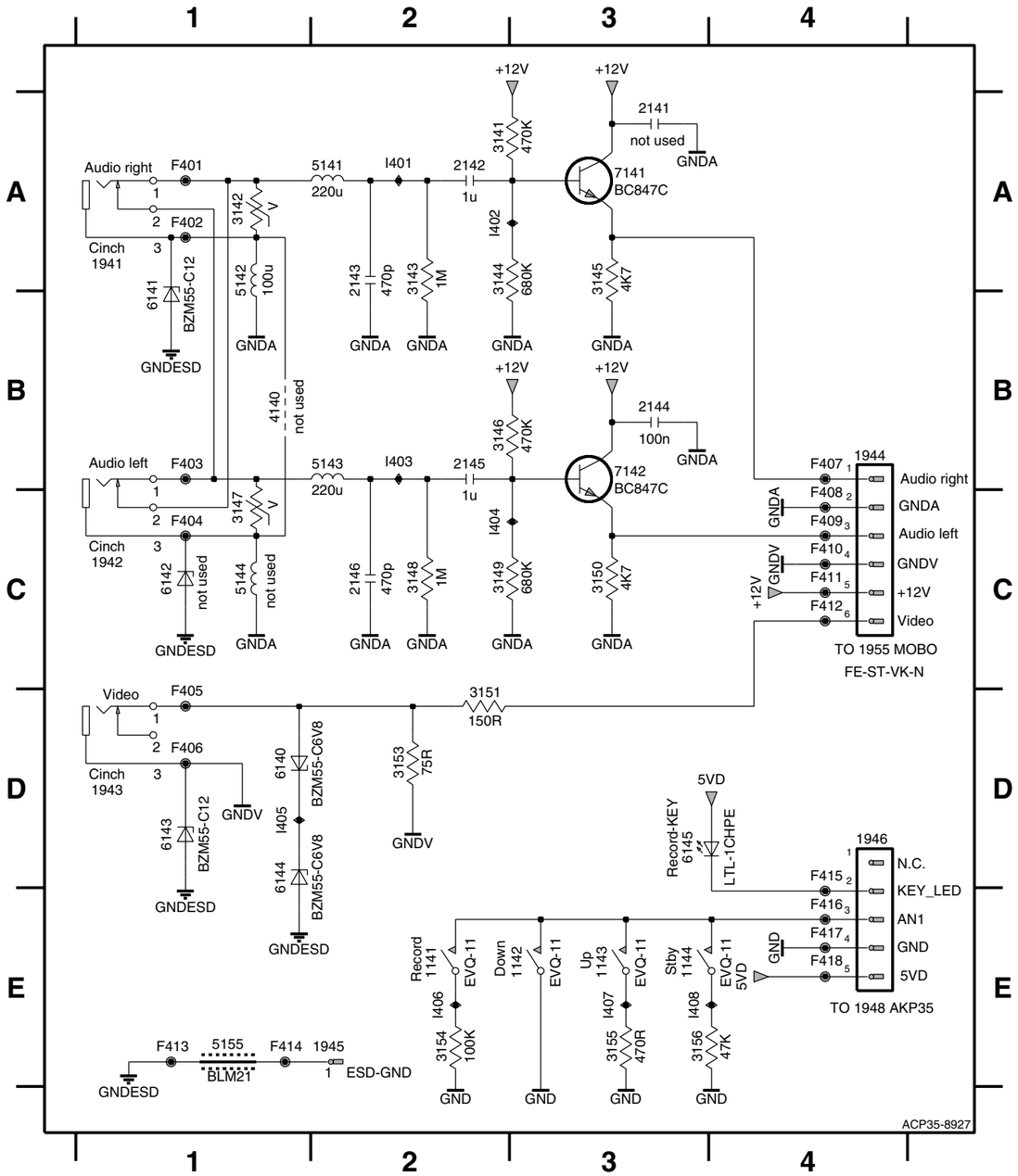
7.25 Connector print (QBOG1)

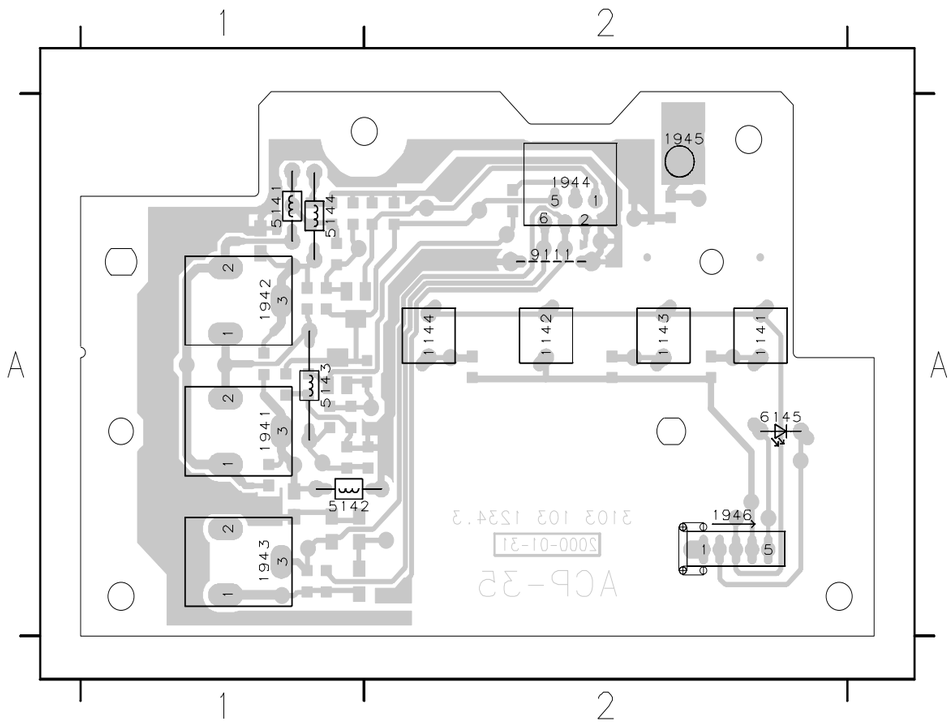




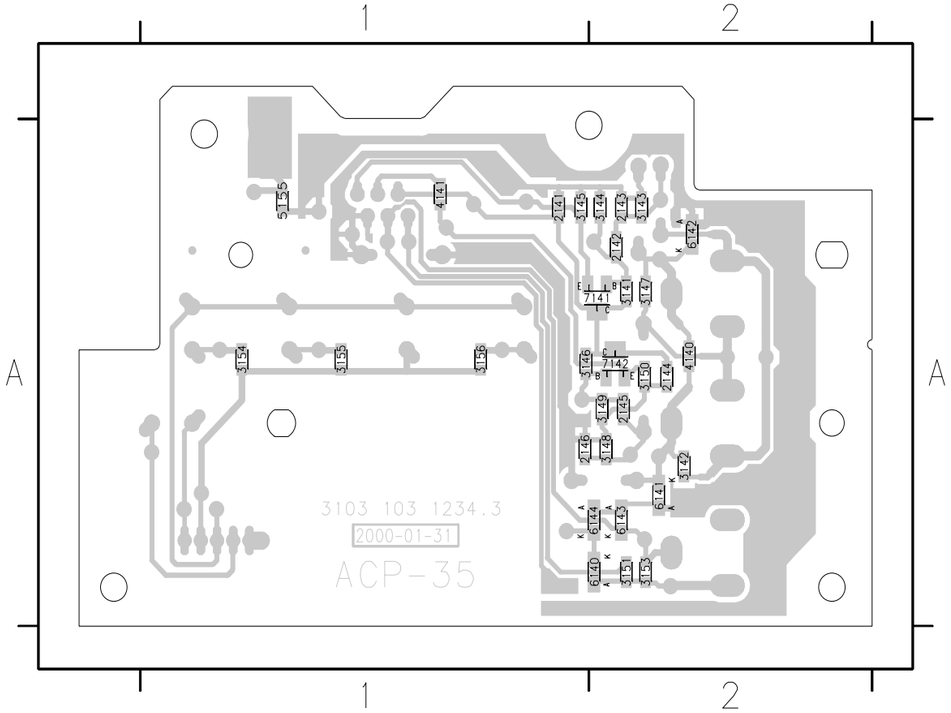
7.26 Connector print (ACP35)

1141 E2	1943 D1	2143 A2	3143 A2	3149 C2	3156 E3	5145 E1	6145 D3	F404 C1	F410 C4	F416 E4	I404 C2	
1142 E3	1944 B4	2144 B3	3144 A2	3150 C3	4140 B1	6140 D1	7141 A3	F405 D1	F411 C4	F417 E4	I405 D1	
1143 E3	1945 E2	2145 B2	3145 A3	3151 D2	5141 A2	6141 B1	7142 B3	F406 D1	F412 C4	F418 E4	I406 E2	
1144 E3	1946 D4	2146 C2	3146 B2	3153 D2	5142 A1	6142 C1	F401 A1	F407 B4	F413 E1	I401 A2	I407 E3	
1941 A1	2141 A3	3141 A2	3147 C1	3154 E2	5143 B2	6143 D1	F402 A1	F408 C4	F414 E1	I402 A2	I408 E3	
1942 C1	2142 A2	3142 A1	3148 C2	3155 E3	5144 C1	6144 D1	F403 B1	F409 C4	F415 D4	I403 B2		





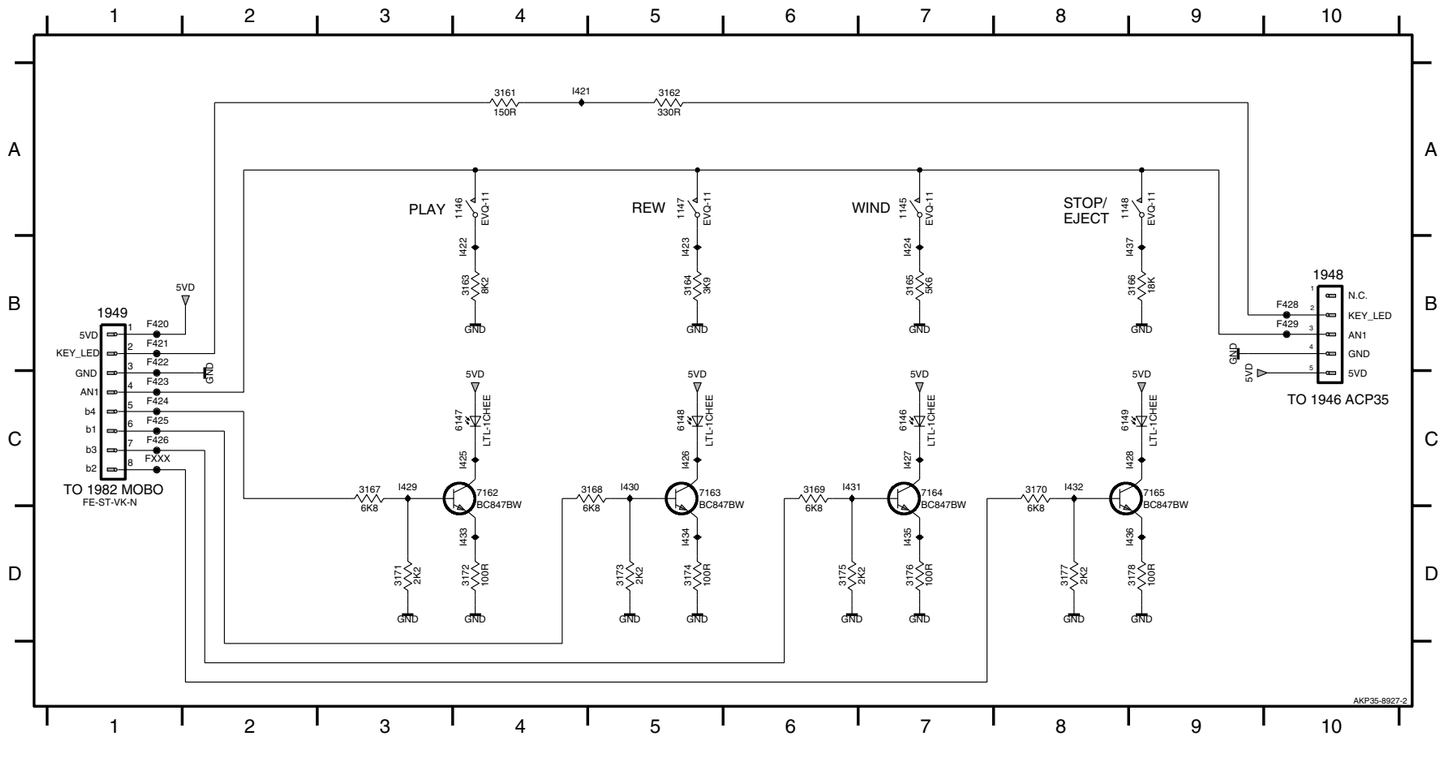
1141 A2
1142 A2
1143 A2
1144 A2
1941 A1
1942 A1
1943 A1
1944 A2
1945 A2
1946 A2
5141 A1
5142 A1
5143 A1
5144 A1
6145 A2
9111 A2

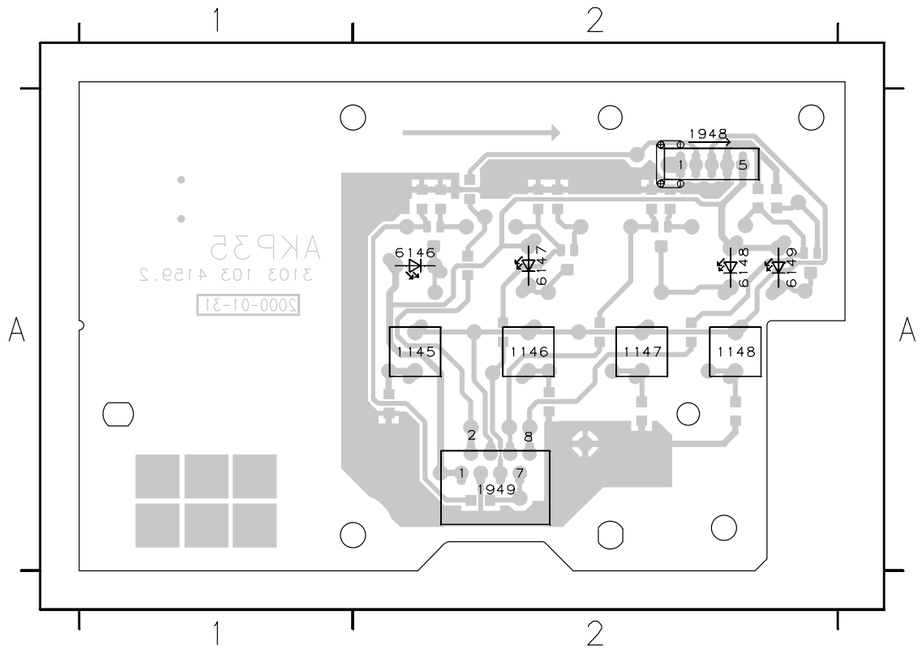


2141 A1
2142 A2
2143 A2
2144 A2
2145 A2
2146 A1
3141 A2
3142 A2
3143 A2
3144 A2
3145 A1
3146 A1
3147 A2
3148 A2
3149 A2
3150 A2
3151 A2
3153 A2
3154 A1
3155 A1
3156 A1
4140 A2
4141 A1
5155 A1
6140 A2
6141 A2
6142 A2
6143 A2
6144 A2
7141 A2
7142 A2

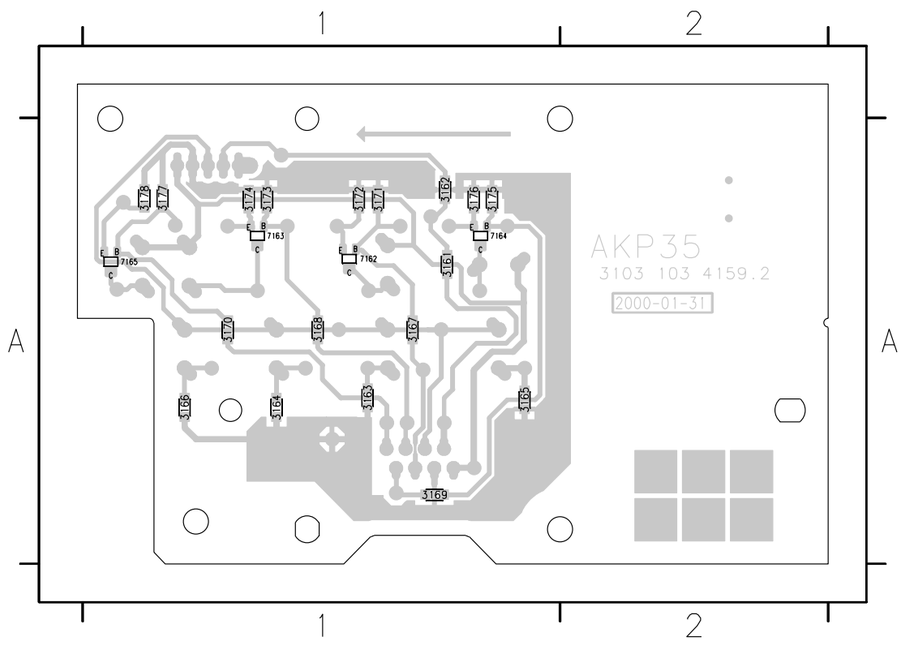
7.27 Key print (AKP35)

1145 A7 1148 A8 3161 A4 3164 B5 3167 C3 3170 C8 3173 D5 3176 D7 6146 C7 6149 C8 7164 C7 F421 B1 F424 C1 F428 B10 I421 A4 I424 B7 I427 C7 I430 C5 I433 D4 I436 D9
1146 A4 1948 B10 3162 A5 3165 B7 3168 C5 3171 D3 3174 D5 3177 D8 6147 C4 7162 C4 7165 C9 F422 B1 F425 C1 F429 B10 I422 B4 I425 C4 I428 C9 I431 C6 I434 D5 I437 B9
1147 A5 1949 B1 3163 B4 3166 B9 3169 C6 3172 D4 3175 D6 3178 D9 6148 C5 7163 C5 F420 B1 F423 C1 F426 C1 FXXX C1 I423 B5 I426 C5 I429 C3 I432 C8 I435 D7



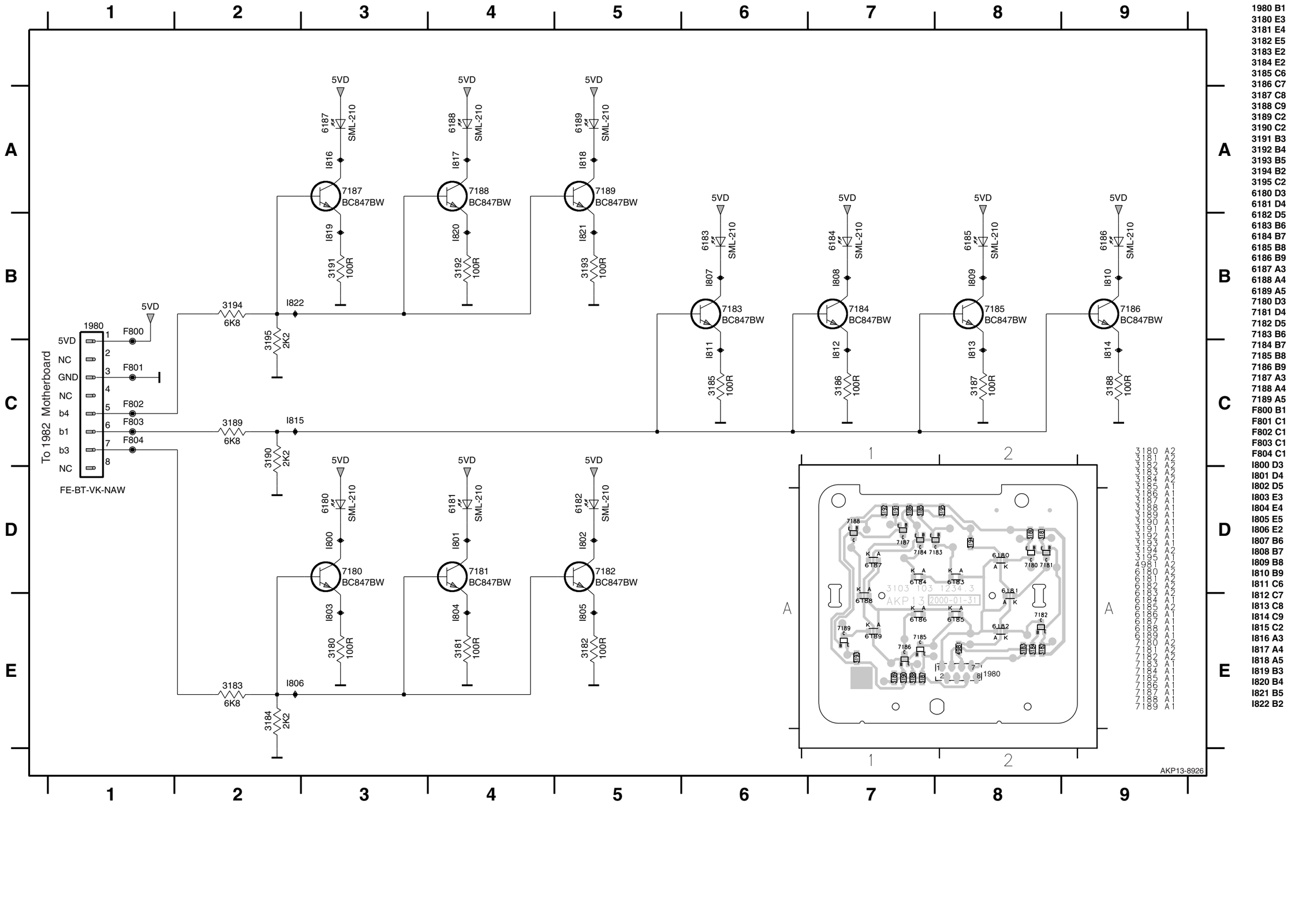


1145 A2
1146 A2
1147 A2
1148 A2
1948 A2
1949 A2
6146 A2
6147 A2
6148 A2
6149 A2



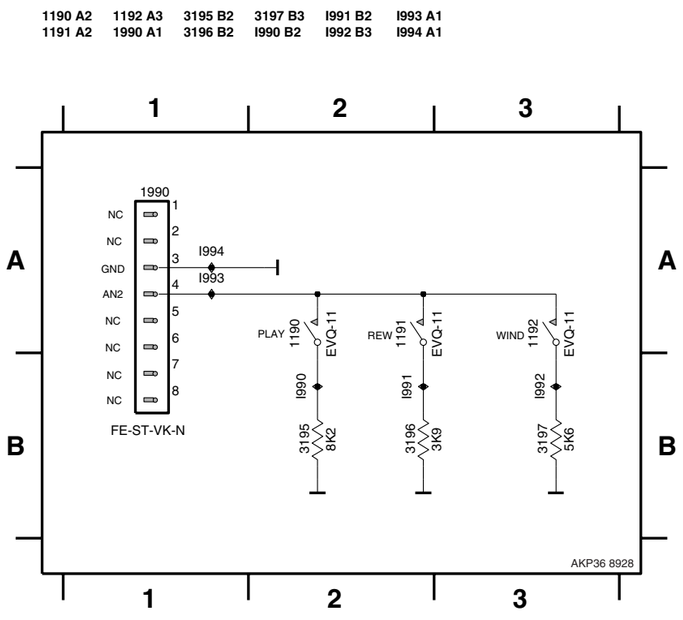
3161 A1
3162 A1
3163 A1
3164 A1
3165 A1
3166 A1
3167 A1
3168 A1
3169 A1
3170 A1
3171 A1
3172 A1
3173 A1
3174 A1
3175 A1
3176 A1
3177 A1
3178 A1
7161 A1
7162 A1
7163 A1
7164 A1
7165 A1

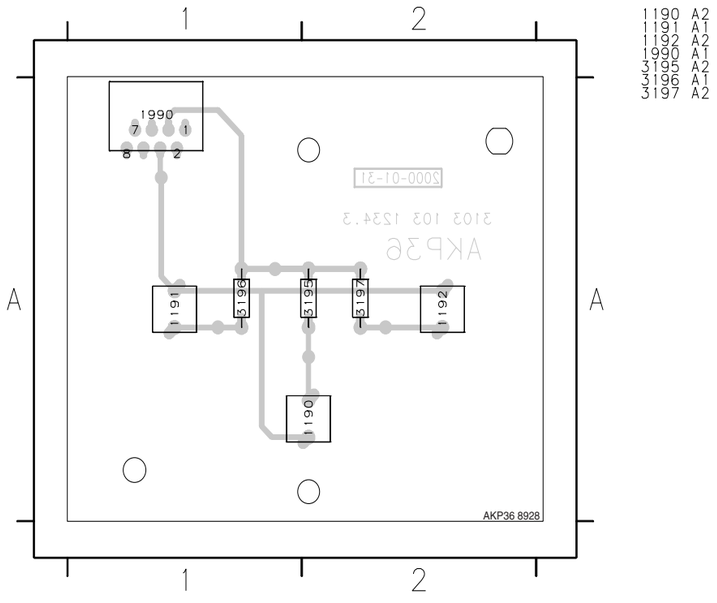
7.28 Illumination print (AKP13)



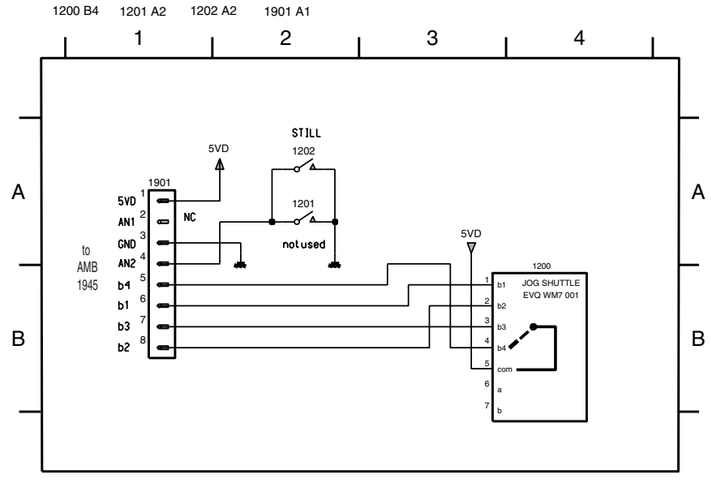
1980 B1
3180 E3
3181 E4
3182 E5
3183 E2
3184 E2
3185 C6
3186 C7
3187 C8
3188 C9
3189 C2
3190 C2
3191 B3
3192 B4
3193 B5
3194 B2
3195 C2
6180 D3
6181 D4
6182 D5
6183 B6
6184 B7
6185 B8
6186 B9
6187 A3
6188 A4
6189 A5
7180 D3
7181 D4
7182 D5
7183 B6
7184 B7
7185 B8
7186 B9
7187 A3
7188 A4
7189 A5
F800 B1
F801 C1
F802 C1
F803 C1
F804 C1
I800 D3
I801 D4
I802 D5
I803 E3
I804 E4
I805 E5
I806 E2
I807 B6
I808 B7
I809 B8
I810 B9
I811 C6
I812 C7
I813 C8
I814 C9
I815 C2
I816 A3
I817 A4
I818 A5
I819 B3
I820 B4
I821 B5
I822 B2

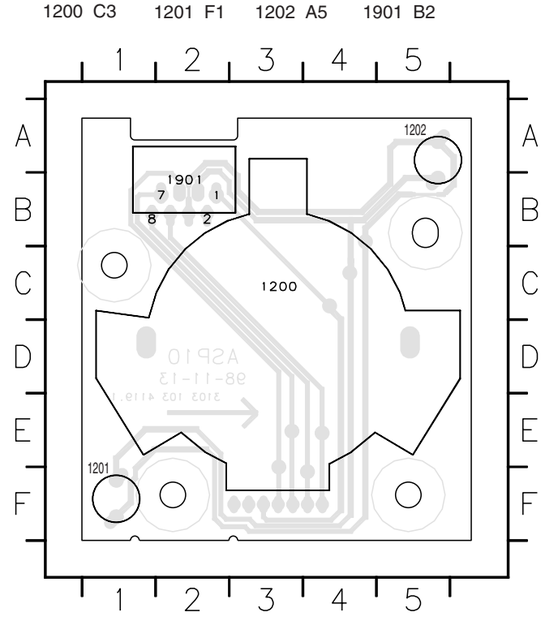
7.29 Key print (AKP36)



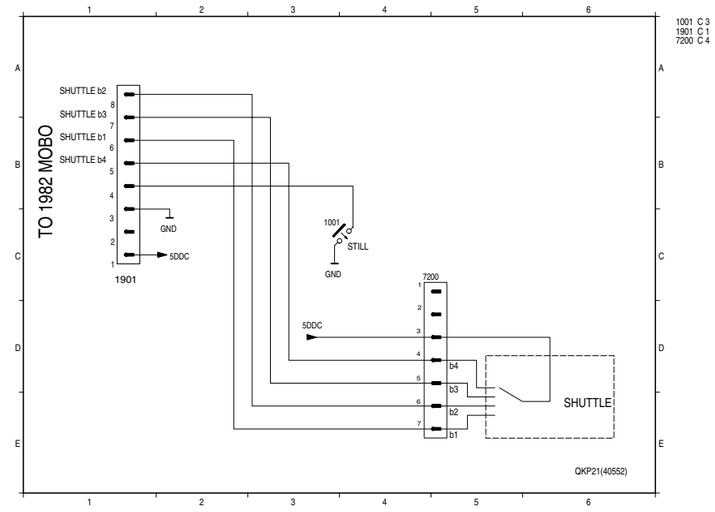


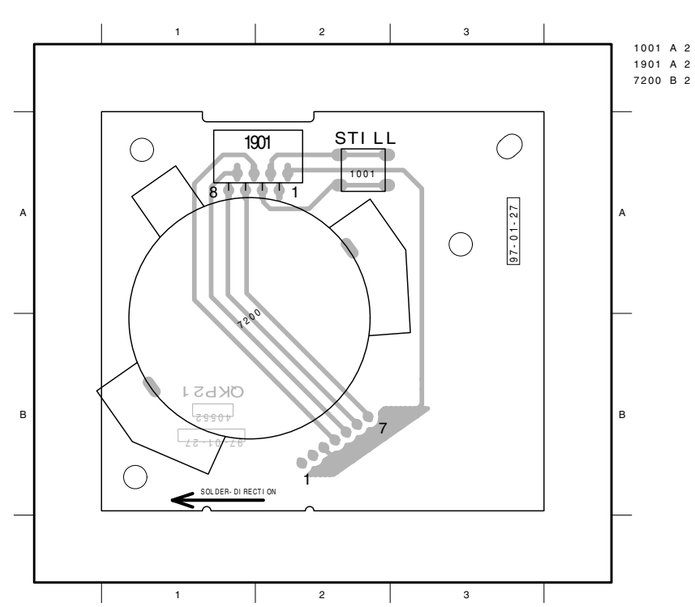
7.30 Shuttle board (ASP10)



