

Service Manual

General Description
Adjustment Procedures
Block / Schematic Diagrams
Exploded Views / Parts List

DVD-Recorder
LOEWE



MODELS

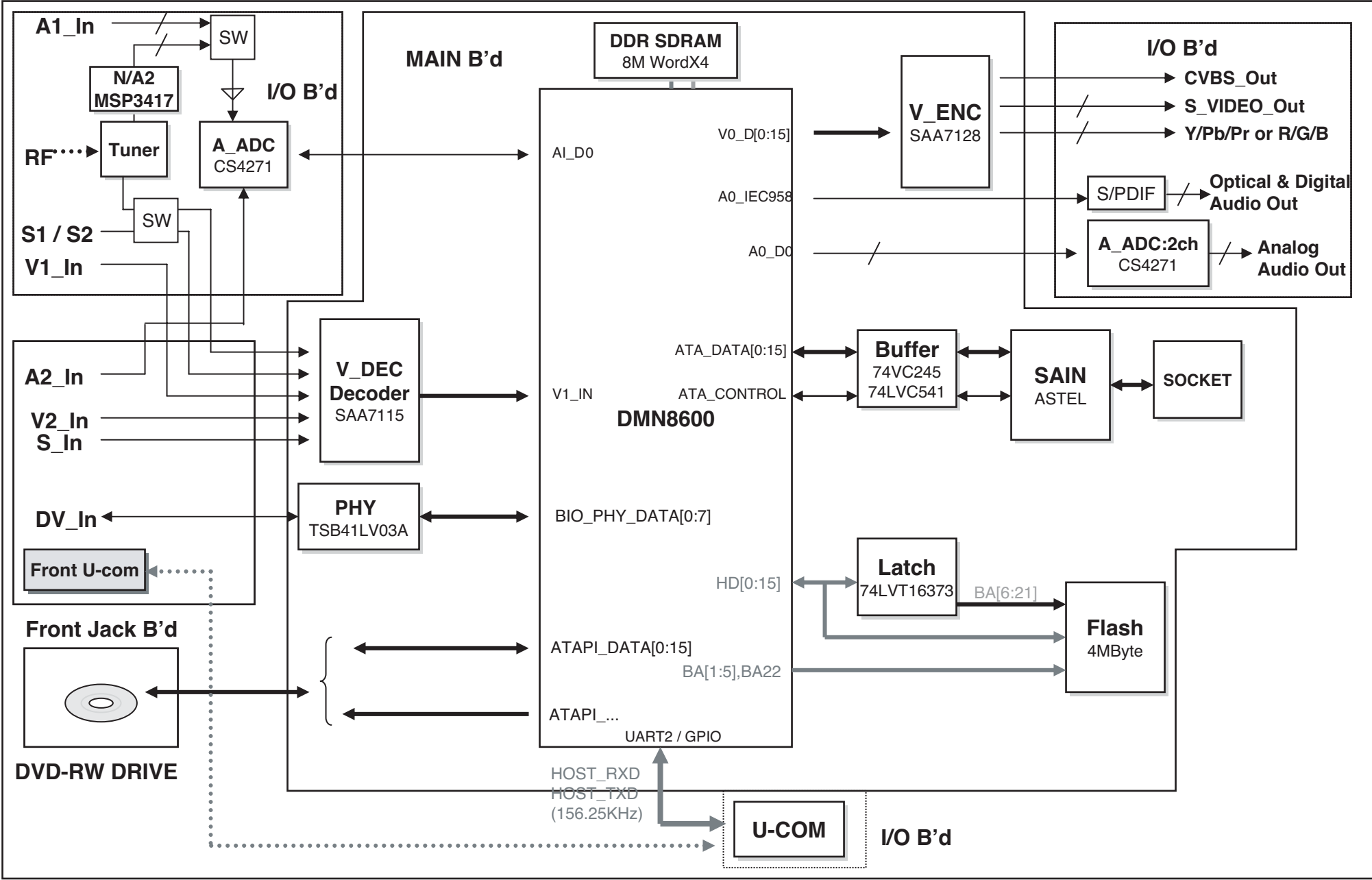
CENTROS 1102
Art.-Nr. 64501

CENTROS 1172
Art.-Nr. 64511

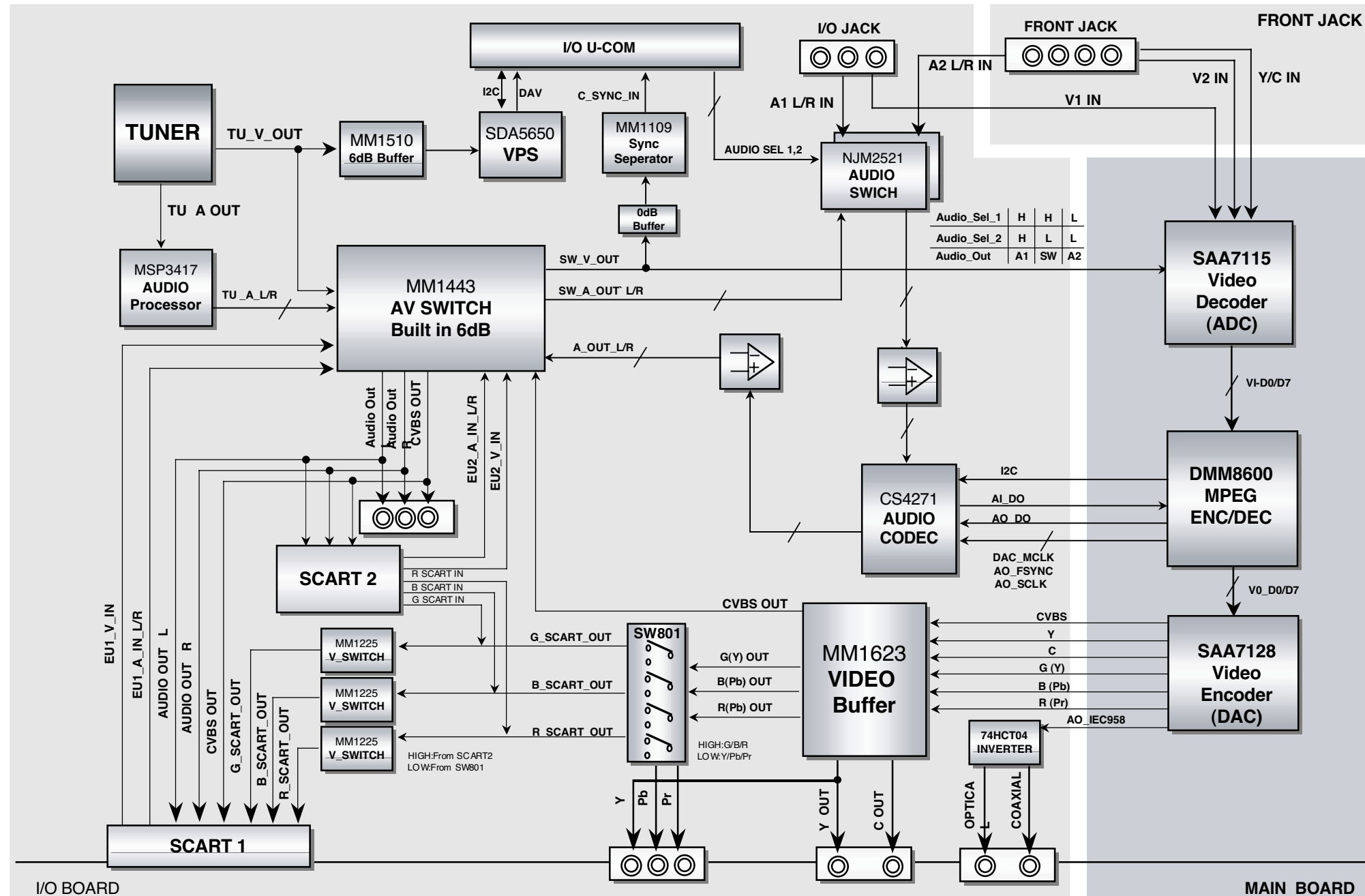
LOEWE.

BLOCK DIAGRAMS

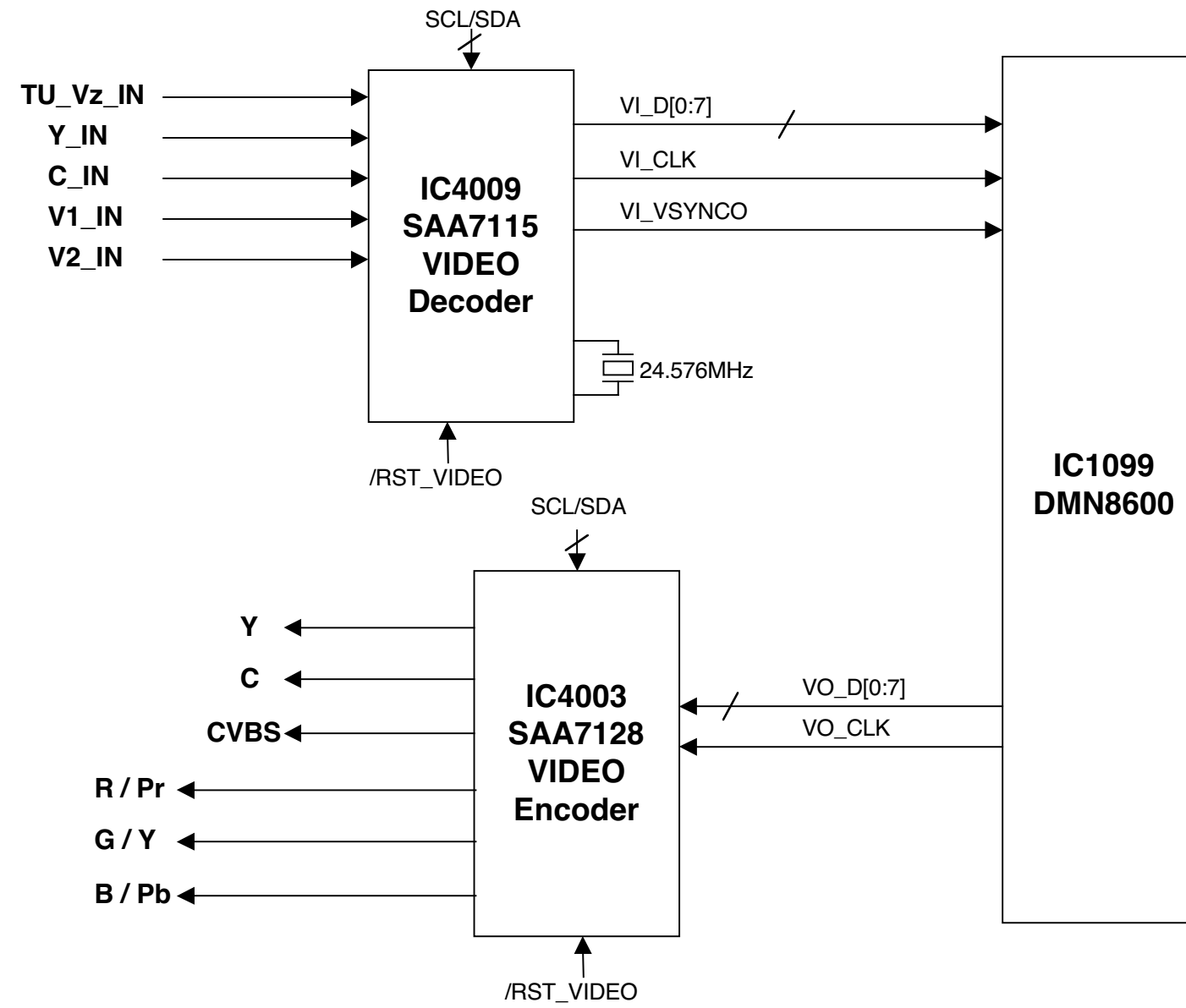
1. LSI Overall Block Diagram



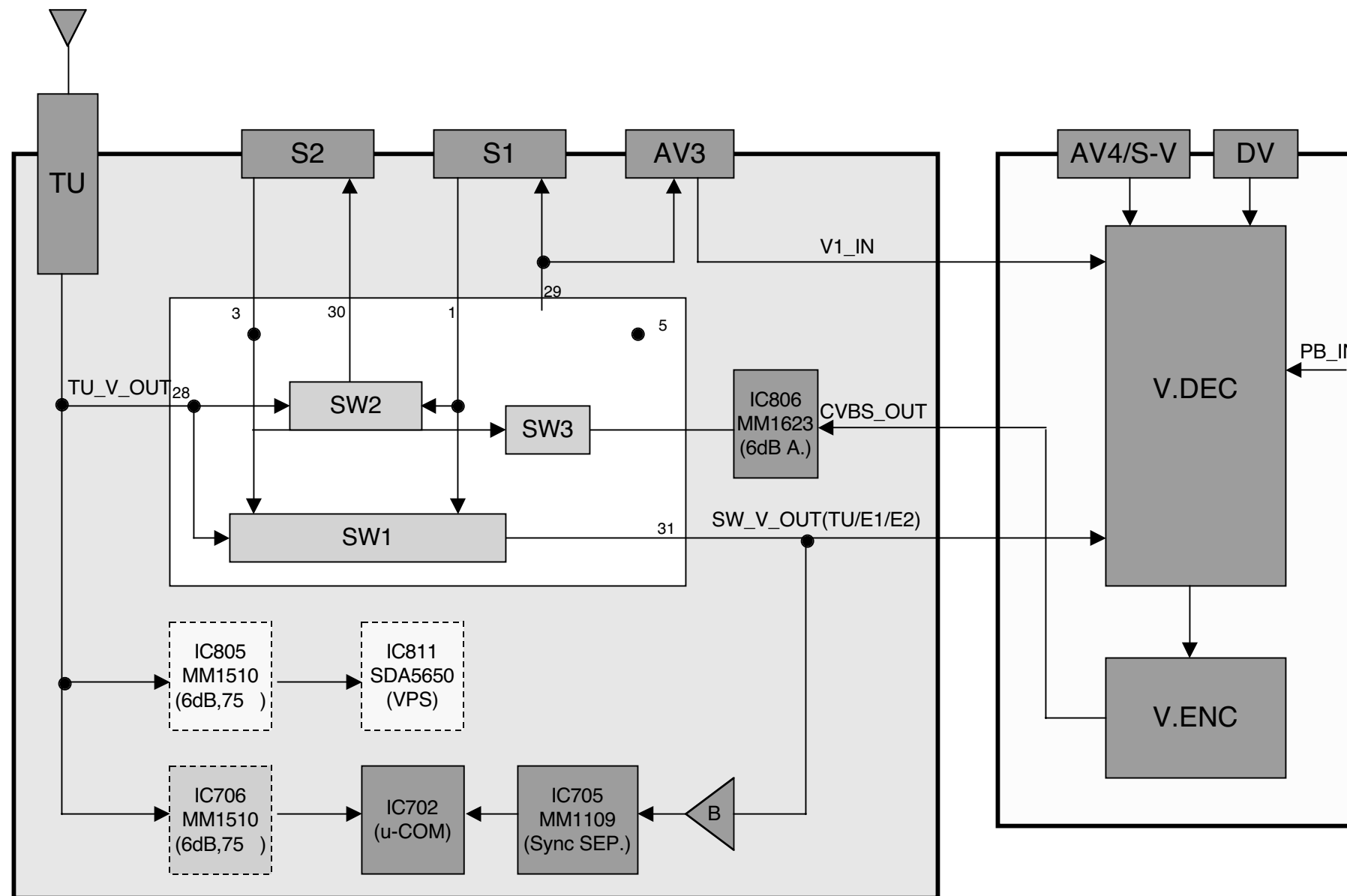
2. In/Out Block Diagram



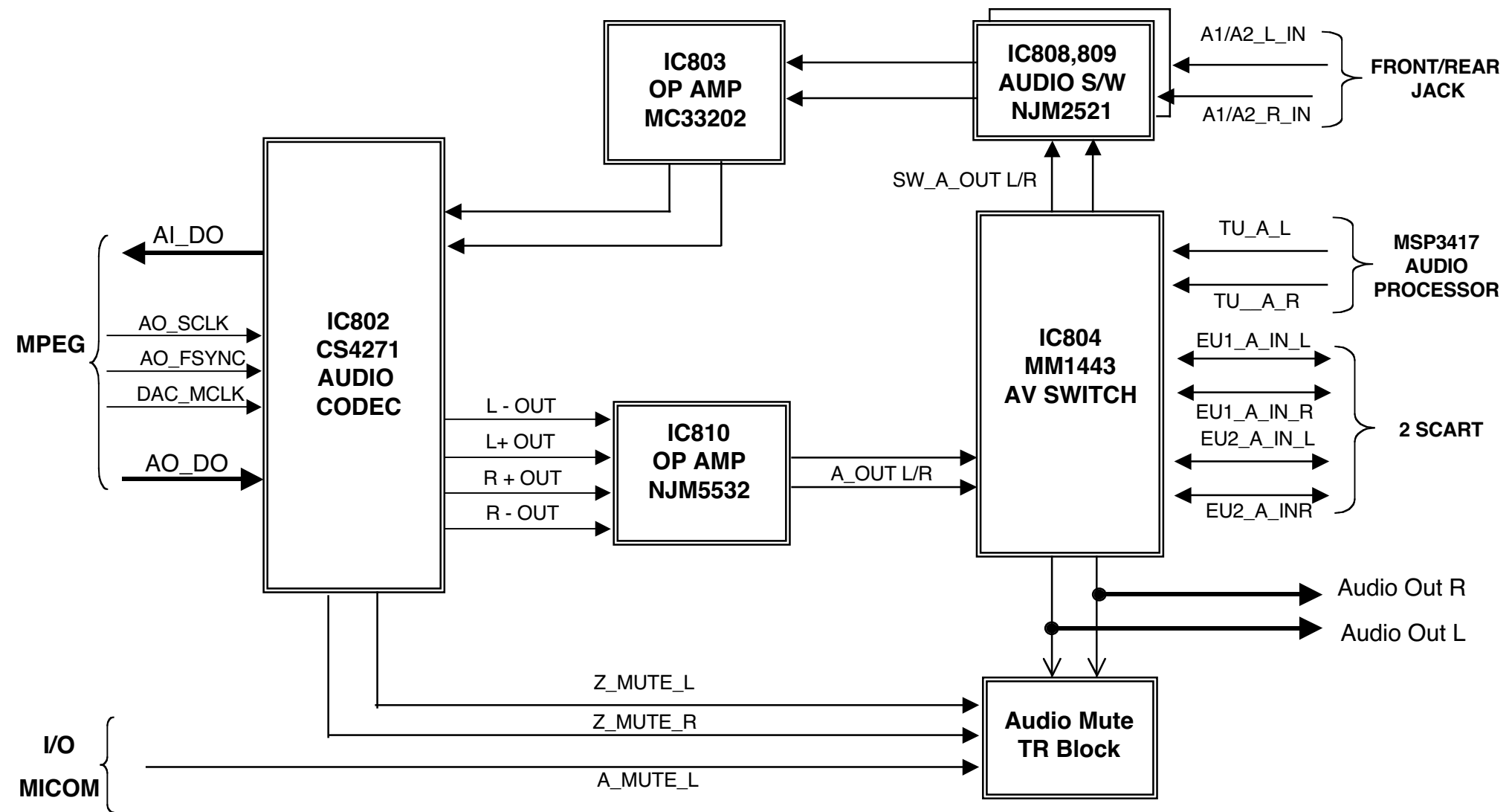
3. Video In/Out Block Diagram



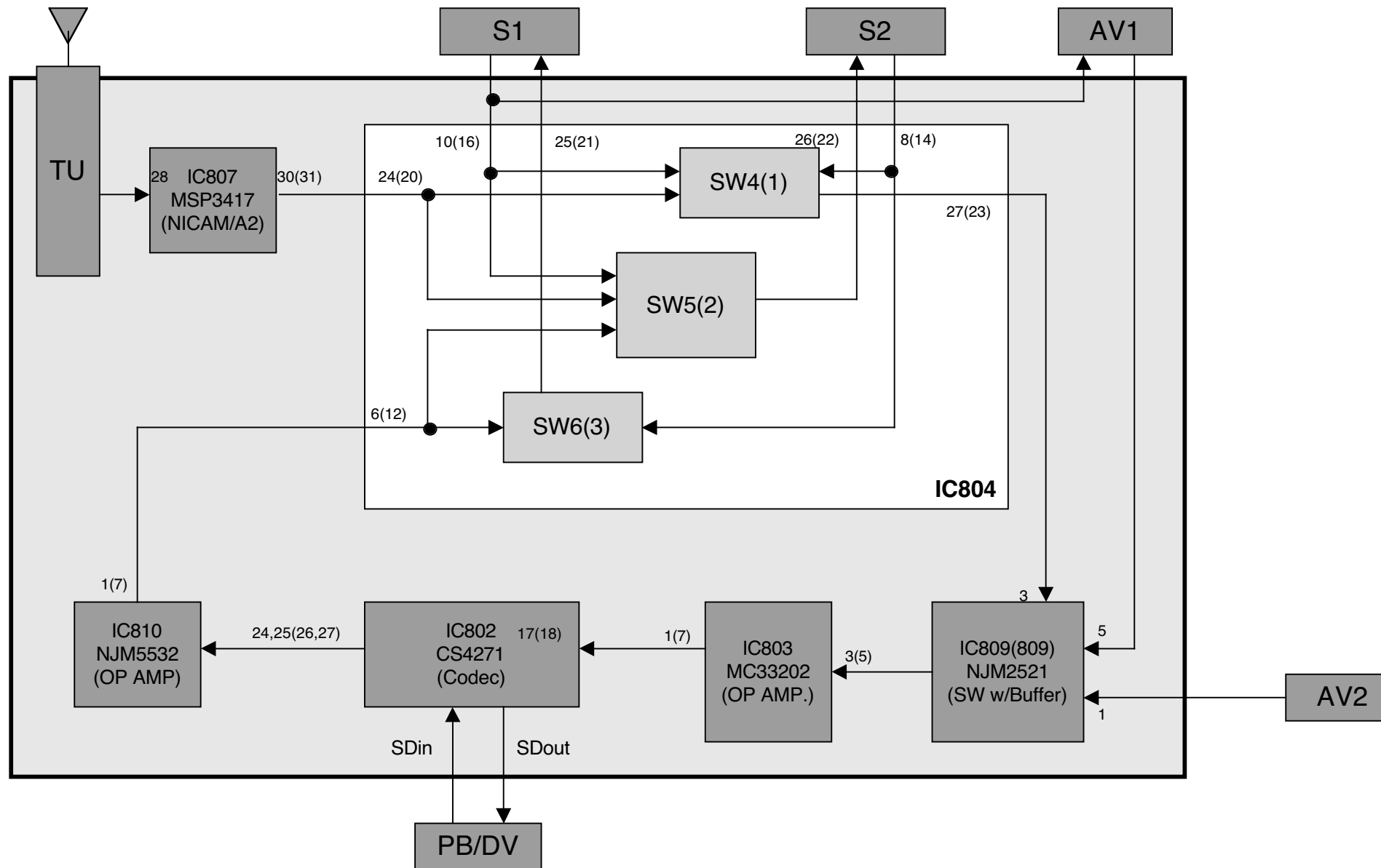
4. Video SW Path Block Diagram



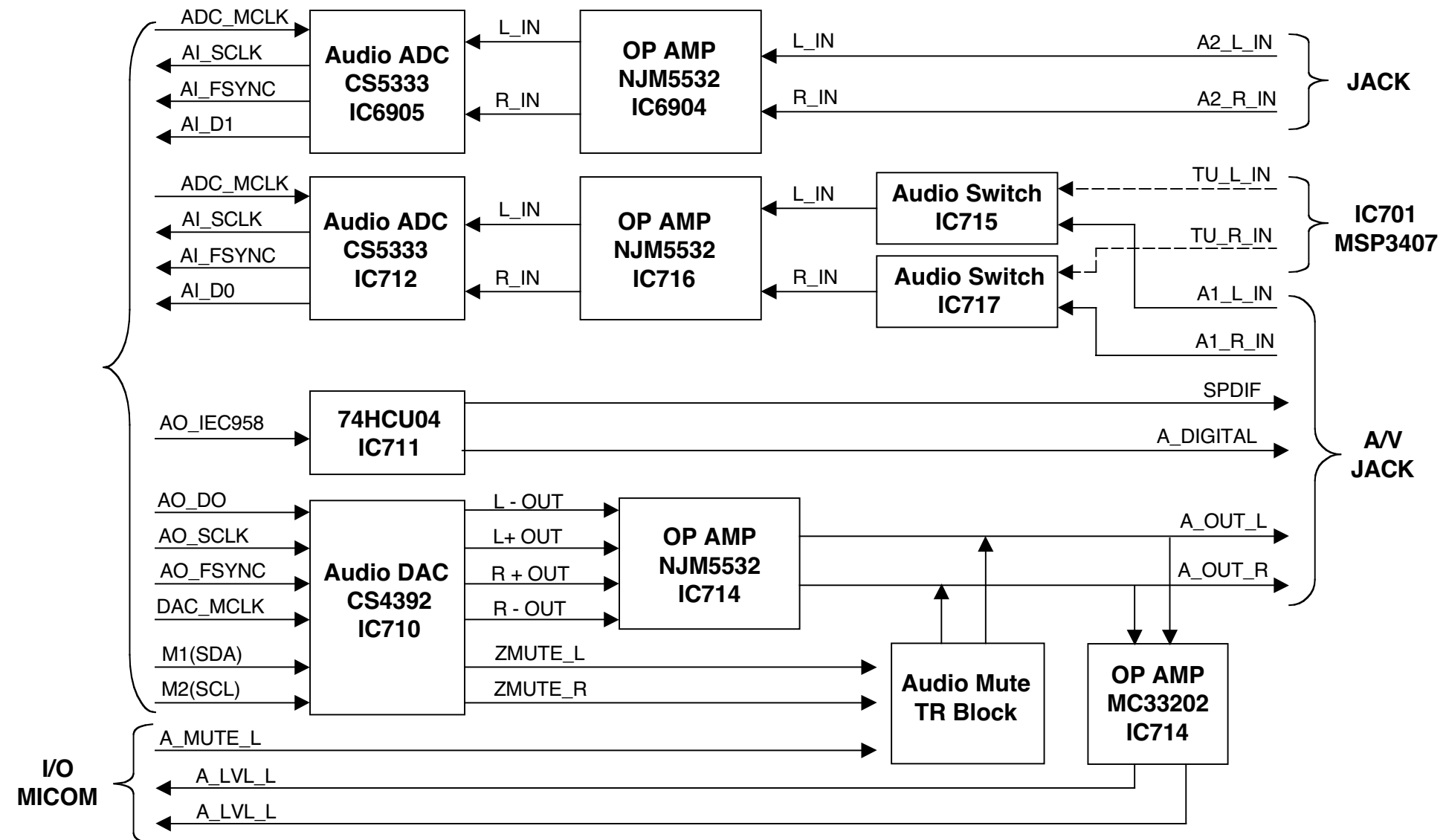
5. Audio Block Diagram



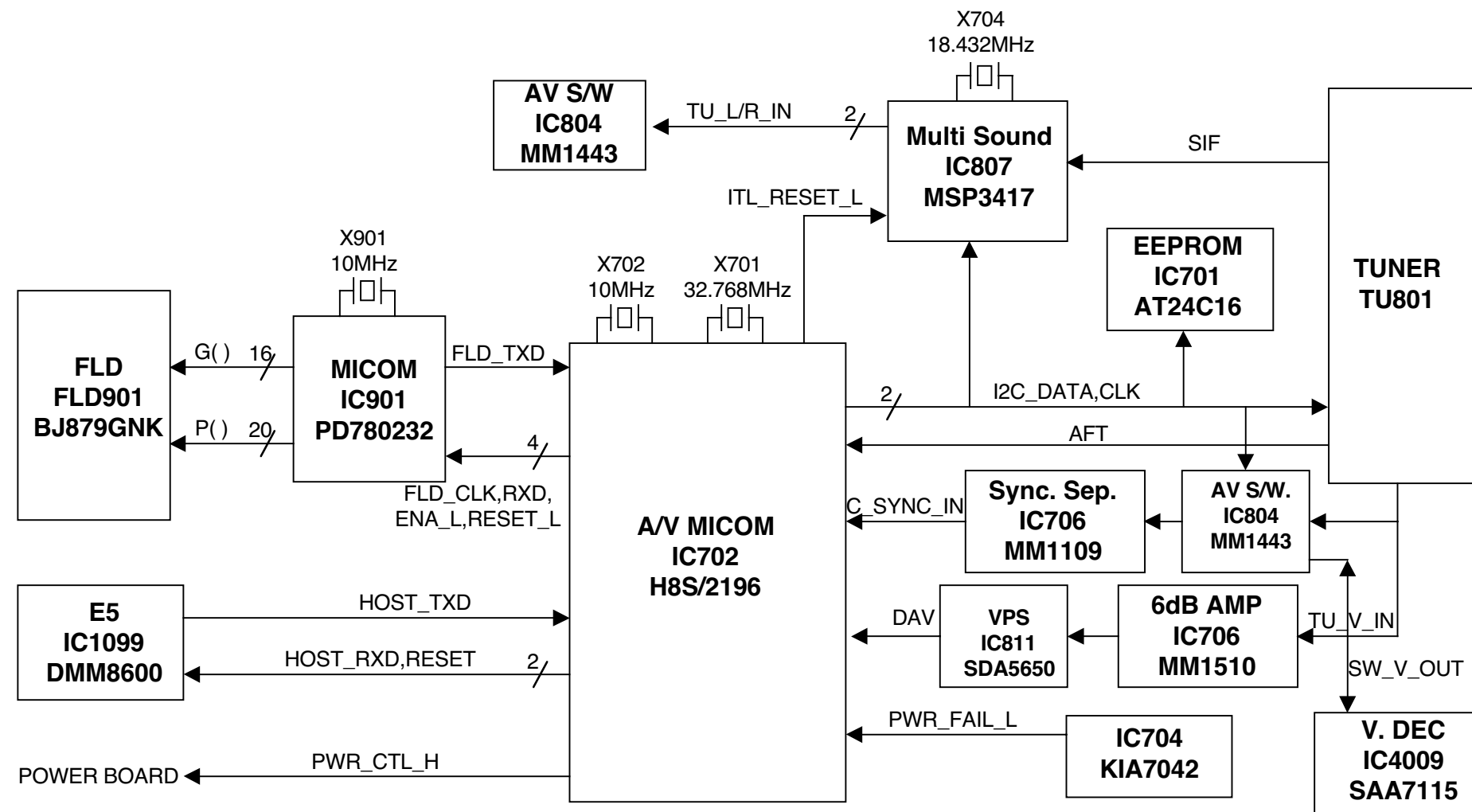
6. Audio SW Path Block Diagram