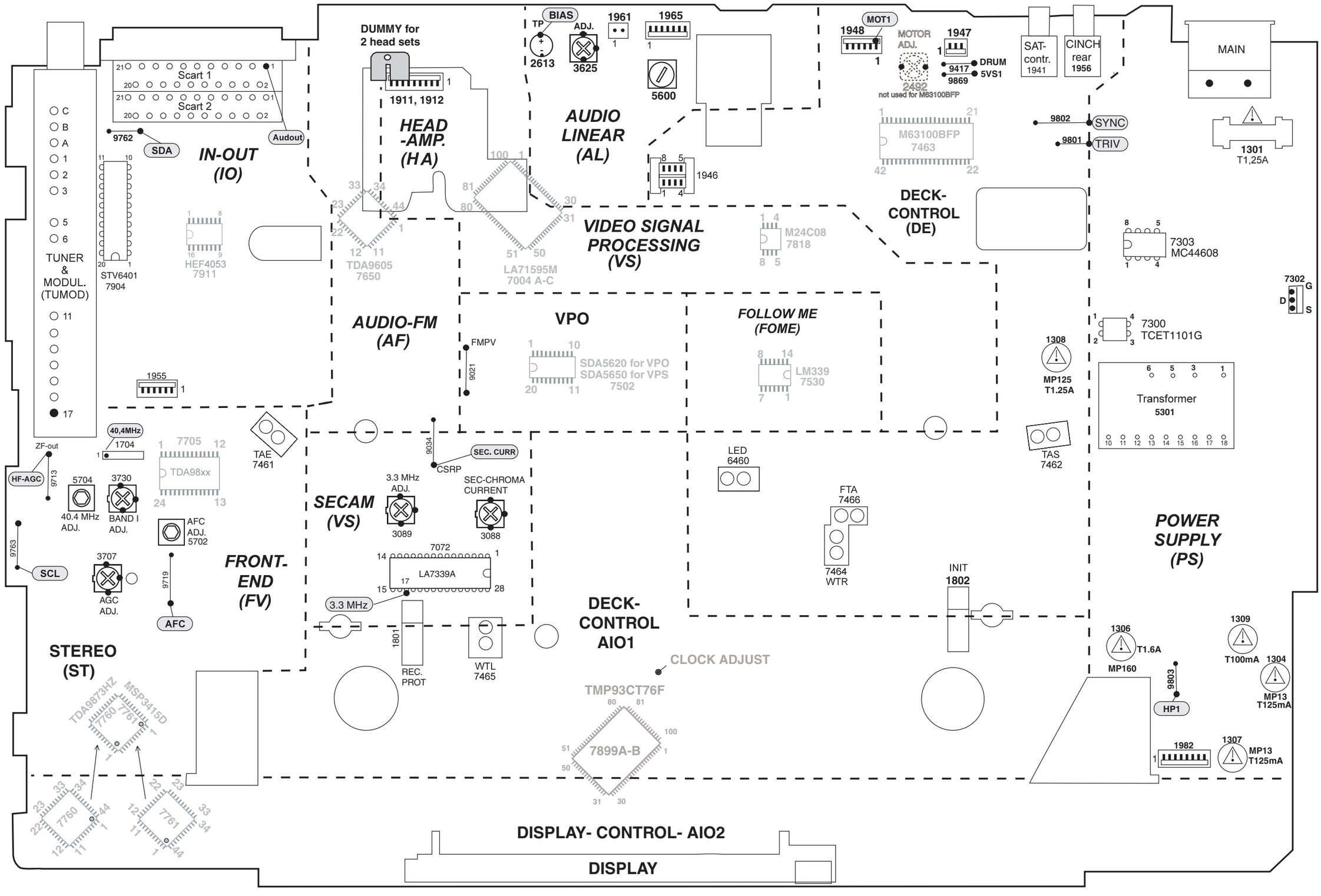


7.31 Shuttle board (QKP21)





7.32 Test point overview



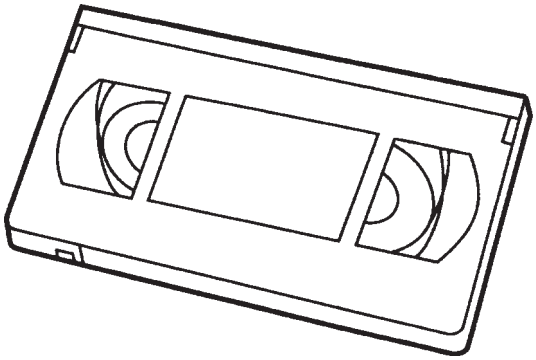
8. Electrical alignments

8.1 Measuring instruments

The following instruments are required to carry out the electrical setting work:

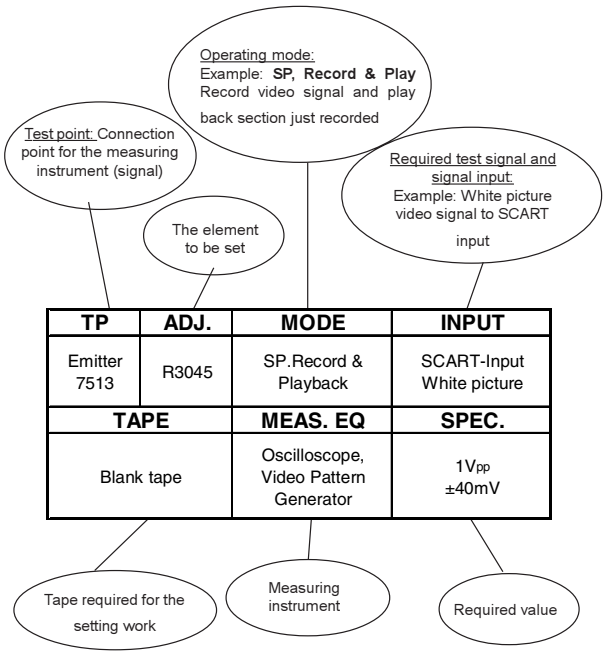
1. Dual trace oscilloscope
Voltage range : 0.001 ~ 50V/Div.
Frequency range : DC ~ 50 MHz
Probe : 10:1; 1:1
2. Digital Multimeter
3. Frequency meter
4. Sine-wave generator : 0 ~ 50MHz
5. Test pattern generator
6. Plastic adjustment tool
7. Isolating transformer (regulating transformer)
8. VHS test cassette 4822 397 30103
SPC test cassette 4822 397 30268

VHS test cassette



Counter Reading Start	0	0040 ±8	0310 ±12
Video	Blank	B&W Pattern	Color Bars
Audio	Blank	6kHz (mono)	40Hz, 3kHz, 15kHz (Mono & Stereo)

8.2 Setting instructions



TP	ADJ.	MODE	INPUT
Emitter 7513	R3045	SP.Record & Playback	SCART-Input White picture
TAPE		MEAS. EQ	SPEC.
Blank tape		Oscilloscope, Video Pattern Generator	1V_{pp} ±40mV

8.3 Video signal processing (VS-SEC)

Service tasks after replacement of ICs 7004, 7072:

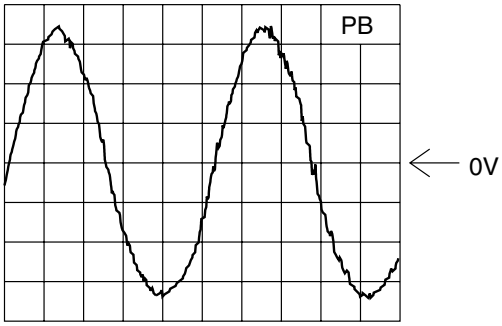
Before commencing adjustment:
Call the service test program and enter Step 10 (Dummy mode). Remove the drive from the motherboard.

8.3.1 3.3 MHz adjustment [3089] (for SECAM)

Purpose:
To adjust the mixing oscillator

Consequences of incorrect settings:
Cross patterns in coloured areas, coloured noise.

TP	ADJ.	MODE	INPUT
IC7072 pin 17	R3089	Dummy mode step 10 playback	1.2 MHz sinus 100mVpp, wire 9021 (FMPV)
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope Video pattern generator Sinus generator	adjust to optimum sinus



A: AC, 50mV/Div, 50ns/Div
IC 7072 Pin 17

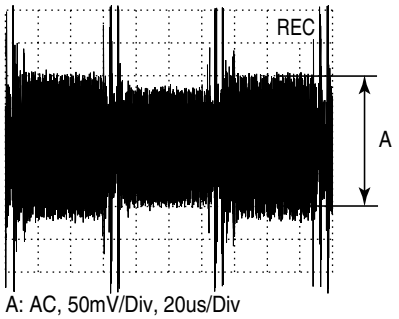
8.3.2 SECAM chrominance record current adjustment [3088]:

Purpose:
To set the optimum record SECAM chroma level.

Symptom, if incorrectly set:
If the record level is too high, beats may appear on the picture. If the level is too low, the colour may be degraded.

TP	ADJ.	MODE	INPUT
CSRP pos.9034	R3088	Dummy mode Record Preset E2	(VIDEO IN E2) Red Picture SECAM 75% Saturation
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Oscilloscope Video Pattern Generator	**A**=200 ± 15 $mV_{pp,}$

Notes:
With varying frame amplitudes, the setting is made for the greatest amplitude.



A: AC, 50mV/Div, 20us/Div

8.4 Front End (FV)

Service tasks after replacement of IC 7705, coil L5702 and TUMOD:

8.4.1 AFC Adjustment:

Purpose:
Correct adjustment of demodulator AFC - circuit

Symptom, if incorrectly set:
Bad or disturbed TV channel reception.

PAL - AFC adjustment [5702]:

TP	ADJ.	MODE	INPUT
IC 7705 Pin 17 (AFC TP9719)	L5702	E to E	38,9MHz 500mV$_{pp}$ at Tuner 1701 Pin 17 (TP9713,ZF-out)
TAPE		MEAS. EQ.	SPEC.
		DC Voltmeter Frequ. Generator	2,5V ±0,2V

SECAM band 1 - AFC adjustment [3730]: (SECAM L / L' only)

Before commencing adjustment:
- Switch to a band 1 SECAM L' preset.
- Is the system switch, in the menu 'MANUAL SEARCHING', not possible, press the right cursor key of the remote in the 'CHANNEL NUMBER' line for a short moment.
- A fine-tuning will be done and the system will switch to the 'AUTO' function.

TP	ADJ.	MODE	INPUT
IC 7705 pin 17 (AFC TP9719)	R3730	E to E, SECAM L' tuned on this preset	33,9MHz 500mV$_{pp}$ at Tuner 1701, pin 17 (TP9713, ZF-out)
TAPE		MEAS. EQ.	SPEC.
		DC Voltmeter Sinus Generator	2,5V ±0,2V

8.4.2 HF - AGC adjustment [3707]:

Service tasks after replacement of ICs 7705, or TUMOD:

Purpose:
Set amplifier control.

Symptom, if incorrectly set:
Picture jitter if input level is too low and picture distortion if input level is too high.

TP	ADJ.	MODE	INPUT
Tuner 1701 Pin 17 (TP9713, ZF-out)	R3707	Set tuned to channel 27	4,5mV(74dBµV) on aerial input PAL white picture, audio IF on, no modulation
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope Video Pattern Generator	550mV$_{pp}$ +/-50mV (use a 10:1 probe)

8.4.3 Attenuating the 40.4 MHz [5704]: (SECAM only)

Service tasks after replacement of coil 5704:

Purpose:
To attenuate the band I carrier rests.

Symptom, if incorrectly set:
Bad picture quality when the filter attenuates the picture carrier (38.9MHz).

TP	ADJ.	MODE	INPUT
OFW 1704 Pin 1	L5704	E to E	40.4 MHz, 300mV$_{rms}$ at Tuner 1701 Pin 17 (TP9713,ZF-out)
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope, Sinus Generator, Counter	adjust minimum amplitude

If the adjustment is correct the signal at pin 1 of SFW [1704] must be smaller than the input signal amplitude by at least 5 dB.

8.5 Deck electronics (DE)

Service tasks after replacement of IC 7463:

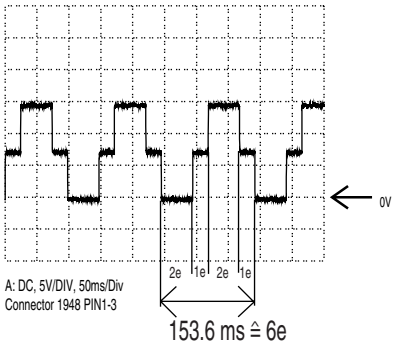
8.5.1 Motor frequency - adjustment [2492] (OPTION):

Purpose:
To adjust the working frequency of the head motor driver (not necessary for M63100 BFP).

Result of an incorrect adjustment:
Head motor doesn't start correctly.

Before commencing adjustment:
- bring VCR in to EJECT state
- disconnect set from main power source
- remove cable 8004 from connector 1948
- connect test point DRUM [9417] with 5VS1 [9869] (wires on component side)
- reconnect to main power source

TP	ADJ.	MODE	INPUT
Connector 1948 Pin 1	C2492	EJECT	
TAPE		MEAS. EQ.	SPEC.
		Oscilloscope, Counter	153,6 ms ±1,5ms see Diagram



8.6 Servo System (AIO1)

Service tasks after replacement of the head drum SYCA 7004-B or EEPROM.

8.6.1 Setting the gap position (GAP):

Purpose:
To determine the correct head switching point during playback.
Symptom if incorrectly set:
Head switching fault and/or vertical picture flickers.

- Enter the service test program and, whilst step display is flashing, enter the step number 51, using the numerical keys.
- Insert a test cassette (e.g. 4822 397 30103) with the standard video signal in the VCR.
- By pressing the SELECT key whilst step 51 is flashing, the automatic adjustment is triggered and stored in the EEPROM .

TP	ADJ.	MODE	INPUT
		Stop Service Mode	
TAPE		MEAS. EQ.	SPEC.
VHS Alignment Tape			Call up Step 51 of Service Mode

After a correct adjustment, the display shows 1;0 when incorrect. In case of unsuccessful tuning the VCR ejects the cassette. To leave the step, press SELECT.

Causes of incorrect adjustment :
Incorrect standard video signal.
Scanner fault.
Microprocessor fault.

8.6.2 "Studio Picture control" adjustment (SPC):

Purpose:
Adjustment of the reference level for the SPC.
Symptom if incorrectly set:
The picture is played back at a lower resolution than would be possible.

TP	ADJ.	MODE	INPUT
		Stop Service Mode	RF or A1- input, black picture without BURST
TAPE		MEAS. EQ.	SPEC.
SPC Alignment Tape			Call up Step 52 of Service Mode

- Video signal via Scart or aerial
- Enter the service test program and, whilst the step is flashing, input the step number 52, using the numerical keys.
- Insert SPC Alignment Tape 4822 397 30268.
- By pressing the SELECT key whilst step 52 is flashing, the recorder makes a recording in SP mode (approx. 10 sec.) and in LP mode (approx. 10 sec.), rewinds and carries out a playback with automatic adjustment.
- After a correct adjustment the display shows 1, and 0 for incorrect adjustments. In case of unsuccessful tuning the VCR ejects the cassette.

To leave the step press SELECT.

8.7 Audio linear - (AL)

Service tasks after replacement of coil L5600, IC7004 or the audio heads:

8.7.1 Adjusting the erasing frequency [5600]:

Purpose:
To set the correct recording erasing frequency.
Symptom, if incorrectly set:
Erasing frequency or its harmonics cause audio faults.

TP	ADJ.	MODE	INPUT
connector 1965 pin 5	L5600	Record E1	PAL white picture, with sound on E1 (1kHz or 10kHz)
TAPE		MEAS. EQ.	SPEC.
Blank Tape		Frequency Counter	70kHz ±10kHz

8.7.2 Adjustment of bias current [3625]:

Purpose:
To set the optimum record bias current.
Symptom, if incorrectly set:
If the audio level is too high, the higher frequencies of the linear sound are too low.
If the level is too low, the higher frequencies are too strong and sound distortions increase.

TP	ADJ.	MODE	INPUT
C2613 (TP BIAS)	R3625	Record E1	PAL white picture, with sound on E1 (1kHz or 10kHz)
TAPE		MEAS. EQ.	SPEC.
Blank Tape		AC Millivoltmeter, Oszilloskop, Video Pattern Generator	$14V_{RMS}$ ±$1V_{RMS}$ (70kHz)

Checking the 'bias' adjustment:
Apply a sine-wave signal with an amplitude of 50mVeff to the SCART audio input. Record the 1kHz signal and 10kHz signal for 30 seconds each. Play back the recording and check that the amplitude difference is in the ±3dB range. If this is not the case, correct the value for the magnetic biasing current. If the treble is too low, the bias current should be reduced slightly. If the distortion is too great, the bias current should be increased slightly.
(approximate value: +1V = -1dB Treble).

8.7.3 Adjustment of the audio linear playback amplitude [IIC-bus]:

Purpose:
To set audio part amplification LA71595 [7004-A]
Symptom, if incorrectly set:
Playback sounds too low or too loud.

Enter the service test program and, whilst step display is flashing, enter the step number 62, using the numerical keys.

TP	ADJ.	MODE	INPUT
Pin 1 of Scart 1 (Audout)	refer to description	SP Self-recording and Playback, Service mode call up Step 62	(Video white picture) Audio in Scart 1, $700mV_{RMS}$, 1kHz
TAPE		MEAS. EQ.	SPEC.
Blank Tape		AC Millivoltmeter, Video Pattern, Frequency Generator	$500mV_{RMS}$ ±50mV

By pressing the SELECT button whilst step 62 is flashing, the output select is switched to Mono and the display shows, for instance:

– Make a recording of the audio signal on E1.
– Connect the millivoltmeter to Scart1 Pin1(Audio out) and play the recording back.
– The level on Scart 1, Pin1 (Audio out) can be adjusted to the set value by pressing the UP (value increases) or DOWN keys (value decreases).
– (The amplitude changes by 1 dB each time the key is pressed).
– The range is shown in the display by the numbers 0...31.
– The value is automatically stored in the EE-PROM each time the button is pressed.

8.8 Display Control (AIO2)

Service tasks after replacement of the clock quartz [1170] or the EEPROM:

8.8.1 Clock frequency output

Purpose:
Setting the exact clock function.
Symptom, if incorrectly set:
The clock is too fast or too slow.

Remove the Motherboard from the frame and bring it into the service position.
Enter the service test program and, whilst step display is flashing, enter the **step number 99**, using the numerical keys.

TP	ADJ.	MODE	INPUT
7899-A pin 71 CLOCK ADJ.		Stop Service Mode call up Step 99	
TAPE		MEAS. EQ.	SPEC.
		Frequency counter with 6 digits	refer to description below

After entering with SELECT, the display is switched off and the watch symbol is flashing, no further function can be carried out. At the CLOCK ADJUST measuring point [7899-A, pin 71], the uncorrected clock frequency of approx. 8192 Hz is always output.
Measure the output frequency with the calibrated counter (minimum resolution of 6 digits) and note down the value (f_{mess}).

Determining the deviation (in ppm):
f_{mess}..... measured frequency
f_{nom}.....target frequency (8192,00 Hz)
Deviation = 1x106 x (f_{mess} - f_{nom}) / $_{fnom}$

Determining the correction value for Step 53:
Correction value = Deviation / 0.763 + 128 (round off to whole number)

The calculated **correction value** must be between 0 and 255 (change quartz otherwise), and must be entered in Step 53 and saved.
This step can either be exited by performing a main power source reset, after which the service program must be entered again **or by pressing any key on the set**, before step 53 can be entered.

Example:
f_{mess}=8191.97Hz f_{nom} =8192.00Hz

Deviation = 1x10^6 x (8191.97 - 8192.00) / 8192.00 = **-3.662**
Correction value = -3.662 / 0.763 + 128 = 123.20 = **123**

8.8.2 Inputing the clock correction

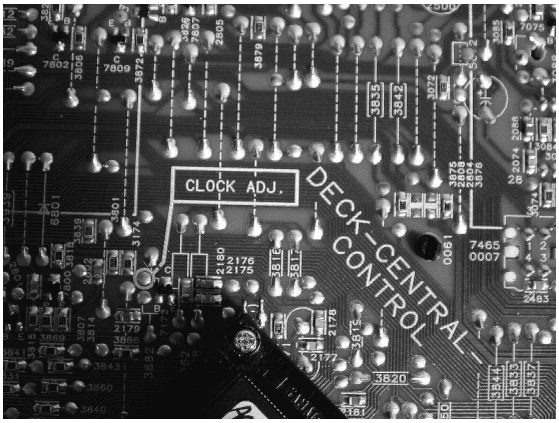
Before carrying out step 53, the correction value must be established in step 99.

By pressing the SELECT key whilst **step 53** is flashing, the display shows, for instance (128 is the default value of an empty EEPROM):

Using the numerical keys of the remote control, the established correction value from **Step 99** is entered as a 3-digit number (value must be between 0 and 255).

After pressing the OK key on the remote control, the entered code is stored, the display shows OK for approx. 3 seconds and then the stored value in decimal format.

In case of an invalid entry (value >255), the activation of the OK key causes the content of the last stored value to be displayed and OK does not appear in the display.
To leave the step press Select.



Adjustment table of the clock frequency:
Measured frequency in Hertz:

measured clock frequency pos. 7899-A pin 71 [Hz]	corrected value for Step 53 input	Time deviation minutes / year
8192,00	**128**	0,0
8191,98	**125**	-1,2
8191,96	**122**	-2,4
8191,94	**118**	-3,7
8191,92	**115**	-4,9
8191,90	**112**	-6,1
8191,88	**109**	-7,3
8191,86	**106**	-8,5
8191,84	**102**	-9,8
8191,82	**99**	-11,0
8191,80	**96**	-12,2
8191,78	**93**	-13,4
8191,76	**90**	-14,6
8191,74	**86**	-15,9
8191,72	**83**	-17,1
8191,70	**80**	-18,3
8191,68	**77**	-19,5
8191,66	**74**	-20,8
8191,64	**70**	-22,0
8191,62	**67**	-23,2
8191,60	**64**	-24,4
8191,58	**61**	-25,6
8191,56	**58**	-26,9
8191,54	**54**	-28,1
8191,52	**51**	-29,3
8191,50	**48**	-30,5
8191,48	**45**	-31,7
8191,46	**42**	-33,0
8191,44	**38**	-34,2
8191,42	**35**	-35,4
8191,40	**32**	-36,6
8191,38	**29**	-37,8
8191,36	**26**	-39,1
8191,34	**22**	-40,3
8191,32	**19**	-41,5
8191,30	**16**	-42,7
8191,28	**13**	-43,9
8191,26	**10**	-45,2
8191,24	**6**	-46,4
8191,22	**3**	-47,6
8191,20	**0**	-48,8

measured clock frequency pos. 7899-A pin 71 [Hz]	corrected value for Step 53 input	Time deviation minutes / year
8192,00	**128**	0,0
8192,02	**131**	1,2
8192,04	**134**	2,4
8192,06	**138**	3,7
8192,08	**141**	4,9
8192,10	**144**	6,1
8192,12	**147**	7,3
8192,14	**150**	8,5
8192,16	**154**	9,8
8192,18	**157**	11,0
8192,20	**160**	12,2
8192,22	**163**	13,4
8192,24	**166**	14,6
8192,26	**170**	15,9
8192,28	**173**	17,1
8192,30	**176**	18,3
8192,32	**179**	19,5
8192,34	**182**	20,8
8192,36	**186**	22,0
8192,38	**189**	23,2
8192,40	**192**	24,4
8192,42	**195**	25,6
8192,44	**198**	26,9
8192,46	**202**	28,1
8192,48	**205**	29,3
8192,50	**208**	30,5
8192,52	**211**	31,7
8192,54	**214**	33,0
8192,56	**218**	34,2
8192,58	**221**	35,4
8192,60	**224**	36,6
8192,62	**227**	37,8
8192,64	**230**	39,1
8192,66	**234**	40,3
8192,68	**237**	41,5
8192,70	**240**	42,7
8192,72	**243**	43,9
8192,74	**246**	45,2
8192,76	**250**	46,4
8192,78	**253**	47,6

9. Circuit descriptions and List of abbreviations

9.1 Switched-mode power supply PS (PS Part)

9.1.1 Technical data:

Mains voltage	:	195-264 Vrms
Maximum output	:	15W / 40W (continuous / maximum output)
Operating frequency	:	40 kHz
Efficiency	:	approx. 75 % at maximum output

Six different direct voltages are supplied on the power supply outputs.

9.1.2 Functional principle:

This power supply functions in a similar way to a blocking oscillator. In the supply voltage part [1300 to 2318], the mains voltage is rectified and buffered in the capacitor [2318]. From this direct voltage [2318] energy is transferred into the transformer [5301, pins 1-3] during the conductive phase of the switching transistor [7302] and is stored there as magnetic energy. This energy is passed to the secondary outputs on the power supply in the in the blocking phase of the switching transistor [7302]. With the switch-on time of the switching transistor [7302], the energy transferred in every cycle is regulated in such a way that the output voltages remain constant regardless of changes in the load or input voltages. The power transistor is activated using the integrated switch [7303] (see figure 9-1).

9.1.3 Supply voltage part

The supply voltage part extends from the mains socket [1300] to the capacitor [2318]. Using the diodes [6310, 6311, 6312 and 6313] the a.c. supply voltage is rectified and buffered using the capacitor [2318]. The line reactor [5305] and capacitor [2316] create a filter to keep interference arising in the power supply away from the mains. Components [1302], [3326] and [3323] protect the power supply against short-term overvoltages in the mains, e.g. caused by indirect effects from lightning.

9.1.4 Start-up with Mains-on:

Following connection to the mains, the capacitor [2310] is loaded via the start-up resistor [3318] and a current source between pin 8 and pin 6 on the IC [7303]. Once the voltage on [2310] and therefore the supply voltage Vcc on the IC [7303] has reached approx. 13V, the IC starts up and issues pulses to its output on pin 5. These pulses are used to control the gate on the power transistor [7302] (see figure 9-2). The frequency has a fixed setting in the IC (approx. 40 kHz). The current input on the IC is approx. 5 mA in normal mode.
If Vcc drops to below approx. 10V (e.g. with power limitation) or if Vcc exceeds around 15V (interruption of the control loop), the output on the IC [7303, pin 5] is blocked. All output voltages on the power supply, and therefore also Vcc, decrease. Once Vcc has dropped to below approx. 6.5V, a new start-up cycle begins. (See also “Overload, Power Limitation, Burst Mode“ section)

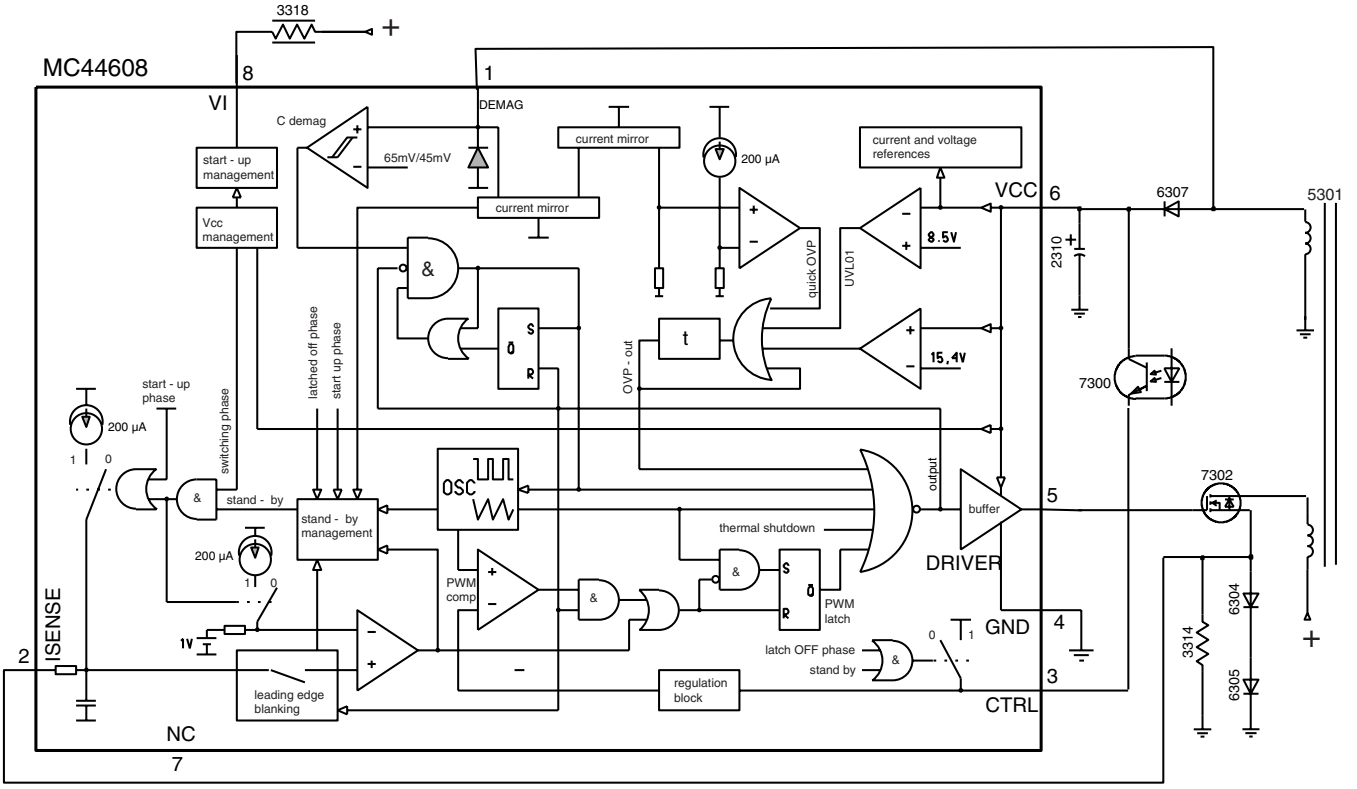


Figure 9-1

9.1.5 Normal mode:

With the power supply in normal mode, the periodic sequences in the circuit are divided primarily into the conductive and blocking phase of the switching transistor [7302]. During the **conductive phase** of the switching transistor [7302], current flows from the rectified mains voltage to the capacitor [2318] through the primary coil on the transformer [5301, pins 1-3], the transistor [7302] and resistors [3314, 3331] to earth (see figure 9-1). The positive voltage on pin 1 of the transformer [5301] can be assumed to be constant for a switching cycle. The current in the primary coil on the transformer [5301] increases linearly in the pattern of U=L*di/dt. A magnetic field representing a certain volume of the primary current is formed inside the transformer. In this phase, the voltages on the secondary coils are polarised in such a way that the diodes [6300, 6301, 6306, 6308 and 6309] block. From the controller on [7301], a current is supplied to the CTRL input on the IC [pin 3, 7303] via optocoupler [7300]. Once the switch-on time for the switching transistor [7302] has been reached, which corresponds to the current supplied on the CTRL input, the switching transistor is switched off.

Once the switching transs been switched off, the **blocking phase** begins. No more energy will be transferred into the transformer. The inductivity of the transformer will still attempt to maintain the current which has flowed through it (U=L*di/dt) at a constant level. As the primary current circuit is interrupted by the shut-off switching transistor [7302], the current will flow through the secondary coils.
The polarity of the voltages on the transformer is reversed, which means that the diodes [6300, 6301, 6306, 6308 and 6309] become conductive and current flows into the capacitors [2301, 2305, 2309, 2311 and 2312] and the load. This current is also ramp-shaped (di/dt negative, therefore decreasing).
The **control adjustment** for the switched-mode power supply is made by changing the conductive phase of the switching transistor (see figure 9-2), so that either more or less energy is transferred from the rectified mains voltage to [2318] in the transformer. The control information is provided by the control element [7301]. This element compares the 5V output voltage via the voltage dividers [3300, 3306, 3336] with an internal 2.5V reference voltage. The output voltage from [7301] passes via an optocoupler [7300] (for the metallic isolation of the primary and secondary parts) as the current value to pin 3 on the IC [7303]. The switch-on time for the switching transistor [7302] is inversely proportional to the value of this current.