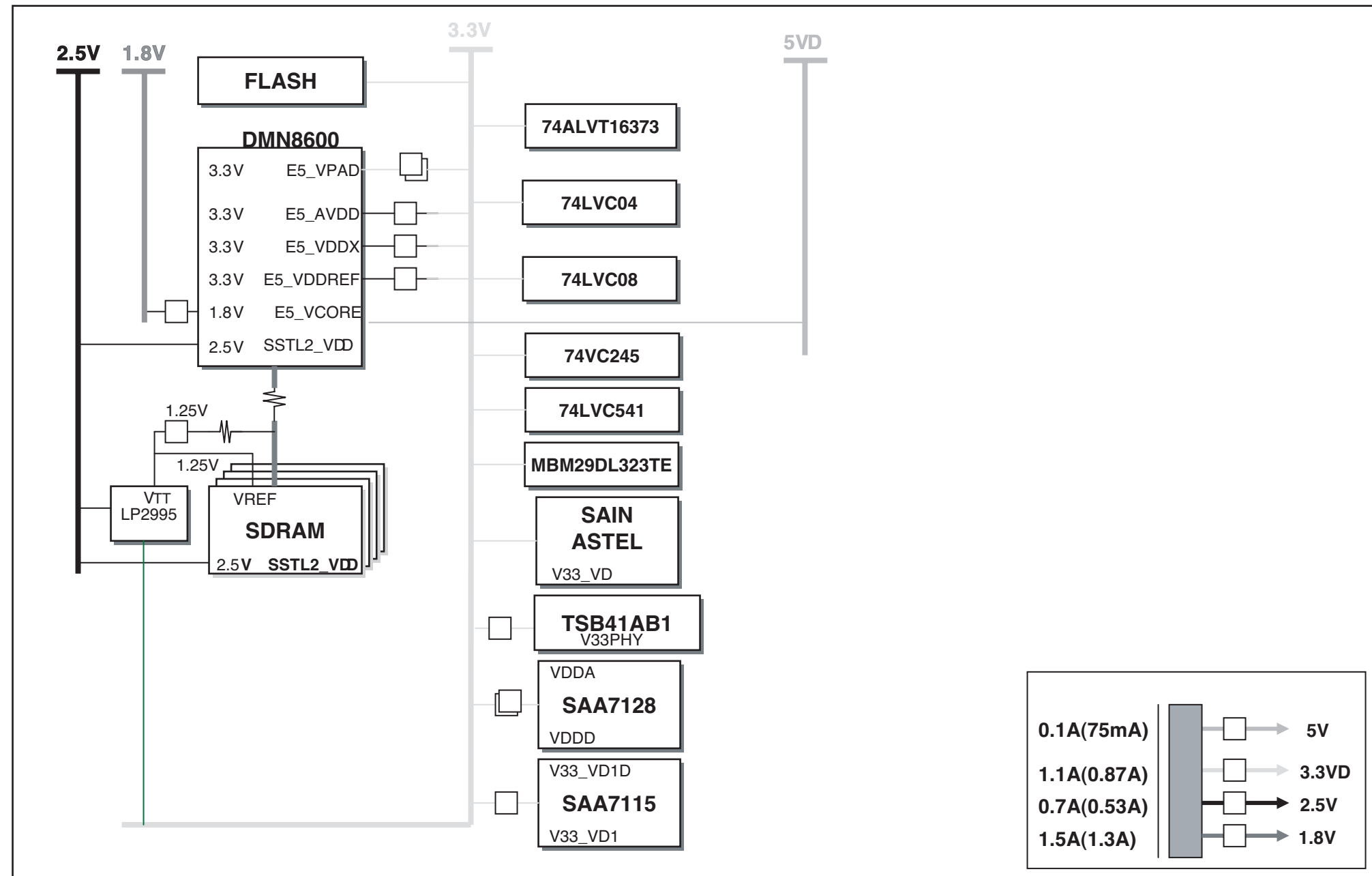
7. Audio In/Out Block Diagram



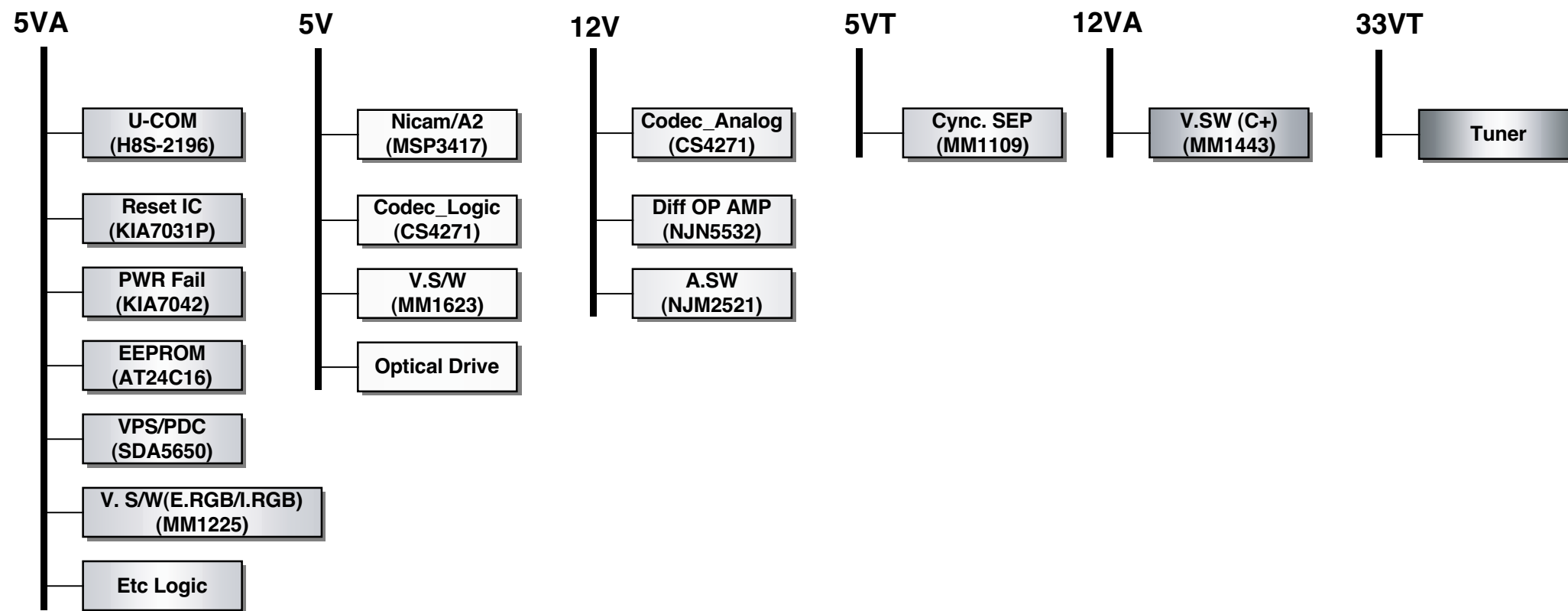
8. FLD/ μ -COM/Tuner Block Diagram



9. Power : Main Board Block Diagram

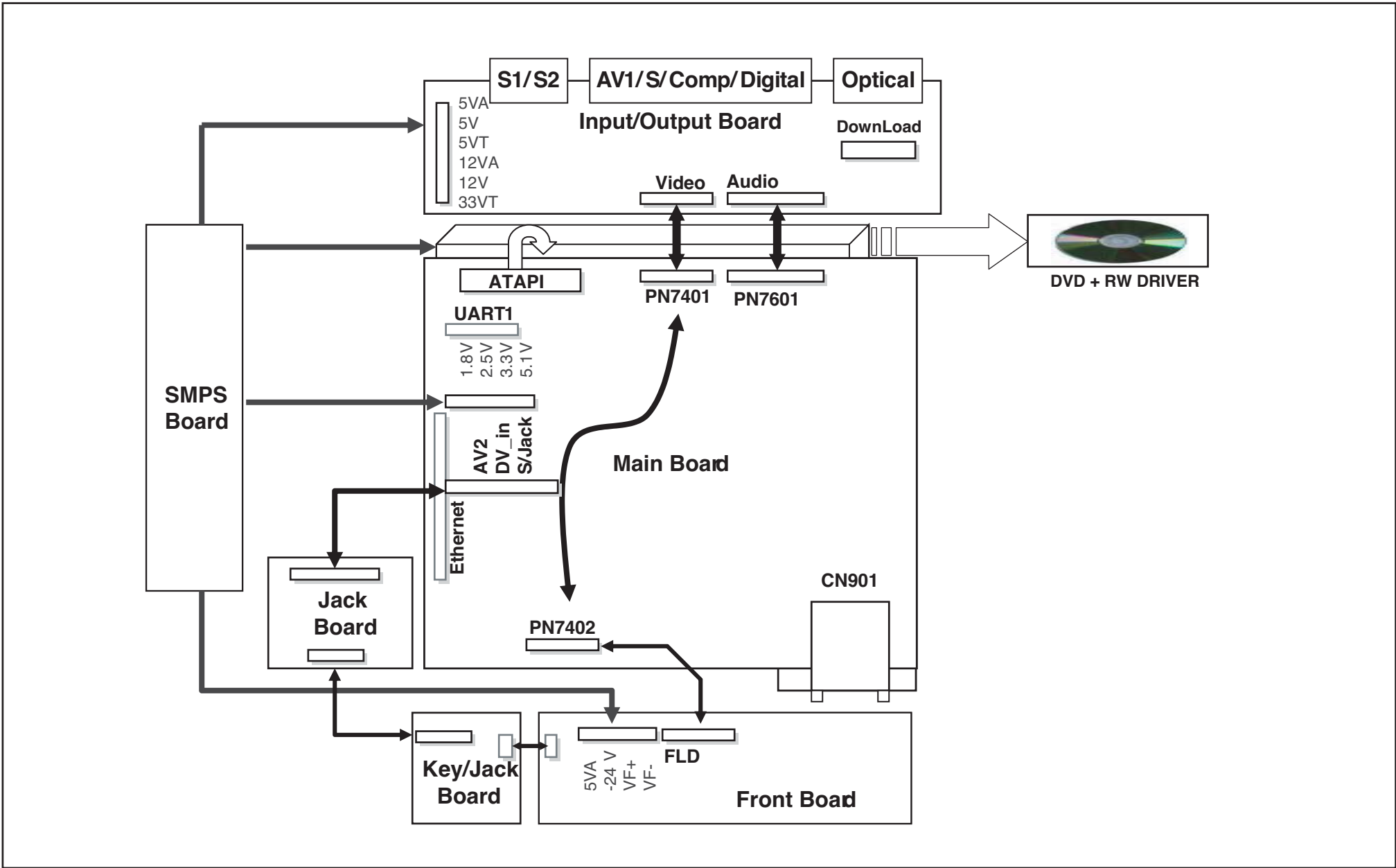


10. Power : I/O Board Block Diagram

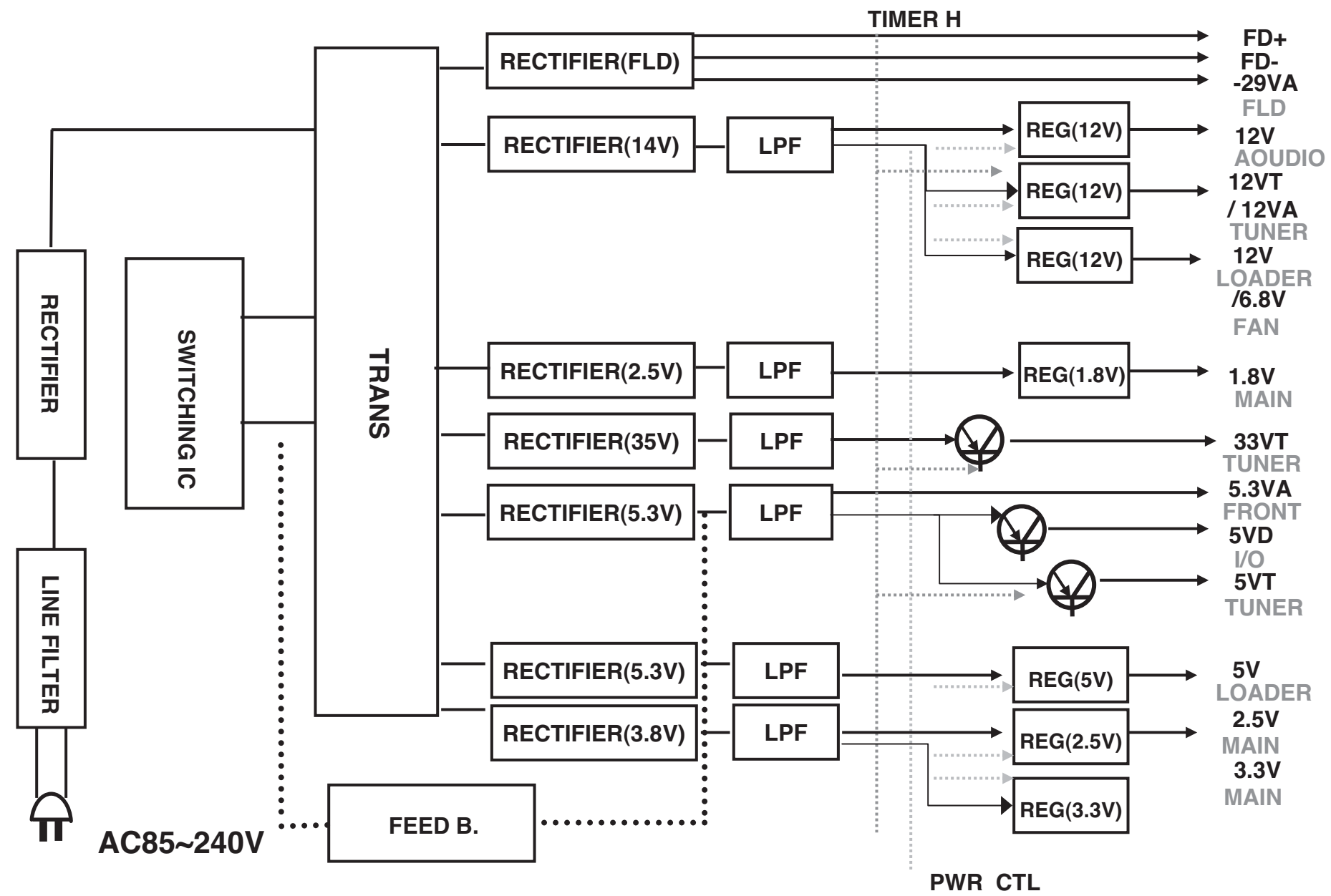


I/O Ucom PWR CTL SIGNAL	
PWR_CTL_H	5V, 12V CONTROL
TIMER_H	5VT, 33VT

11. Power : Layout Connection Block Diagram

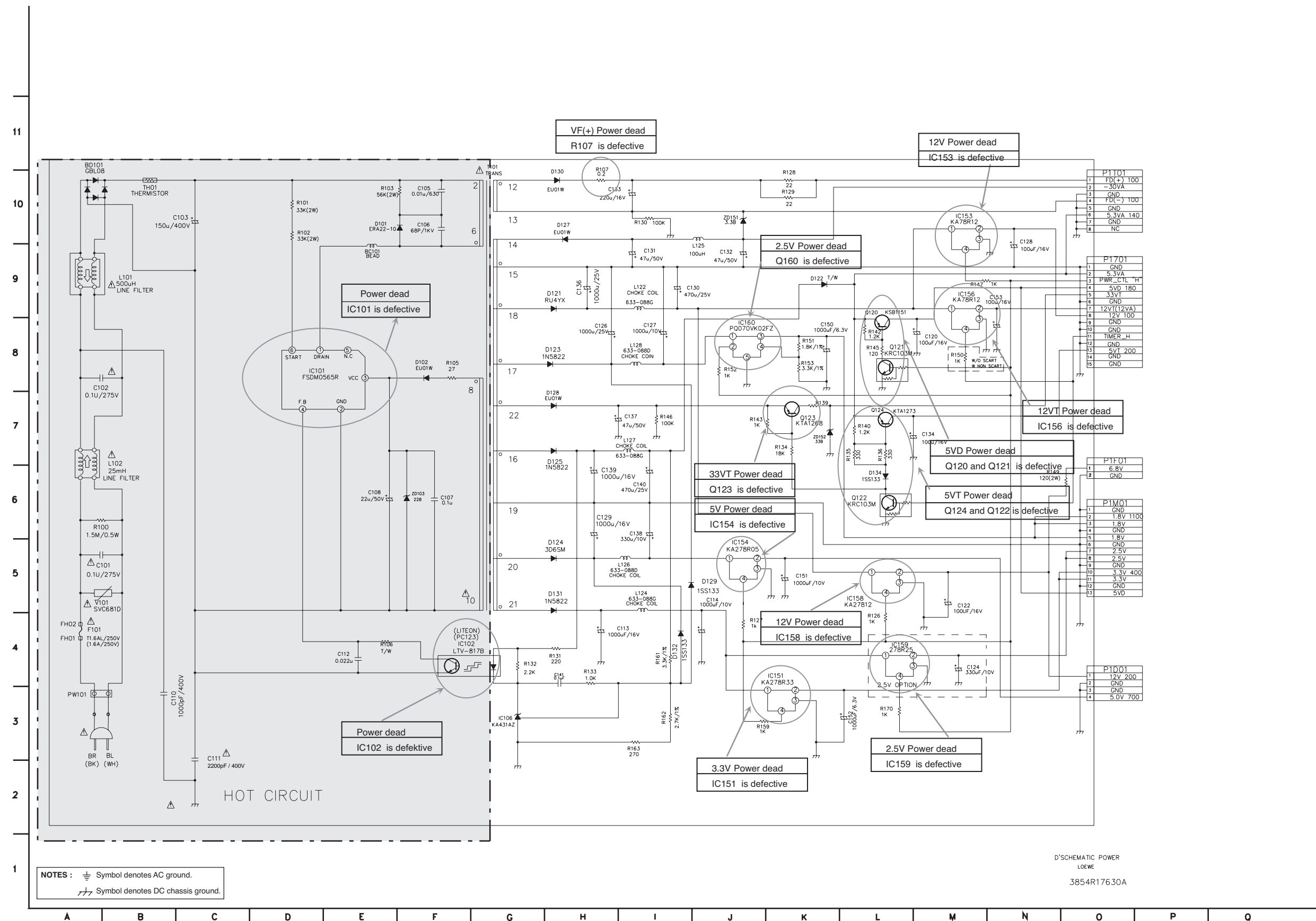


12. SMPS Block Diagram

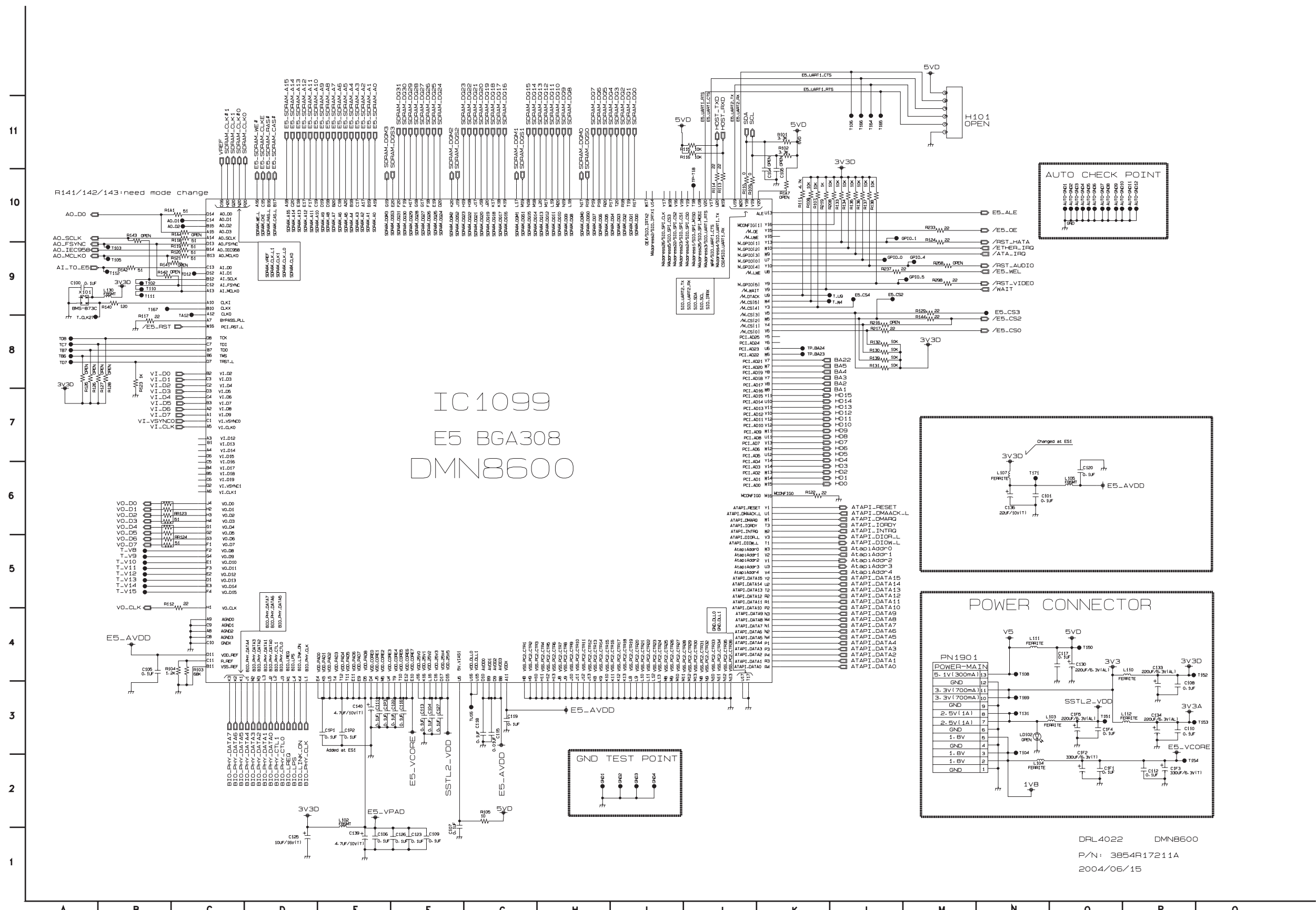


CIRCUIT DIAGRAMS

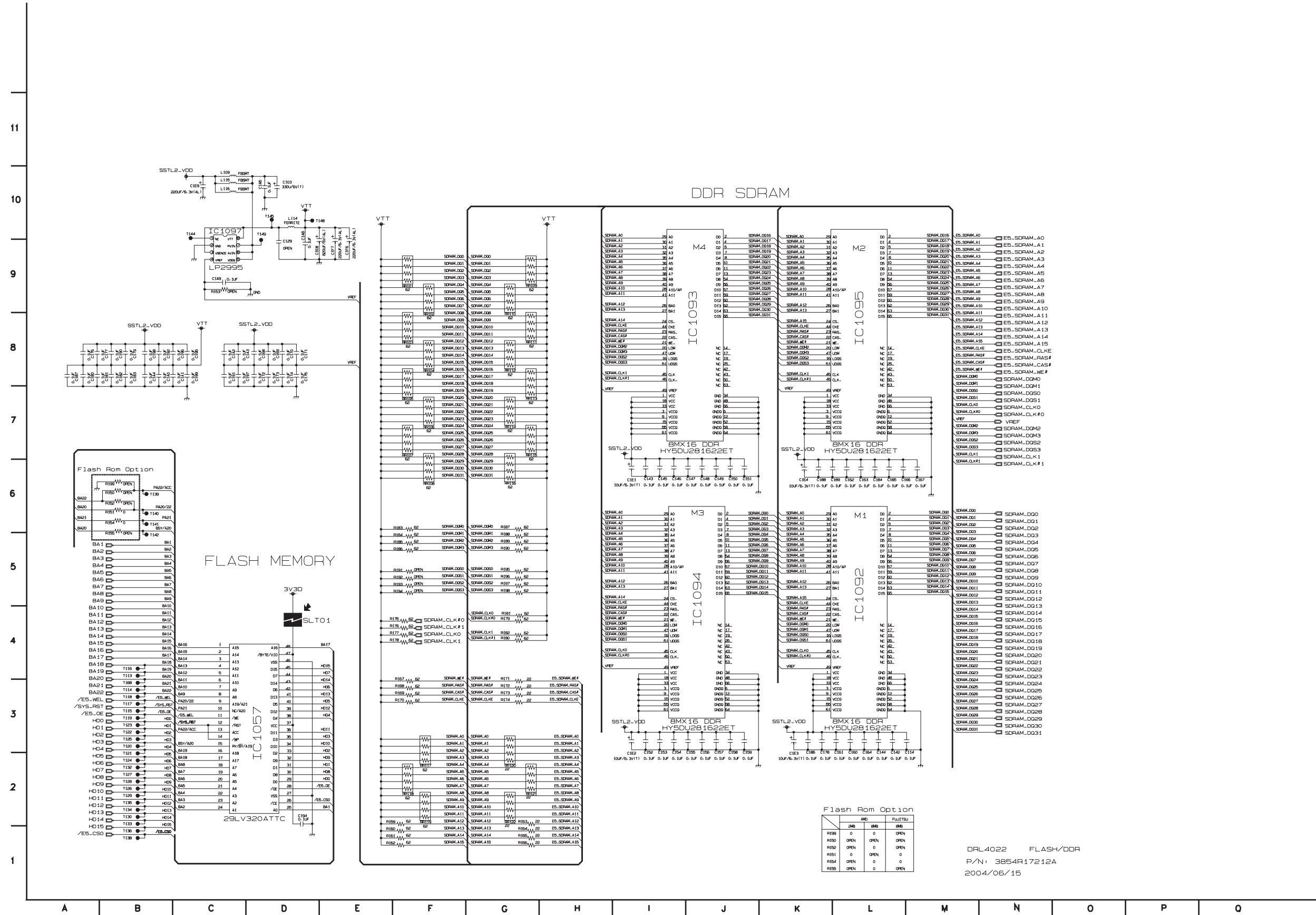
1. POWER CIRCUIT DIAGRAM



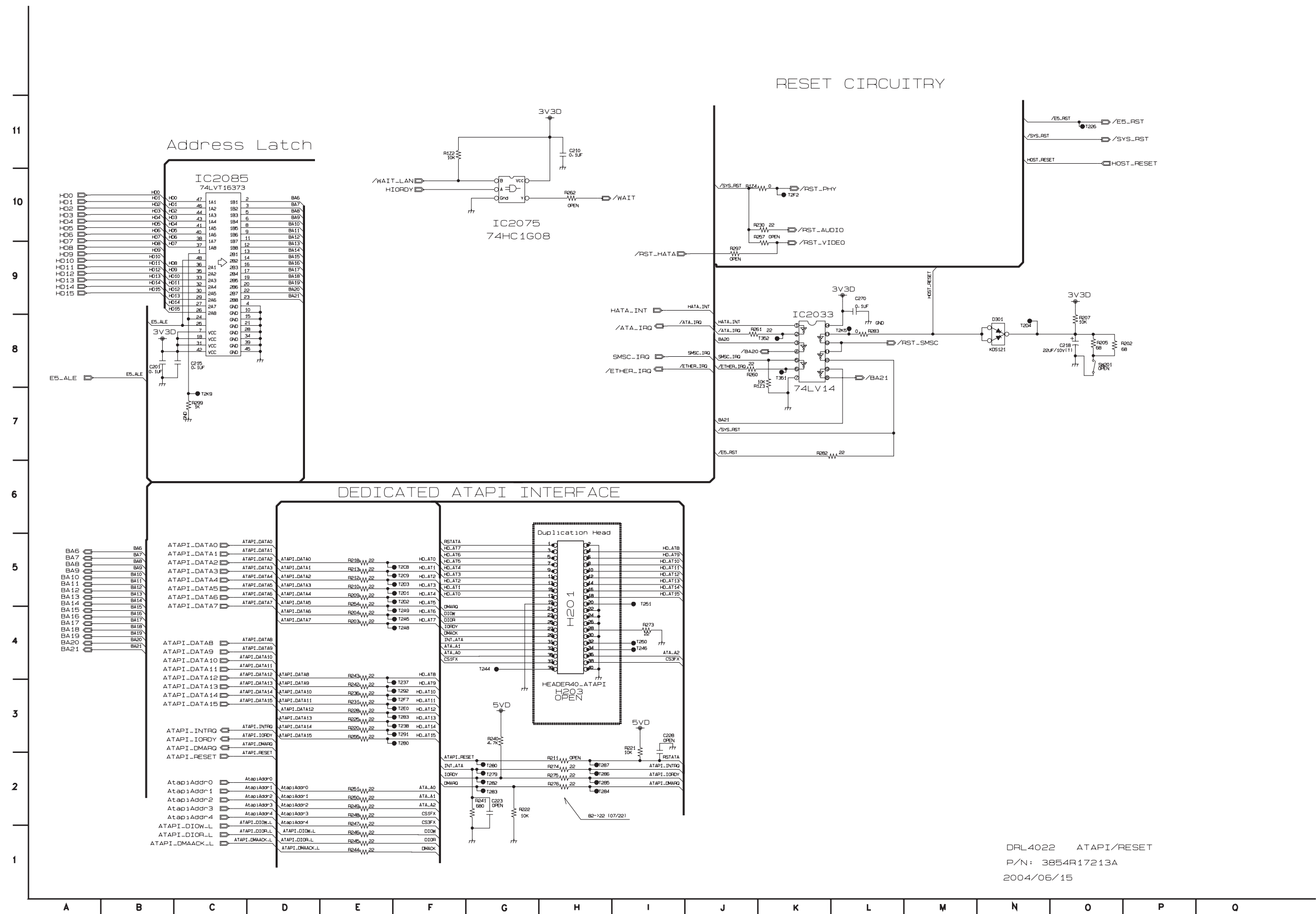
2. E5 BGA, POWER, UART2 CIRCUIT DIAGRAM



3. DDR SDRAM, FLASH CIRCUIT DIAGRAM

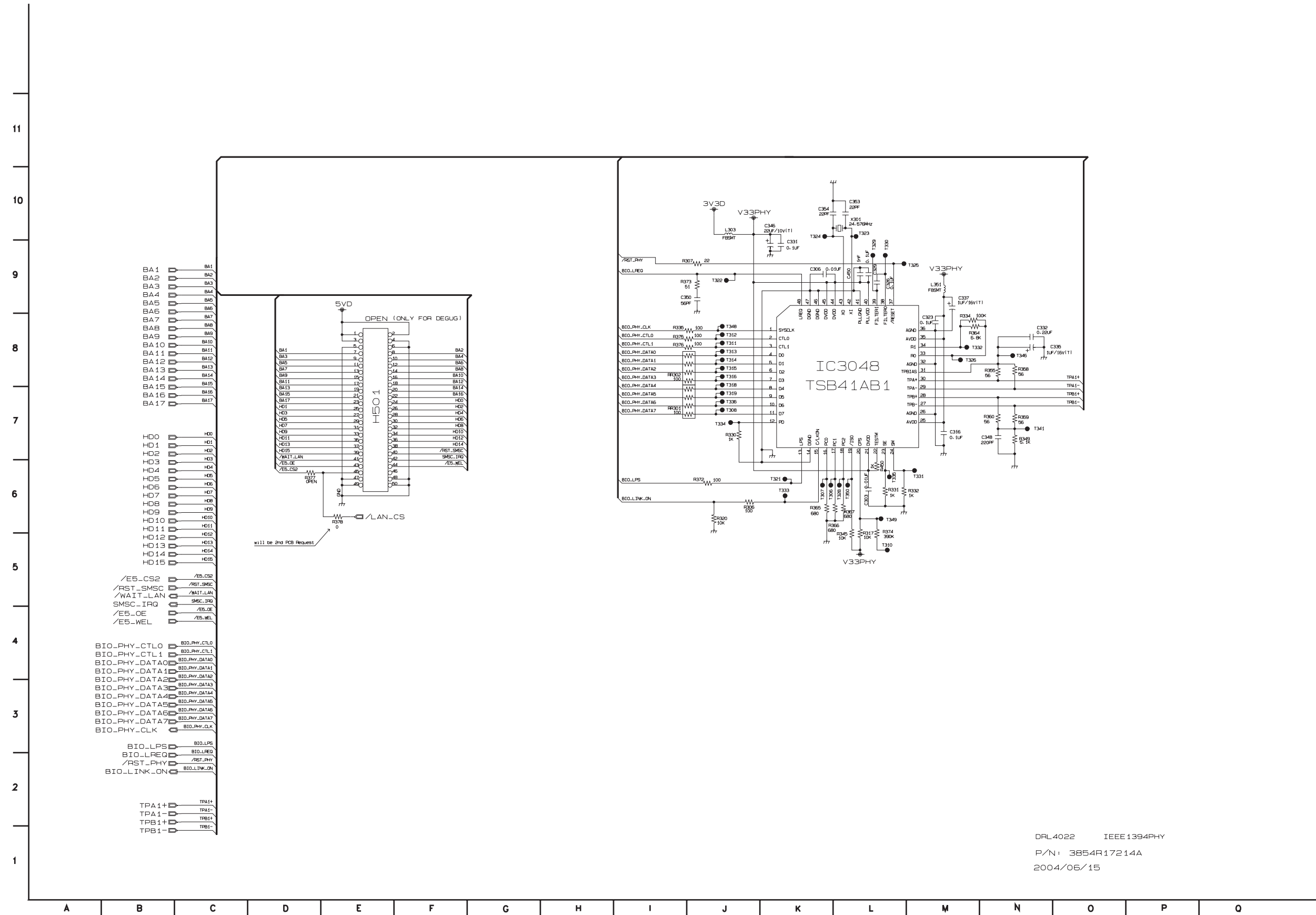


4. RST, CONTROL/STATUS REG, ATAPI, HOST CPLD, LATCH CIRCUIT DIAGRAM



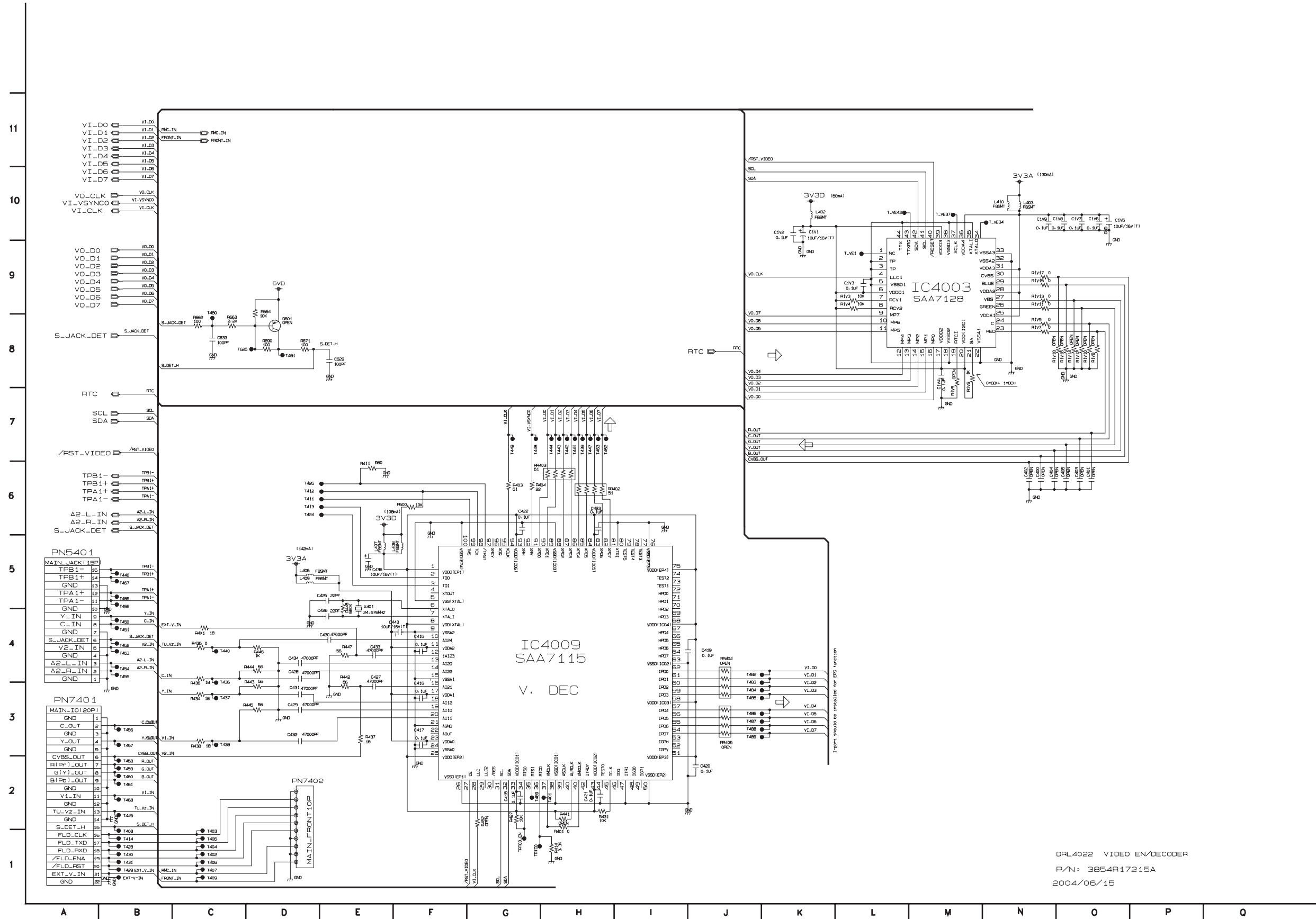
DRL4022 ATAPI/RESET
 P/N: 3854R17213A
 2004/06/15