9.1.6 Overload, power limitation, burst mode:

With an increasing load on one or more power supply outputs, the switch-on time for the power transistor [7302] also increases, and thus also the peak value of the delta-shaped current through this power transistor. The equivalent voltage circuit for this current profile is passed from resistors [3314] and [3331] via [3312] and [3347] to pin 2 on the IC [7305]. If the voltage on pin 2 reaches 1V in one switching cycle, the conductive phase of the switching transistor is ended immediately. This check is made in each individual switching cycle. This process ensures that no more than approx. 48W can be taken out of the mains (**= power limitation**).
If the power supply reaches the power limit, the output voltages and the supply voltage Vcc on pin 6 of the IC [7303] will be reduced following further loading. If Vcc is less than approx. 10V at any point during this process, the output on the IC [7303, pin 5] is blocked. All output voltages and Vcc are reduced. Once Vcc has dropped to below approx. 6.5V, a new start-up cycle begins. If the overload status or short-circuit remains, the power limitation will be activated immediately and the voltages will continue to be reduced, followed by another start-up attempt (Burst Mode). The amount of power taken up from the mains in burst mode is low.

9.1.7 Standby mode:

In the ‘Standby‘ operating mode on the device, the ’STBY‘ control line is used to shut off the output voltages 14AL, 5VA and 5VD on the power supply to minimise the amount of power taken up from the mains. The supply to the display heating can also be switched off using the ‘I1WSTBY‘ control line. The power supply itself will continue to function continuously in the ‘Standby‘ operating mode with a switching frequency of 40kHz.

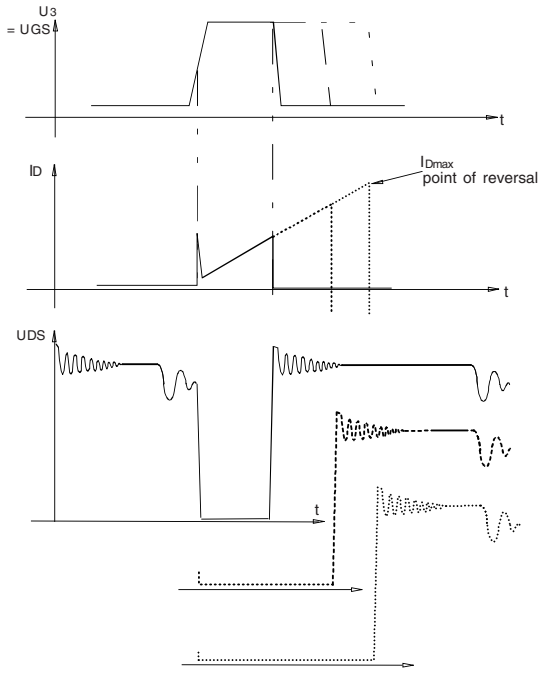


Figure 9-2

9.2 Operating unit DC (DC part)

The microcontroller TMP93CT76F [7899-A] is a 16 bit microcontroller fitted with 128Kb ROM and 2.5Kb RAM.
It is the core element of the operating unit, fulfilling the following tasks with the respective functional groups:

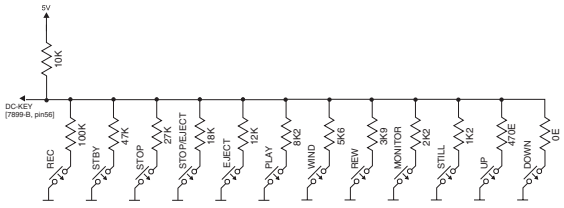
- Integrated VFD driver
- Timer
- Evaluation of the keyboard matrix
- Decoding the remote control commands from the infra-red receiver pos. 6170
- Activation of the display
- Back-up mode

In normal operation, the P is operated in dual-clock mode, i.e. both quartzes [1170, 1171] oscillate. The time is derived from the slow quartz [1170] (32.768 kHz), and the fast quartz [1171] (16MHz) is used to generate the system clock frequency.
In case of a mains failure (back-up mode) the P is not reset, but instead the mains failure is registered by the IPOR interrupt 3 [7899-B] (pin 67) and the P is moved into “Sleep mode” (low power consumption). The 16MHz quartz is turned off and the 32kHz quartz is then used as the clock and system clock frequency. The operating voltage for the AIO is buffered by a back-up cell [pos. 2174, 2172]. A diode [6171] prevents this gold capacity from discharging.

9.2.1 Evaluation of the keyboard matrix

There are 12 different keys. Each key function is assigned a fixed voltage value. This value is decoded using an analogue/digital (A/D) port (7899-B, pin 56). Each mechanical key position on the printed board can adopt any key function via a coding resistor. Pressing keys simultaneously may lead to undesired functions!

Schematic:



9.2.2 IR receiver and signal evaluation

The IR receiver [6170] includes a selective, controlled amplifier in addition to a photo-diode. The photo-diode changes the received transmission (approx. 940nm) in electrical pulses, which are then amplified and demodulated. On the output of the IR receiver [7220] a level lift 0V/5V pulse sequence, which corresponds to the envelope curve of the received IR remote control command, can be measured. This pulse sequence is input into the controller for further signal evaluation via input IRR [7899-B, pin 46].

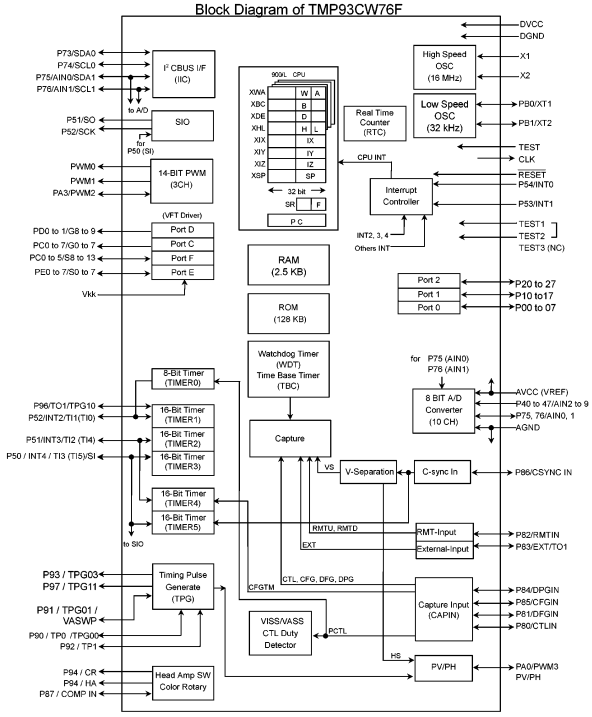
9.2.3 Activation and function of the VFD display

In principle, the VFD display [7170] is a tube triode in which the heating filaments in the tube serve as cathodes (F+,F-). The 7 grids (G1 - G7) are activated via PC2 - PC7, PD0 on the controller, and the 16 anodes (P1 - P16) are controlled via ports PE0 - PE7, PF0 - PF7, PC0, PC1 on the controller, each with a positive potential compared to the cathode.
The grids and anodes (digits and symbols to be displayed) are activated in the time-multiplex procedure, voltage lift 5V/ -18V. A dimmer function is generated using pulse-width modulation of the grid control signals. At maximum display brightness, the pulse width for each grid is 2.16 ms. It can be reduced, controlled using software, which reduces the visual brightness of the VFD display accordingly.
A digit or symbol is only illuminated if the corresponding anode and the surrounding grid are switched simultaneously to 5V for a certain time within a scanning period. The electrons emitted from the cathode are accelerated by the positively charged grid and hit the luminous layer of the anode which is also positively charged.
During the remainder of the scanning period, the corresponding grid and parts of the anode are at -18V, due to the internal pull-down resistors in the controller. This potential is still lower than the average cathode potential of approx. -15V, prevents the acceleration of electrons, thus causing the relevant grid and anode segments to go dark.
The heating direct voltage of the display (U = 3.5V) is supplied from the power supply via lines HELO or HEHI to pins F+ and F- to the VFD display. Resistors [3070] and [3071] restrict F- to approx. -15V.

9.3 Central Control AIO (AIO part)

The microcontroller (µC) TMP93CT76F [7899-B] includes the following functions:

- PWM outputs
- A/D converters
- Composite sync input
- Special servo inputs for VCR functions
- I^2C-BUS interface
- Shuttle evaluation



9.3.1 Analogue interface to the C:

The following analogue levels are supplied to the µ C's internal analogue/digital (A/D) converter:

• TAE/TAS	Tape End / Tape Start Detection
• TRIV	Tracking Information Video
• TRIA	Tracking Information Audio
• AGC	Automatic Gain Control
• AFC	Automatic Frequency Control
• 8SC1/2 voltage	Pin 8 Scart1 or Scart2 switching
• Key-in	Keypad evaluation

9.3.2 Tape end - LED control :

The LED current is switched using transistor [7804]. The ON time is approx. 1 msec and the OFF time approx. 12 msec during playback and 1msec to 5.5msec during the winding functions.
The LED current is typically 150 mA. In order to prevent interference from the relatively high pulsed current 'spreading' through the entire unit, the LED is fed from the 14VM1, and filtered by 2 resistors [3800, 3805] with 10R each and a 220µF electrolytic capacitor [2803].

9.3.3 CMT detection (video detection with CSYNC)

This has been extended due to identification problems with weak transmission signals and video signals not conforming to the STANDARD (common channel interference). The CSYNC line is supplied to the µP [7899-B] on pin 50. A hardware integration [7807,7808,7809] of the video pulse compensates the interference generated by the common channels and weak signals.

9.3.4 EE-PROM

The EE-PROM [7818] is a non-volatile memory which can be erased and written to electrically. (Data remains even if the operating voltage fails). Data specific to the device such as the X distance, head changeover position, preset stations, optional bytes etc. is stored in the EE-PROM [7818]. The data is accessed by the µP via the I^2C bus.

9.3.5 Easy link (P50)

For the communication between the TV set, video recorder and the peripheral devices, a bi-directional single-wire bus is used, which runs via pin 10 to scart socket 1.
The output signal is generated on pin 84 of the µC [7899-B], pin 68 is the signal input.

9.3.6 Shuttle

The shuttle is connected to the motherboard on plug pos.1982. It is a binary coded rotary switch with a rotation angle of +/- 70 degrees and 16 switch positions. These are input and evaluated via four lines (shuttle b1 - shuttle b4) to the input ports P24 - P27 [7899B pins 2-5].

9.3.7 Satmouse

For activating a sat-receiver via an external infrared electronic transmission unit (Satmouse) a bi-directional data line, a short-circuit proof +5V and earth are provided via a 3-pin 3.5mm jack [1941].
The +5V is limited to approx. 140 mA using a current limiting switch [7812 and peripherals].

9.4 Deck electronics DE (DE part)

The deck interface IC MP63100FP [7463] contains the following functional groups:

- CTL stage (tape synchronisation)
- Sensor interface
- Power on reset
- Head drum motor driver
- Loading motor driver
- Capstan motor control

9.4.1 CTL stage

The IC M63100FP [7463] contains a read/write stage for the CTL track with the option of overwriting an existing CTL track without any interference. The playback stage is fitted with a "digital" five-stage AGC. This logic circuit identifies the size of the output signal supplied by the CTL head, and then selects the best amplification ratio in the playback stage using comparators.
The CTL head voltage can therefore vary greatly, if V_{max} / V_{min} is great. The slowest tape speed is in LP mode. The fastest speed is adjusted during rewind. To ensure that the duty cycle in the tape sync is always reproduced correctly in the conditions mentioned above (important for detecting VISS marks), the amplifier must not be overdriven.

The five-stage AGC alone cannot cover the large dynamic range of the input voltage. The amplifier is therefore also equipped with a low pass characteristic (fg = 3kHz typ.; internal).
In parallel with the CTL head is the RC cell comprising capacitor [2479] and resistor [3471]. The capacitor [2479], together with the CTL head inductivity, causes a resonance step-up at around 10 kHz and the resistor [3471] suppresses this step-up. This creates an aperiodic transient response in the resonance. Beyond the resonance frequency, there is an adjustment in terms of a steep fall in the frequency transmission characteristic. This effectively suppresses high-frequency pick-ups. The CTL head signal amplitude in standard play is around 1mVp (typ.) which means that the amplification for the playback amplifier must be correspondingly high. To avoid offset problems, a 100 F electrolytic capacitor [2490] is fitted in the negative feedback branch for DC decoupling.
The polarity of the playback amplifier can be changed using the Video Index Search System (VISS) voltage. This is the only way in which the P can write a VISS mark on the tape without spikes. The Write/Read (W/R) signal is used to switch over between record and playback:
W = "H", R = "L".

9.4.2 Power on reset (POR) generator

The POR generator contained in the M63100FP [7463] requires only one external capacitor [2477], which specifies the length of the POR pulse. For 33 nF, t_{POR} is approx. 30ms. The response threshold of the reset circuit is between 4.5 and 4.8 V. Supply fluctuations which are shorter than tPOR/ 100 area and which do not fall below 4.0 V, do not trigger the POR. The P is reset using the inverted POR.

9.4.3 The sensor interface :

The four comparators in the M63100FP [7463] are used to convert sensor signals to the logic level. The outputs are overload protected by a current limiter and thermal overload protection. Only the non-inverting input on each comparator is accessible from the outside. The other inputs are connected to an internal reference of 2.5V. The fixed hysteresis of the comparators of approx. 18 mV is also located internally.

The comparators are connected as follows:

Comparator 1: In = FTA, pin 39; Out = FTAD, pin 34:
FTA = threading tachometer. This signal comes from a forked light barrier in the deck. An infra-red light beam is interrupted by a 4-blade impeller (butterfly). The output amplitude for the light barriers should be less than 2V for the low level and greater than 3V in the high level to ensure a correct evaluation process. An additional hysteresis is created with a resistor [3476]. For unit versions <1W and FOME the external operation amplifier [7530B] is used to reduce the power consumption in <1W mode.

Comparator 2: In = WTR, pin 38; Out = WTRD, pin 33:
WTR = Winding tachometer right, from a reflection photoelectric barrier. The level is the same as for the FTA.

Comparator 3: In = WTL, pin 37; Out = WTLD, pin 31 :
WTL = Winding tachometer left, from a reflection photoelectric barrier. The level is the same as for the FTA.

Comparator 4: In = FG, pin 35; Out = FGD, pin 30:
FG = capstan tachometer. This signal stems from an amplifier for the tachometer hall sensor on the motor unit [1946 pin 4]. The output impedance is 10 kOhm. The amplitude of the virtually sinusoidal signal is normally 1 Vp. It should not fall below 300 mVpp. It is AC-coupled via a capacitor [2485]. In order for a bias current to flow, the input pin 31 must be passed via a resistor [3474] to the reference voltage on pin 4. A capacitor [2480] for filtering out high-frequency interference is arranged in parallel to the bias resistor.

9.4.4 Interface to the head drum motor driver part

The head drum control voltage (speed and phase control information) is output via a P-output (7899-B pin 35; PWM 14-bit). This pulse-wide modulated signal is fed to the motor driver IC M63100FP [7463 pin 11] and integrated with the capacitor [2469]. This IC already has a completely integrated 'start-up' circuit fitted. For the commutation, the head drum motor driver uses the e.m.f. on the non-current carrying motor coil (transformer principle). The motor speed is also discharged from there at the same time. The phase of the head disc is discharged from a position coil. The speed and phase are multiplexed into one signal [7463 pin 6] and output, which means that the falling edge of the signal is available with a positive edge for the speed (FG/450Hz) and at 25Hz for the position pulse (PG).
The motor driver M63100FP [7463] is connected to the head drum motor on the motherboard using plug [1948].

- DRUM is the speed-phase control signal. The resolution is 14 bit.
- PG/FG is the combined POS/tachometer signal from the M63100FP [7463].

9.4.5 Interface to the loading motor driver part:

The loading motor driver part is constructed for use as a bridged dual power operations amplifier (OPAMP). It can supply max. +/-0.8A output current. The output current is limited to approx. 0.7A by the internal resistance of the loading motor (18 Ohm typ.) (start-up or motor is blocked). Between the IC outputs [7463, pins 22 and 24] there is a "Boucherot" circuit [3467] 1E, [2474] 100 nF for suppressing a spurious 3MHz oscillation from the output stage. One half of the bridge is controlled via the TMO line on pin 27 and acts as a comparator. The other half is an amplifier integrator with a 3.9 gain. A change in the input voltage (THIO) of between 0 and 5V on pin 25 results in a change in the output voltage of between 0V and almost Ub. With 50% modulation (THIO = 2.5 V) pin 24 has approx. 7 V. The 100nF capacitor [2473] in the negative feedback of the op-amp filters out the PWM frequency of approx. 39kHz. During POR, the P issues "L" to the THIO line, whilst TMO is "H". This ensures that no current flows in the motor for the duration of the POR pulse. This prevents the motor being destroyed in case of prolonged running or blockage. This arrangement also has a disadvantage, however. This is that if the 5 V supply fails (e.g. because the 5V fuse has blown), residual voltages may be passed to the IC inputs via the adjacent 14 V voltages. These residual voltages trigger the comparator and the op-amp in opposite ways, causing a short-circuit in the blocked loading motor after about a minute. To get around this problem, a separate voltage divider is used internally for the comparator. Both outputs on the M63100FP [7463] are then in "common mode" if this error occurs.

9.4.6 Interface to the capstan motor

The driver IC on the capstan motor is activated via connector [1946].
CAP is the signal for the capstan speed. This voltage may vary without load between 0 and 5 V.
The rotational direction of the motor is determined using CREV (capstan reverse). The maximum current input for the motor is limited to 1A. Typical values in PLAY mode are 0.2 ... 0.3 A.

9.5 Front end FV (FV part)

9.5.1 The front end comprises the following parts :

- TUMOD = Tuner (+ Modulator Option) (+Booster Option) (+Passive Loop Through Option)
- IF amplifier & video demodulator IC TDA 9817, [7705] with FM - PLL demodulator
- IF amplifier & video demodulator IC TDA 9818, [7705] with FM - PLL and AM demodulator
- FM stereo decoder TDA 9873 [7760]
- Multi-standard FM stereo, AM, NICAM decoder MSP3415D [7761]

9.5.2 The front end has been designed to receive the following systems:

- PAL B/G with FM stereo
- PAL 1 or PAL BG with NICAM stereo
- PAL BG with NICAM and FM stereo
- PAL BG/I SECAM L/L' with NICAM and FM stereo
- PAL BG SECAM DK with NICAM and FM stereo

- PAL B/G = /01,/02/16
- PAL I = /05 Pal I with UHF reception
- PAL I Ireland = /07 Pal I with VHF/UHF reception
- SECAM L,L', PAL BG/I = /39
- PAL B/G, PAL I, SECAM D/K = /55
- PAL B/G, SECAM DK = /58

The relevant layout is given in the version list on the circuit diagram.

9.5.3 Tuner modulator (TUMOD)

The tuner and modulator are fitted into the same housing. Both the tuner and the modulator are PLL-controlled. The reception frequency or modulator frequency is set using the IIC bus.
The amplification is determined by the AGC voltage at pin 5 [1701] (for operation, see IF demodulator section).

9.5.4 IF selection

The IF frequency of the video carrier is 38.9 MHz for all systems except SECAM L' (33.9 MHz).
For PAL BG-SECAM DK and for PAL BG/I-SECAM L/L´ a quasi-split audio system is used; i.e. for video and audio carriers, separate surface-wave filters (OFW) are required [1704, 1703]. For all other standards an intercarrier system is used; i.e. a common OFW with audio stair-step can be used [1704] for video and audio carriers.
For the PAL BG/I-SECAM L/L' version, an additional circuit for suppressing the adjacent channel audio carrier is provided, which is set using coil [5704] to maximum suppression at 40.4MHz.

9.5.5 IF demodulator

TDA 9818
The IF signal from the tuner is processed by another demodulator IC of type TDA 9818 [7705]. The TDA 9818 is

used to demodulate pos. or neg. modulated video carriers. It is possible to generate a QSS-audio-IF signal or an intercarrier IF signal for demodulation in the audio demodulator [7761]. For the best possible video signal performance the IF signal is conveyed via an OFW [1704] according to the standard. The audio-IF carrier is selected in the audio OFW [1703] which is switched for SECAM L'. The output signal for this OFW is further processed in the TDA 9818. FM carriers are converted from the IF level into the audio IF position and further processed in the audio demodulator. The AFC coil [5702] on the TDA 9818 is adjusted so that when a frequency of 38.9 MHz is supplied to the IF output of the tuner, the AFC voltage on pin 17 on the TDA 9818 is 2.5V. The setting of the picture carrier frequency for SECAM L in the TDA 9818 is achieved by connecting pin 7 of the IC via a potentiometer [3730] to earth. The AFC voltage on pin 17 TDA 9818 should then also be 2.5V at 33.9 MHz. The HF-AGC is set using the AGC controller [3707] so that with a sufficiently large input signal (74 dBV), the voltage at the IF output on the tuner [1701, pin 17] is 550 mVpp. The setting must be carried out when the audio carrier is switched off. The demodulated video signal appears on pin 16 [7705]. The video drop [1705] reduces adjacent channel sound carrier and sound carrier remainders in the video.

TDA 9817
As for TDA9818, without the option for processing AM audio and positive video modulation (SECAM L,L').

9.5.6 Audio demodulator

Multi-standard audio processor MSP 3415D
The MSP 3415D [7761] is a multi-standard sound processor which can demodulate FM Mono/Stereo, NICAM and AM signals. The incoming signal is first controlled and then digitised. The digital signal is then demodulated in 2 separate channels. In the first MSP channel, FM and NICAM (B/G/I/D/K) are demodulated, whereas in the second MSP channel, FM and AM is demodulated again (NICAM L corresponds to NICAM B/G). These demodulated signals are selected digitally in the I/O and switched to the D/A converter on the outputs. Amplitude and bandwidth of the demodulated audio signals can be determined in the MSP using the corresponding commands via the I^2C bus. This means that the setting required for the best possible performance can be made.

FM stereo audio decoder TDA 9873
The TDA 9873 [7760] is a multi-standard A2 audio processor which can demodulate FM mono/stereo signals. The audio IF SIF2 is passed from pin 3 [7705] to pin 25 [7760]. The demodulated stereo signals AFL and AFR I^2C bus are available controlled on pins 1 and 2.

9.6 Video signal processing VS (VS part)

9.6.1 Switchover functions in the signal electronics IC LA71695xM [7004]:

The signal electronics IC LA71595M [7004] are controlled via the I^2C Bus on pins 23 and 24 by the AIO.
As groups 5 and 6 can only be transferred with a change in HP1, it must be ensured that during measurements the HP1 line is always connected to the SE IC or replaced by a corresponding signal.

REC/PB via IIC bus
During RECORD pin 30 must be passed via [7009] on 5V (IREV=LOW) to activate the video write current stages. To keep the transient condition of the write current as short as possible, the signal electronics IC is set to REC via IIC bus before the pin 30 change.

PAL/SECAM/MESECAM/NTSC via IIC bus

SP/LP/SLP via IIC bus

VIDEO INPUT SELECTOR SWITCH via IIC bus
In 1-scart units a distinction is made via the IIC bus between VFV (pin 36 / VID2) and VBS which corresponds to VIN1 (pin 38 / VID1). In 2-scart units the video input selection is made via IIC bus in the STV6401 [7904] and the SE IC is always on VBS (pin 38 / VIN1).

VIDEO ENTRY
The feature frame pulse FFP signal on pin 26 is used to enter the artificial picture pulse for playback features and the test picture for the unit installation procedure:

Loop through	< 0.8V
Test picture	= 1.2 ... 3.8V
Artificial picture pulse	> 4.2V

LP/SP head pair switchover
The switchover between the long play LP head pair and the standard play SP head pair is made via the HSC signal (pin 25).

4/x scanner in play back:	SP head pair:	1.2V <= HSC <= 2.8V
	LP head pair:	0V<= HSC <= 0.8V
2/x scanner in play back:	always	3.2V <= HSC <= 5V

Head switchover
The video head switchover is made using the HP1 signal (pin 11). To keep audio linear interference as low as possible, the HP1 polarity should be selected to be inverse and the HP1 level should be the same as the CROT signal on pin 10.

PB:	SP1 / LP1:	1.2V <= HP1 <= 2.8V
	SP2 / LP2:	0V <= HP1 <= 0.8V

Envelope curve comparator
If the ENVC signal (pin 94) is HIGH, the FM envelope curve on the LP head is greater than that on the SP head, and vice versa.

9.6.2 Recording

Luminance
The input signal (1-scart: pin 38 = scart , pin 36 = front end; 2-scart: pin 38 = input video selected using STV6401) is connected in the IC [7004] and is available uncontrolled on pin 32 as VREC (SECAM; VPS only unit data slicers). It reaches pin 31 via an electrolytic capacitor [2036]. In the IC [7004] the video signal first goes through an amplification control process (time constants determined by C [2035]). After the AGC the video signal reaches the FBC clamping stage (feed back clamp), then the video signal is divided onto 3 paths:

- **Loop-through signal path:** The video signal is amplified by 6dB following video entry and is available controlled on pin 29 as a VSB signal (OSD entry, data slicer -> I/O, front end,..).

- **Y-REC path:** The video signal passes via a 3.5 MHz low pass filter to vertical emphasis comprising the YNR block (part of this circuit block is used in REC for vertical emphasis) and a 1H-CCD delay line integrated into the SE IC [7004-C] and an external emitter follower [7006]. This vertical emphasis can be switched via IIC and is only active in LP. The Y-signal before the 1H-CCD can be measured on pins 43 and 45 on the IC [7004-C] (separated only by a coupling electrolytic capacitor). The Y-signal after the 1H-CCD is passed back from pin 46 IC [7004-C] via the E-follower [7006] on pin 41 IC [7004]. After the vertical emphasis the Y-signal passes via pin 21 [7004], the E-follower [7008] (the filter, on the base of the emitter follower is not active in REC mode (due to the low resistance of the output stage on pin 21 [7004]), via pin 21 [7004] and a clamping stage to the detail enhancer. The Y-signal is then passed to the non-linear emphasis, the linear emphasis (time constant via pin 18, 19 - due to the low resistance of the pin 18 output stage and the transistor [7010] introduced for impedance decoupling, the FM PB all-pass does not influence the linear emphasis) and the white/dark clipping stage. The signal generated in this way then triggers the FM modulator directly. The FM-Y-signal generated in this way is passed via the REC-EQ filter and the REC-FM-AGC1 to the Y-C addition point. The FM-Y-signal can be measured after the REC-EQ filter on pin 12 [7004].
- **C-REC path:** see Chrominance PAL Recording (6.2.2).

Chrominance PAL
The chroma signal is separated from the video signal after the FBC clamping stage (see “Luminance recording“) by the BPF1 band pass filter and reaches the ACC stage via a delay element (D.E.) and a low pass filter (LPF). The ACC amplifier stage controls the chroma amplitude for the subsequent stages (time constant via capacitor [2038] on pin 14 [7004]). The chroma signal is then conveyed to the main converter (Main Conv.). The main converter mixes the 5.06MHz subcarrier with the 4.43 MHz chroma signal to the 627kHz chroma FM signal. The subcarrier is a mixture of 4.43MHz (the REC APC time constant on pin 65 compares quartz and burst frequency) and (40+ 1/8) fH = 627kHz (produced by 321fH -VCO corresponds to 8(40+1/8)fH, time constant pin 60/62 and phase rotation in accordance with the VHS standard, 10 [7004] (CROT)). Via a low pass filter (C_LPF) and the colour killer stage (KIL), the converted chroma signal reaches pin 72 on the IC [7004], where it is added directly to the Y FM signal IC internally via a capacitor [2007]. The colour killer can either identify the incoming signal itself (PAL yes/no, PAL: chroma signal out, SECAM L: chroma signal killed) or be set via the I^2C bus to PAL MESECAM or SECAM L. The quartz oscillation (pin 66) is used for chroma processing, in addition to the reference frequency, and also for generating the pulse frequency for the combined CCD on pin 49 integrated into the IC [7004].

MESECAM
The signal path is virtually identical to the path for PAL.

The differences are:
- No phase rotation.
- The filter characteristic for the chroma band passes becomes wider.
- Free-running quartz frequency

SECAM L
The video signal (VREC) from the SE IC pin 32 [7004] passes through SECAM L SE IC pin 15 [7072] and a band pass filter (4.3MHz BPF-A) and reaches the cloche filter (CA filter components pin 21) which reverses the Hf pre-emphasis on the sender side. The C-signal is then limited (LIM, time constant pin 18) and divided to 1/4 of the frequency in the frequency divider. The C-signal is suppressed in SYNC GATE during the H-sync. period. The harmonics arising in the division into four and the gating are suppressed in the band pass filter (1.1MHz BPF) and then pre-processed in the anti-cloche filter (filter components pin 8) for standard VHS recording. The amplitude on the REC-chrome signal on pin 11 [7072] can be set using the setting resistor [3088] on pin 10 [7072]. This REC-chroma signal is passed via transistor [7077] as a CSRP signal to SE IC pin 72 [7004] following an external drop (3.9MHz, suppression of the 3rd harmonics of the low frequency REC-chroma) and added to the FM-Y-signal in the SE IC.
As the SECAM SE IC (LA7339A) has an automatic cloche and anti cloche comparison, only the REC-chroma signal level is required to be set.

FM signal
After the addition of the FM-Y-signal and the C-signal, this FM-signal is adjusted by the REC-FM-AGC2 controlled by the IIC bus to the preset amplitude (reference: pin 74 [7004] resistor [3009]). The head pair is selected using the HSC control line.

9.6.3 Playback

FM signal
The FM signal coming from the scanner is amplified by approx. 60dB. Depending on the level of the HSC and HP1 line, the amplified FM signal is connected to pin 74 [7004]. The envelope curve signal for the head currently active (TRIV) is output on pin 93 [7004]. In addition, the envelope curves for the SP and the LP heads which read from the tape are compared and output as the ENVC signal.
The FM signal (FMPV) on pin 74 [7004] is used internally for Y, SECAM, MESECAM and NTSC M/N playback and externally for SECAM playback.

Luminance
The FM playback signal is first adjusted in the AGC stage to a constant level and filtered in the FM processing (PB-EQ). The signal exits the IC [7004] on pin 18, passes via an E-follower [7010] with drop (1.07MHz - only in SECAM units - to suppress additional chroma remainders externally) to a phase shifter [7003] and enters the IC once more on pin 17 [7004]. The FM-Y signal limited using the double limiter is demodulated (FM-DEM) and filtered using a low pass (SUB_LPF). The demodulated Y signal is also affected by the recording-side pre-emphasis. This now removes the linear de-emphasis at the base of the emitter follower [7008]. The filter circuit is effective, as pin 21 [7004] becomes an open collector output in playback mode, where the load impedance is determined by the de-emphasis circuit.
The Y signal is then clamped after the E-follower on pin 20 [7004], filtered using a low pass, and carried by a vertical noise canceller or dropout compensator (Y.N.R.). To do this the Y-signal exits the IC [7004] (out: pin 43, in: pin 41) and delayed by 1H in the internal CCD. The CCD-1H delay line is effective for the Y signal first as a comb filter (vertical noise suppression) and secondly as a line storage device for the dropout compensation. The subsequent switching stages are: The non-linear de-emphasis (NON_LIN DE_EMP), horizontal noise canceller (N.C.1 / N.C.2) and the picture control switching to the increase in edge steepness (PIC_CTL ANR; sharpness). The luminance signal is then added to the chroma signal (Y/C MIX) and output (pin 29 [7004]) as FBAS signal via a clamp (FBC), the video input (CHARA INSERT) and a 6dB amplifier (6dB_AMO).