5. 1394, ETHERNET CONNECTOR CIRCUIT DIAGRAM



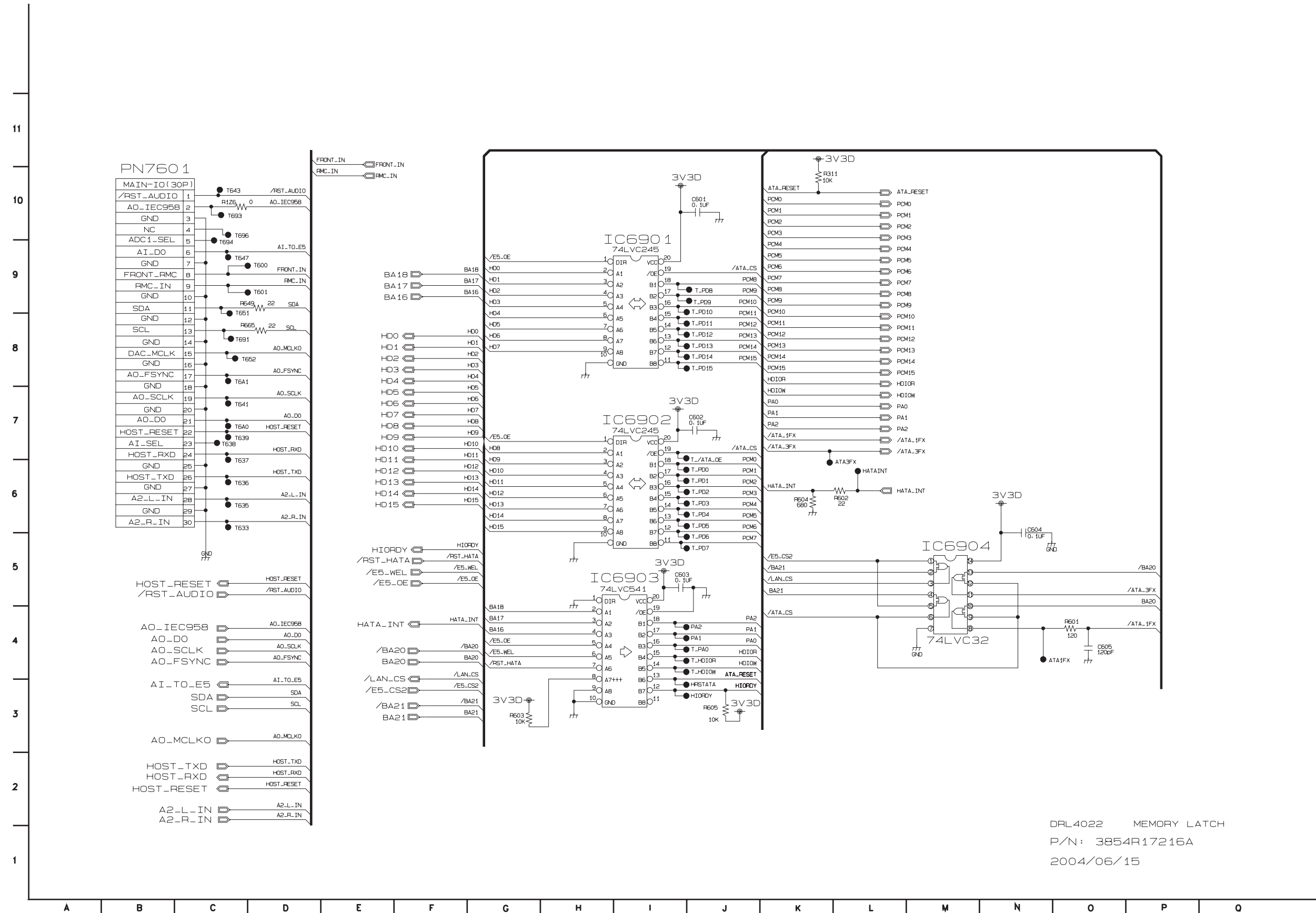
DRL4022 IEEE 1394PHY
P/N: 3854R17214A
2004/06/15

6. VIDEO IN/OUT CIRCUIT DIAGRAM



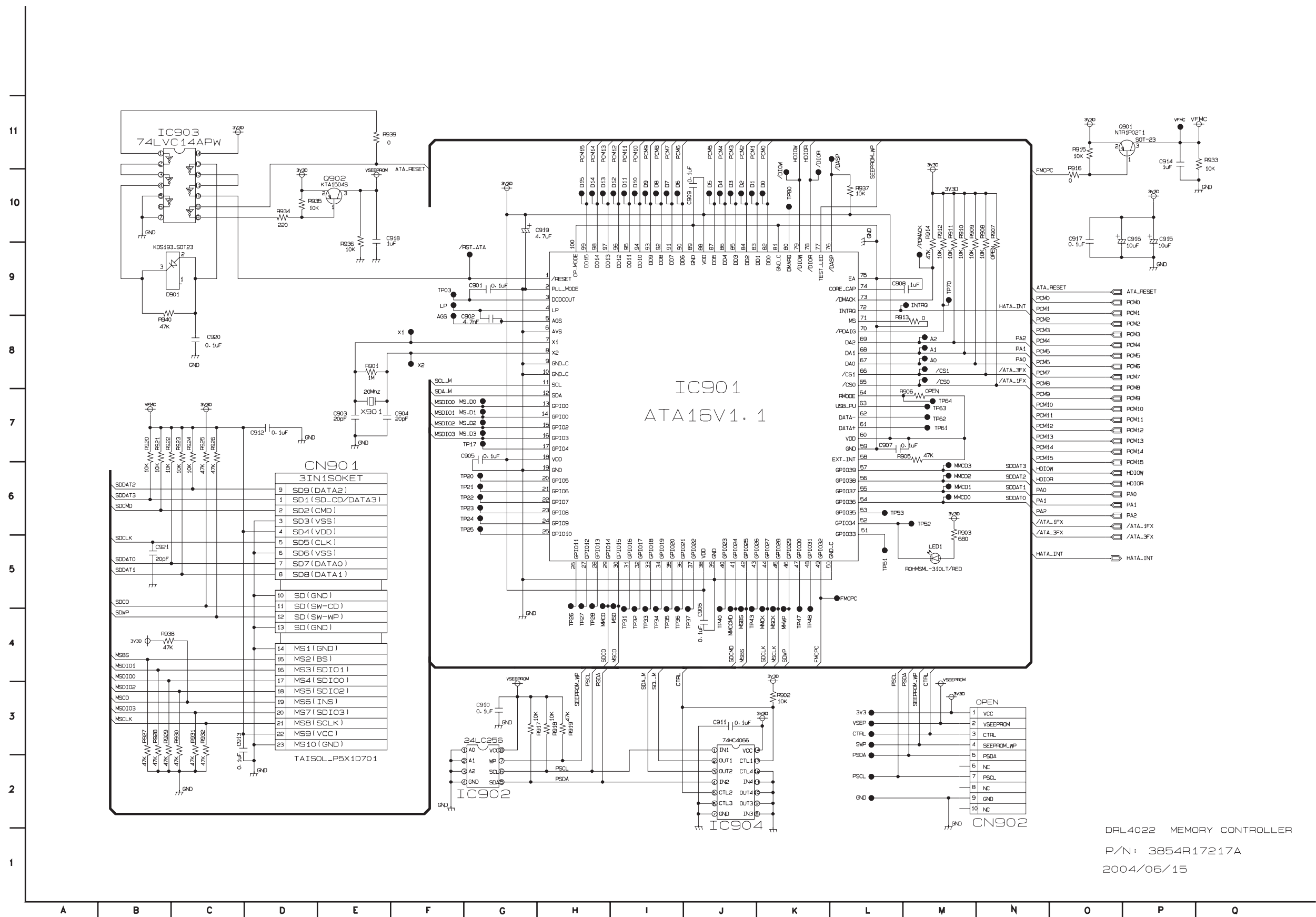
DRL4022 VIDEO EN/DECODER
 P/N: 3854R17215A
 2004/06/15

7. AUDIO IN/OUT NON-STD VIDEO CIRCUIT DIAGRAM



DRL4022 MEMORY LATCH
P/N: 3854R17216A
2004/06/15

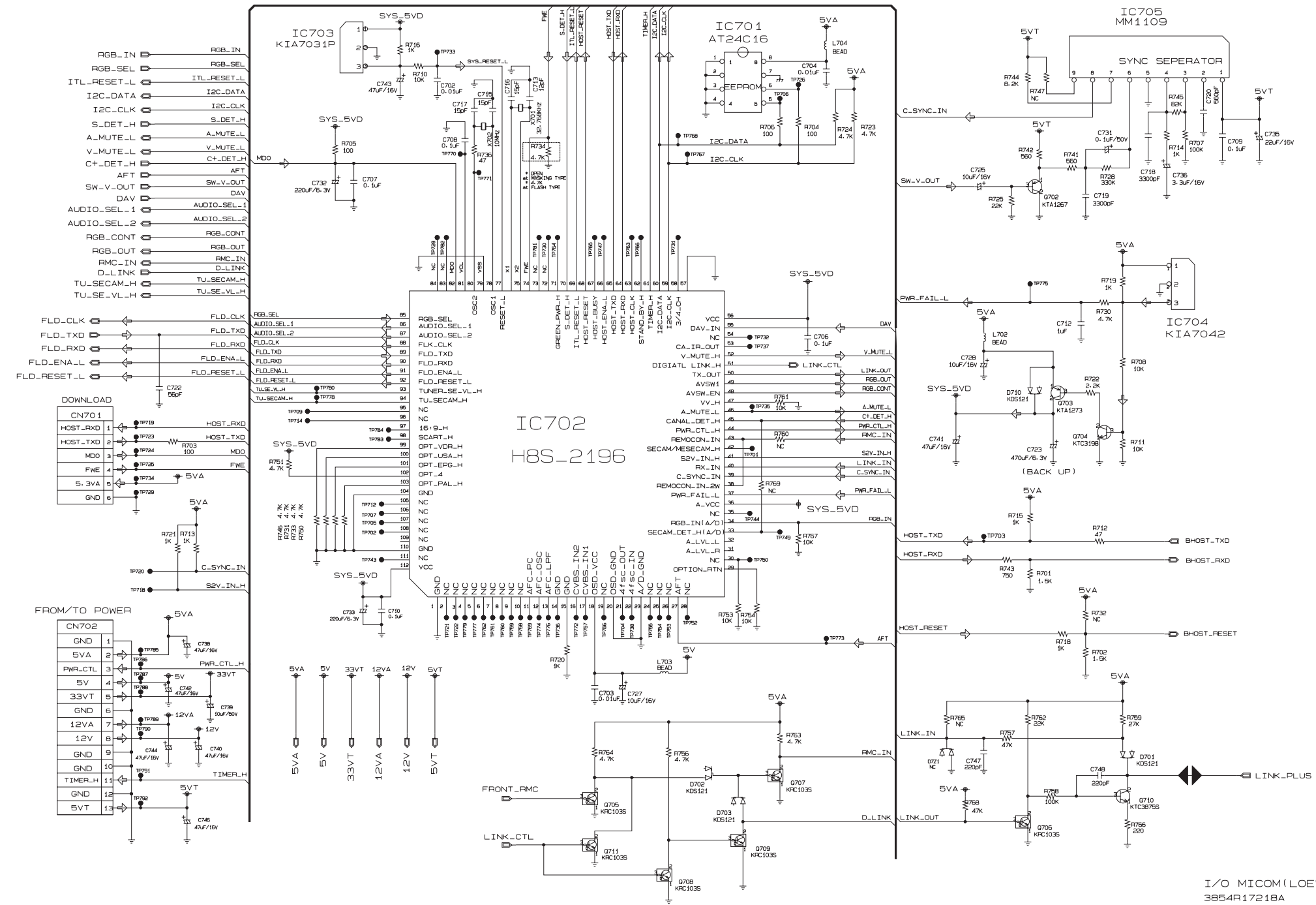
8. 3-IN-1 MEMORY CIRCUIT DIAGRAM



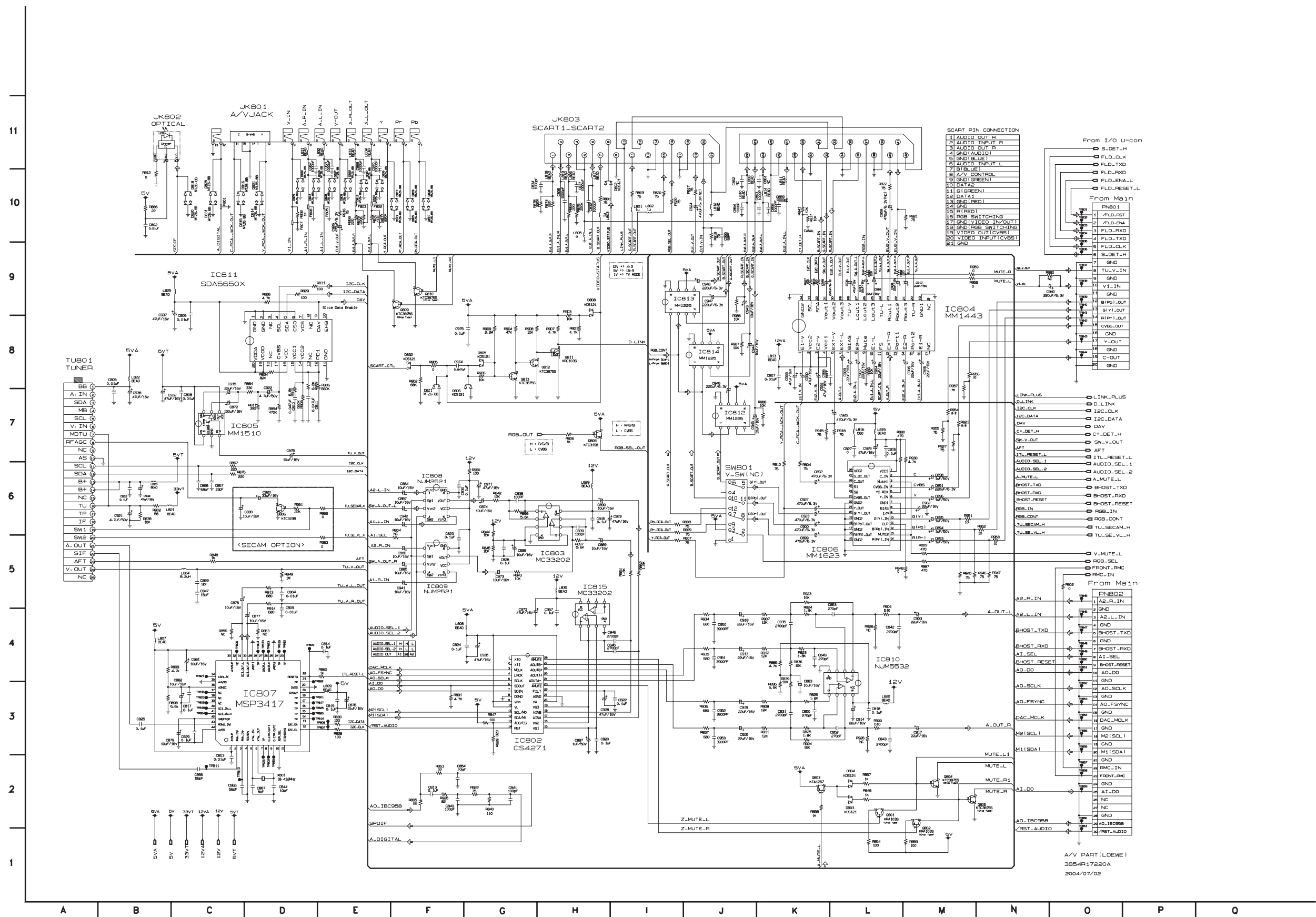
DRL4022 MEMORY CONTROLLER
P/N: 3854R17217A
2004/06/15

9. I/O MICOM CIRCUIT DIAGRAM

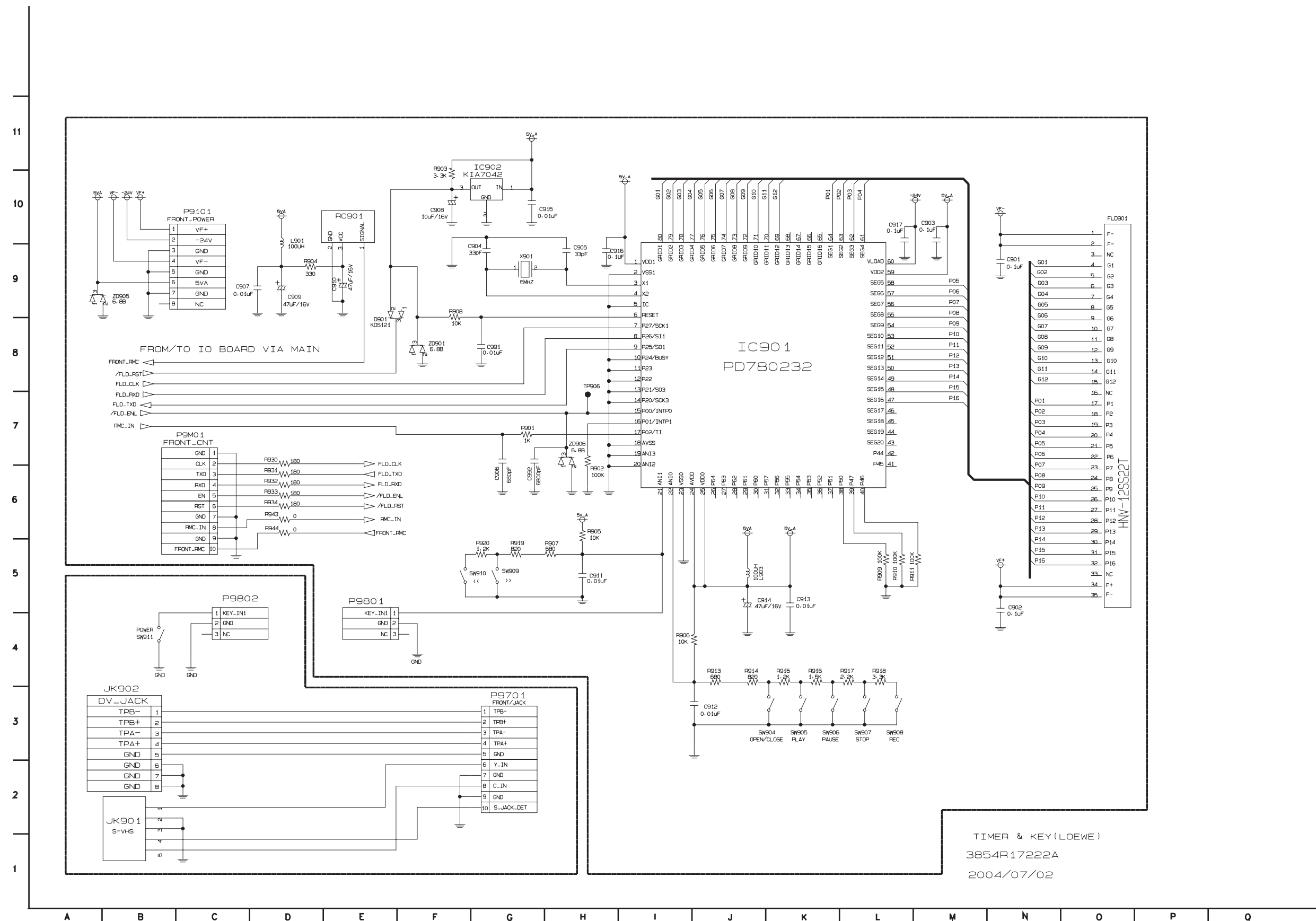
11
10
9
8
7
6
5
4
3
2
1



10. I/O JACK CIRCUIT DIAGRAM

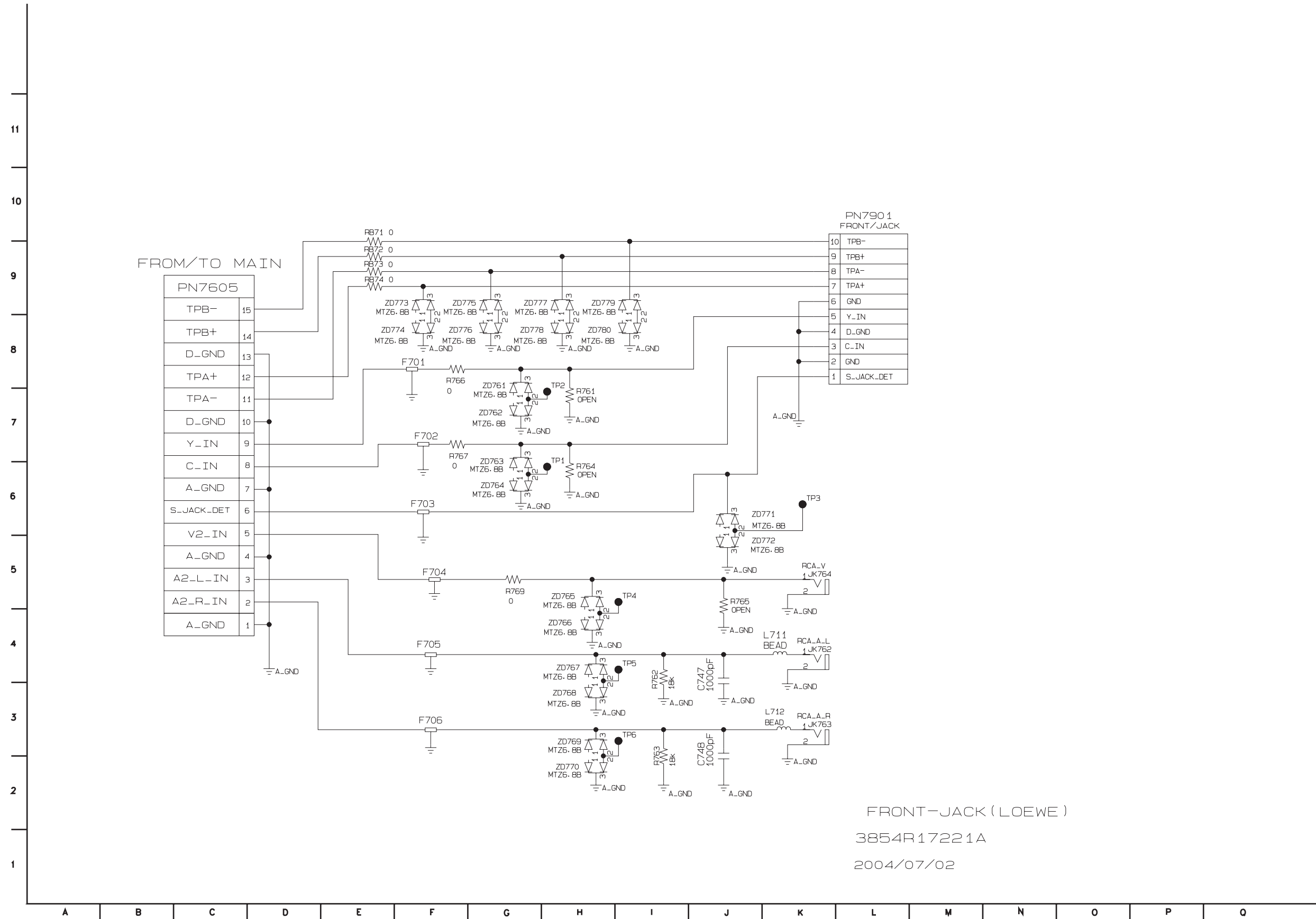


11. FRONT CIRCUIT DIAGRAM

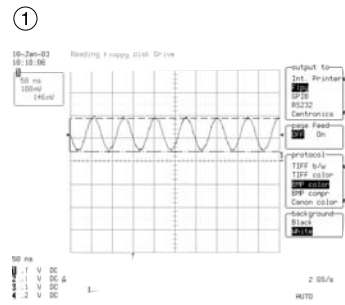


TIMER & KEY (LOEWE)
3854R17222A
2004/07/02

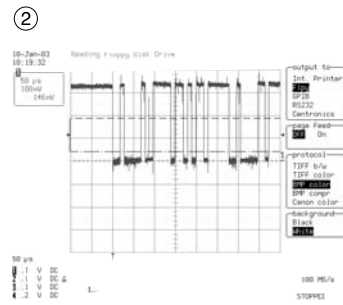
12. FRONT JACK CIRCUIT DIAGRAM



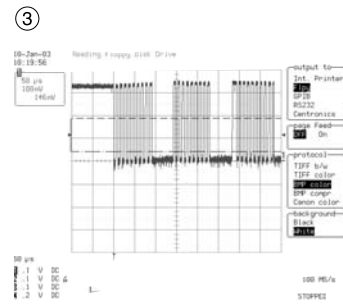
• WAVEFORMS



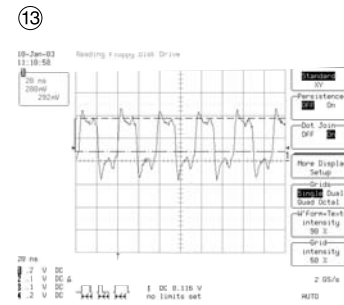
X102
13.5MHz



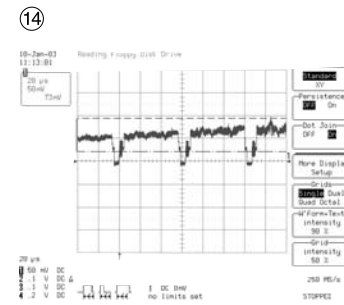
IC4009
PIN32
SDA



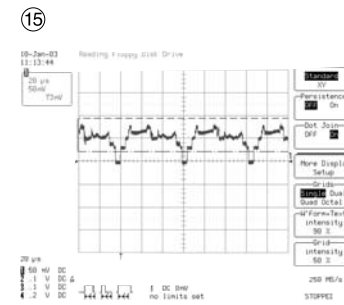
IC4009
PIN31
SCL



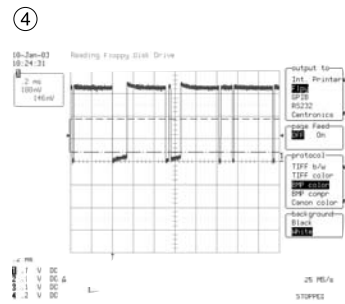
IC4002
PIN22
/PIXCLKIX



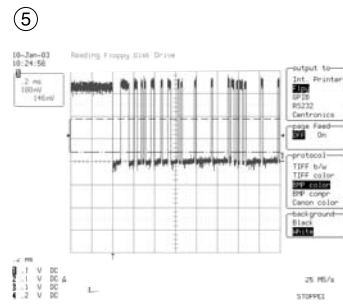
PN7401
PIN6
CVBS_OUT



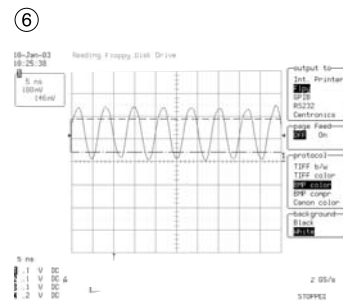
PN7401
PIN4
Y_OUT



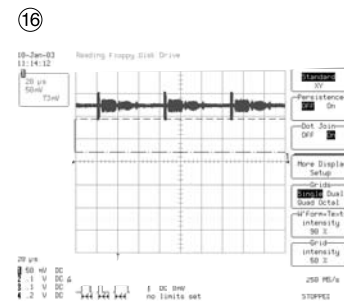
PN7601
PIN24
HOST_RXD



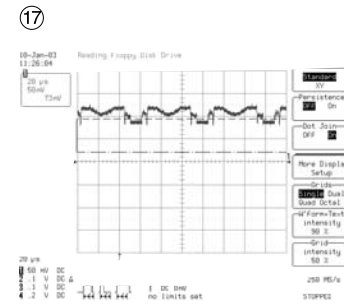
PN7601
PIN26
HOST_TXD



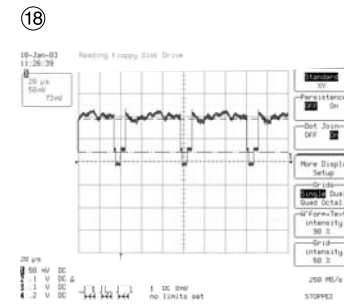
IC1094
PIN45
SDRAM_SCLK0



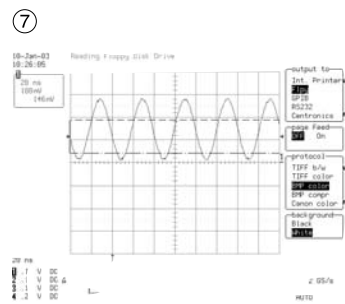
PN7401
PIN2
C_OUT



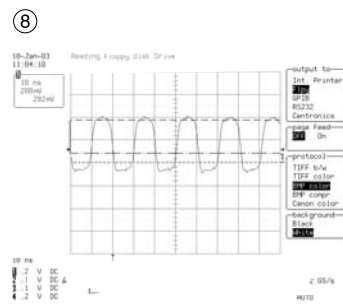
PN7401
PIN7
R_Pr_OUT



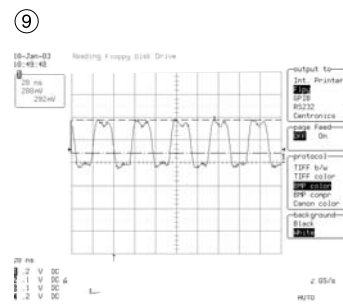
PN7401
PIN8
G_Y_OUT



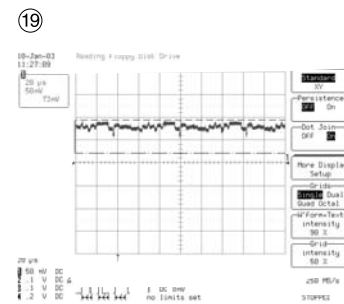
IC3048
PIN77
24.576MHz



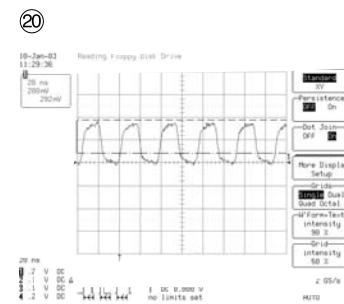
IC3048
PIN2
BIO_PHY_CLK



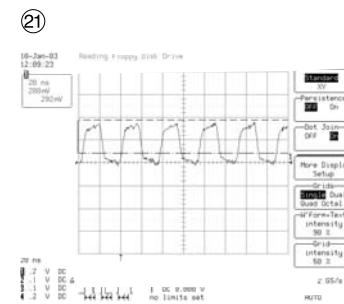
IC4009
PIN94
VI_CLK0



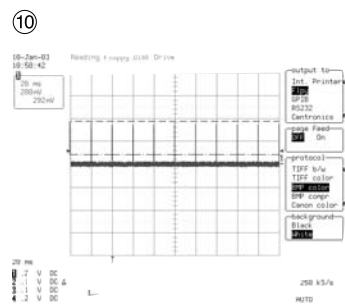
PN7401
PIN9
B_Pb_OUT



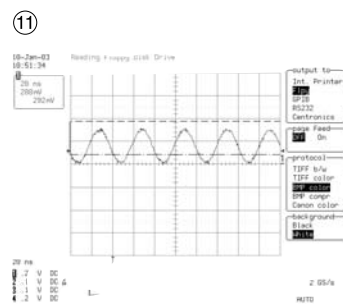
IC4003
PIN4
VO_CLK



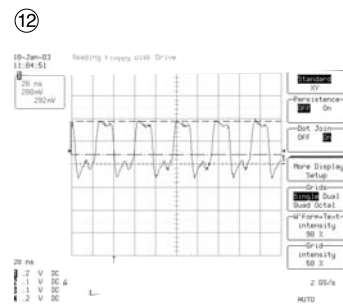
IC4002
PIN37
VO_CLK



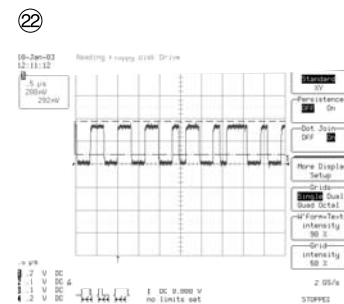
IC4009
PIN91
VI_SYNC0



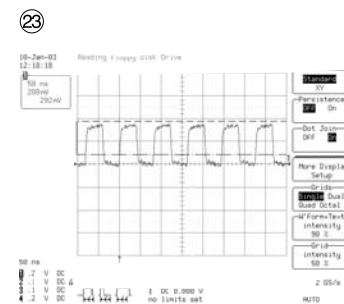
IC4009
PIN6
24.576MHz



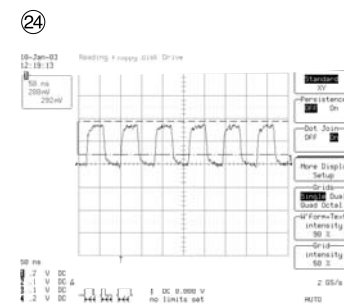
IC6902
PIN76
VI_CLK



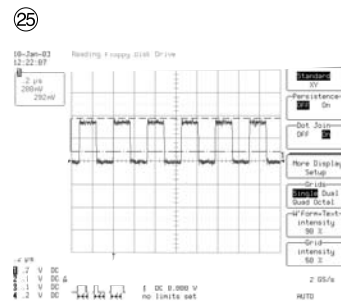
PN7601
PIN29
AO_IEC958



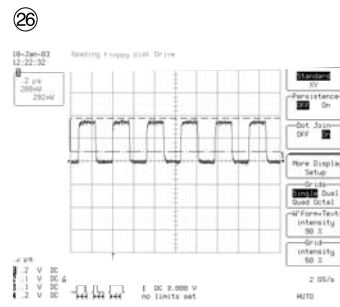
PN7601
PIN2
ADC_MCLK



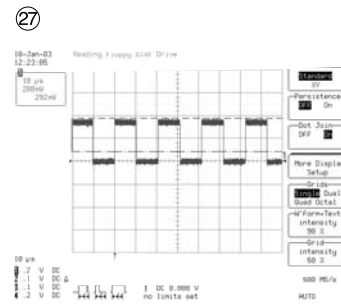
PN7601
PIN15
DAC_MCLK



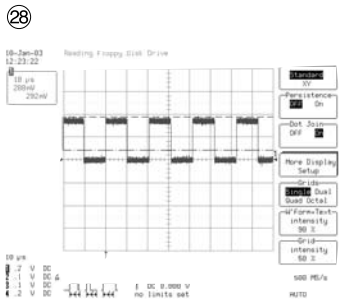
PN7601
PIN4
AI_SCLK



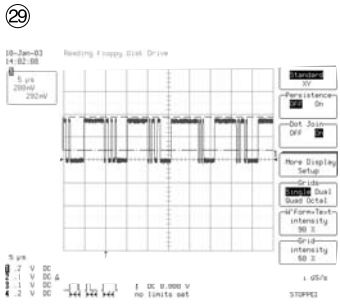
PN7601
PIN19
AO_SCLK



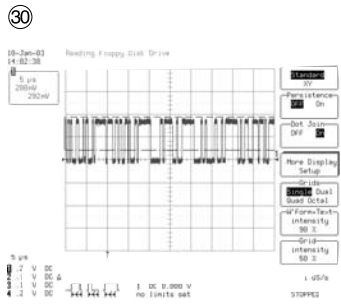
PN7601
PIN8
AI_FSYNC



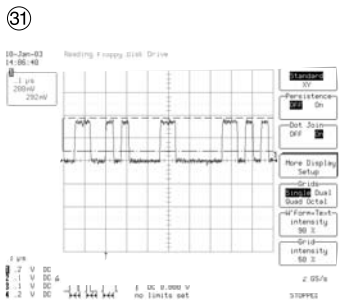
PN7601
PIN17
AO_FSYNC



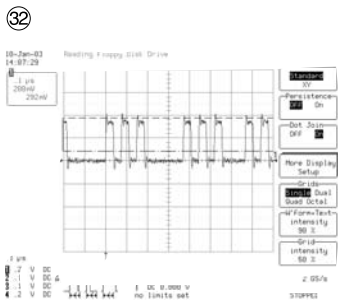
PN7601
PIN6
AI_D0



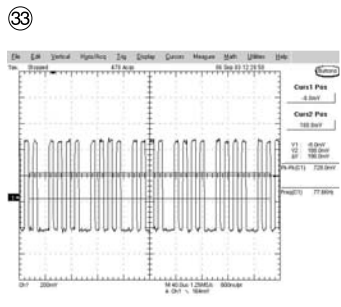
PN7601
PIN21
AO_D0



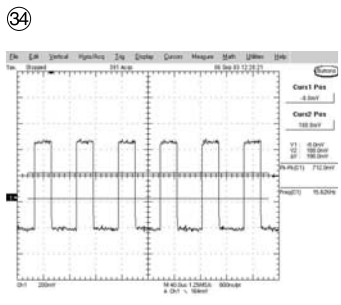
IC4002
PIN40
VO_D0