Chroma PAL
This is first adjusted in the AGC stage to a constant level and filtered in the FM processing (PB-EQ). The signal exits the IC on pin 18 [7004], and passes via an E-follower [7010] with drop (1.07MHz). On pin 17, the FMPV signal is carried from the head amplifier to the IC [7007] signal electronics.
From the FM playback signal the 627 kHz chroma signal is filtered using the internal low pass (C_LPF). The ACC amplifier amplifies and controls the chroma amplitude. In the main converter (MAIN CONV), the chroma signal is mixed with 5.06 MHz back to the original 4.43 MHz. The 5.06 MHz are produced in playback from the free-running quartz oscillator and from the (40+1/8) f_H = 627 kHz frequency derived from the 321fH-VCO. After the main converter the chroma signal is freed as far as possible from crosstalk from additional traces using a 2H comb filter (internal CCD connections: pin 57 -> 54; pin 59 -> 52 and pin 51 -> 61). The chroma signal is then filtered using a low pass (LPF), checked by the colour killer, filtered once again by a band pass, looped through pins 72 and 71 and then added to the Y signal.

Chroma MESECAM
The signal path is virtually identical to the path for PAL.

The differences are:
- No phase rotation.
- The comb filter is not active.

Chroma SECAM L
During playback the FM signal is passed from the band on pin 74 [7004] after the E-follower [7002] (FMPV) to pin 13 [7072], where the amplitude is adjusted in the AGC and passed via the same band pass (1.1MHz BPF) as for recording. The NF pre-emphasis for the recording is then reversed using a cloche filter (external filter components on pin 8; the same components as for recording). In the subsequent stages the frequency of the signal is doubled, filtered using a band pass (2.2MHz BPF) and doubled once again. Then follows another band pass (4.3MHz BPF-B), and then the limiter (LIM) already used for recording. The signal is then suppressed again during the H-sync. period and passed through a band pass filter (4.3MHz BPF-A; also used for recording). Before the SECAM-chroma signal exits the IC on pin 17 [7072], an Hf pre-emphasis is carried out once more (anti-cloche; external filter components on pin 21; the same components as for recording). After pin 17 there is a drop at 2.4MHz which suppresses the 2nd harmonic of the chroma from the band, a low pass filter which improves the harmonics of the high frequency chroma and a transistor [7073] which has an emitter connected to pin 72 (CSRP) on the SE IC [7004].

NTSC
During the playback of NTSC signals, the original NTSC chroma is converted into a PAL chroma signal. This requires an internal switchover in the IC in the chroma part:
The internal CCD is switched over on a 1H comb filter to reduce crosstalk.
The NAP switchover is activated and translates the 4.43MHz NTSC chroma signal into a PAL signal.
Line and picture frequencies remain unchanged in accordance with the NTSC standard.
The result is a 60Hz NTSC Y-signal with a 4.43MHz PAL C-signal.

PAL M,N
As for chroma PAL (6.3.3).

9.6.4 General

SECAM:
Automatic cloche and anti-cloche comparison: During the vertical blanking gap the external filter components (pin 21 or pin 8) on the cloche or anti-cloche are used to create an oscillator and to divide the resonance frequency produced, and compared with a frequency derived from the 4.43MHz oscillation (reference signal from the SE IC [7004]). Depending on the deviation, more or less internal capacity is connected in parallel to the external cloche and anti-cloche filter components. This process is carried out during each vertical blanking gap and thus also improves the temperature stability.

Chroma selection for REC and PB pin 71 and 72 SE IC [7004]:
Both the PB chroma and the REC chroma in PAL (MESECAM, PAL M/N) and also in SECAM are passed into the SE IC [7004] via pin 71 [7004]. In all PAL and MESECAM modes the DC voltage is on the base of the output emitter follower pin 72 [7004] 3.2V and the both bases of transistors [7077] and [7073] of the SECAM chroma signals are at 0V -> the PAL/MESECAM chroma signal is added to the FM-Y signal or to the PB-Y signal, according to REC or PB. In SECAM PB mode only the transistor [7073] has 2.5V DC voltage on the base. In SECAM REC mode only the transistor [7075] has 2.5V DC voltage on the base.

9.7 Audio linear (AL part)

9.7.1 Audio I/O for the 1-scart version

The input is selected via the IIC bus control in the IC signal electronics [7004-A]. Either signal AIN1 (pin 76) or AFV (pin 80) is selected. The output signal AMLP (pin 96) is passed to scart 1 and to the HF modulator.

9.7.2 Audio I/O for the 2-scart version

The input is selected via the IIC bus control in the IC signal electronics [7004-A]. Either signal AIN1 (pin 76), AINF_AIN2 (pin 78) or AFV (pin 80) is selected. The output signal AMLP (pin 96) is always passed to the HF modulator.

9.7.3 Audio linear recording

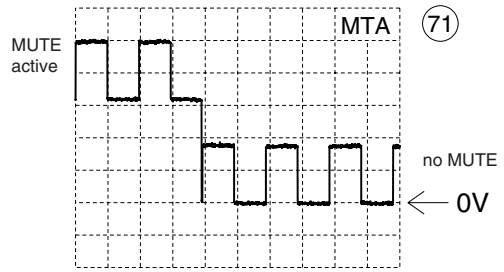
The signal inputs for recording or loop-through are pins 76,78 and 80 on the linear audio part of the IC LA71595 [7004-A]. During record and loop-through, the selected signal passes through the linear amplifier and then a mute stage and exits the IC on pin 96. This is the output which leads to the I/O part or the stereo units back to the AF part. The attenuation chain on pin 96 sets the required level for the ALC (Automatic Level Control) detector and the level for the recording amplifier. The time constant for the ALC detector is specified using R3605 and C2602 on pin 77. R3634, R3640, C2626 and C2627 create the frequency response for the recording amplifier. The output for the recording amplifier is pin 7. The recording current is then added to the bias current via resistor R3642 and flows via the audio head to pin 4 where an electronic switch is closed in the IC.
In long play mode the frequency characteristic is modified to the RC network R3635, R3641, C2630, C2631 for the recording amplifier.
The coil L5600 and the transistor T7608 create the erasing oscillator for the main eraser head and audio track eraser head, and generate the bias current for the audio head. The bias current is set using potentiometer 3625.
To prevent spikes, the erasing oscillator is switched on slowly. This is created using the switching stage T7603, C2609, R3611 and R3613.

9.7.4 Audio linear playback

During playback the switch [T7604, T7607] is controlled by pin 99 and is closed. The playback signal from the head is amplified in the equaliser stage (time constant between pin 1 and pin 3) and passed to pin 1. The resistor R3633 and the capacitor C2619 determine the head resonance during playback.
In long play mode the frequency characteristic is modified using R3627, C2617 for playback.
The output of the playback amplifier (pin 1) is passed via the filter R3632, C2623 to pin 100 where an electronic potentiometer sets the playback level via the IIC bus. Amplifier and head tolerances are compensated here. The amplification can be compensated via software control (IIC bus) in service mode.

9.7.5 Audio linear muting

The mute stage in the linear audio part on the IC LA71595 [7004-A] is controlled by the combination control line MTA_CROT which is connected on pin 10 (VS part). The mute stage is activated in that the CROT control signal (square-wave pulse 1.7 Vss) is moved into the upper direct voltage range (> 2.2 V).



A: DC, 1 V/Div, 20ms/Div
IC7004-B PIN10 CROT/MTA

9.8 Audio HiFi - for stereo units (AF part)

9.8.1 General

All audio input and output selection switches, and the hi-fi FM audio signal processing, are located in the TDA9605 [7650]. This IC is controlled solely by the IIC bus. The carrier frequencies and band pass filter for the FM audio part are adjusted by the TDA9605 independently. This adjustment is started via the IIC bus following a mains reset. The RMHI signal is used as a reference for this [7650 Pin 41].

9.8.2 Audio I/O

The input and output selection switches are controlled exclusively by the IIC bus. Audio signals coming from the receiver part, the two scart sockets and the front sockets pass via pins 2 to 9 to the two input selector switches which select the relevant signals for the FM and the linear audio part. The output selector switch for SCART 1 and SCART 2 (pins 16,17 and 19, 20) select the relevant signal sources, independently from one another.
The RFAGC limits the maximum amplitude of the signal to the AMCO modulator (pin 13) to prevent overmodulation.

9.8.3 Audio HiFi recording

The signal coming from the input selector switch (INPUT SEL) reaches, via a level actuator (VOLUME L//R) and a low pass filter (LPF), the NOISE REDUCTION block, which compresses the dynamics during recording. The compressed signal is passed to both FM modulators (1.4MHz and 1.8MHz carrier frequencies). Both carriers are added and pass to the FM audio head amplifier. Via the recording / playback switch on the head amplifier, which is switched using the control line RMHI, the FM signal reaches the output (pin 35, pin 36, pin 37) on the FM audio processor and then the audio heads via the rotating transformer. The TRIA_ALM line forwards the size of both audio signals (1 VRMS = 2.68 VDC) to the AIO processor [7899-B]. This DC level information is required during recording by the SCART or front cinch socket to prevent overmodulation of the FM carriers. When the audio signal levels are too high, they are attenuated using the VOLUME controller via the I^2C bus.

9.8.4 Audio HiFi playback

The FM signal from the audio heads goes via the rotating transformer to the recording / playback switch (pin 35, pin 36, pin 37) on the head amplifier. After amplification in the head amplifier (66 dB), the FM signal reaches the HF-AGC (Automatic Gain Control), where the tolerances of the tape, the heads and the rotating transformer are balanced. Via the two band pass filter and limiters, the FM signals reach the PLL demodulators. Head change-over interference is suppressed using SAMPLE & HOLD stages (triggered by the RMHI signal). The demodulated signals are then expanded into the NOISE REDUCTION stage. The hi-fi signals are then available at the output selection switches. If there is no audio FM on the tape during playback, the output selector switch is switched over automatically from the IC to linear audio (input pin 22). In playback mode the TRIA_ALM line supplies the level of the FM envelope curve to the AIO processor [IC7899-B]. This level information from the FM envelope curve is used for the hi-fi tracking of the rotating FM audio heads to achieve the best possible playback quality (typically: 3.5 VDC).

9.8.5 Interface to the audio linear

In recording mode, the input selection switch NORMAL SEL in the TDA9605 [7650] selects the audio source for the linear audio part in the signal electronics IC LA71595 [7004 - A] and passes this signal to pin 21 (AMLR).
In stereo sets, the input selection switch on the signal electronics IC LA71595 [7004-A] is always set to IN2 (pin 78).
During playback the AMLP signal passes from the linear audio part in the signal electronics IC [7004-A] pin 96 to the linear audio input on pin 22 on the TDA9605 [7650].

9.9 IN/OUT (IO part)

9.9.1 Video

The entire video-I/O is carried out in 2-scart units using the matrix switch STV6401 [7904), which is controlled by the AIO via the IIC bus (SDA,SCL). To do this, the following signals are connected to STV6401 at the inputs: VFV-pin4, VIN1-pin6, VIN2-pin8, VOUT[1)]-pin10 ([1)]The VOUT signal is also passed through a voltage divider and a low pass [2906,3934,3928] and passed to the modulator where necessary via the emitter follower [7909]) and VFR-pin12 (front cinch input). The outputs OUT3/pin15 (scart 2) and OUT2/pin16 (scart 1) in the IC are fitted with a 6dB amplifier and convey the signal to the relevant scart socket. OUT1/ pin2 has no amplifier; this signal (VBS) is passed on to the VS circuit parts for further processing:
In 1-scart units the SE IC [7004] selects the input video. SE IC original layout: VIN1 (the VBS line is used in the plan) pin 38 , VFV pin 36. The VOUT1 signal (scart 1 video out) is generated using an E-follower [7908] from the VOUT signal.

Audio for the 2-scart version:
The output signal for scart 1 is selected using the switch - IC HEF4053 [7911-C] using the MON control line (pin 9) from AMLP (pin 5) and AINF_AIN2 (pin 3). The output signal for scart 2 is selected using the switch - IC HEF4053 [7911-B] using the DEC control line (pin 10) from AIN1 (pin 2) and AFV (pin 1).

9.9.2 Decoder mode: (REC or STOP)

Program position with decoder (front end)
The front end signal (VFV or AFV1/2) is passed to the decoder connected to Scart 2 and from there, goes back to the VCR via VIN2 or AIN2L/AIN2R .
External input with decoder (9.2.2) is not possible for these program positions.

External input with decoder
The signal from scart 1-in (normally TV set) is passed to the decoder connected to scart 2. For scrambled programs, the decoder switches the pin 8 to high. The VCR then passes the decoded signal from scart 2-in to scart 1-out.

9.10 Follow Me (FOME part)

This circuit is used to compare the front end video with the video on scart 1 (video from the TV connected) in order to be able to save the stations in the same order as on the TV. The video signals from the front end (VFV) and from the scart socket (VIN1) are “digitised” using filters and comparators [7530-C, 7530-D] and compared with one another [7531, 7532, 7530-A]. Low on the output for the circuit means that the picture contents for the two video signals are identical and that both receiver parts (TV and VCR) therefore have to be adjusted for the same station. Possible errors detected may result with similar signals, e.g. news programmes.

9.11 VPS/PDC, on-screen display (VPO part)

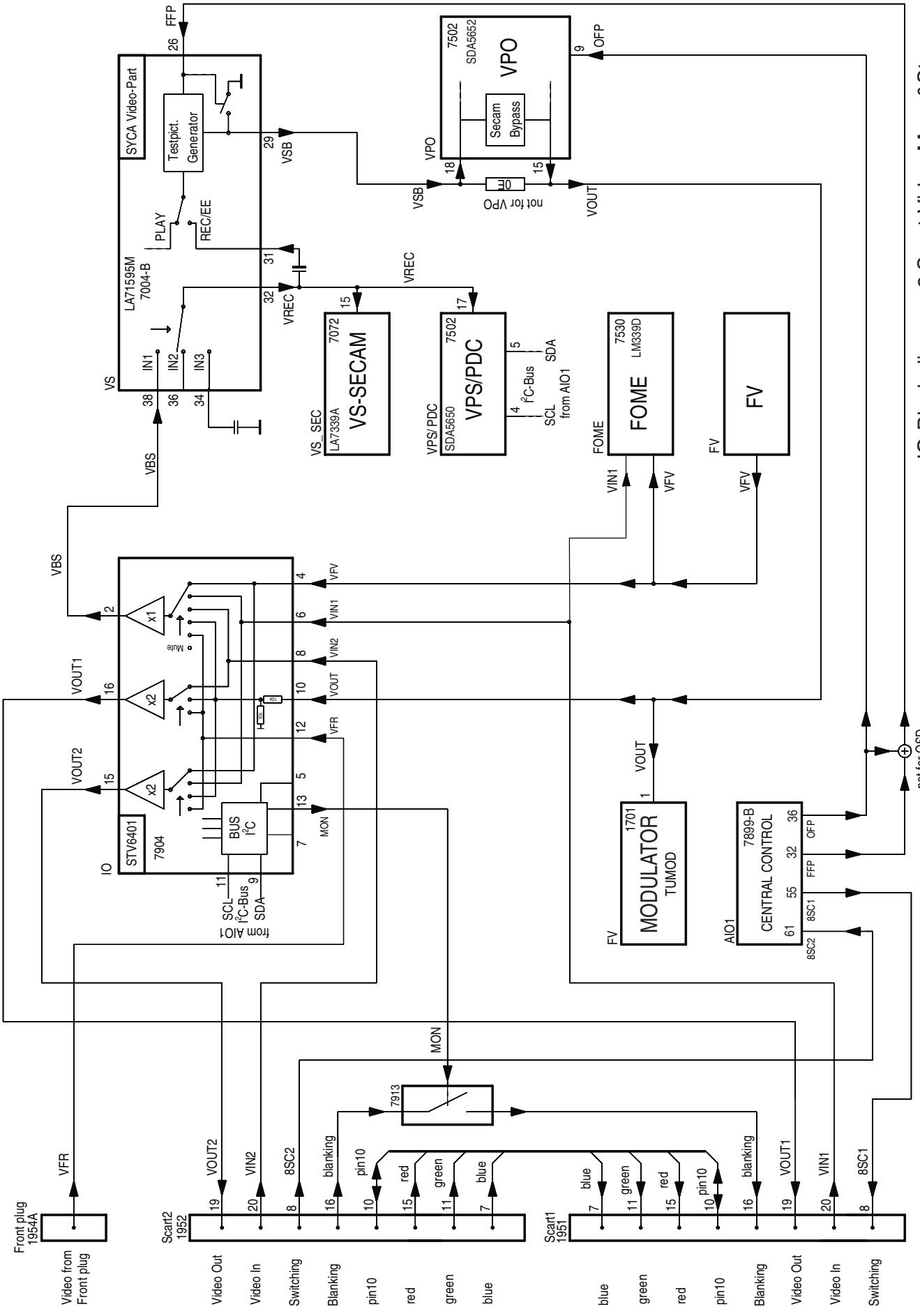
9.11.1 VPS/PDC

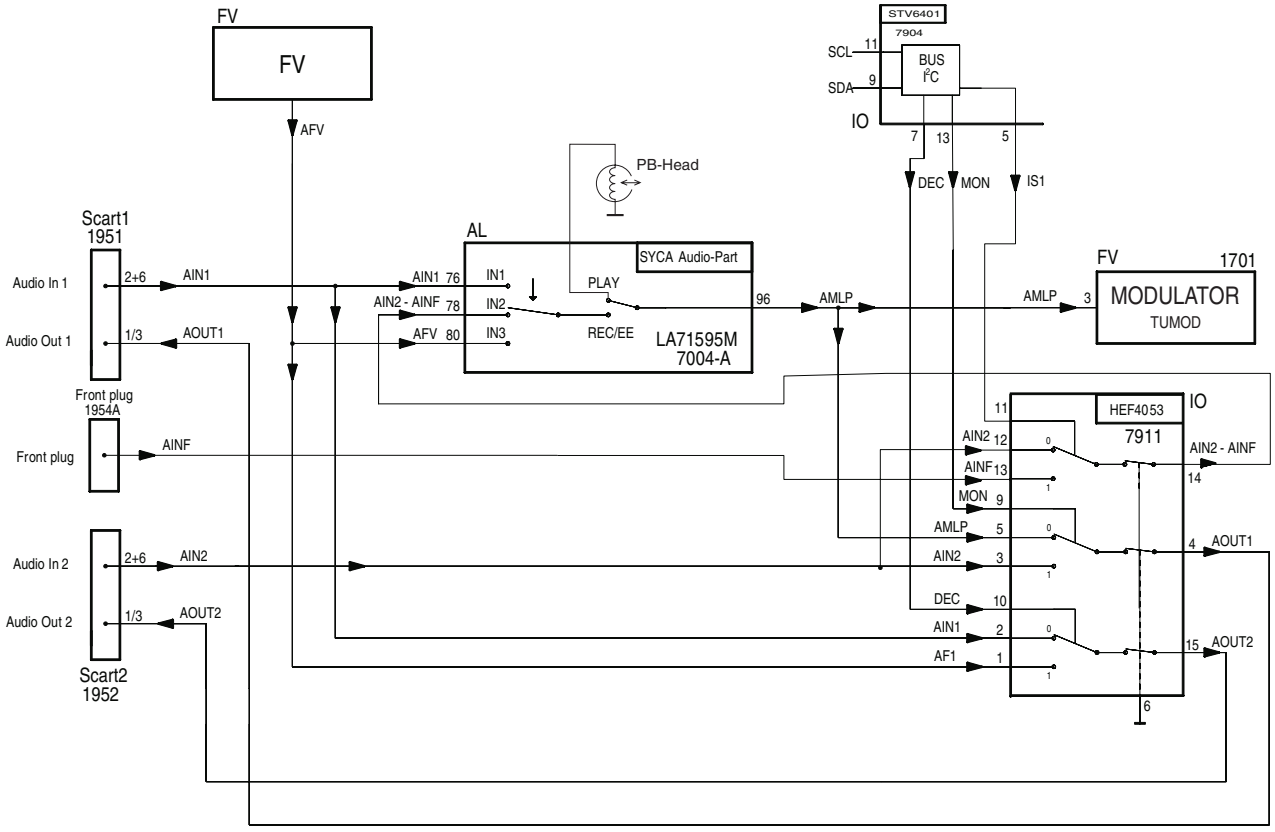
The VPS and PDC data is either decoded by the VPS-PDC decoder-IC SDA5650 [7502] or by the OSD-IC with integrated VPS, PDC decoder SDA5652 [7502]. Both ICs are compatible in terms of pins, despite any differences in the peripherals.
The VPS-PDC data are read from the vertical blanking gap and stored in the internal RAM. This data is read from the P via the I^2C bus.
The time can also be read from the TXT header line (required for “Time download“). The date is not called up from the TXT header (various write versions of the preset stations) but only via PDC format-1.
In the case of the SDA5650 [7502] the input video signal comes from the signal electronics IC LA71595M [7004-B pin 32] (VREC) via a 470n capacitor [2504] to the data slicer input on the SDA5650 (pin 17). For the SDA5652 the input signal from pin 29 (VSB) on the LA71595M [7004-B] comes via an emitter follower [7501] with a voltage divider to the data slicer input on the SDA5652 (pin1 17).

9.11.2 OSD-PART

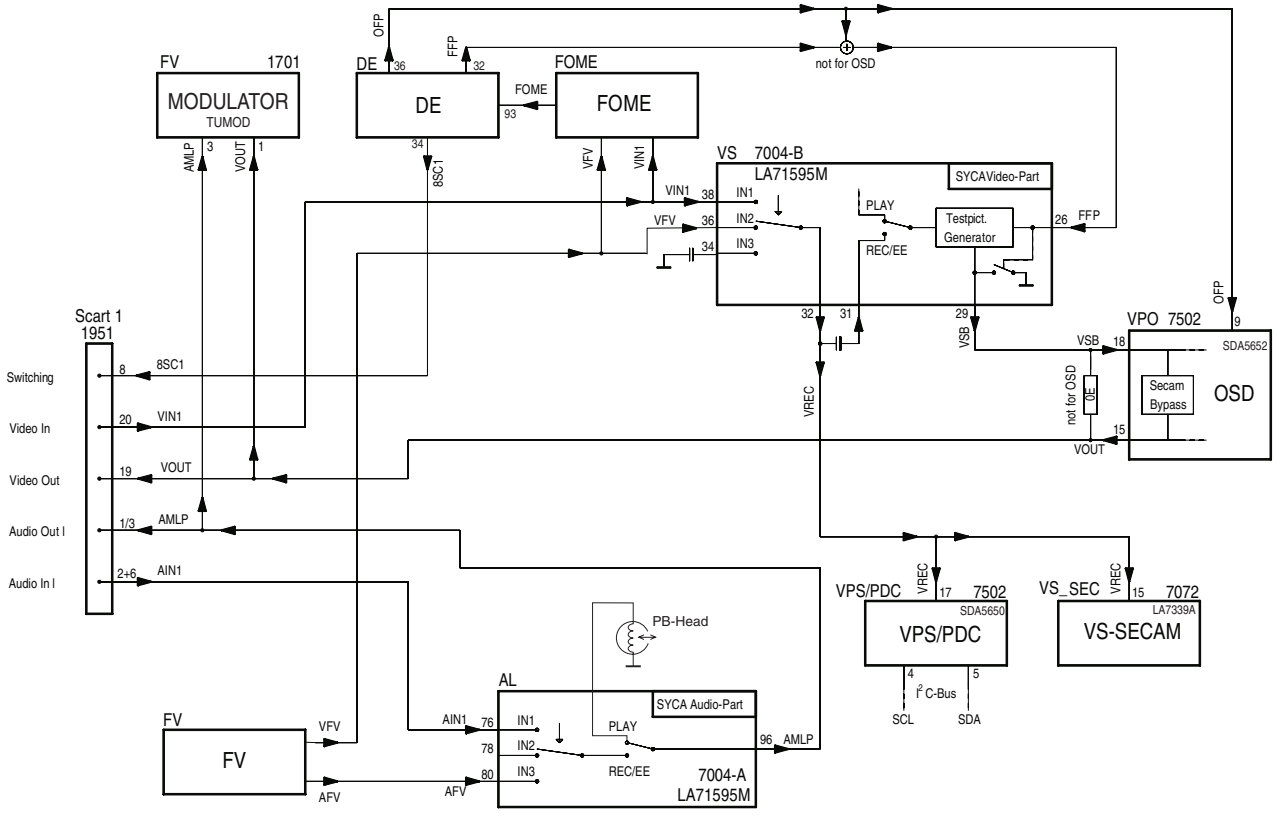
The IC SDA5652 [7502] also allows both the generation of text keyboard matrices into a video signal and the generation of an entire picture (full page) for menu-control or if no background video is available.
The video signal (VSB) passes from the signal electronics IC LA71595M [7004-B pin 29] via a resistor [3512] to the input for the OSD-IC [7502 pin 18]. For keyboard matrices in Secam video signals, a bypass between video-in and video-out is activated via a switch inside the IC and a band filter [2507, 5502]. The output signal is available on pin 15.
A multiple of the doubled colour subcarrier oscillation from the signal electronics (2FSC/8.86MHz) is used as the system pulse for the IC. It is also used as a reference for generating the various OSD colours. The signal reaches the IC via a coupling capacitor [2509].
For the vertical synchronisation of keyboard matrices, an OSD frame pulse (OFP) is generated by the P [7899-B pin 36] and passed to the IC [7502] on pin 9. The horizontal sync-pulse is generated using an internal sync-separator and an internal H-PLL from the video signal on pin 17.
During full-page OSD (menu or no video) neither a vertical-sync (OFP) nor an H-sync is required, as in this mode, the OSD-IC generates everything from the system clock frequency, i.e. all the necessary pulses are generated internally from the 2FSC signal.

9.12 Simple Blockdiagram



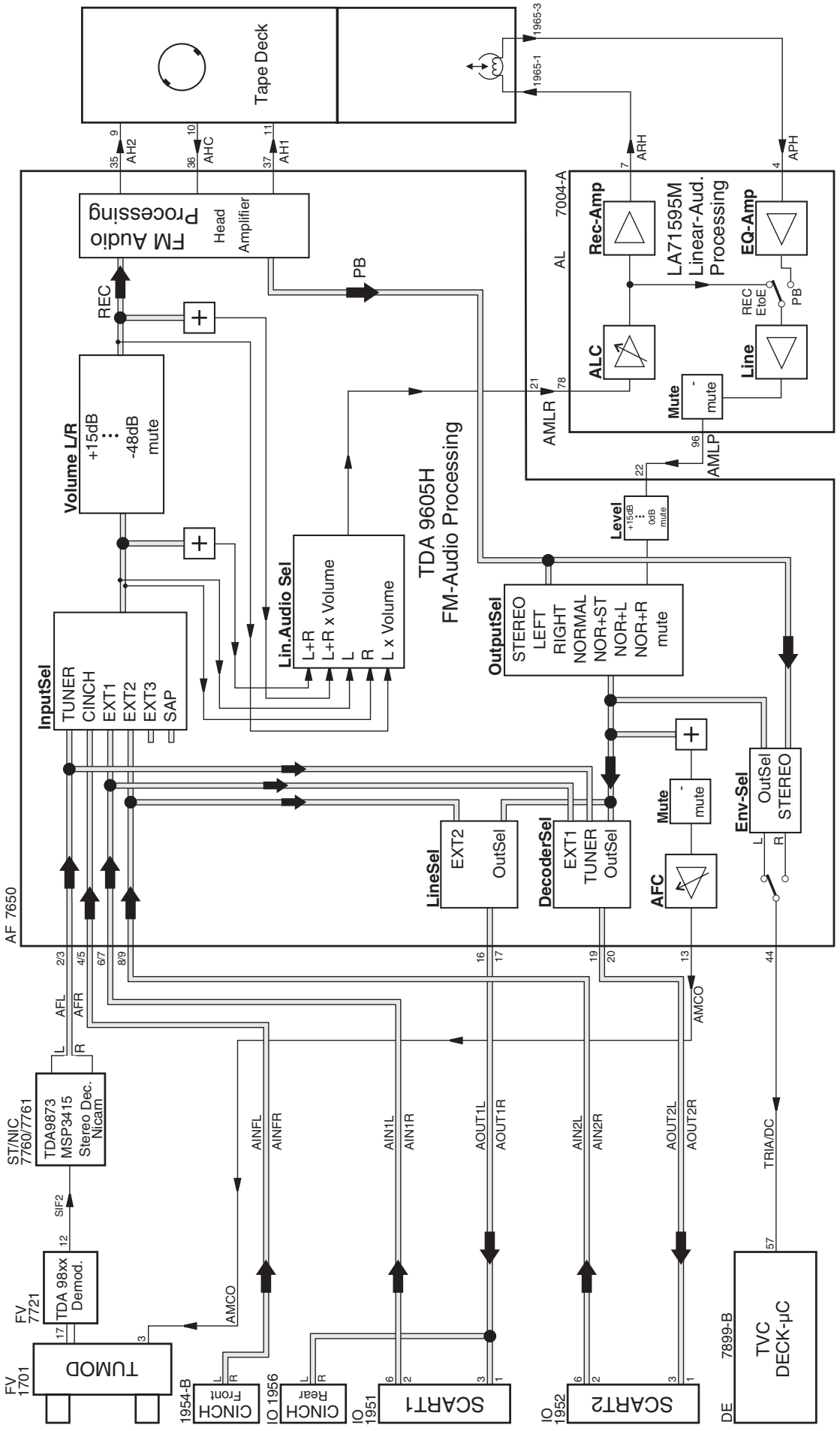


IO-Block diagram 2 Scart-Audio-Mono



QMB1 IO-Block diagram 1 Scart-Audio-Video-Mono

9.13 Simple Blockdiagram FM Audio / Linear Audio processing



9.14 List of abbreviations

Signal	Description	Application										
5V_1WSTBY	+5V analog in < 1W mode	PS	AIO1	AIO2	DE							FOME
5V_STBY	+5V analog in STDBY mode	PS		AIO2	DE				FV		VPO	IO	
5VA	+5V analog	PS				AF		FM	FV	VS	VPO		
5VD	+5V digital	PS	AIO1		DE								
5VS	+5V analog for power on reset stage				DE								
5VS1	+5V analog for head wheel position				DE								
7NEG	-7V I/O-switches supply											IO	
8SC1	Scart 1 pin 8 output		AIO1									IO	
8SC1L	Scart 1 pin 8 output low		AIO1									IO	
8SC1M	Scart 1 pin 8 output medium		AIO1									IO	
8SC2	Scart 2 pin 8 input		AIO1									IO	
9-14VM2	Capstan motor supply, switched	PS			DE								
9VA	+9V analog	PS				AF							
9VASW	+9V analog stereo	PS						FM				IO	
10SC12	Scart 1/2 pin 10 in/out P50		AIO1									IO	
14AL	+14V analog	PS					AL						
14VM1	+14V for threading- and headmotor	PS	AIO1		DE		AL					IO	
18VNEG	-18V display supply	PS		AIO2								IO	
33V	+33V for tuner tuning voltage	PS							FV				
2FSC	2 fold sub carrier frequency									VS	VPO		
AEH1	Audio erase head						AL						
AEH2	Audio erase head						AL						
AFC	Automatic frequency control		AIO1						FV				
AFL	Audio FM Stereo left					AF		FM					
AFR	Audio FM Stereo right					AF		FM					
AFV	Audio-Frontend						AL	FM	FV				
AGC	Automatic gain control		AIO1						FV				
AH1	AudioFM-Head-1					AF				VS			
AH2	AudioFM-Head-2					AF				VS			
AHC	AudioFM-Head-Common					AF				VS			
AIN1	Audio input scart 1						AL					IO	
AIN1L	Audio input scart 1 left					AF						IO	
AIN1R	Audio input scart 1 right					AF						IO	
AIN2L	Audio input scart 2 left					AF						IO	
AIN2R	Audio input scart 2 right					AF						IO	
AINF_AIN2	Audio input front/scart 2						AL					IO	
AINFL	Audio left from front connector					AF						IO	
AINFR	Audio right from front connector					AF						IO	
AMCO	Audio to the modulator					AF			FV				
AMLP	Audio mono playback					AF	AL		FV				
AMLR	Audio mono record					AF	AL						
AOUT1L	Audio output from scart 1, left					AF						IO	
AOUT1R	Audio output from scart 1, right					AF						IO	
AOUT2L	Audio output from scart 2, left					AF						IO	
AOUT2R	Audio output from scart 2, right					AF						IO	
APH	Audio playback head						AL						
ARH	Audio record head						AL						
BLANKING	Blanking pulse RGB loopthrough											IO	
BLUE	Blue signal between scart 1/2											IO	
CAP	Capstan control voltage		AIO1		DE								
CREV	Capstan reverse		AIO1		DE								
CSI	Colour system information		AIO1							VS			
CSRP	Chroma-SEC-Rec-Playback									VS			
CSW	8V/14V switching for capstan motor	PS	AIO1										