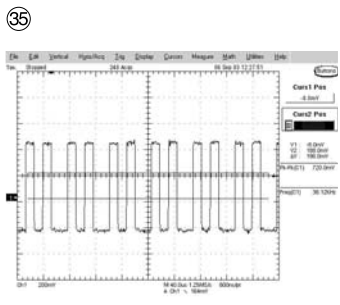
IC4009
PIN90
VI_D0



PN7401
PIN7
R_Pr_OUT



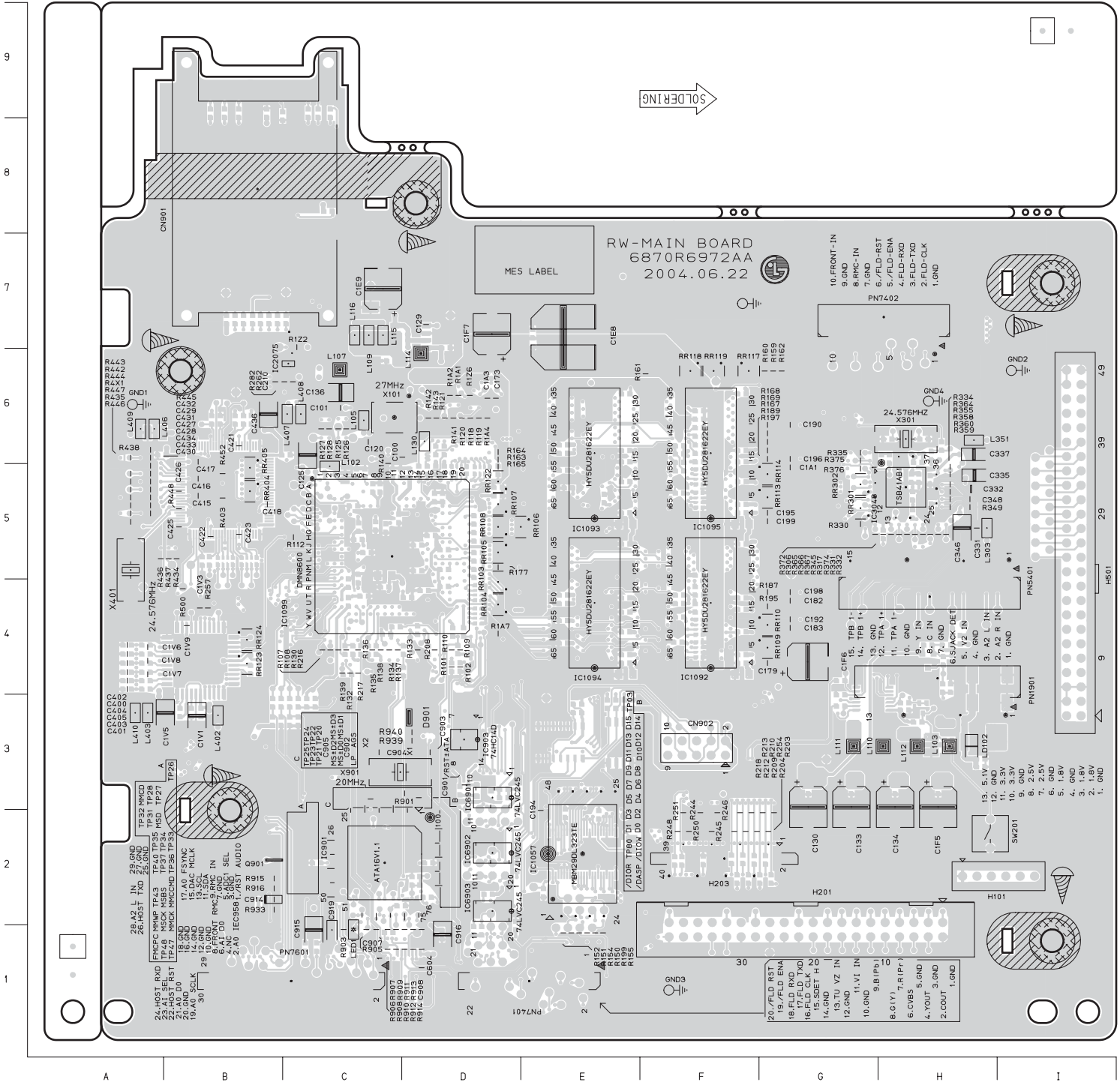
PN7401
PIN8
G_Y_OUT



PN7401
PIN9
B_Pb_OUT

PRINTED CIRCUIT DIAGRAMS

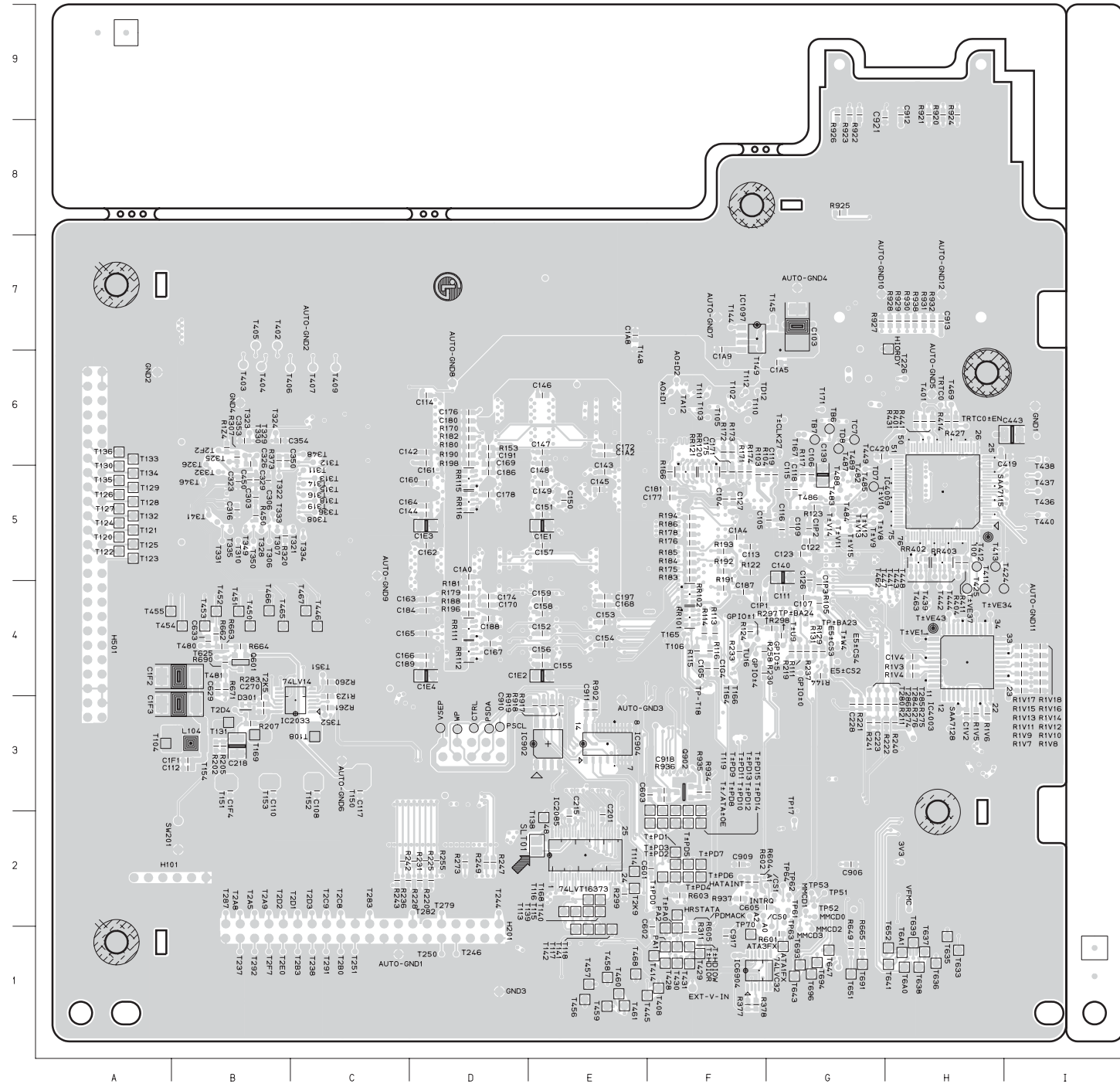
1. MAIN P.C.BOARD(TOP SIDE)



LOCATION GUIDE

/DASPD2	C4223	B5	IC1095	F6	RR119	D6	RR915	B2
/DIORD2	C4225	B5	IC1099	C5	RR120	D6	RR916	B2
/DIOWD2	C4226	B5	IC2075	C6	RR121	D6	RR933	B2
/RST=ATAC	D3	A5	IC3048	H5	RR125	C6	RR939	D3
AGS	D3	A5	IC6901	D3	RR126	C6	RR940	D3
C100	D6	A5	IC6902	D2	RR127	C6	RR103	D4
C101	C6	A5	IC6903	D2	RR128	C6	RR104	D4
C120	C6	A5	IC901	C2	RR130	C4	RR105	D5
C125	C6	A6	IC903	D3	RR132	C4	RR106	D5
C129	D7	A5	L102	C5	RR133	D4	RR107	D5
C130	G3	A5	L103	H3	RR134	C4	RR108	D5
C133	G3	B6	L105	C6	RR135	C4	RR109	G4
C134	H3	D1	L107	C6	RR136	C4	RR110	G4
C136	C6	D3	IC901	D3	RR109	C7	RR113	G5
C173	C6	D3	IC902	D3	RR110	H3	RR114	G5
C179	G4	D3	IC903	D3	RR111	G3	RR117	F6
C182	G4	C3	IC904	C3	RR112	D6	RR118	F6
C183	G4	C3	L114	H6	RR114	D6	RR119	F6
C190	G6	C1	L115	C7	RR115	C7	RR122	D5
C192	G4	D1	L116	C7	RR116	C7	RR123	B4
C194	F2	B2	L130	D6	RR119	D6	RR124	B4
C195	G5	C1	L303	H5	RR151	F1	RR301	G5
C196	G6	D1	L351	H6	RR152	F1	RR302	G5
C198	G4	C1	L402	B3	RR154	F1	RR404	B5
C1A1	G5	B8	L403	A3	RR155	F1	RR405	B5
C1A3	D6	B8	L406	A6	RR159	G6	SW201	H2
C1E6	F7	D0	L407	C6	RR160	G6	TP03	D3
C1E9	F7	D0	L408	C6	RR161	F6	TP20	C3
C1E9	F7	D0	L409	A6	RR162	G6	TP21	C3
C1F5	H3	D2	L410	A3	RR163	D6	TP22	C3
C1F6	G4	D2	LD102	H3	RR164	D6	TP23	C3
C1F7	D7	D2	LED1	C1	RR165	D5	TP24	C3
C1V1	B3	D2	LP	D3	RR167	G6	TP25	C3
C1V3	B4	D2	MMCM02	C2	RR168	G6	TP26	C3
C1V5	B3	D2	MMCK	C2	RR169	G6	TP27	C2
C1V6	A4	D2	MMWP	C2	RR177	D5	TP28	C2
C1V8	A4	D4	MSB5	C2	RR187	G4	TP31	C2
C1V9	B4	D5	MSCK	C2	RR189	G6	TP32	C2
C210	C6	D6	MSD	C2	RR195	G4	TP33	C2
C331	H5	D7	MS±D	C3	RR197	G6	TP34	C2
C332	H5	D8	MS±D1	C3	RR199	E1	TP35	C2
C333	H5	D9	MS±D2	C3	RR1A1	D6	TP36	C2
C337	H6	D901	MS±D3	C3	RR1A2	D6	TP37	C2
C346	H5	FMCP	C2	PN190H4	RR1A7	D4	TP40	C2
C348	H5	GND	F7	PN540H4	RR1Z2	C7	TP47	C2
C400	A4	GND1	A6	PN740E1	RR1Z6	D6	TP48	C2
C401	A4	GND2	I6	PN740E7	RR1Z6	D6	TP80	D2
C402	A4	GND3	F1	PN760C1	RR204	G2	X1	D3
C403	A4	GND4	H6	Q901	RR208	F2	X101	C6
C404	A4	H101	H2	RR101	RR209	D4	X2	C3
C405	A4	H201	H2	RR102	RR210	F2	X301	H6
C415	B5	H203	F2	RR107	RR212	C4	X401	A5
C416	B5	H501	I3	RR108	RR213	F2	X901	C3
C417	B6	IC1057	E2	RR109	RR216	C4		
C418	B5	IC1092	F4	RR110	RR217	F4		
C421	B6	IC1093	E6	RR112	RR218	C5		
C422	B5	IC1094	F4	RR118	RR244	D6		