Signal	Description	Application											
CSYNC	Composite sync pulse		AIO1							VS			
CTL1	CTL-Synch-1				DE		AL						
CTL2	CTL-Synch-2				DE		AL						
DEC	Audio switching voltage AIN1/AFV											IO	
DECK_INIT	Init switch		AIO1										
DRUM	Head motor speed phase signal		AIO1		DE								
ENVC	Envelope comparator signal		AIO1							VS			
FFP	Feature frame pulse		AIO1							VS			
FGD	Capstan tacho pulse digital		AIO1		DE								
FMPV	FM video playback									VS			
FOME	Follow Me (video signals equal)		AIO1										FOME
FSC	Sub carrier frequency									VS			
FTA	Threading tacho				DE								
FTAD	Threading tacho digital		AIO1		DE								
GREEN	Green signal between scart1/2											IO	
GND	Ground	PS	AIO1		DE	AF						IO	
GNDAF	Ground on C650/651					AF							
GNDAIO	Ground on C601					AF	AL					IO	
GNDAL	Ground on C603						AL						
GNDAL1	Ground on C602						AL						
GNDD	Ground digital	PS	AIO1	AIO2									
GNDDE	Ground digital deck		AIO1		DE								
GNDEO	Ground on C601						AL						
GNDFMS	Ground FM							FM					
GNDFOME	Ground FOME on C530												FOME
GNDFV	Ground FV-ZF							FM	FV			IO	
GNDKEY	Ground key			AIO2									
GNDLED	Ground led	PS	AIO1										
GNDM1	Ground capstan motor	PS			DE								
GNDS	Ground for DE-CTL ampl.				DE								
GNDVIO	Ground video IO								FV	VS	VPO	IO	FOME
GNDVPO	Ground VPO on C500/501										VPO		
GNDVS	Ground VS on C602/603					AF	AL			VS			
GNDVARI	Ground front cinch											IO	
HEHI	Heater for displaytube high	PS		AIO2									
HELO	Heater for displaytube low	PS		AIO2									
HP1	Head-Puls-1		AIO1							VS			
HSC	Head switch puls SP / LP		AIO1							VS			
I1WSTBY	Inverse < 1W switch	PS	AIO1										
ILED	LED-tower supply		AIO1										
IPOR	Inverse power on reset		AIO1	AIO2	DE								
IREV	Erase oscillator on/off		AIO1				AL			VS			
IRR	IR receiver pulse		AIO1	AIO2									
IS1	Audio switching voltage AINF/AIN2											IO	
KEY_IN	Key matrix voltage		AIO1	AIO2									
KEY_LED	Key led front shuttle		AIO1										
LH1	Longplay-Head-1									VS			
LH1'	Longplay-Head-1'									VS			
LH2	Longplay-Head-2									VS			
LH2'	Longplay-Head-2'									VS			
MON	Blanking loop through scart 1/2											IO	
MOT1	Scanner motor 1 phase				DE								
MOT2	Scanner motor 2 phase				DE								
MOT3	Scanner motor 3 phase				DE								

Signal	Description	Application										
MTA_CROT	Audio mute / Colour rotation on/off		AIO1				AL			VS			
OFP	Frame pulse		AIO1								VPO		
PBH	PB-switch									VS			
PG_FG	Head wheel position/-speed		AIO1		DE								
PGIN	Scanner-Motor-Pulse				DE								
PSS	PAL or secam-L		AIO1						FV				
RECP	Record protection		AIO1										
RED/C	Red signal between scart 1/2											IO	
RMHI	REC-Mute/HeadPuls-Audio		AIO1			AF							
SATCO	Satelite control signal		AIO1										
SB1	Secam band 1		AIO1						FV				
SCL	IIC bus clock		AIO1	AIO2	DE	AF		FM	FV	VS	VPO	IO	
SDA	IIC bus data		AIO1	AIO2	DE	AF		FM	FV	VS	VPO	IO	
SDA-VS	IIC bus data filtered to VS									VS			
SFS	Sound filter switch		AIO1						FV				
SH1	Standard play-Head-1									VS			
SH1'	Standard play-Head-1'									VS			
SH2	Standard play-Head-2									VS			
SH2'	Standard play-Head-2'									VS			
SIF2	Sound-interfrequency							FM	FV				
STBY	Stand by switch	PS	AIO1	AIO2	DE								
SYNC	Control track pulse		AIO1		DE								
TAE	Tape end detection		AIO1										
TAS	Tape start detection		AIO1										
THIO	Threading motor in/out		AIO1		DE								
TMO	Threading motor on/off		AIO1		DE								
TRIA-ALM	Tracking audio / audio level indication		AIO1			AF							
TRIV	Tracking information video		AIO1							VS			
VBS	Video input									VS		IO	
VFV	Video from frontend								FV	VS		IO	FOME
VIN1	Video input scart 1											IO	FOME
VISS	Control sync pulse inversion		AIO1		DE								
VMOD	Video to the modulator								FV			IO	
VOUT	Video from OSD part										VPO	IO	
VREC	Video record from I/O									VS	VPO		
VSB	Video from signal electronics									VS	VPO		
W_R	Control track write/read		AIO1		DE								
WTL	Wind tacho left				DE								
WTLD	Wind tacho left digital		AIO1		DE								
WTR	Wind tacho right				DE								
WTRD	Wind tacho right digital		AIO1		DE								

AF	Audio FM Processing	page 73
AL	Audio Linear	page 72
AIO1	Central Control	page 66
AIO2	Display Control	page 65
DE	Deck Electronics	page 67
FM	Audio Stereo Nicam	page 70
FV	Frontend	page 69
FOME	Follow me	page 78
IO	In/Out	page 77
PS	Power Supply	page 64
VPO	OSD, VPS/PDC	page 76
VS	Video Signal Processing	page 74

10. Tape deck

10.1 Drive assembly

This tape deck has three motors; one providing precision drive for the scanner unit; the second providing direct drive for the capstan and belt drive for the reel tables; the third motor drives the lift and tape threading/dethreading operations.

Special features are:
- Quick start
- Short winding time
- Automatic cleaning of video heads by cleaning roller

To obtain a high repair standard we have developped a range of service kit's. These kit's covers the spare parts which are engaged together.
The tape deck's sensors are located on the motherboard underneath the tape deck, and included in its circuitry, lay out and parts list.

10.1.1 Deck parts replacement

The procedure for the removal and refitting of the following parts is described; only the lift, the scanner, the capstan motor and the A/C head are fixed by screws.
All the other deck assembly parts are held only by snap hooks.

For the replacement of parts on the underside of the tape deck, remove the tape deck from the motherboard.

Manual extraction of cassette:
If, after the Eject button has been pressed, the drive does not unthread and eject the cassette, the dethreading/eject operation can also be carried out manually by turning the wheel at the rear of the threading motor.

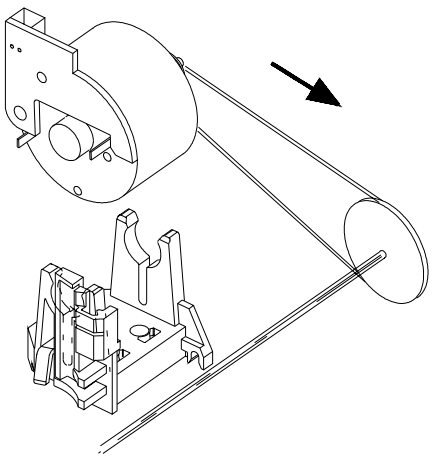
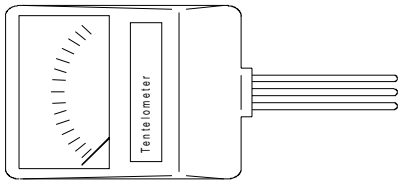


Figure 10-1

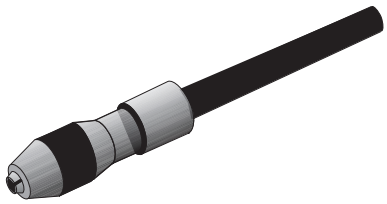
IMPORTANT:
After each repair has been carried out in the drive assembly, the first operation after repairing must be to bring the cassette compartment into „eject" position by hand.

Auxiliary tools for deck adjustment:

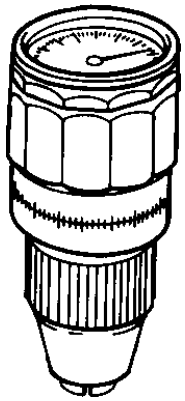


Tentelometer 4822 395 90584

Tool for tapetension adjustment 4822 395 50188



Handle 4822 256 90493



Torquemeter: 600 gf-cm 4822 395 90232
90 gf-cm 4822 395 80196

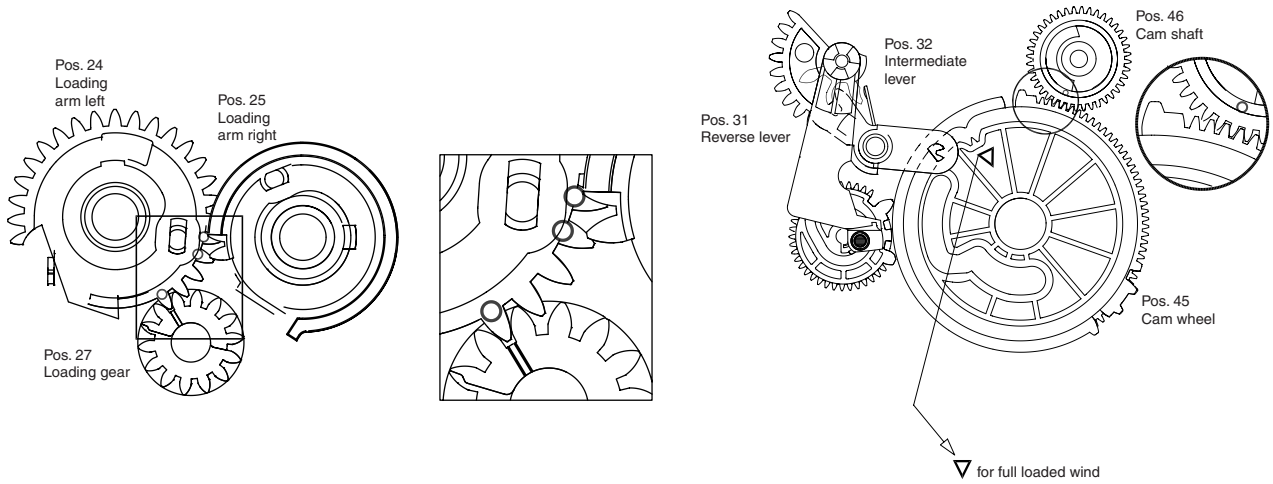
Post adjustment screwdriver 4822 395 50275

Testcassette 4822 397 30103
Nylon gloves 5322 395 94022

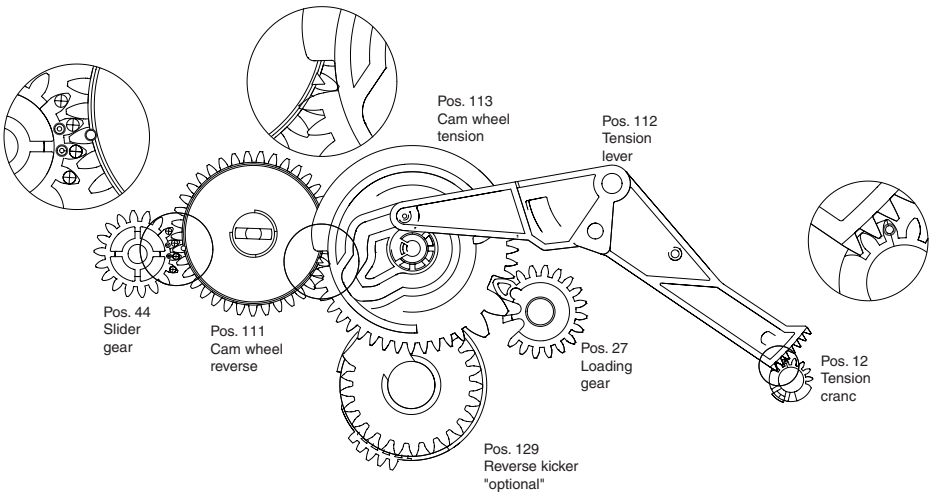
10.1.2 Deck layout diagram

Deck in position „threaded out“. The following diagrams indicate the relative position of the gearwheels and levers when the deck is in the threaded out (cassette-compartment down) position.

Top view



Underside view



10.1.3 The lift

Refitting the lift compartment:
Ensure the lift compartment is down and gear A is rotated one click stop anticlockwise from the down position.
The removal and refitting of the lift can be carried out in all deck positions with the exception of „eject“ (ensure that gears 103/105 are free and if present the cassette loader gear 2 pos.105 is positioned to the rear).

To remove the lift:
Free the holding bracket (see figure 10-2) by rotating it up and back from the upper end.
Unscrew the 4 screws on the underside of the deck.
Carefully remove the lift vertically, noting the position of the record protect operating lever.

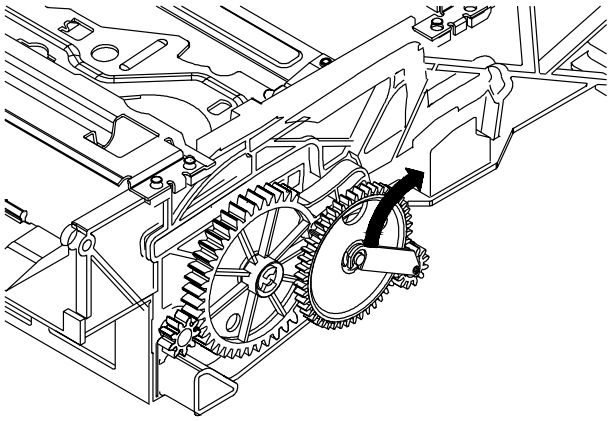


Figure 10-2

10.1.4 Scanner replacement

Removal:
Nylon gloves should be worn when handling the head disc.
Remove the deck from the set/mobo.
Unscrew the three scanner screws on the underside of the deck.
Pull out the scanner from the top. (see figure 10-3)

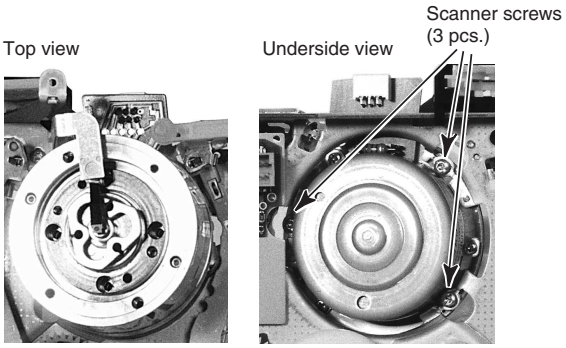


Figure 10-3

Installation:
Insert the scanner (with protective cover) carefully from top.
PCB and flex foil to the rear.
Be shure that the scanner is engaged to the referenc pin located on the chassis.
Turn the tape deck, holding the scanner in the deck by hand and fix it by use of the tree scanner screws.
Remove carefully the protective cover from top.

After replacing the scanner, carry out the following adjustments and checks:
Head switching puls.
Writing current adjustment.
Tape path alignment.
Check and adjust if necessary.

10.1.5 A/C Head (Combi head) (Pos. 36)

Remove the fixing spring (A) (see figure 10-4)
Remove the fixing screw and replace the A/C head.
Use a new fixing spring (included with new A/Chead) for reassembly.

After the A/C head has been replaced, all adjustments described in paragraph “A/C Combi head” and paragraph 10.2.2 have to be carried out.

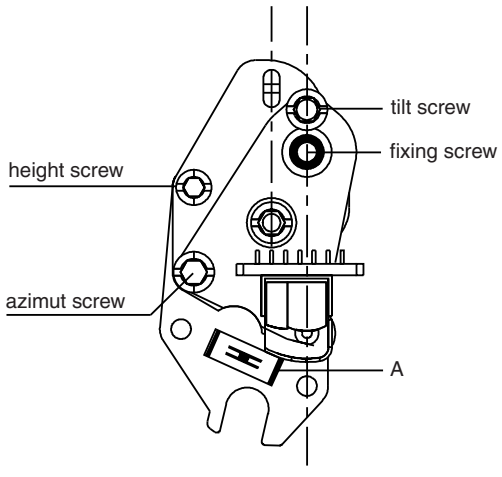


Figure 10-4

10.1.6 Threading motor (Pos. 38)

Remove the belt and disconnect the connector plug.
Remove the threading motor from the motor supports (see figure 10-5).

During reassembly ensure that the threading motor is correctly located in the front and rear supports.

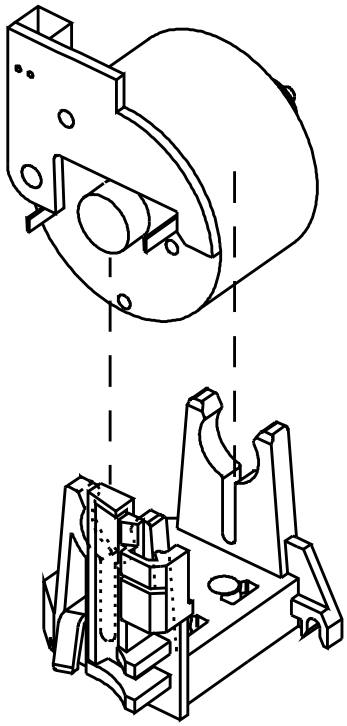


Figure 10-5

10.1.7 Capstan motor (Pos. 127)

Remove the tape deck.
Remove the belt (pos.126) on the underside;
Remove the three capstan motor fixing screws (see figure 10-6) and withdraw the capstan motor downward from the drive assy.
The reassembly is carried out in reverse order. Make sure that the capstan is free of grease.

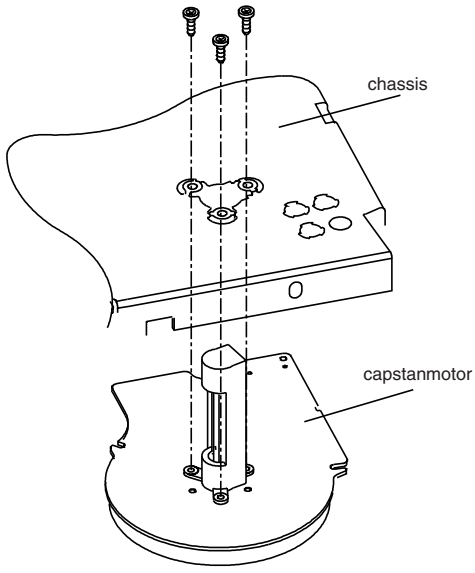


Figure 10-6

10.1.8 Pressure roller (Pos. 37)

Remove the tape deck.
Unhook and remove the pressure roller tension spring.
Release the pressure roller guide (pos. 41) from the guide in the threading motor holder by pressing the top of the motor guide rearwards and rotating the pressure roller guide assembly clockwise by approximately a quarter of a turn (see figure 10-7). The pressure roller and guide can now be lifted clear.

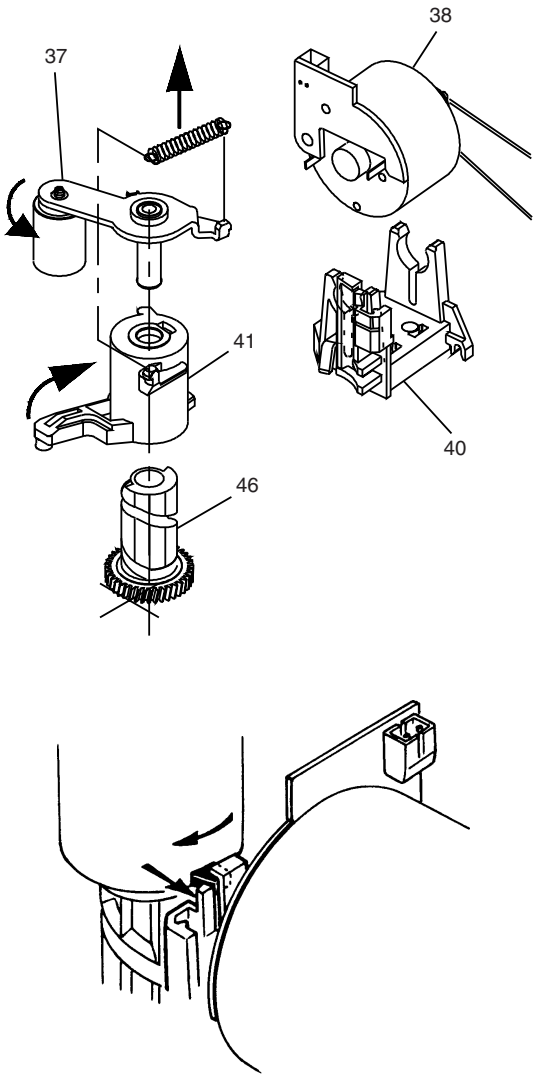


Figure 10-7

Ensure that no grease from the pressure roller guide gets to the capstan or pressure roller.
The reassembly is carried out in reverse order.

10.1.9 Roller unit right (Pos. 26)

Remove the tape deck.
Compress the two snap hooks by means of a pair of tweezers and remove the roller assy from the roller unit right (see figure 10-8).
Unhinge the loading arm right fromthe holding plate and push the latter towards the front of the deck to remove from the guide (right).

NOTE:
During reassembly ensure the link from 25 is engaged in the hole of the holder plate 26.
After replacing the roller unit (right), the tape path has to be checked, and adjusted if necessary.

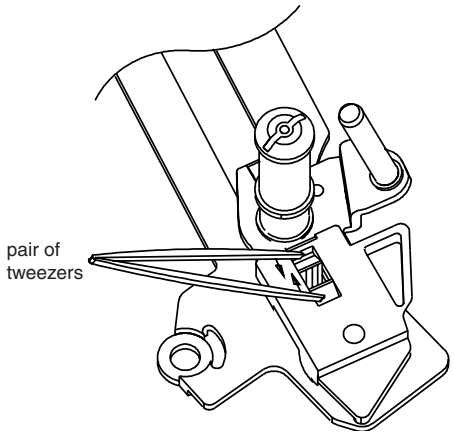


Figure 10-8

10.1.10 Roller unit left (Pos.23)

Set the drive assy to „Eject“ position.
Unhook the tension arm spring (pos. 11), to avoid the tension arm spring being pre-loaded.
At the bottom side of the drive assy remove the tension lever (pos.112).
Compress the two snap hooks by means of a pair of tweezers and remove the roller assy (A) from the plate (B).
Unhinge the loading arm (left) from the holding plate and remove the latter downward from the drive assy through the recess in the chassis (see figure 10-9).
The reassembly is carried out in reverse order.

NOTE :
During reassembly
1. Place the carriage holding plate in the assembly with the half-round cutout nearest the rear of the deck.
2. When the loading arm is refitted ensure the pin on the underside of 23 is through the link of 24B.

After replacing the roller unit (left) the tape path has to be checked (see division 10.2.1 Tape path), and adjusted if necessary.

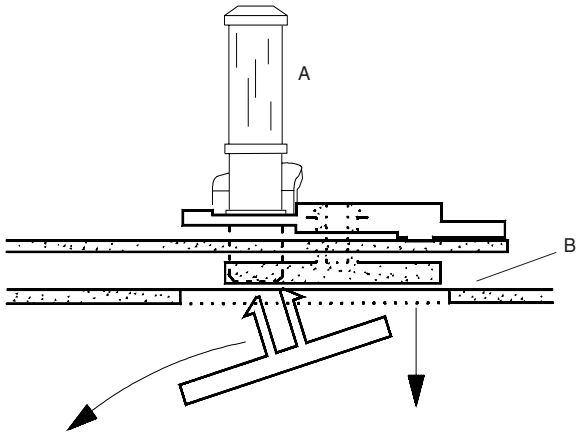


Figure 10-9

10.2 Adjustments

Adjustments must not be made in the service position.

10.2.1 Tape path

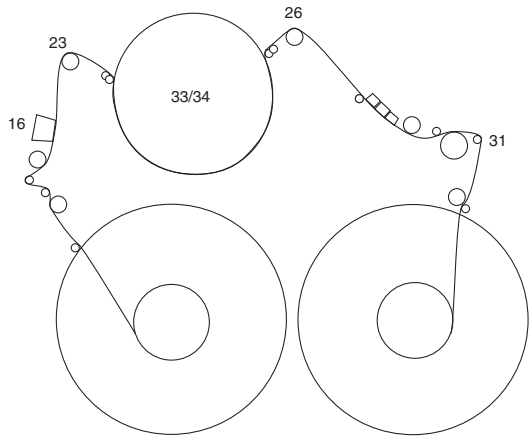


Figure 10-10

Roller left unit/roller unit right

Preparation:
Connect one input of a dual trace oscilloscope to observe the tape sync pulse CTL. The other input (DC coupled) to observe the tracking information TRIV.
Trigger the oscilloscope externally on the head pulse HP1 ("SWIN").
Playback the black and white section of the alignment test tape.
Set the deck in the condition where the video heads are running along the upper edge of the tracks only by:

- Call the service test program (see chapter 5.2 Service test program).
- Activate manual tracking (service test program step 03) and watch the tape sync pulse move to the left in relation to the TRIV signal.
- Note the extreme left hand position reached by the sync pulse, repeat as necessary.
- Stop the movement of the pulse when the TRIV signal reduces to 1/2 to 2/3 maximum amplitude by pressing the normal play button. A noisy picture (disturbances) is visible on the TV set and the CTL pulse should be to the left of the display.

The recorder will hold this position until the service test program step 03 is left.
This condition works only if X-distance is adjusted.

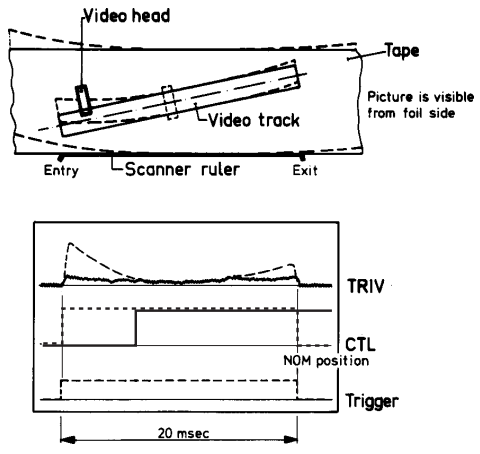


Figure 10-11

Adjustment:
Adjust the left and right roller units to make the tracking signal TRIV straight and flat as possible (see figure 10-11).

A/C Combi head

Tilt angle adjustment
Set the drive to feature mode (e.g. +7)

Adjustment :
By means of the tilt angle adjusting screw move the tape until the lower edge just touches the tape guide A1 (see figure 10-12) the tape must not be distorted at the lower edge (by pressing onto guide).

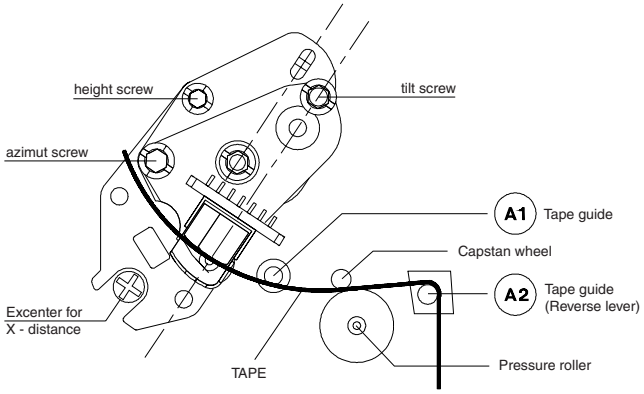


Figure 10-12

Adjustment of the azimuth angle and the head height:
Connect an oscilloscope to the linear Audio output.
Play the section of the test cassette with the audio signal 400 Hz.
Adjust for maximum output voltage by means of the height adjustment screw
Play the section of the test cassette with the audio signal 8 kHz.
Adjust to maximum output voltage by means of the azimuth adjustment screw (see figure 10-12).
If necessary, repeat this procedure
Check the tilt angle adjustment
If the tape path was completely out of adjustment or if several components in the tape path have been replaced, it is possible, that the adjustments described in paragraph "Roller left unit/roller unit right" and paragraph "A/C Combi head" have to be repeated several times.

10.2.2 Adjustment of the horizontal distance (x-distance)

Before this adjustment is carried out, insert the test cassette (start from Eject position). Call the service test program (tracking value will take up its nominal position) and press the „play" button.
Playback the black/white part of the test cassette.)
Display the TRIV signal on an oscilloscope (DC-coupled) and adjust for maximum voltage by means of the excentric screw (see figure 10-12).

10.2.3 Brake band and tape tension

Due to further development it is no longer necessary to make theseadjustments after replacement of the brake band.
If the brake band or tape tension are completely misadjusted, set them to a center position; set the drive to „play“ and adjust the brake band until the edge of the elbow of the tape tension arm is aligned with the left inner edge of the left guide (see figure 10-13).

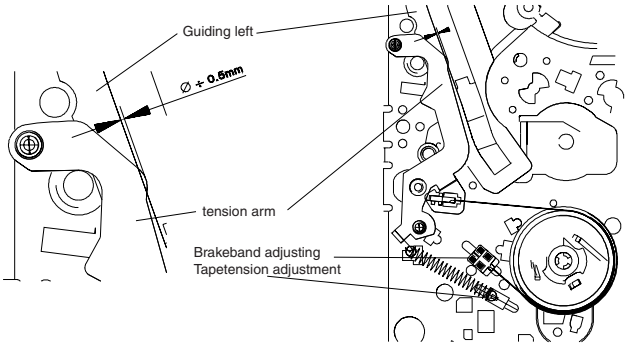


Figure 10-13

10.2.4 Friction clutch control check

Set the drive to „Play“ position.
Place the torquemeter on the right reel.
Turn the capstan motor to move the right reel clockwise.
Keep turning, until the indication at the torquemeter no longer changes (see figure 10-14).
The torque has to be 10,5 mNm +/-25% (105gFcm +/-25%)

10.2.5 Reverse brake control

Set the drive to „Reverse“ position.
Place a torquemeter on the right reel and turn the latter counterclockwise, until the reel just starts to flip.
The value indicated at the torquemeter has to be 7mNm +/-3mNm (70 gFcm +/-30gFcm) (see figure 10-14).

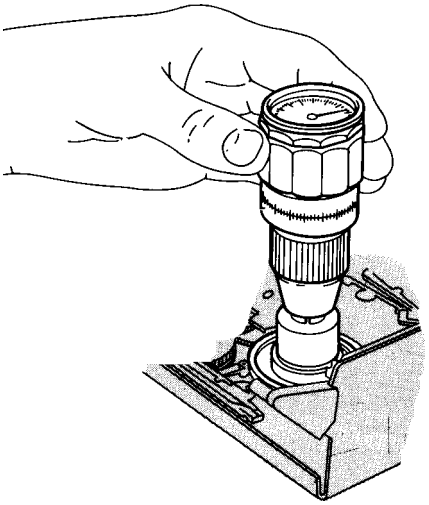
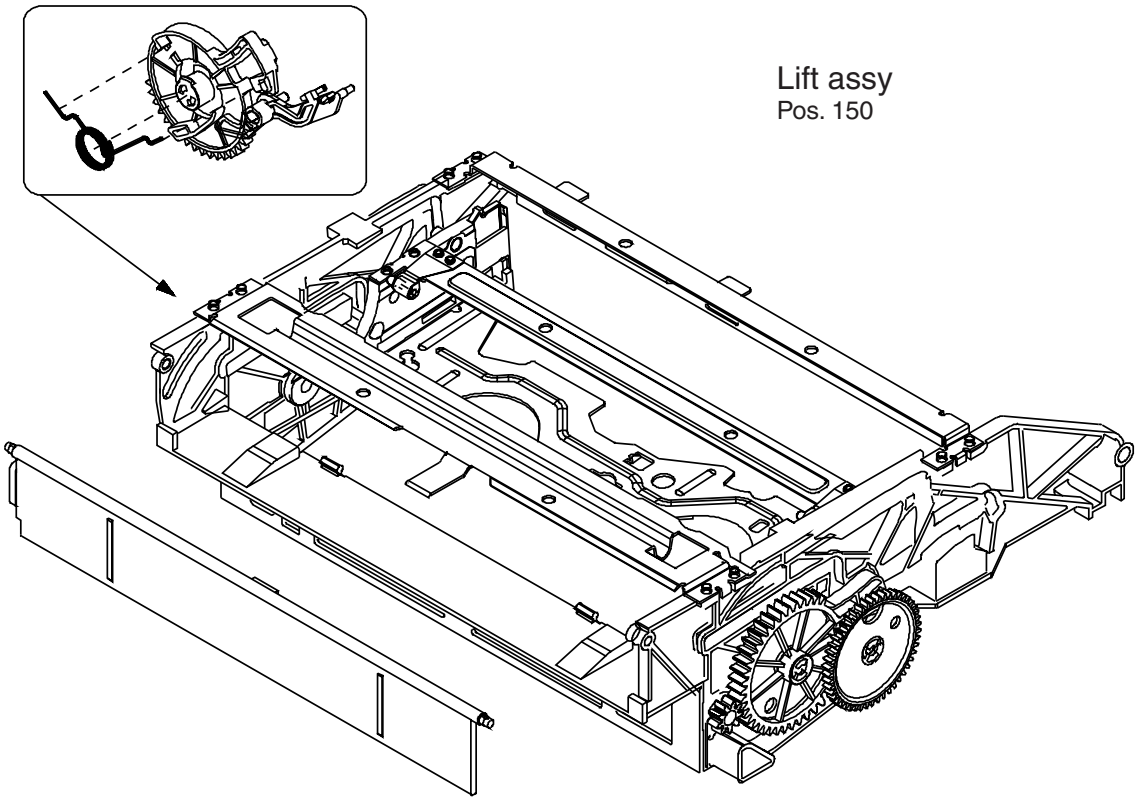
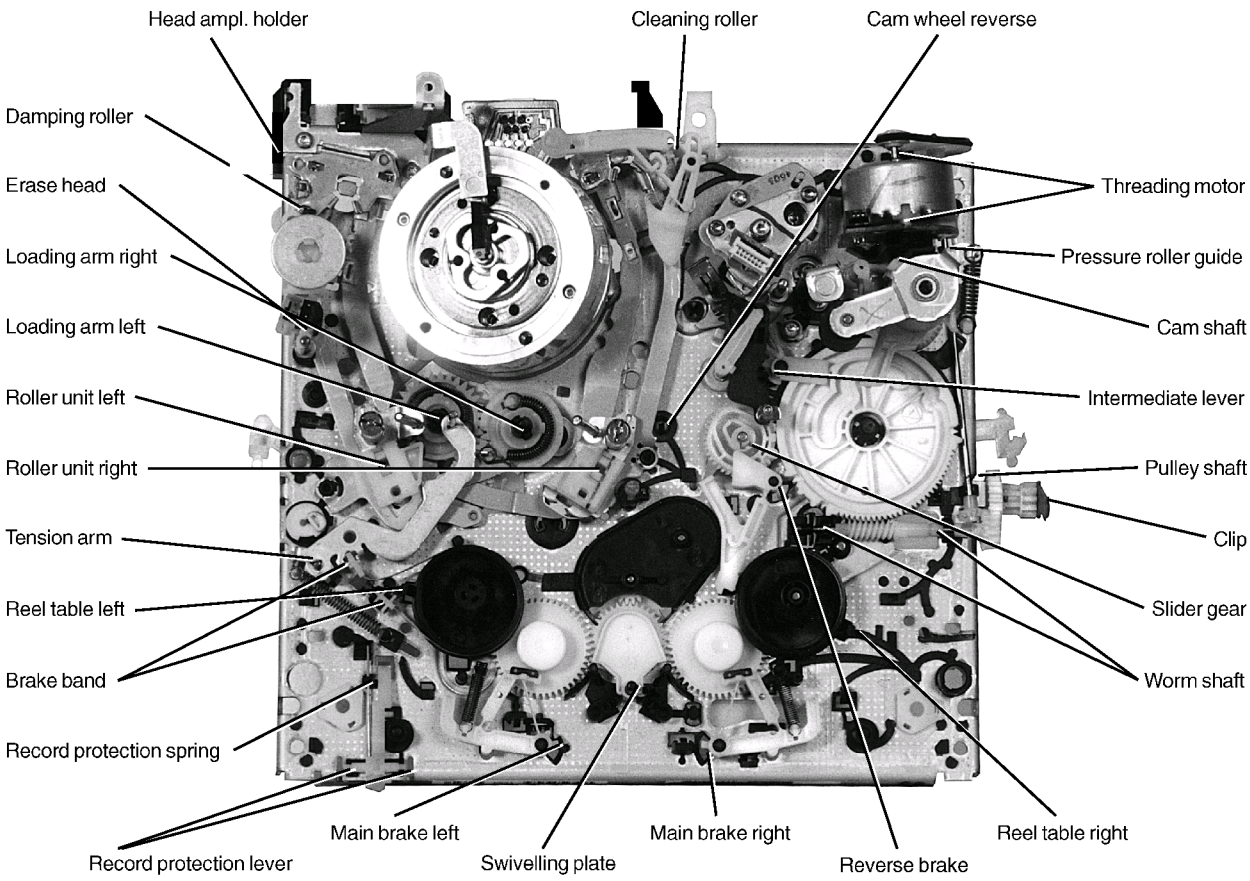


Figure 10-14

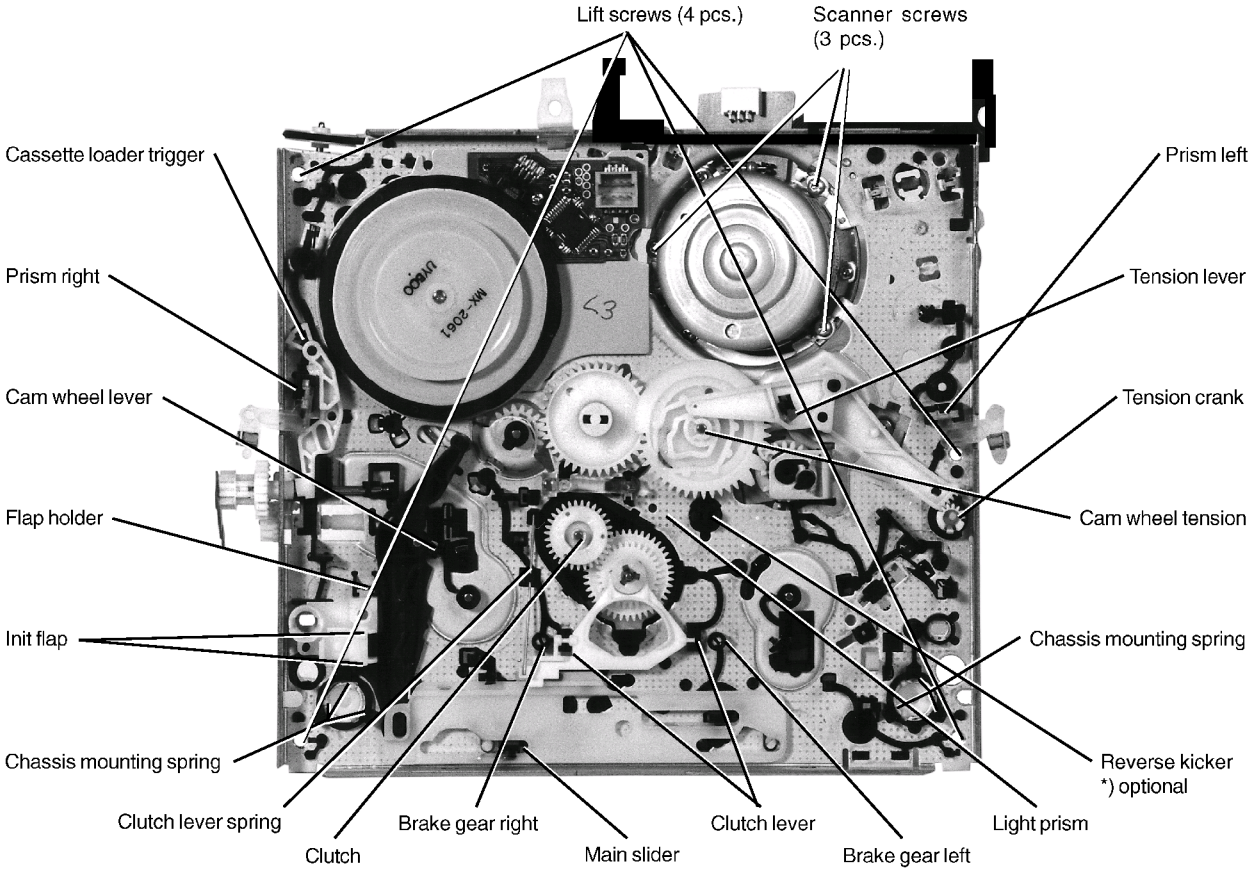


In order to make the replacement of the deck parts easier, the snap hooks are marked with an arrow.

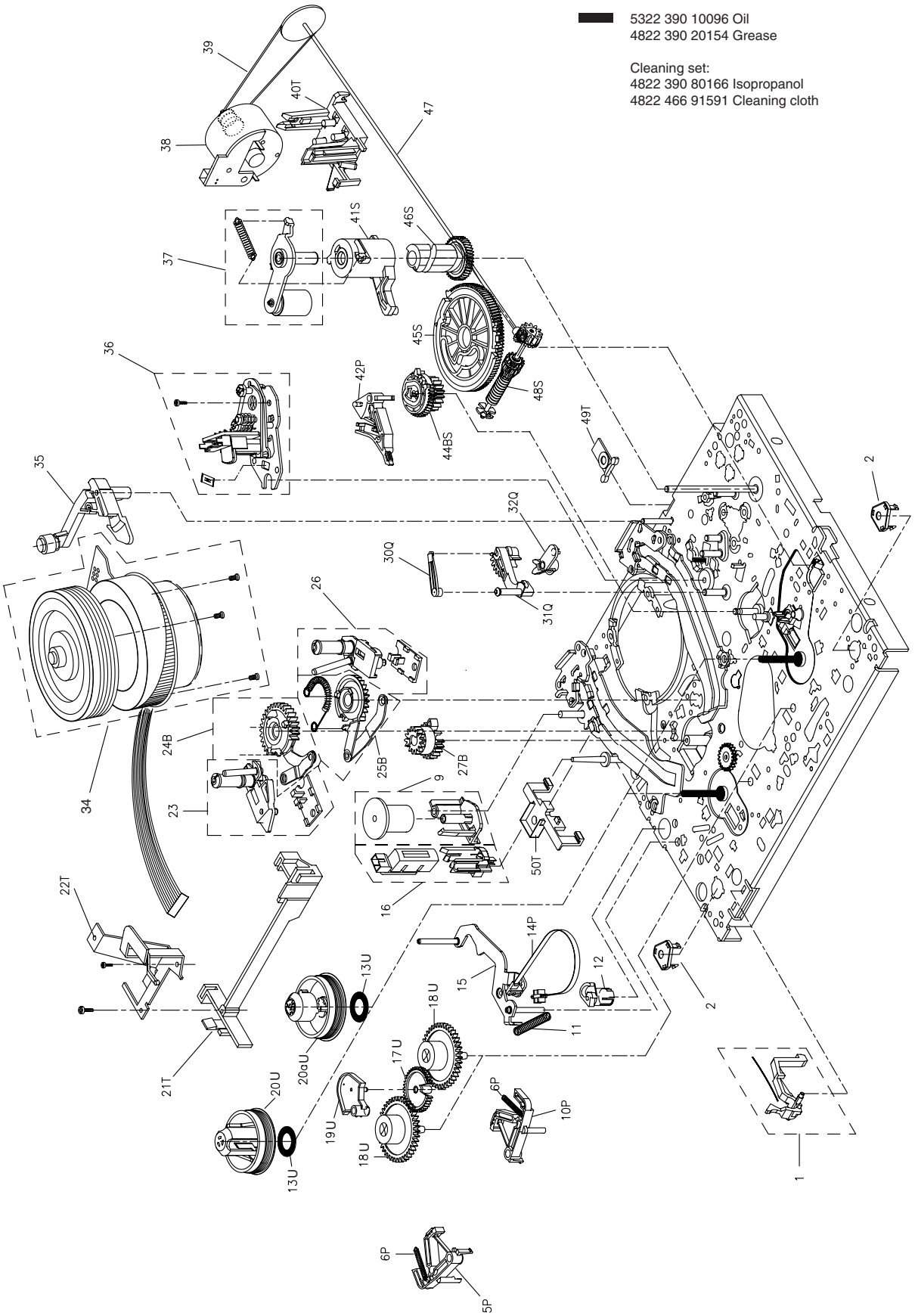
TOP VIEW



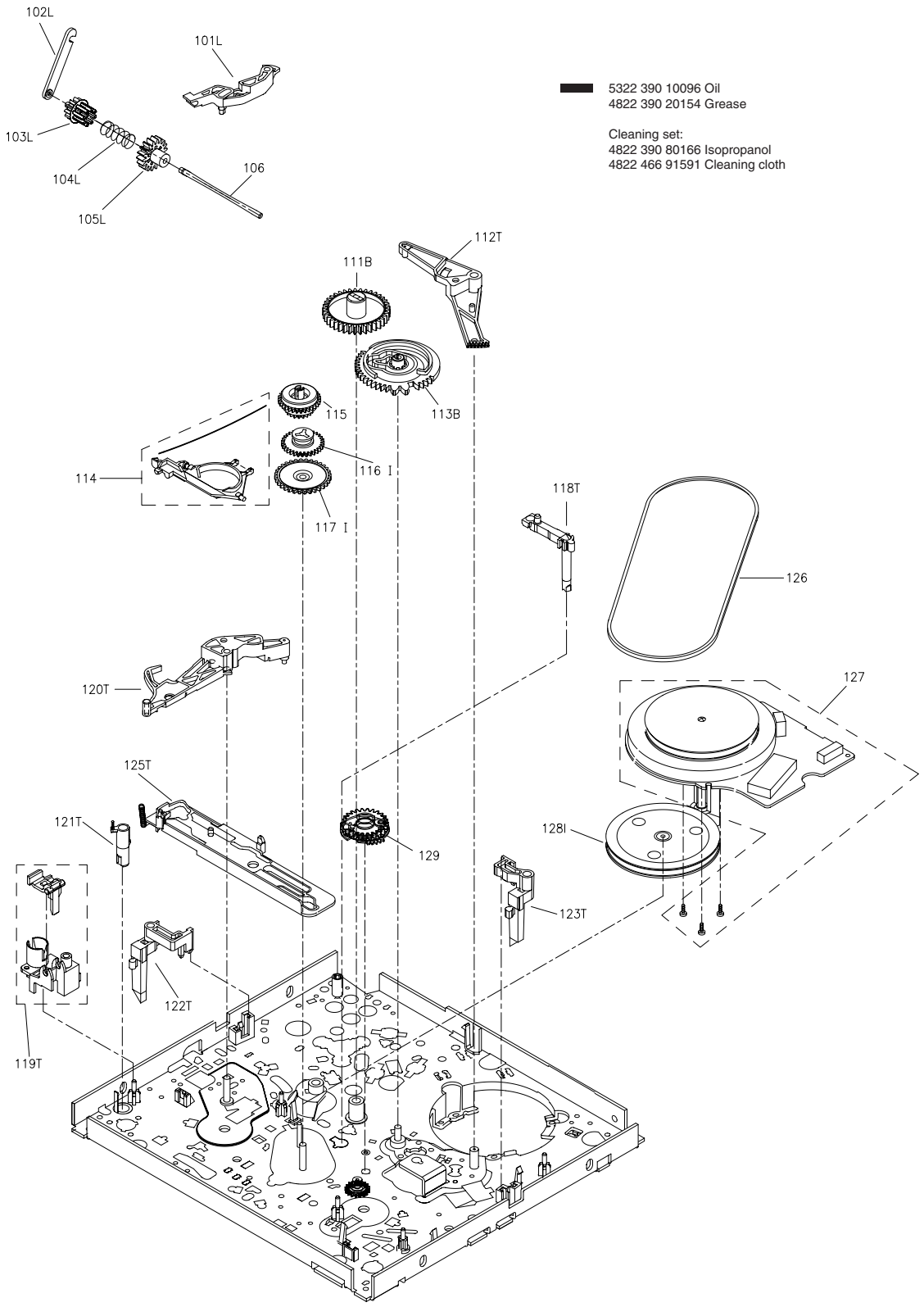
UNDERSIDE VIEW



10.3 Deck exploded view (TOP)



10.4 Deck exploded view (BOTTOM)



10.5 Mechanical parts list

Pos.	Description	KITS							Code number
		B	I	L	P	Q	S	T	U	4822
1	Rec. protection lever (with spring)									402 10202
2	Chassis mounting spring (2x)									492 71022
5	Main brake left				P					
6	Main brake spring (2x)				P					
9	Damping roller *)									528 70782
10	Main brake right				P					
11	Tension arm spring									492 33317
12	Tension crank									403 70551
13	Slip ring								U	
14	Tension band				P					
15	Tension arm									403 70547
16	Erase head									249 10522
17	Swivelling gear								U	
18	Brake gear (2x)								U	
19	Swivelling plate								U	
20	Reel table (S)								U	
20a	Reel table (T)								U	
21	Headamplifier holder							T		
22	Bracket							T		
23	Roller unit left									528 70771
24	Loading arm left	B								
25	Loading arm right	B								
26	Roller unit right									528 70772
27	Loading gear	B								
30	Reverse clip					Q				
31	Reverse lever					Q				
32	Intermediate lever					Q				
34	Scanner assy. 2/0 (Head disc and motor)									**4803** 218 00011
34	Scanner assy. 2/0-LP (Head disc and motor)									**4803** 218 00021
34	Scanner assy. 4/0 (Head disc and motor)									**4803** 218 00031
34	Scanner assy. 4/2 (Head disc and motor)									**4803** 218 00041
35	Cleaning roller									528 70773
36	A/C Head (with clip and screws)									249 10468
37	Pressure roller (with spring)									528 70774
38	Threading motor									361 10809
39	Threading belt									358 20421
40	Motor holder							T		
41	Pressure roller guide						S			
42	Reverse brake				P					
44	Slider gear	B					S			
45	Cam wheel						S			
46	Cam shaft						S			
47	Pulley shaft									528 81462
48	Worm shaft						S			
49	Chassis mounting clip							T		
50	WD-holder							T		

Pos.	Description	KITS								Code number
		B	I	L	P	Q	S	T	U	4822
101	Cassette loader trigger			L						
102	Clip			L						
103	Cassette loader gear1			L						
104	Cassette loader spring			L						
105	Cassette loader gear2			L						
106	Spindle									535 93277
111	Cam wheel reverse	B								
112	Tension lever							T		
113	Cam wheel tension	B								
114	Clutch lever (with spring)									403 70549
115	Clutch									528 20736
116	Changing gear		I							
117	Double gear		I							
118	Light prism							T		
119	Init flap and holder							T		
120	Cam wheel lever							T		
121	S-VHS lever							T		
122	Prism rihgt							T		
123	Prism left							T		
125	Main slider							T		
126	Driving belt									358 31166
127	Capstan motor (with screws)									361 10805
129	Reverse kicker with transmission gears *)									522 20451
128	Gear pulley		I							
150	Lift									443 64112
KIT	B									310 31955
KIT	I									310 31963
KIT	L									310 32116
KIT	P									310 32191
KIT	Q									310 10658
KIT	S									310 10661
KIT	T									310 10662
KIT	U						3103			109 09190

*) optional

Um eine hohen Reparaturstandard zu gewährleisten sind mit Ausnahme von Kit T immer alle im Kit enthaltenen Teile zu tauschen.

In order to guarantee a high repairstandard all spare parts included in a kit have to be replaced with the exception of kit T.

Per una riparazione garantita ocorre sostituire tutti i pezzi contenuti nei kit, fatta eccetione per il kit T.

Para obtener un estandár de reparaciones elevado,es necesario cambiar todas las partes contenidas en el kit, la única exceptión es para el kit T.

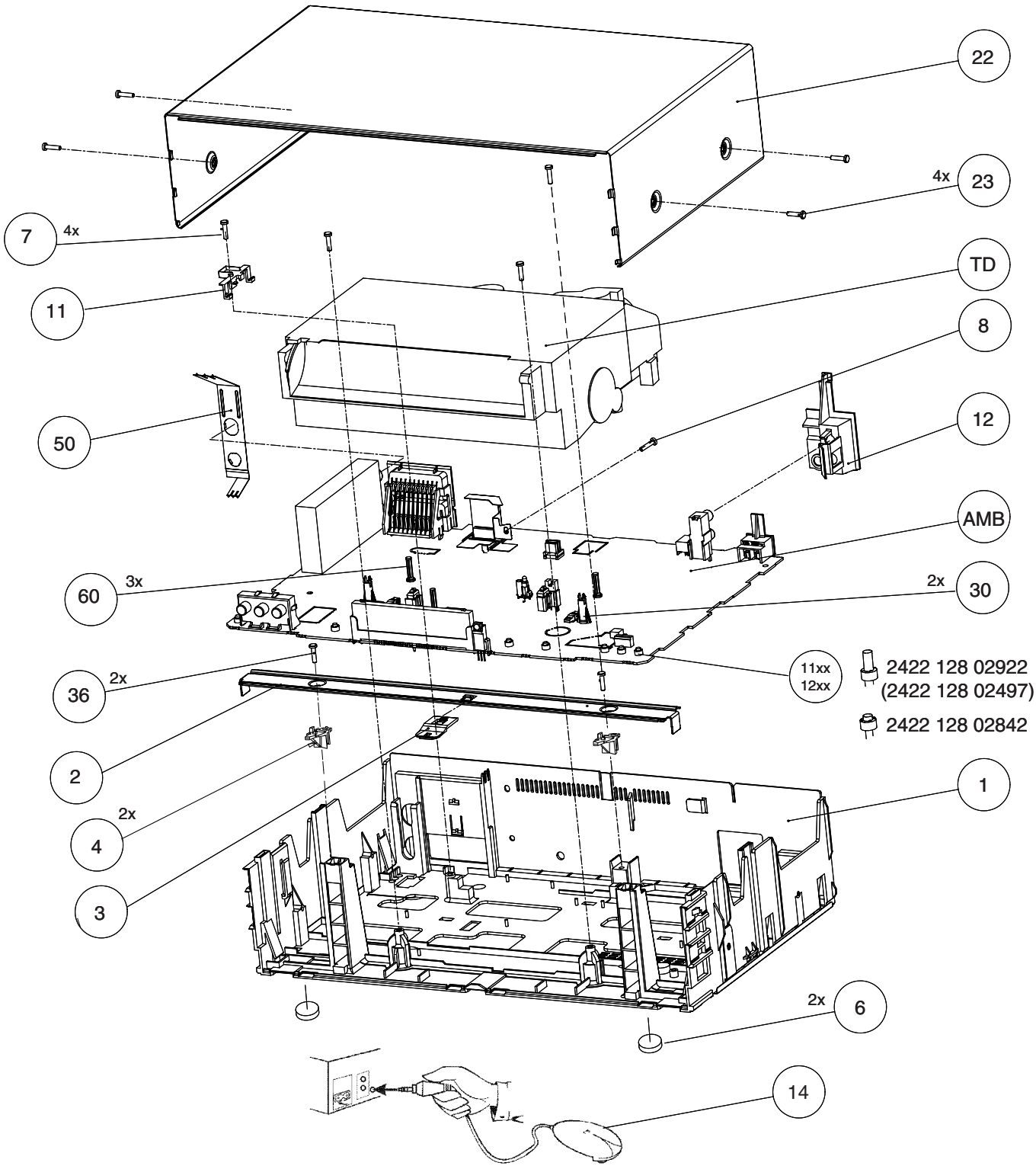
A fin d'obtenir un standard de réparations élevé, toutes les pièces de rechange incluses dans un kit sont à remplacer, exception faite du kit T.

Om een hoge reparatiekwaliteit te waarbogen moeten, met uitzondering van kit T, altijd alle zich in een kit bevindende onderdelen worden vervangen.

Engineer's remarks:

11. Exploded views

11.1 Exploded view set



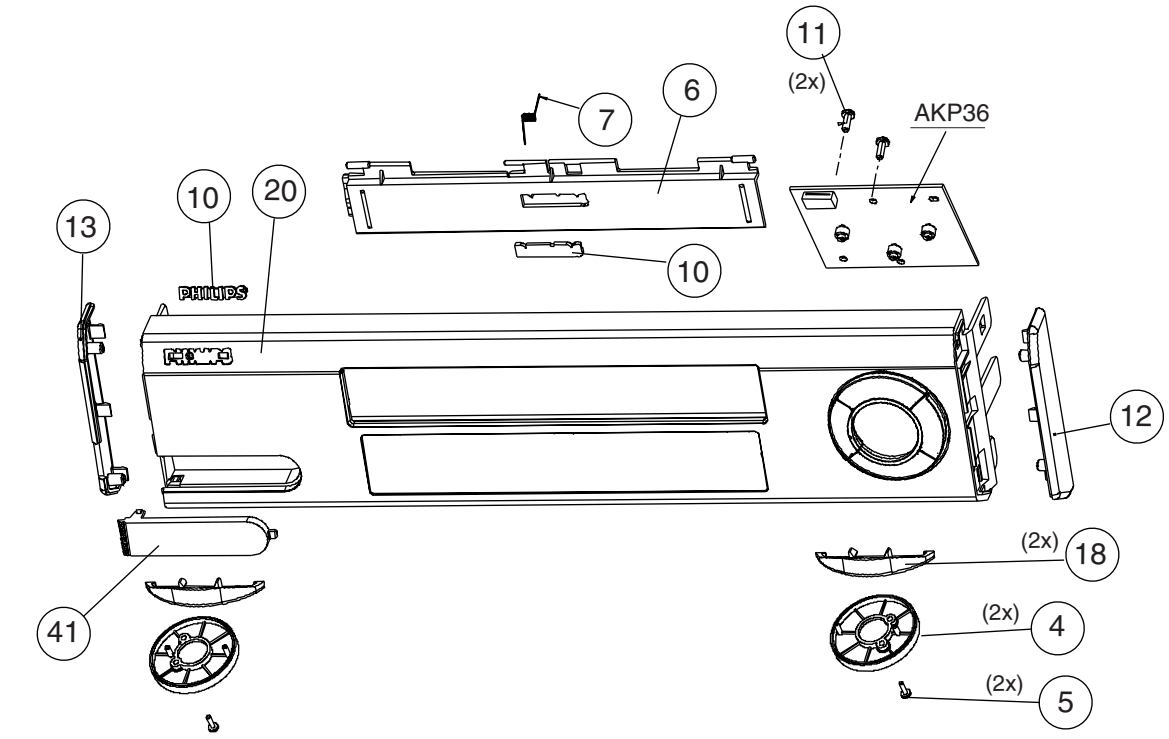
11.2 Set Parts List

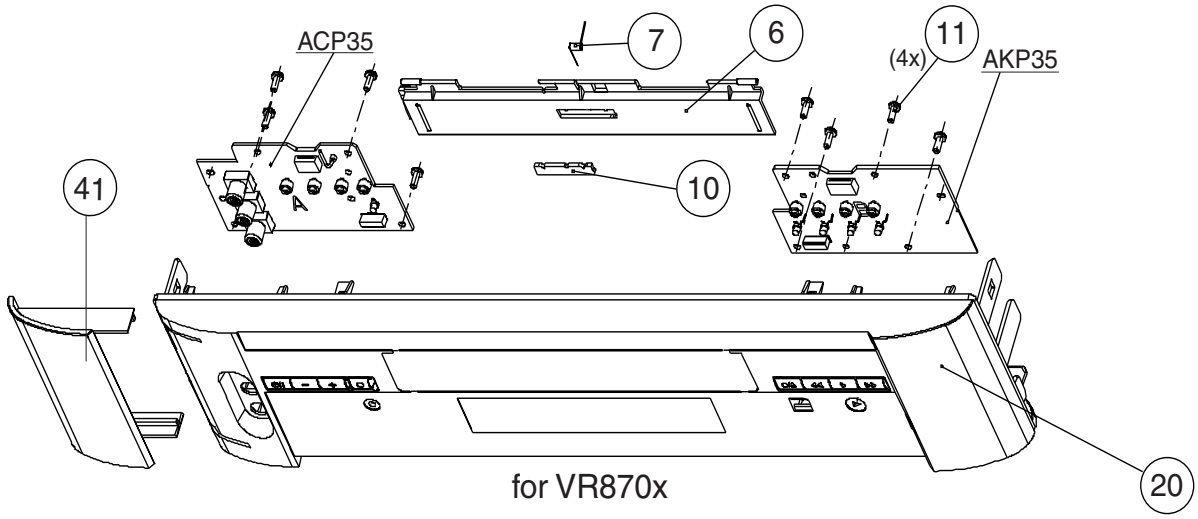
Pos	Service Code	Description
1	3103 138 92410	FRAME ASSY 2SCART 435 mm sets
	3103 138 90120	FRAME ASSY STEREO 380 mm sets
	3103 138 91710	FRAME ASSY 2SCART 380 mm sets
	3103 138 91700	FRAME ASSY 1SCART 380 mm sets
2	3103 141 22800	BRACKET 380 mm sets
	3103 141 23740	BRACKET 435 mm sets
3	3103 104 20960	SNAP CATCH
6	3103 184 00830	FOOT
7	3103 100 42400	SCREW 3,5X16
8	3103 100 42530	SCREENING SCREW
11	3103 104 01530	WD-HOLDER
12	3103 104 25950	CINCH COVER
	3103 104 25890	CINCH COVER SAT
14	8622 666 10101	VCR SAT MOUSE
22	3103 141 23810	COVER VR120, 402, 520
	3103 141 23680	COVER VR170, 220, 270x, 420, 57x, 620, 622, 670x
	3103 141 23790	COVER VR720, VR870x
	3103 141 23590	COVER VR627
	3103 141 23070	COVER SBx, xxDV30
23	3103 100 42640	SCREW 3,5X10 SILVER
	3112 400 40220	SCREW 3,5X10 BLACK
30	3103 107 61760	DISTANCE HOLDER DECK
36	2511 076 50014	SCREW 3X12
50	3103 111 02560	SPRING
60	3103 104 20110	DISTANCE HOLDER MOBO

Service Code	Description Control Panel pos 20
3103 138 92280	CONTROL PANEL VR120
3103 138 92420	CONTROL PANEL VR170/02/58
3103 138 92730	CONTROL PANEL VR170/07
3103 138 92620	CONTROL PANEL VR170/39
3103 138 92640	CONTROL PANEL VR220/02/58
3103 138 92650	CONTROL PANEL VR220/07
3103 138 92660	CONTROL PANEL VR220/39
3103 138 92690	CONTROL PANEL VR270B/02/07/58
3103 138 92290	CONTROL PANEL VR270B/39
3103 138 92720	CONTROL PANEL VR270W/02/07/58
3103 138 92740	CONTROL PANEL VR270W/39
3103 138 92770	CONTROL PANEL VR402/58
3103 138 92780	CONTROL PANEL VR420/02/58
3103 138 92790	CONTROL PANEL VR420/39
3103 138 92830	CONTROL PANEL VR520/02
3103 138 92840	CONTROL PANEL VR520/07
3103 138 92850	CONTROL PANEL VR520/16/58
3103 138 92880	CONTROL PANEL VR570/02
3103 138 92890	CONTROL PANEL VR570/07
3103 138 92950	CONTROL PANEL VR570/16/58
3103 138 92910	CONTROL PANEL VR570/39
3103 138 92870	CONTROL PANEL VR572/02
3103 138 92900	CONTROL PANEL VR572/16
3103 138 92340	CONTROL PANEL VR620/02
3103 138 93030	CONTROL PANEL VR620/07
3103 138 93040	CONTROL PANEL VR620/16/58
3103 138 93050	CONTROL PANEL VR620/39
3103 138 92920	CONTROL PANEL VR622/02
3103 138 93000	CONTROL PANEL VR622/16
3103 138 93060	CONTROL PANEL VR627/02
3103 138 93070	CONTROL PANEL VR627/16
3103 138 92930	CONTROL PANEL VR670B/02/16/58
3103 138 92940	CONTROL PANEL VR670B/07
3103 138 92960	CONTROL PANEL VR670B/39
3103 138 92980	CONTROL PANEL VR670W/02/16/58
3103 138 92990	CONTROL PANEL VR670W/07
3103 138 93010	CONTROL PANEL VR670W/39
3103 138 93090	CONTROL PANEL VR720/02
3103 138 93100	CONTROL PANEL VR720/07
3103 138 92190	CONTROL PANEL VR720/16/58
3103 138 93110	CONTROL PANEL VR720/39
3103 138 92630	CONTROL PANEL VR870CC/02/16/58
3103 138 92670	CONTROL PANEL VR870CC/07
3103 138 92680	CONTROL PANEL VR870CC/39
3103 138 92210	CONTROL PANEL VR870L/02/16/58
3103 138 93130	CONTROL PANEL VR870L/07
3103 138 93140	CONTROL PANEL VR870L/39
3103 138 93170	CONTROL PANEL SB140/03
3103 138 93200	CONTROL PANEL SB140/38
3103 138 93180	CONTROL PANEL SB145/03
3103 138 93250	CONTROL PANEL SB145/11
3103 138 93260	CONTROL PANEL SB445/11
3103 138 93220	CONTROL PANEL SB445/38
3103 138 93190	CONTROL PANEL SB645/03
3103 138 93270	CONTROL PANEL SB645/11
3103 138 93230	CONTROL PANEL SB645/38
3103 138 92300	CONTROL PANEL SB745/03
3103 138 93280	CONTROL PANEL SB745/11
3103 138 93240	CONTROL PANEL SB745/38
3103 138 93290	CONTROL PANEL 20DV30/39
3103 138 93300	CONTROL PANEL 45DV30/39
3103 138 93310	CONTROL PANEL 65DV30/39

Service Code	Description Lift Flap pos 6
3103 178 33150	LIFT FLAP VR120
3103 178 33250	LIFT FLAP VR170/02/07/58
3103 178 35090	LIFT FLAP VR170/39
3103 178 33300	LIFT FLAP VR220
3103 178 33370	LIFT FLAP VR270x, VR670x
3103 178 33520	LIFT FLAP VR402/58
3103 178 33330	LIFT FLAP VR420
3103 178 33870	LIFT FLAP VR520/02
3103 178 33550	LIFT FLAP VR520/07/16/58
3103 178 34790	LIFT FLAP VR570/02
3103 178 33920	LIFT FLAP VR570/07/16/58
3103 178 34970	LIFT FLAP VR570/39
3103 178 35340	LIFT FLAP VR572/02
3103 178 35350	LIFT FLAP VR572/16
3103 178 33900	LIFT FLAP VR620/07/16/39/58, VR622/16
3103 178 34510	LIFT FLAP VR627/02
3103 178 34720	LIFT FLAP VR627/16
3103 178 33600	LIFT FLAP VR62x/02
3103 178 33020	LIFT FLAP VR720/02
3103 178 34040	LIFT FLAP VR720/07/16/39/58
3103 178 34310	LIFT FLAP VR870x
3103 178 33660	LIFT FLAP SB140/03
3103 178 34780	LIFT FLAP SB140/38
3103 178 33680	LIFT FLAP SB145/03
3103 178 33690	LIFT FLAP SB145/11
3103 178 34060	LIFT FLAP SB445/11
3103 178 34800	LIFT FLAP SB445/38
3103 178 34160	LIFT FLAP SB645/03
3103 178 34810	LIFT FLAP SB645/11
3103 178 34980	LIFT FLAP SB645/38
3103 178 33730	LIFT FLAP SB745/03
3103 178 34820	LIFT FLAP SB745/11
3103 178 35110	LIFT FLAP SB745/38
3103 178 34430	LIFT FLAP 20DV30/39
3103 178 34570	LIFT FLAP 45DV30/39
3103 178 34590	LIFT FLAP 65DV30/39

11.3 Front Parts List





for VR870x

Pos	Service code	Description
4	3103 178 29460	FOOT
5	2511 076 50014	SCREW 3X12
7	3103 111 02450	LEG SPRING
10	3103 110 01560	WORDMARK VR120, 402,520
	3103 110 01570	WORDMARK VR170,270x,57x,670x
	3103 110 01550	WORDMARK VR220,420,62x,720
	3103 110 01580	WORDMARK VR870x
11	2511 076 50012	SCREW 3X8
12	3103 104 27640	SIDE CAP RIGHT VR620, 622
	3103 178 34250	SIDE CAP RIGHT VR627
13	3103 104 27630	SIDE CAP LEFT VR620, 622
	3103 178 34260	SIDE CAP LEFT VR627

Pos	Service code	Description
18	3103 178 34270	FOOT VR627
	3103 104 27650	FOOT VR620, 622
41	3103 178 34170	AV-COVER **FR** VR620, 622
	3103 178 33700	AV-COVER **GB** VR620, 622
	3103 178 34200	AV-COVER **GB** VR627
	3103 178 33080	AV-COVER **GB** VR720
	3103 178 34690	AV-COVER **FR** VR720
	3103 178 34300	CINCH DOOR VR870x
	3103 198 89270	ACP35/AKP35 CONN / KEY PRINT
	3103 198 89280	AKP36 KEYPRINT

12. Spare parts list

MOBO

Various

0005	3103 104 25900	DISPLAY HOLDER
0007	3103 107 61690	TACHO HOLDER
0008	3103 107 61840	TACHO HOLDER
0020	3103 150 12050	SENSORHOLDER
0021	3103 107 61680	SENSORHOLDER
0022	3103 150 12050	SENSORHOLDER
1001	2422 543 01125	CRYSTAL 4.43MHz
1101	2422 128 02497	SWITCH long
1101	2422 128 02922	SWITCH long
1105	2422 128 02497	SWITCH
1108	2422 128 02497	SWITCH
1109	2422 128 02842	SWITCH short
1118	2422 128 02842	SWITCH
1119	2422 128 02497	SWITCH
1119	2422 128 02922	SWITCH
1122	2422 128 02842	SWITCH
1123	2422 128 02497	SWITCH
1123	2422 128 02922	SWITCH
1125	2422 128 02497	SWITCH
1125	2422 128 02922	SWITCH
1127	2422 128 02497	SWITCH
1127	2422 128 02842	SWITCH
1127	2422 128 02922	SWITCH
1152	2422 128 02497	SWITCH
1152	2422 128 02922	SWITCH
1153	2422 128 02497	SWITCH
1153	2422 128 02922	SWITCH
1156	2422 128 02497	SWITCH
1157	2422 128 02842	SWITCH
1157	2422 128 02497	SWITCH
1157	2422 128 02922	SWITCH
1158	2422 128 02922	SWITCH
1158	2422 128 02497	SWITCH
1160	2422 128 02497	SWITCH
1163	2422 128 02842	SWITCH
1163	2422 128 02497	SWITCH
1163	2422 128 02922	SWITCH
1170	2422 543 00056	CRYSTAL 32.768kHz
1171	2422 543 00761	CRYSTAL 16MHz
1201	2422 128 02842	SWITCH
1203	2422 128 02497	SWITCH
1204	2422 128 02922	SWITCH
1204	2422 128 02497	SWITCH
1205	2422 128 02497	SWITCH
1205	2422 128 02922	SWITCH
1209	2422 128 02922	SWITCH
1209	2422 128 02497	SWITCH
1213	2422 128 02497	SWITCH
1213	2422 128 02922	SWITCH
1213	2422 128 02842	SWITCH
1216	2422 128 02497	SWITCH
1217	2422 128 02497	SWITCH
1217	2422 128 02842	SWITCH
1217	2422 128 02922	SWITCH
1221	2422 128 02497	SWITCH
1222	2422 128 02842	SWITCH
1222	2422 128 02497	SWITCH
1222	2422 128 02922	SWITCH
1253	2422 128 02497	SWITCH
1253	2422 128 02922	SWITCH
1300▲	3103 100 23910	MAINS PLUG
1301▲	3103 138 86490	FUSE T1.25A
1302▲	2422 549 43073	SURGE PROTECT
1304▲	2422 086 10919	PROT 125mA
1306▲	2422 086 10956	PROT 1.6A
1308▲	2422 086 10955	PROT 1.25A
1309▲	2422 086 10514	FUSE T100mA
1501▲	2422 086 10919	PROT 125mA
1701	3112 297 12180	TUMOD TP926 MK2 BOOSTER
1702	2422 542 90081	TUMOD TCBZ4-002A BG/I/DK
1703	2422 549 44341	OFWK9656M PAL/SEC
1704	2422 549 42273	OFWJ1980M PAL I
1704	2422 549 42068	OFWG3956M SEC/NIC
1704	2422 549 41518	OFWG1961M PAL/MONO
1704	2422 549 41801	OFWG1984M PAL/STEREO
1704	9322 042 72682	OFWK3953M PALI/SECAM
1704	2422 549 42004	OFWK2955M for K1
1705	2422 549 42391	FILTER TPW 6,0/6,5MHz PAL I
1705	2422 549 41595	FILTER 5.5MHz PAL BG
1705	2422 549 41433	FILTER 6.5MHz SEC
1706	2422 549 42824	FILTER 5,5MHz PAL BG
1706	2422 549 42825	FILTER 6,0MHz PAL I
1706	2422 549 42826	FILTER 6,5MHz SEC
1707	2422 549 42826	FILTER 6,5MHz SEC
1707	2422 549 42825	FILTER 6,0MHz PAL I
1760	2422 543 01119	CRYSTAL 4MHz
1761	2422 543 00781	CRYSTAL 18.432MHz
1766	2422 549 42826	FIL CER 6MHz 5 EFCT-YS5 KB
1801	3103 107 90110	SWITCH ASSY
1802	3103 107 90110	SWITCH ASSY
1911	2422 025 14521	CONNECTOR 11 PIN
1912	2422 025 16933	CONNECTOR 9 PIN
1941	2422 026 04294	PHONES CONNECTOR
1946	3103 107 20720	CAPSTAN CONNECT
1947	2422 025 14512	CONNECTOR 3 PIN
1948	2422 025 14515	CONNECTOR 6 PIN
1951	3103 100 24010	SCART SOCKET 7133
1952	3103 100 24210	SCART SOCKET 7135
1954	3103 100 24250	TRIPLE PIN JACK
1955	2422 025 14515	CONNECTOR 6 PIN
1956	2422 026 05087	CINCH CONNECTOR
1961	2422 025 09405	CONNECTOR 2 PIN
1965	2422 025 14516	CONNECTOR 7 PIN
1969	2422 025 14532	CONNECTOR 3 PIN
1982	2422 025 16742	CONNECTOR 8 PIN

⊣⊢

2000	3198 023 41040	100 nF 25V
2001	3198 017 31030	10 nF 50V
2002	3198 017 31030	10 nF 50V
2003	3198 029 31090	10 µF 25V
2004	3198 017 31030	10 nF 50V
2005	3198 023 41040	100 nF 25V
2006	3198 029 31090	10 µF 25V
2007	3198 017 01030	10 nF 50V
2008	3198 017 32230	22 nF 25V
2009	3198 017 21050	1 µF 16V
2010	3198 017 21050	1 µF 16V
2011	3198 017 32230	22 nF 25V
2012	3198 017 31030	10 nF 50V
2013	3198 017 31030	10 nF 50V
2014	3198 024 44730	47 nF 50V
2015	3198 017 31030	10 nF 50V
2016	3198 017 31030	10 nF 50V
2017	3198 017 21050	1 µF 16V
2018	3198 023 41040	100 nF 25V
2019	3198 029 31090	10 µF 25V
2020	3198 029 31090	10 µF 25V
2021	3198 017 01040	100 nF 16V
2022	3198 029 31090	10 µF 25V
2023	3198 017 21050	1 µF 16V
2024	3198 029 04790	47 µF 6.3V
2025	3198 017 31030	10 nF 50V
2026	3198 023 41040	100 nF 25V
2027	3198 017 21050	1 µF 16V
2028	3198 017 01040	100 nF 16V
2029	3198 023 41040	100 nF 25V
2030	3198 017 31030	10 nF 50V
2031	3198 017 24740	470 nF 16V
2032	3198 016 32790	27 pF 50V
2033	3198 017 31030	10 nF 50V
2034	3198 017 31020	1 nF 50V
2035	3198 029 22290	22 µF 16V
2036	3198 029 31090	10 µF 25V
2037	3198 017 21050	1 µF 16V
2038	3198 023 21040	100 nF 25V
2039	3198 017 21050	1 µF 16V
2040	3198 017 31030	10 nF 50V
2041	3198 025 54780	4.7 µF 50V
2042	3198 017 31040	100 nF 16V
2043	3198 029 31090	10 µF 25V
2044	3198 017 21040	100 nF 50V
2045	3198 017 01040	100 nF 16V
2046	3198 017 32210	220 pF 50V
2047	3198 016 04780	4.7 pF 50V
2048	2022 552 05334	180 pF 50V
2049	3198 017 31030	10 nF 50V
2050	3198 016 32290	22 pF 50V
2051	2238 861 14391	390 pF 50V
2052	3198 016 33310	330 pF 50V
2053	3198 017 31030	10 nF 50V
2054	3198 017 31030	10 nF 50V
2055	3198 016 32790	27 pF 50V
2056	3198 016 34790	47 pF 50V
2071	3198 017 31030	10 nF 50V
2072	3198 016 31510	150 pF 50V
2073	3198 029 21010	100 µF 16V
2074	2022 552 05335	220 pF 50V
2075	3198 017 31030	10 nF 50V
2076	3198 023 41040	100 nF 25V
2077	3198 017 31040	100 nF 16V
2079	3198 016 38290	82 pF 50V
2080	3198 016 31010	100 pF 50V
2082	3198 017 31030	10 nF 50V
2083	3198 017 31030	10 nF 50V
2084	3198 029 31090	10 µF 25V
2085	3198 017 24740	470 nF 16V
2086	3198 017 31030	10 nF 50V
2087	3198 016 36810	680 pF 25V
2088	3198 017 21050	1 µF 16V
2089	3198 017 32230	22 nF 25V
2090	3198 016 32210	220 pF 50V
2096	3198 017 31040	100 nF 16V
2097	3198 016 31090	10 pF 50V
2170	3198 029 04790	47 µF 6.3V
2171	3198 023 21040	100 nF 25V
2173	3198 023 21040	100 nF 25V
2174	2020 025 90019	220 mF 5.5V
2175	3198 016 31890	18 pF 50V
2176	3198 016 31590	15 pF 50V
2177	3198 016 02290	22 pF 50V
2178	3198 016 32290	22 pF 50V
2179	3198 017 24740	470 nF 16V
2180	3198 017 31030	10 nF 50V
2181	3198 023 41040	100 nF 25V
2182	3198 029 24790	47 µF 16V
2300	3198 017 31040	100 nF 16V
2301	3198 025 51090	10 µF 50V
2302	2020 558 90442	47 pF 2kV
2303	3198 017 33320	3.3 nF 50V
2304	2020 558 90442	47 pF 2kV
2305	2020 021 91536	330 µF 16V
2308	2022 318 00108	47 nF 250V
2309	2020 021 91332	47 µF 50V
2310	2020 021 91529	22 µF 50V
2311	2020 021 91527	100 µF 10V
2312	2020 021 91528	560 µF 6.3V
2313	3198 025 01020	1000 µF 6.3V
2314	3198 023 21040	100 nF 25V
2315	3198 017 31030	10 nF 50V
2316▲	2022 330 00014	100 nF 275V
2317▲	2020 554 90127	2.2 nF 250V
2318▲	2020 021 91525	18 µF 385V
2319	3198 025 51090	10 µF 50V
2325	3198 017 31030	10 nF 50V
2327	3198 017 31040	100 nF 16V
2328	2238 910 15649	100 nF 25V
2459	3198 017 32230	22 nF 25V
2460	2022 552 05448	150 nF 50V
2461	3198 029 21010	100 µF 16V
2462	2022 020 00625	220 µF 16V
2463	3198 017 21040	100 nF 50V
2464	3198 023 41040	100 nF 25V
2465	3198 017 34730	47 nF 16V
2466	3198 017 34730	47 nF 16V
2467	3198 017 34730	47 nF 16V
2468	2022 552 05236	5.6 nF 50V
2469	3198 017 31040	100 nF 16V
2470	3198 029 21010	100 µF 16V
2471	3198 017 31040	100 nF 16V
2472	3198 017 02230	22 nF 50V
2473	3198 017 01030	10 nF 50V
2474	3198 017 21040	100 nF 50V
2475	3198 016 01010	100 pF 50V
2476	3198 017 01040	100 nF 16V
2477	3198 017 33330	33 nF 16V
2479	3198 017 34720	4.7 nF 50V
2480	3198 017 02220	2.2 nF 50V
2481	3198 029 24790	47 µF 16V
2482	3198 017 21040	100 nF 50V
2483	3198 017 31030	10 nF 50V
2484	3198 017 31030	10 nF 50V
2485	3198 023 41040	100 nF 25V
2486	3198 017 04720	4.7 nF 50V
2487	3198 025 31010	100 µF 25V
2488	3198 029 31090	10 µF 25V
2490	3198 025 31010	100 µF 25V
2500	3198 029 02210	220 µF 6.3V
2501	3198 023 41040	100 nF 25V
2502	3198 023 41040	100 nF 25V
2503	3198 023 41040	100 nF 25V
2504	3198 017 24740	470 nF 16V
2505	3198 017 34730	47 nF 16V
2506	2238 910 15649	100 nF 25V
2507	3198 016 31210	120 pF 50V
2509	3198 017 31020	1 nF 50V

2530	3198 023 41040	100 nF 25V
2531	3198 029 31090	10 µF 25V
2532	3198 017 32220	2.2 nF 50V
2533	3198 017 32220	2.2 nF 50V
2534	3198 016 31810	180 pF 50V
2535	3198 016 31810	180 pF 50V
2536	3198 017 21050	1 µF 16V
2537	3198 017 21050	1 µF 16V
2601	3198 023 41040	100 nF 25V
2602	3198 029 22290	22 µF 16V
2603	3198 029 24790	47 µF 16V
2604	3198 023 41040	100 nF 25V
2605	3198 023 41040	100 nF 25V
2606	3198 023 41040	100 nF 25V
2607	3198 029 24790	47 µF 16V
2608	3198 017 31030	10 nF 50V
2609	3198 029 24790	47 µF 16V
2610	3198 029 31090	10 µF 25V
2611	3198 023 41040	100 nF 25V
2612	3198 017 21050	1 µF 16V
2613	3198 029 31090	10 µF 25V
2614	3198 023 21040	100 nF 25V
2615	3198 016 33310	330 pF 50V
2616	3198 017 31020	1 nF 50V
2617	3198 017 32220	2.2 nF 50V
2618	3198 017 34730	47 nF 16V
2619	2022 552 05341	820 pF 50V
2620	3198 029 24790	47 µF 16V
2621	3198 017 31030	10 nF 50V
2623	3198 016 31020	1 nF 25V
2624	3198 029 21010	100 µF 16V
2625	2020 300 90611	27 nF 50V
2626	3198 017 34720	4.7 nF 50V
2627	2022 552 05234	3.9 pF 50V
2628	3198 029 22290	22 µF 16V
2630	3198 017 31030	10 nF 50V
2631	3198 017 32220	2.2 nF 50V
2632	3198 017 21050	1 µF 16V
2633	3198 029 31090	10 µF 25V
2650	3198 029 31090	10 µF 25V
2651	3198 029 31090	10 µF 25V
2652	3198 023 41040	100 nF 25V
2653	3198 017 36820	6.8 nF 50V
2654	3198 017 31030	10 nF 50V
2655	3198 029 24790	47 µF 16V
2656	3198 029 31090	10 µF 25V
2657	3198 017 42240	220 nF 16V
2658	3198 017 42240	220 nF 16V
2659	3198 017 42240	220 nF 16V
2660	3198 029 52280	2.2 µF 50V
2661	3198 017 42240	220 nF 16V
2662	3198 017 42240	220 nF 16V
2663	3198 029 52280	2.2 µF 50V
2664	3198 017 42240	220 nF 16V
2665	3198 017 42240	220 nF 16V
2666	3198 017 42240	220 nF 16V
2667	3198 017 22250	2.2 µF 10V
2668	3198 017 22250	2.2 µF 10V
2669	3198 023 21040	100 nF 25V
2670	3198 017 42240	220 nF 16V
2671	3198 029 31090	10 µF 25V
2672	3198 029 52280	2.2 µF 50V
2673	3198 029 21010	100 µF 16V
2674	3198 017 32230	22 nF 25V
2675	3198 029 24790	47 µF 16V
2676	3198 017 21050	1 µF 16V
2678	3198 017 31040	100 nF 16V
2679	3198 029 31090	10 µF 25V
2680	3198 017 36820	6.8 nF 50V
2681	3198 029 04790	47 µF 6.3V
2700	3198 016 31090	10 pF 50V
2701	2020 021 91355	2.2 µF 50V
2702	3198 023 21040	100 nF 25V
2703	3198 029 22290	22 µF 16V
2704	3198 016 34710	470 pF 50V
2705	3198 017 31030	10 nF 50V
2706	3198 029 31090	10 µF 25V
2707	3198 023 21040	100 nF 25V
2708	3198 017 42240	220 nF 16V
2709	2020 552 94914	8.2 pF 50V
2710	3198 023 41040	100 nF 25V
2712	3198 017 01020	1 nF 50V
2713	3198 016 31210	120 pF 50V
2714	3198 016 32210	220 pF 50V
2715	3198 029 52280	2.2 µF 50V
2718	3198 017 32230	22 nF 25V
2719	3198 029 22290	22 µF 16V
2720	2020 021 91527	100 µF 10V
2721	3198 023 41040	100 nF 25V
2722	3198 016 34710	470 pF 50V
2723	3198 023 41040	100 nF 25V
2724	3198 017 31030	10 nF 50V
2725	3198 017 21040	100 nF 50V
2726	3198 029 52280	2.2 µF 50V
2727	3198 016 31010	100 pF 50V
2728	3198 016 31010	100 pF 50V
2760	3198 017 33320	3.3 nF 50V
2761	3198 017 31040	100 nF 16V
2763	3198 016 36810	680 pF 25V
2764	3198 017 31030	10 nF 50V
2765	3198 017 31040	100 nF 16V
2766	3198 029 31090	10 µF 25V
2767	3198 017 31030	10 nF 50V
2768	3198 029 31090	10 µF 25V
2769	3198 029 31090	10 µF 25V
2770	3198 017 24740	470 nF 16V
2771	3198 016 34790	47 pF 50V
2772	3198 016 36810	680 pF 25V
2773	3198 017 33320	3.3 nF 50V
2775	3198 017 31030	10 nF 50V
2776	3198 025 54780	4.7 µF 50V
2778	3198 017 24740	470 nF 16V
2779	3198 017 24740	470 nF 16V
2780	2022 552 05344	4.7 nF 50V
2781	3198 017 24740	470 nF 16V
2782	3198 029 24790	47 µF 16V
2783	3198 017 31040	100 nF 16V
2784	3198 016 34790	47 pF 50V
2785	3198 017 24740	470 nF 16V
2786	3198 017 24740	470 nF 16V
2787	3198 016 33380	3.3 pF 50V
2788	3198 016 33380	3.3 pF 50V
2789	3198 017 31030	10 nF 50V
2790	3198 029 31090	10 µF 25V
2791	3198 017 31030	10 nF 50V
2792	3198 016 34790	47 pF 50V
2793	3198 017 31020	1 nF 50V
2794	3198 017 31020	1 nF 50V
2795	3198 016 31590	15 pF 50V
2800	3198 017 31040	100 nF 16V
2801	3198 016 32210	220 pF 50V
2802	3198 017 32220	2.2 nF 50V
2803	3198 025 32210	220 µF 25V
2805	3198 017 32220	2.2 nF 50V
2809	3198 029 21010	100 µF 16V
2812	3198 016 33390	33 pF 50V
2814	3198 016 36890	68 pF 50V
2815	3198 016 36890	68 pF 50V
2901	3198 017 31040	100 nF 16V
2902	3198 029 24790	47 µF 16V
2903	3198 029 31090	10 µF 25V
2904	3198 029 31090	10 µF 25V
2905	3198 023 41040	100 nF 25V
2906	3198 016 32290	22 pF 50V
2907	3198 023 41040	100 nF 25V
2908	3198 029 31090	10 µF 25V
2909	3198 023 21040	100 nF 25V
2910	3198 023 41040	100 nF 25V
2911	3198 023 41040	100 nF 25V
2912	3198 023 21040	100 nF 25V
2913	3198 023 41040	100 nF 25V
2914	3198 023 41040	100 nF 25V
2916	3198 016 34710	470 pF 50V
2917	3198 016 04710	470 pF 50V
2918	3198 017 04710	470 pF 50V
2919	3198 016 34710	470 pF 50V
2920	3198 017 04710	470 pF 50V
2921	3198 016 34710	470 pF 50V
2922	3198 029 31090	10 µF 25V
2923	3198 029 02210	220 µF 6.3V
2924	3198 016 36890	68 pF 50V
2926	3198 016 31010	100 pF 50V
2927	3198 016 01010	100 pF 50V
2930	3198 017 31020	1 nF 50V
2931	3198 017 31020	1 nF 50V
2932	3198 016 01010	100 pF 50V
2933	3198 016 31010	100 pF 50V

3000	3198 021 32220	2.2 k 0.063W
3001	3198 021 31520	1.5 k 0.063W
3002	3198 011 01820	1.8 k 0.17W
3003	3198 021 32220	2.2 k 0.063W
3004	3198 021 31020	1 k 0.063W
3005	3198 021 31020	1 k 0.063W
3006	3198 021 38220	8.2 k 0.063W
3007	3198 021 33920	3.9 k 0.063W
3008	3198 021 32250	2.2 M 0.063W
3009	2120 108 91451	1 k 0.1W
3010	3198 021 31020	1 k 0.063W
3011	3198 021 31010	100 R 0.063W
3012	3198 021 51010	100 R 0.1W
3013	3198 011 03910	390 R 0.17W
3014	3198 021 33920	3.9 k 0.063W
3015	3198 021 33910	390 R 0.063W
3016	2120 108 92621	2.7 k 1%
3017	2120 108 92618	1.8 k 1%
3018	3198 021 31020	1 k 0.063W
3019	2322 156 26801	680 R 1%
3020	2322 704 64702	4.7 k 0.063W
3021	3198 021 31510	150 R 0.063W
3022	3198 011 01020	1 k 0.17W
3023	3198 021 34730	47 k 0.063W
3024	3198 011 04730	47 k 0.17W
3025	3198 021 32210	220 R 0.063W
3026	3198 021 31050	1 M 0.063W
3027	3198 021 51080	1 R
3028	3198 021 31510	150 R 0.063W
3029	3198 021 31050	1 M 0.063W
3030	3198 021 33330	33 k 0.063W
3031	3198 021 52250	2.2 M 0.1W
3032	3198 021 36810	680 R 0.063W
3070	3198 021 31020	1 k 0.063W
3071	3198 011 04730	47 k 0.17W
3072	3198 021 31520	1.5 k 0.063W
3073	3198 021 38220	8.2 k 0.063W
3074	2120 108 92514	15 k 1%
3075	3198 021 31040	100 k 0.063W
3076	3198 021 31030	10 k 0.063W
3078	3198 021 31830	18 k 0.063W
3079	3198 021 36810	680 R 0.063W
3082	3198 011 03320	3.3 k 0.17W
3083	3198 021 31020	1 k 0.063W
3084	3198 021 32230	22 k 0.063W
3085	3198 021 32730	27 k 0.063W
3086	3198 021 32720	2.7 k 0.063W
3087	3198 021 31030	10 k 0.063W
3088	2120 368 90124	22 k POT
3089	2120 368 90119	1 k POT
3091	3198 021 38220	8.2 k 0.063W
3092	3198 011 04730	47 k 0.17W
3094	3198 021 31230	12 k 0.063W
3095	3198 021 36810	680 R 0.063W
3108	3198 021 54730	47 k 0.1W
3108	3198 021 34730	47 k 0.063W
3110	3198 021 34730	47 k 0.063W
3112	3198 021 31040	100 k 0.063W
3112	3198 021 51040	100 k 0.1W
3115	3198 021 31040	100 k 0.063W
3115	3198 021 34710	470 R 0.063W
3116	3198 021 34730	47 k 0.063W
3119	3198 021 31040	100 k 0.063W
3119	3198 021 31080	1 R 0.063W
3120	3198 021 31080	1 R 0.063W
3120	3198 021 34710	470 R 0.063W
3135	3198 021 33920	3.9 k 0.063W
3135	3198 021 31080	1 R 0.063W
3136	3198 021 31080	1 R 0.063W
3140	3198 021 35620	5.6 k 0.063W
3140	3198 021 34710	470 R 0.063W
3140	3198 021 32220	2.2 k 0.063W
3140	3198 021 31080	1 R 0.063W
3141	3198 021 34710	470 R 0.063W
3142	3198 021 38220	8.2 k 0.063W
3142	3198 021 31830	18 k 0.063W
3146	3198 021 34730	47 k 0.063W
3150	3198 021 31830	18 k 0.063W
3152	3198 021 31830	18 k 0.063W
3154	3198 021 31830	18 k 0.063W
3157	3198 021 33920	3.9 k 0.063W
3159	3198 021 38220	8.2 k 0.063W
3161	3198 021 38220	8.2 k 0.063W
3163	3198 021 35620	5.6 k 0.063W
3170▲	2120 106 90603	470 R
3171	3198 021 31830	18 k 0.063W
3172	3198 021 32210	220 R 0.063W
3173	3198 021 31080	1 R 0.063W
3174	3198 021 34730	47 k 0.063W
3175	3198 021 31030	10 k 0.063W
3176	3198 021 31080	1 R 0.063W
3300	2120 108 92624	4.7 k 1%
3302	3198 011 02210	220 R 0.17W
3303	3198 021 31030	10 k 0.063W
3305	3198 021 52240	220 k 0.1W
3306	2120 108 92624	4.7 k 1%
3307▲	2322 205 33229	22 R FUSE
3308▲	2120 106 90633	100 R
3309	2322 156 23309	33 R 1%
3312	3198 021 51080	1 R
3314	2322 156 21508	1.5 R 1%
3315	3198 012 32230	22 k 3W
3316▲	2322 205 33229	22 R FUSE
3318▲	2322 207 33102	1 k FUSE NFR25H
3319	3198 011 04780	4.7 R 0.17W
3320	3198 011 03340	330 k 0.17W
3321	3198 021 32240	200 k 0.063W
3324▲	2322 242 13335	3.3 M
3325▲	2322 242 13335	3.3 M
3326	2120 103 90018	220 R
3327	3198 011 01820	1.8 k 0.17W

3328	2322 156 23309	33 R 1%
3329	3198 011 04730	47 k 0.17W
3330	3198 021 34710	470 R 0.063W
3331	2322 156 21508	1.5 R 1%
3332	3198 021 34710	470 R 0.063W
3334	3198 011 01210	120 R 0.17W
3336	2120 108 92632	33 k 1%
3343	3198 021 31040	100 k 0.063W
3344	3198 021 32230	22 k 0.063W
3345	3198 021 34730	47 k 0.063W
3347	3198 021 51080	1 R
3350	3198 021 31040	100 k 0.063W
3351	3198 021 31030	10 k 0.063W
3352	3198 021 31030	10 k 0.063W
3353	3198 021 34720	4.7 k 0.063W
3459	3198 021 32210	220 R 0.063W
3460	3198 021 52230	22 k 0.1W
3461	3198 021 54710	470 R 0.1W
3462	3198 021 34710	470 R 0.063W
3463	3198 021 34710	470 R 0.063W
3464▲	2322 205 33228	2.2 R NFR25
3465	2322 193 95074	0.47 R
3466	3198 021 34710	470 R 0.063W
3467	3198 021 51080	1 R
3468	3198 021 58230	82 k 0.1W
3470	3198 021 32210	220 R 0.063W
3471	3198 021 34720	4.7 k 0.063W
3472	3198 021 33310	330 R 0.063W
3473	3198 021 35620	5.6 k 0.063W
3474	3198 021 54730	47 k 0.1W
3475	3198 011 01830	18 k 0.17W
3476	3198 011 01040	100 k 0.17W
3477	2120 101 74274	270 k
3478	2120 101 74274	270 k
3479	3198 021 32250	2.2 M 0.063W
3480	3198 011 03910	390 R 0.17W
3481	3198 011 03330	33 k 0.17W
3482	3198 011 03330	33 k 0.17W
3484	3198 011 01030	10 k 0.17W
3485	3198 011 04720	4.7 k 0.17W
3486	3198 011 01030	10 k 0.17W
3489	3198 011 03910	390 R 0.17W
3490	2120 108 93963	200 k 0.1W
3502	3198 021 36830	68 k 0.063W
3503	3198 021 38210	820 R 0.063W
3504	3198 011 01010	100 R 0.17W
3505	3198 011 01010	100 R 0.17W
3506	3198 021 38210	820 R 0.063W
3507	3198 021 33320	3.3 R 0.063W
3508	2120 108 91725	270 k 0.1W
3509	3198 021 53320	3.3 k 0.1W
3510	3198 011 04790	47 R 0.17W
3512	3198 011 04790	47 R 0.17W
3521	3198 021 31010	100 R 0.063W
3530	3198 021 34720	4.7 k 0.063W
3531	3198 021 31040	100 k 0.063W
3532	3198 021 32230	22 k 0.063W
3533	3198 021 31530	15 k 0.063W
3534	3198 021 34720	4.7 k 0.063W
3535	3198 021 34720	4.7 k 0.063W
3536	3198 021 32220	2.2 k 0.063W
3537	3198 021 32220	2.2 k 0.063W
3538	3198 021 34720	4.7 k 0.063W
3539	3198 021 31060	10 M 0.063W
3540	3198 021 31060	10 M 0.063W
3541	3198 021 33330	33 k 0.063W
3542	3198 021 33330	33 k 0.063W
3543	3198 021 33330	33 k 0.063W
3544	3198 021 33330	33 k 0.063W
3545	3198 021 33330	33 k 0.063W
3546	3198 021 33330	33 k 0.063W
3547	3198 021 31030	10 k 0.063W
3548	3198 021 53940	390 k 0.1W
3549	3198 021 31030	10 k 0.063W
3550	3198 021 31030	10 k 0.063W
3601	3198 021 34730	47 k 0.063W
3602	3198 011 04730	47 k 0.17W
3603	3198 021 38220	8.2 k 0.063W
3604	3198 021 38220	8.2 k 0.063W
3605	3198 021 32250	2.2 M 0.063W
3606	3198 021 32730	27 k 0.063W
3607	3198 021 33320	3.3 R 0.063W
3608	3198 011 01210	120 R 0.17W
3609	3198 011 01210	120 R 0.17W
3610	3198 021 31030	10 k 0.063W
3611	3198 021 33320	3.3 R 0.063W
3612	3198 021 34750	4.7 M 0.063W
3613	3198 021 33390	33 R 0.063W
3614	3198 021 31830	18 k 0.063W
3615	3198 021 32240	200 k 0.063W
3616	3198 021 34720	4.7 k 0.063W
3617	3198 021 34720	4.7 k 0.063W
3619	3198 021 31030	10 k 0.063W
3621	3198 021 32230	22 k 0.063W
3622	3198 021 31230	12 k 0.063W
3623	3198 021 32220	2.2 k 0.063W
3624	3198 021 35610	560 R 0.063W
3625	2120 368 90126	100 k POT
3626	3198 021 34730	47 k 0.063W
3627	3198 021 38220	8.2 k 0.063W
3629	3198 021 31230	12 k 0.063W
3630	3198 021 31090	10 R 0.063W
3631	3198 021 32290	22 R 0.063W
3632	3198 021 31230	12 k 0.063W
3633	3198 021 32220	2.2 k 0.063W
3634	3198 021 34730	47 k 0.063W
3635	3198 021 33330	33 k 0.063W
3636	3198 021 53940	390 k 0.1W
3637	3198 021 31510	150 R 0.063W
3638	2120 109 09158	1.5 R
3639	3198 021 34730	47 k 0.063W
3640	3198 021 35610	560 R 0.063W
3641	3198 021 36810	680 R 0.063W
3642	3198 021 32230	22 k 0.063W
3644	3198 021 31040	100 k 0.063W
3650	2120 108 92633	39 k 1%
3651	3198 011 01010	100 R 0.17W
3652	3198 011 01010	100 R 0.17W
3653	3198 021 31020	1 k 0.063W
3654	3198 021 33330	33 k 0.063W
3655	3198 021 32720	2.7 k 0.063W
3656	3198 021 33330	33 k 0.063W
3657	3198 021 32720	2.7 k 0.063W
3658	3198 021 34710	470 R 0.063W
3659	3198 021 34750	4.7 M 0.063W
3660	3198 021 31040	100 k 0.063W
3661	3198 021 51040	100 k 0.1W
3700	3198 021 34710	470 R 0.063W
3701	3198 021 33930	39 k 0.063W
3702	3198 021 31040	100 k 0.063W
3703	3198 021 31830	18 k 0.063W
3704	3198 021 33330	33 k 0.063W
3705	3198 011 06810	680 R 0.17W
3706	3198 021 33310	330 R 0.063W
3707	2120 368 90124	22 k POT
3708	3198 021 51830	18 k 0.1W
3709	3198 021 31540	150 k 0.063W
3710	3198 021 32210	220 R 0.063W
3711	3198 021 33320	3.3 R 0.063W
3712	3198 021 31020	1 k 0.063W
3714	3198 021 51010	100 R 0.1W
3715	3198 021 53310	330 R 0.1W
3715	3198 021 52210	220 R 0.1W
3716	3198 011 02220	2.2 k 0.17W
3717	3198 021 32720	2.7 k 0.063W
3718	3198 021 32220	2.2 k 0.063W
3719	3198 021 36820	6.8 k 0.063W
3720	3198 021 34710	470 R 0.063W
3721	3198 021 34720	4.7 k 0.063W
3722	3198 021 51010	100 R 0.1W
3723	3198 021 31010	100 R 0.063W
3724	3198 021 32230	22 k 0.063W
3725	3198 021 34710	470 R 0.063W
3726	3198 011 01020	1 k 0.17W
3727	3198 021 35620	5.6 k 0.063W
3728	3198 021 35620	5.6 k 0.063W
3729	3198 021 35620	5.6 k 0.063W
3730	2120 368 90126	100 k POT
3731	3198 011 04710	470 R 0.17W
3732	3198 021 33310	330 R 0.063W
3733	3198 021 32720	2.7 k 0.063W
3734	3198 021 31510	150 R 0.063W
3762	3198 021 35620	5.6 k 0.063W
3763	3198 021 90030	jumper
3764	3198 021 34730	47 k 0.063W
3765	3198 011 01010	100 R 0.17W
3766	3198 011 01010	100 R 0.17W
3767	3198 011 01010	100 R 0.17W
3768	3198 021 35620	5.6 k 0.063W
3769	3198 011 01010	100 R 0.17W
3770	3198 021 31020	1 k 0.063W
3771	2120 108 91686	7.5 k
3775	3198 021 54710	470 R 0.1W
3776	3198 021 34710	470 R 0.063W
3796	3198 021 31020	1 k 0.063W
3797	3198 011 01020	1 k 0.17W
3798	3198 011 01020	1 k 0.17W
3799	3198 011 01020	1 k 0.17W
3800▲	2120 106 90597	10 R FUSE
3801	3198 021 32730	27 k 0.063W
3802	3198 011 04780	4.7 R 0.17W
3803	3198 021 32220	2.2 k 0.063W
3804	3198 021 35630	56 k 0.063W
3805▲	2120 106 90597	10 R FUSE
3806	3198 021 54730	47 k 0.1W
3807	3198 021 31040	100 k 0.063W
3808	3198 011 03310	330 R 0.17W
3809	3198 011 03310	330 R 0.17W
3810	3198 011 03310	330 R 0.17W
3811	3198 011 03310	330 R 0.17W
3812	3198 011 08210	820 R 0.17W
3813	3198 021 31030	10 k 0.063W
3814	3198 021 32210	220 R 0.063W
3815	3198 021 33330	33 k 0.063W
3816	3198 011 04710	470 R 0.17W
3817	3198 011 04710	470 R 0.17W
3818	3198 021 36820	6.8 k 0.063W
3819	3198 011 01030	10 k 0.17W
3820	3198 011 04710	470 R 0.17W
3821	3198 011 01010	100 R 0.17W
3822	3198 021 34730	47 k 0.063W
3823	3198 021 34730	47 k 0.063W
3824	3198 011 01030	10 k 0.17W
3825	3198 011 01010	100 R 0.17W
3826	3198 021 31030	10 k 0.063W
3827	3198 011 01020	1 k 0.17W
3828	3198 021 31030	10 k 0.063W
3829	3198 021 31020	1 k 0.063W
3830	3198 021 32210	220 R 0.063W
3831	3198 021 32220	2.2 k 0.063W
3832	3198 021 31030	10 k 0.063W
3833	3198 011 01030	10 k 0.17W
3834	3198 021 34710	470 R 0.063W
3835	3198 011 08220	8.2 k 0.17W
3836	3198 011 01020	1 k 0.17W
3837	3198 011 01030	10 k 0.17W
3838	3198 011 01030	10 k 0.17W
3839	3198 021 51030	10 k 0.1W
3840	3198 021 31020	1 k 0.063W
3841	3198 021 31020	1 k 0.063W
3842	3198 011 08220	8.2 k 0.17W
3843	3198 021 31020	1 k 0.063W
3844	3198 011 01030	10 k 0.17W
3845	3198 021 31020	1 k 0.063W
3846	3198 011 01010	100 R 0.17W
3847	3198 021 32220	2.2 k 0.063W
3848	3198 011 01010	100 R 0.17W
3849	3198 021 34710	470 R 0.063W
3850	3198 011 01030	10 k 0.17W
3851	3198 011 02220	2.2 k 0.17W
3852	3198 011 02220	2.2 k 0.17W
3853	3198 021 34710	470 R 0.063W
3854	3198 021 32230	22 k 0.063W
3855	3198 021 32220	2.2 k 0.063W
3856	3198 011 02220	2.2 k 0.17W
3857	3198 021 31030	10 k 0.063W
3858	3198 011 01030	10 k 0.17W
3859	3198 021 31020	1 k 0.063W
3860	3198 021 34720	4.7 k 0.063W
3861	3198 021 34710	470 R 0.063W
3862	3198 011 04730	47 k 0.17W
3863	3198 021 31530	15 k 0.063W
3864	3198 021 34730	47 k 0.063W
3865	3198 021 31830	18 k 0.063W
3866	3198 021 31020	1 k 0.063W
3867	3198 011 01030	10 k 0.17W
3868	3198 011 01030	10 k 0.17W
3869	3198 021 31020	1 k 0.063W
3870	3198 021 31830	18 k 0.063W
3871	3198 021 31030	10 k 0.063W
3872	3198 021 51020	1 k 0.1W
3874	3198 021 31830	18 k 0.063W
3875	3198 021 34720	4.7 k 0.063W
3876	3198 021 34720	4.7 k 0.063W
3878	3198 021 32220	2.2 k 0.063W
3879	3198 021 31030	10 k 0.063W
3880	3198 021 31080	1 R 0.063W
3881	3198 021 51830	18 k 0.1W
3882	3198 011 01030	10 k 0.17W
3883	3198 021 32230	22 k 0.063W
3885	3198 021 51080	1 R
3886	3198 011 03920	3.9 k 0.17W
3887	3198 021 32230	22 k 0.063W
3888	3198 021 32230	22 k 0.063W
3889	3198 021 31030	10 k 0.063W
3890	3198 011 01030	10 k 0.17W
3891	3198 021 34720	4.7 k 0.063W
3896	3198 021 34720	4.7 k 0.063W
3897	3198 021 34730	47 k 0.063W
3898	3198 021 31520	1.5 k 0.063W
3899	3198 011 01030	10 k 0.17W
3901	3198 021 32220	2.2 k 0.063W
3901	3198 021 51030	10 k 0.1W
3902	3198 021 37590	75 R 0.063W
3903	2122 551 00008	VDR MAX 21V
3903	2322 574 10402	VDR MAX 21V
3904	2122 551 00008	VDR MAX 21V
3904	2322 574 10402	VDR MAX 21V
3905	2122 551 00008	VDR MAX 21V
3905	2322 574 10402	VDR MAX 21V
3906	2322 574 10402	VDR MAX 21V
3906	2122 551 00008	VDR MAX 21V

3907	2122 551 00008	VDR MAX 21V
3907	2322 574 10402	VDR MAX 21V
3908	2322 574 10402	VDR MAX 21V
3908	2122 551 00008	VDR MAX 21V
3909	2122 551 00008	VDR MAX 21V
3909	2322 574 10402	VDR MAX 21V
3910	3198 021 31040	100 k 0.063W
3911	3198 021 31040	100 k 0.063W
3912	3198 021 37590	75 R 0.063W
3913	3198 021 37590	75 R 0.063W
3914	3198 021 36820	6.8 k 0.063W
3915	2322 574 10402	VDR MAX 21V
3915	2122 551 00008	VDR MAX 21V
3916	3198 021 56820	6.8 k 0.1W
3917	3198 021 34720	4.7 k 0.063W
3918	3198 021 36820	6.8 k 0.063W
3919	3198 021 51040	100 k 0.1W
3920	3198 011 06820	6.8 k 0.17W
3921	3198 021 37590	75 R 0.063W
3922	3198 011 02210	220 R 0.17W
3923	3198 021 32210	220 R 0.063W
3924	3198 011 02210	220 R 0.17W
3925	3198 021 52210	220 R 0.1W
3926	3198 021 31040	100 k 0.063W
3927	3198 021 34720	4.7 k 0.063W
3928	3198 021 34710	470 R 0.063W
3929	3198 021 37590	75 R 0.063W
3930	3198 021 32210	220 R 0.063W
3931	3198 021 32210	220 R 0.063W
3932	3198 021 32210	220 R 0.063W
3933	3198 021 52210	220 R 0.1W
3934	3198 021 34710	470 R 0.063W
3935	3198 021 34790	47 R 0.063W
3936	3198 021 31030	10 k 0.063W
3937	3198 021 34790	47 R 0.063W
3938	3198 021 31020	1 k 0.063W
3939	3198 011 08210	820 R 0.17W
3940	3198 021 32210	220 R 0.063W
3941	3198 021 32210	220 R 0.063W
3942	3198 021 33910	390 R 0.063W
3943	3198 021 31030	10 k 0.063W
3944	3198 021 36830	68 k 0.063W
3945	3198 021 36820	6.8 k 0.063W
3946	3198 021 34720	4.7 k 0.063W
3947	3198 021 34790	47 R 0.063W
3948	3198 021 51010	100 R 0.1W
3949	3198 011 01010	100 R 0.17W
3953	3198 011 01040	100 k 0.17W
3954	3198 021 51040	100 k 0.1W
3955	3198 021 31040	100 k 0.063W
3957	2122 551 00008	VDR MAX 21V
3957	2322 574 10402	VDR MAX 21V
3958	2122 551 00008	VDR MAX 21V
3958	2322 574 10402	VDR MAX 21V
3959	2122 551 00008	VDR MAX 21V
3959	2322 574 10402	VDR MAX 21V
3960	2122 551 00008	VDR MAX 21V
3960	2322 574 10402	VDR MAX 21V
3961	3198 021 51080	1 R
3961	3198 021 31510	150 R 0.063W
3962	3198 011 06820	6.8 k 0.17W
3962	3198 011 01020	1 k 0.17W
3963	3198 021 51010	100 R 0.1W
3964	3198 021 31010	100 R 0.063W
3965	3198 021 31010	100 R 0.063W
3966	3198 011 06820	6.8 k 0.17W
3966	3198 011 01020	1 k 0.17W
3967	3198 021 51010	100 R 0.1W

5000	2422 535 97877	10 µH
5001	2422 535 97877	10 µH
5002	2422 535 97877	10 µH
5003	2422 535 97877	10 µH
5004	3198 018 15690	56 µH
5005	3198 018 11090	10 µH
5006	3198 018 11010	100 µH
5007	2422 535 94885	470 µH
5071	3198 018 16880	6.8 µH
5072	2422 535 97877	10 µH
5073	3198 018 15690	56 µH
5074	3198 018 12290	22 µH
5075	3198 018 12790	27 µH
5170	2422 535 97877	10 µH
5300	3198 018 90020	BEAD 100mH z
5301▲	3128 138 39060	MAINS TRANSFORMER
5302	3198 018 21090	10 µH
5304	2422 535 94639	10 µH
5305▲	2422 549 44287	MAINS TER
5306▲	2422 535 94674	330 nH
5307	3198 018 90080	COIL
5308	3198 018 90080	COIL
5460▲	2422 535 94674	330 nH
5500	3198 018 11090	10 µH
5501	3198 018 11090	10 µH
5502	3198 018 11090	10 µH
5600	3103 138 24910	COIL ASSY
5601	2422 549 44607	EMI100mH z 600RR
5602	2422 549 44607	EMI100mH z 600RR
5603	2422 549 44607	EMI100mH z 600RR
5604	2422 549 44607	EMI100mH z 600RR
5605	3198 018 90080	COIL
5610	2422 535 97877	10 µH
5650	3198 018 26880	6.8µH
5651	3198 018 12290	22 µH
5701	3198 018 11590	15 µH
5701	3198 018 11090	10 µH
5702	2422 549 44162	COIL VAR
5703	3198 018 90080	COIL
5704	2422 549 44162	COIL VAR
5706	3198 018 16880	6.8 µH
5707	2422 535 97875	6.8 µH
5708	3198 018 11090	10 µH
5709	3198 018 90090	COIL
5710	3198 018 13990	39 µH
5760	3198 018 21090	10 µH
5761	3198 018 21010	COIL
5762	3198 018 21090	10 µH
5901	2422 535 97877	10 µH
5904	2422 535 94306	COIL
5905	3198 018 90080	COIL
5906	3198 018 90080	COIL

6170	9322 155 82667	IR SENSOR TSOP2236
6171	9336 247 60133	BAT85
6300	9337 234 20133	BYD33J
6301	9322 103 46673	SBYV27-200
6302	9322 126 71673	BYT42M
6304	9334 515 80673	1N4003
6305	9334 515 80673	1N4003
6306	9337 234 00133	BYD33D
6307	3198 010 10070	BAV21
6308	9337 234 00133	BYD33D
6309	9322 128 68682	SB360
6310	9338 386 60673	1N4006GP
6311	9338 386 60673	1N4006GP
6312	9338 386 60673	1N4006GP
6313	9338 386 60673	1N4006GP
6315	3198 010 54780	BZX79-B4V7
6316	3198 010 53980	BZX79-B3V9
6317	9322 128 15685	MCL4148(TEGO)R
6460	3103 138 87290	Kit: 2x Sens. + 1x LED
6601	9322 145 52685	BZM55-B7V5 R
6602	9322 129 41685	BZM55C12
6702	9340 255 20115	BA792
6760	3198 010 10010	1N4148
6761	9322 128 15685	DIO SIG MCL4148
6801	9336 247 60133	BAT85
6802	9340 386 40115	BZX284-C6V8
6802	9322 129 38685	BZM55-C6V8
6803	9322 129 38685	BZM55-C6V8
6803	9340 386 40115	BZX284-C6V8
6804	3198 010 10010	1N4148
6805	3198 010 10010	1N4148
6901	9340 386 40115	BZX284-C6V8
6902	9322 032 16673	MTZJ12C
6903	9322 032 16673	MTZJ12C
6904	9322 129 41685	BZM55C12
6905	9340 386 40115	BZX284-C6V8
6905	9322 129 38685	BZM55-C6V8
6906	9322 129 38685	BZM55-C6V8
6907	9322 129 41685	BZM55C12
6908	9340 386 40115	BZX284-C6V8
6908	9322 129 38685	BZM55-C6V8
6909	9322 129 41685	BZM55C12
6910	9322 129 41685	BZM55C12
6911	9340 386 40115	BZX284-C6V8
6911	9322 129 38685	BZM55-C6V8
6912	9340 386 40115	BZX284-C6V8
6912	9322 129 38685	BZM55-C6V8
6913	9322 129 41685	BZM55C12

7002	9330 921 11215	BFS20
7003	9330 921 11215	BFS20
7004	8203 107 03610	LA71595BM(TSAJ)
7005	3198 010 42310	BC847BW
7006	3198 010 42320	BC857BW
7008	3198 010 42310	BC847BW
7009	3198 010 44220	DTA124EU
7010	3198 010 42310	BC847BW
7071	3198 010 42320	BC857BW
7072	9322 147 59682	LA7339A
7073	3198 010 42310	BC847BW
7075	3198 010 42310	BC847BW
7077	3198 010 42310	BC847BW
7170	2722 171 07186	DISPLAY
7172	3198 010 44320	DTC124EU
7300▲	9322 127 19682	OPT CP TCET1101G
7301	9322 086 97676	TL431ACZ-AP S
7302▲	9322 162 02687	FET POW STP4NC60
7303	9322 136 56682	MC44608P40
7306	9322 163 75685	FET SIG SI2306DS(VISH)
7307	3198 010 44320	DTC124EU
7308	3198 020 43430	BC327-25
7309	3198 010 42310	BC847BW
7310	3198 010 44320	DTC124EU
7315	3198 010 42310	BC847BW
7316	3198 010 42320	BC857BW
7350	3198 020 43530	BC337-25
7351	3198 010 42320	BC857BW
7461	3103 138 87290	Kit: 2x Sens. + 1x LED
7462	3103 138 87290	Kit: 2x Sens. + 1x LED
7463	9322 164 65668	M63100BFP(MITJ) L
7464	9322 097 89682	OPT CP TCRT5000L
7465	9322 097 89682	OPT CP TCRT5000L
7466	9322 097 91682	OPT CP TCST1030L
7501	3198 010 42320	BC857BW
7502	9322 136 21668	SDA5652-2X
7530	9339 476 70668	LM339DT
7531	3198 010 42310	BC847BW
7532	3198 010 42310	BC847BW
7601	3198 010 42310	BC847BW
7602	9335 897 30215	BC856B
7603	9331 795 40126	BC327-40
7604	9335 895 60215	BC846B
7606	3198 010 42310	BC847BW
7607	9335 895 60215	BC846B
7608	3198 010 43240	BC817-40
7650	9352 631 46557	TDA9605H/N2
7701	9333 729 60653	HEF4053BT
7702	3198 010 44320	DTC124EU
7703	3198 010 42310	BC847BW
7704	3198 010 42320	BC857BW
7705	9352 606 11118	TDA9818T/V1 R
7705	9352 621 13118	TDA9817T/V1 R
7706	3198 010 42310	BC847BW
7760	9352 640 81557	TDA9873HZ
7761	9322 147 97668	MSP3415D-QG-B3
7800	3198 010 42310	BC847BW
7801	3198 010 42310	BC847BW
7802	3198 010 42310	BC847BW
7803	3198 010 42320	BC857BW
7804	3198 020 43530	BC337-25
7807	3198 010 42310	BC847BW
7808	3198 010 42310	BC847BW
7809	3198 010 44220	DTA124EU
7811	3198 010 42310	BC847BW
7812	9331 795 40126	BC327-40
7818	9322 120 64668	M24C08-MN6
7818	9322 121 51668	M24C16-MN6 (ST00) R
7899	3103 165 13570	TMP93CT76F/AC3P1-xU
7899	3103 165 13590	TMP93CW76F/AC3P7-xU
7899	3103 165 13580	TMP93CW76F/AC3B1-xU
7904	9322 124 28682	STV6401
7905	3198 010 42040	BC847C
7906	3198 010 42040	BC847C
7907	3198 010 42310	BC847BW
7908	3198 010 42310	BC847BW
7909	3198 010 42320	BC857BW
7910	3198 010 42310	BC847BW
7911	9333 729 60653	HEF4053BT
7912	3198 010 42310	BC847BW
7913	3198 010 43240	BC817-40
7914	3198 010 42310	BC847BW
9759	3198 021 90020	JUMPER

ACP1/ACP10

Various

1950	2422 025 14535	CONNECTOR 6PIN
1951	3103 100 24170	CINCH YELLOW
1952	3103 100 24160	CINCH RED
1953	3103 100 24150	CINCH WHITE

⊣⊢

2401	2222 861 14471	470 pF
2402	2238 910 15649	100 nF 25V
2403	3198 017 21050	1 µF 16V
2404	2222 861 14471	470 pF
2405	3198 017 21050	1 µF 16V
2406	2238 910 15649	100 nF 25V
2412	2122 551 00008	VDR MAX 21V

⊣▭⊢

3000	2422 549 41993	IND FXD100M HZ600Ω
3401	3198 021 57590	75 R 0.1W
3402	3198 021 51050	1 M 0.1W
3403	3198 021 51050	1 M 0.1W
3404	3198 021 54740	470 k 0.1W
3405	3198 021 56840	680 k 0.1W
3406	3198 021 54720	4.7 k 0.1W
3407	3198 021 54740	470 k 0.1W
3408	3198 021 56840	680 k 0.1W
3409	3198 021 54720	4.7 k 0.1W
3410	3198 021 51510	150 R 0.1W
3420	2122 551 00008	VDR MAX 21V
3421	2122 551 00008	VDR MAX 21V
3900	3198 021 90020	CHIP jumper
3901	3198 021 90020	CHIP jumper
3902	3198 021 90020	CHIP jumper
3903	3198 021 90020	CHIP jumper

⊣∿⊢

5001	2422 535 94342	220 µH
5002	2422 535 94342	220 µH
5003	2422 535 94338	100 µH
5004	2422 535 94338	100 µH

⊣▶⊢

6000	3198 010 21290	BZX79-C12
6000	9340 387 00115	BZX284-C12 for ACP10 only
6001	3198 010 21290	BZX79-C12
6001	9340 387 00115	BZX284-C12 for ACP10 only
6002	3198 010 21290	BZX79-C12
6002	9340 387 00115	BZX284-C12 for ACP10 only
6003	3198 010 21290	BZX79-C12
6003	9340 387 00115	BZX284-C12 for ACP10 only

7001	3198 010 42040	BC847C
7002	3198 010 42040	BC847C

QBOE1/QBOG1

Various

1103	2422 025 14535	CONNECTOR 6PIN
1106	3103 100 23840	CINCH WHITE
1107	3103 100 23830	CINCH RED
1108	3103 100 23820	CINCH YELLOW

⊣⊢

2401	3198 016 04710	470 pF 50V
2402	3198 017 21040	100 nF 50V
2403	3198 017 21050	1 µF 16V
2404	3198 016 04710	470 pF 50V
2405	3198 017 21050	1 µF 16V
2406	3198 017 21040	100 nF 50V
2410	2122 551 00008	VDR MAX 21V
2411	2122 551 00008	VDR MAX 21V
2412	2122 551 00008	VDR MAX 21V

⊣▭⊢

3401	3198 021 57590	75 R 0.1W
3402	3198 021 51050	1 M 0.1W
3403	3198 021 51050	1 M 0.1W
3404	3198 021 54740	470 k 0.1W
3405	3198 021 56840	680 k 0.1W
3406	3198 021 54720	4.7 k 0.1W
3407	3198 021 54740	470 k 0.1W
3408	3198 021 56840	680 k 0.1W
3409	3198 021 54720	4.7 k 0.1W
3410	3198 021 51510	150 R 0.1W
3903	3198 021 90020	CHIP jumper

⊣∿⊢

5001	3198 018 02210	220 µF
5002	3198 018 02210	220 µF
5003	3198 018 01010	100 µF
5004	3198 018 01010	100 µF
5005	2422 549 41993	100mH z 600R

⊣▶⊢

6000	9322 129 41685	BZM55C12
6000	9322 129 30673	BZM55C12 for QBOG1 only
6001	9322 129 41685	BZM55C12
6001	9322 129 30673	BZM55C12 for QBOG1 only
6002	9322 129 41685	BZM55C12
6002	9322 129 30673	BZM55C12 for QBOG1 only
6003	9322 129 41685	BZM55C12
6003	9322 129 30673	BZM55C12 for QBOG1 only

7001	3198 010 42080	BC848C
7002	3198 010 42080	BC848C

CABLES

8001	310314026250	FFC 7POL TD1-1960
8002	310314027520	CABLE TREE TD2-1962
8003	310314026270	FFCTD3-1944 1710-1750
8004	310314026280	FFCTD4-1930
8005	310314026430	FFC 1901-1945
8006	310314026420	FFC 1103-1711
	4822 321 10886	MAINS CORD (+FUSE) for UK
	4822 321 10249	MAINS CORD
	4822 320 50377	ANTENNA cable
	4822 321 63002	SCART CABLE

SUB MODULES

3103 198 82600	ACP1
3103 198 84520	ACP10
3103 198 89270	ACP35/AKP35
3103 198 89280	AKP36
3103 198 84530	ASP10
3103 198 69920	QBOE1
3103 198 69910	QBOG1
3103 198 68210	QKP21