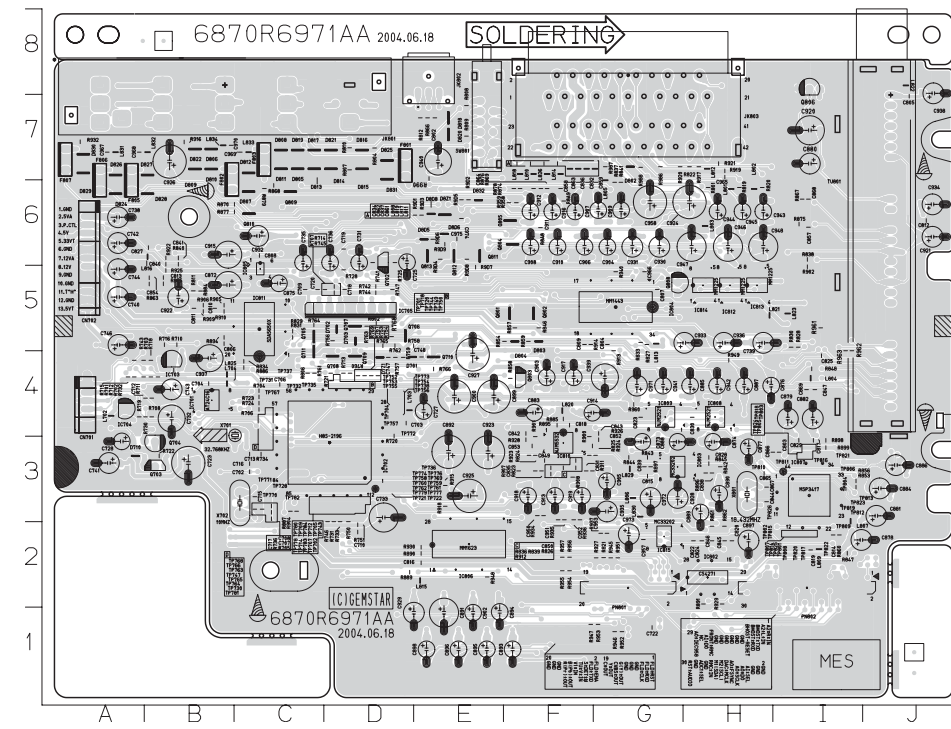
2. MAIN P.C.BOARD(BOTTOM SIDE)



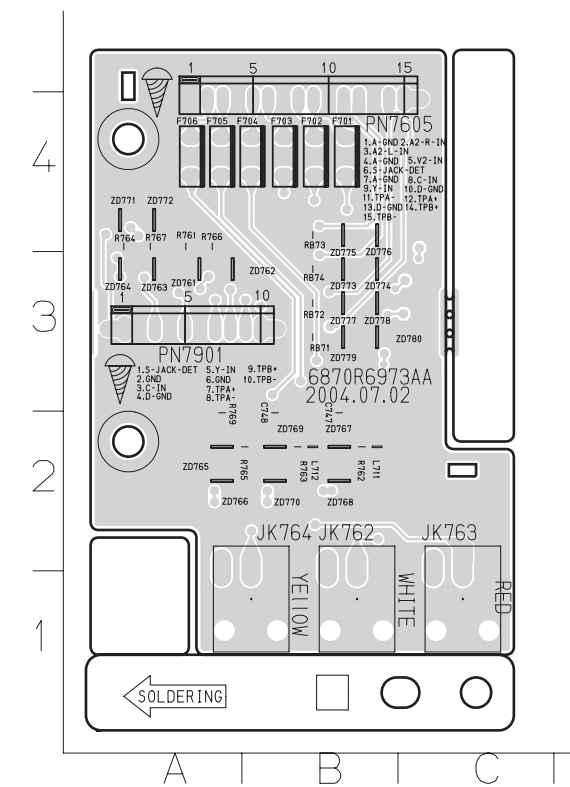
LOCATION GUIDE

/CS0	G2	C157	E5	C32	3	R105	G4	R211	G3	R920	H9	T134	A5	T310	B5	T447	C4	TP-T1	H4
/CS1	G2	C158	E4	C33	2	R111	G4	R220	D2	R921	H9	T135	A5	T311	B5	T448	H5	TP17	G2
/PDMA	G2	C159	E4	C34	6	R113	G3	R222	G3	R922	H9	T136	A6	T312	C6	T449	H5	TP51	G2
A0	G1	C160	D5	C35	3	R114	F4	R221	H3	R923	H9	T138	F2	T313	C5	T450	G5	TP52	G2
A1	G2	C161	D6	C353	3	R115	F4	R222	H3	R924	H9	T139	F2	T314	C5	T451	B4	TP53	G2
A2	F6	C162	D5	C354	3	R116	F4	R225	D2	R925	H9	T140	F2	T315	C5	T452	B4	TP61	G2
A0+D1	F6	C163	D4	C419	6	R117	G5	R228	D2	R926	H9	T141	F2	T316	C5	T453	B4	TP62	G2
A0+D2	F6	C164	D5	C420	6	R122	G5	R230	F4	R927	H7	T142	F2	T318	C5	T454	B4	TP63	G2
ATA1F	X1	C165	D4	C443	3	R123	G5	R231	D2	R928	H7	T144	F2	T319	C5	T455	B4	TP64	G2
ATA3F	X1	C166	D4	C450	3	R124	F4	R233	F4	R929	H7	T145	G7	T321	C5	T456	A4	TP70	F1
AUTO-GND	D4	C167	D4	C601	1	R129	G4	R236	C2	R930	H7	T148	F7	T322	B5	T457	E1	TP±BA	H4
AUTO-GND	D4	C168	D4	C602	1	R131	G5	R237	G4	R931	H7	T149	F7	T323	B6	T458	E1	TP±BA	H4
AUTO-GND	D6	C169	D6	C603	3	R144	G4	R240	H3	R932	H7	T150	C9	T324	B6	T459	E1	TRTCO	H6
AUTO-GND	D4	C170	D4	C605	5	R153	G4	R242	G3	R933	H7	T151	C9	T325	B6	T460	E1	TRTCO	H6
AUTO-GND	D5	C171	D5	C606	6	R166	F5	R244	C2	R934	H7	T152	C9	T326	B6	T461	E1	TU16	F4
AUTO-GND	D5	C172	D5	C607	7	R170	F5	R243	G4	R935	H7	T153	C9	T328	B5	T462	E1	T±/ATA	H6
AUTO-GND	D5	C173	D5	C608	8	R171	F5	R247	D2	R936	H7	T154	C9	T329	B6	T463	H5	T±CLK	H6
AUTO-GND	D5	C174	D5	C609	9	R172	F5	R249	D2	R937	H7	T164	F7	T330	B6	T464	H4	T±HDI	H6
AUTO-GND	D5	C175	D5	C610	10	R173	F5	R255	F4	R938	H7	T165	F7	T331	B5	T465	B4	T±HDI	H6
AUTO-GND	D5	C176	D5	C611	11	R174	F5	R258	F4	R939	H7	T166	F7	T332	B5	T466	B4	T±HDI	H6
AUTO-GND	D5	C177	D5	C612	12	R175	F5	R260	C4	R940	H7	T167	G6	T333	B5	T467	C4	T±PA0	F1
AUTO-GND	D5	C178	D5	C613	13	R176	F5	R261	C3	R941	H7	T168	F2	T334	C5	T468	E1	T±PD0	F2
AUTO-GND	D5	C179	D5	C614	14	R178	F5	R273	D2	R942	H7	T169	F2	T335	B5	T469	H6	T±PD1	F2
AUTO-GND	D5	C180	D5	C615	15	R179	F5	R274	G3	R943	H7	T171	H6	T336	C5	T470	B4	T±PD1	F2
AUTO-GND	D5	C181	D5	C616	16	R180	F5	R275	H3	R944	H7	T226	H6	T341	B5	T471	B4	T±PD1	F2
AUTO-GND	D5	C182	D5	C617	17	R181	F5	R276	H3	R945	H7	T237	B1	T346	B5	T472	G5	T±PD1	F2
AUTO-GND	D5	C183	D5	C618	18	R183	F5	R283	G3	R946	H7	T238	C1	T348	C6	T473	G5	T±PD1	F2
AUTO-GND	D5	C184	D5	C619	19	R184	F5	R297	G4	R947	H7	T244	D2	T349	B5	T474	G5	T±PD1	F2
AUTO-GND	D5	C185	D5	C620	20	R185	F5	R298	G4	R948	H7	T246	D2	T350	B5	T475	G5	T±PD2	F2
AUTO-GND	D5	C186	D5	C621	21	R187	F5	R307	E2	R949	H7	T250	C1	T351	C4	T476	G5	T±PD3	F2
AUTO-GND	D5	C187	D5	C622	22	R188	F5	R311	F1	R950	H7	T251	C1	T352	C3	T477	G5	T±PD4	F2
AUTO-GND	D5	C188	D5	C623	23	R189	F5	R320	B5	R951	H7	T279	D2	T401	H6	T488	G5	T±PD5	F2
AUTO-GND	D5	C189	D5	C624	24	R190	F5	R323	G3	R952	H7	T282	G4	T402	B7	T489	G5	T±PD6	F2
AUTO-GND	D5	C190	D5	C625	25	R191	F5	R327	B5	R953	H7	T283	C2	T403	B6	T600	C1	T±PD7	F2
AUTO-GND	D5	C191	D5	C626	26	R192	F5	R337	F1	R954	H7	T284	C2	T404	B6	T601	G1	T±PD8	F2
AUTO-GND	D5	C192	D5	C627	27	R193	F5	R378	F1	R955	H7	T285	H4	T405	B7	T625	B4	T±PD9	F2
AUTO-GND	D5	C193	D5	C628	28	R193	F5	R401	H6	R956	H7	T286	G4	T406	C6	T633	G1	T±U9	G4
AUTO-GND	D5	C194	D5	C629	29	R194	F5	R404	H5	R957	H7	T287	H4	T407	C6	T634	H1	T±V10	G5
AUTO-GND	D5	C195	D5	C630	30	R196	F5	R411	H5	R958	H7	T287	B2	T408	F1	T635	H1	T±V11	G5
AUTO-GND	D5	C196	D5	C631	31	R197	F5	R414	H6	R959	H7	T291	C1	T409	C6	T636	H1	T±V12	G5
AUTO-GND	D5	C197	D5	C632	32	R198	F5	R427	H6	R960	H7	T292	B1	T411	H4	T638	H1	T±V13	G5
AUTO-GND	D5	C198	D5	C633	33	R198	F5	R431	H6	R961	H7	T292	B2	T412	H5	T639	H1	T±V14	G5
AUTO-GND	D5	C199	D5	C634	34	R199	F5	R434	H6	R962	H7	T292	B2	T413	H5	T641	H1	T±V15	G5
AUTO-GND	D5	C200	D5	C635	35	R200	F5	R450	B5	R963	H7	T292	B2	T414	F1	T643	G1	T±V8	G5
AUTO-GND	D5	C201	D5	C636	36	R201	F5	R601	G1	R964	H7	T292	B2	T424	I4	T644	G1	T±V9	G5
AUTO-GND	D5	C202	D5	C637	37	R202	F5	R602	F2	R965	H7	T292	B2	T425	H4	T645	G1	T±VE1	H4
AUTO-GND	D5	C203	D5	C638	38	R203	F5	R603	F2	R966	H7	T292	B2	T428	F1	T652	G1	T±VE3	H4
AUTO-GND	D5	C204	D5	C639	39	R204	F5	R604	F2	R967	H7	T292	B2	T429	F1	T653	G1	T±VE4	H4
AUTO-GND	D5	C205	D5	C640	40	R205	F5	R605	F1	R968	H7	T292	B2	T431	F1	T654	G1	T±VE5	H4
AUTO-GND	D5	C206	D5	C641	41	R206	F5	R606	F1	R969	H7	T292	B2	T436	I5	T655	G1	T±VE6	H4
AUTO-GND	D5	C207	D5	C642	42	R207	F5	R607	F1	R970	H7	T292	B2	T437	I5	T656	G1	T±W4	H4
AUTO-GND	D5	C208	D5	C643	43	R208	F5	R608	F1	R971	H7	T292	B2	T438	I5	T657	G1	VPMC	G2
AUTO-GND	D5	C209	D5	C644	44	R209	F5	R609	F1	R972	H7	T292	B2	T439	H4	T658	G1	VSEP	D3
AUTO-GND	D5	C210	D5	C645	45	R210	F5	R610	F1	R973	H7	T292	B2	T440	I5	T659	G1		
AUTO-GND	D5	C211	D5	C646	46	R211	F5	R611	F1	R974	H7	T292	B2	T441	H5	T660	G1		
AUTO-GND	D5	C212	D5	C647	47	R212	F5	R612	F1	R975	H7	T292	B2	T442	H4	T661	G1		
AUTO-GND	D5	C213	D5	C648	48	R213	F5	R613	F1	R976	H7	T292	B2	T443	H5	T662	G1		
AUTO-GND	D5	C214	D5	C649	49	R214	F5	R614	F1	R977	H7	T292	B2	T444	H4	T663	G1		
AUTO-GND	D5	C215	D5	C650	50	R215	F5	R615	F1	R978	H7	T292	B2	T445	E1	T664	G1		

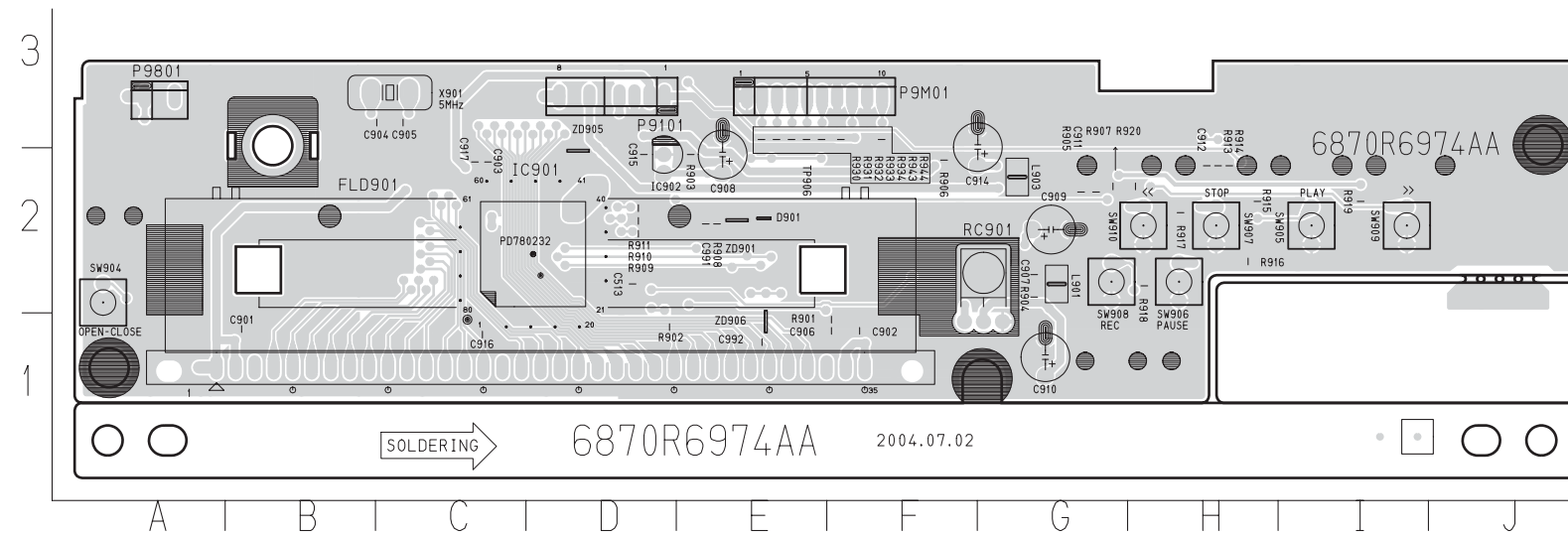
3. I/O P.C.BOARD



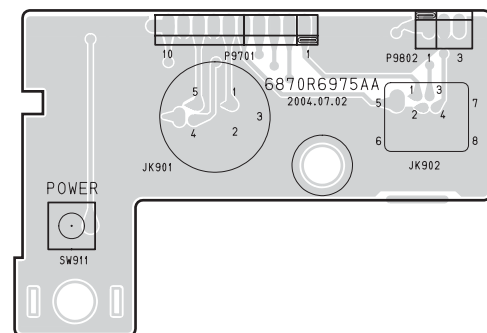
4. JACK P.C.BOARD



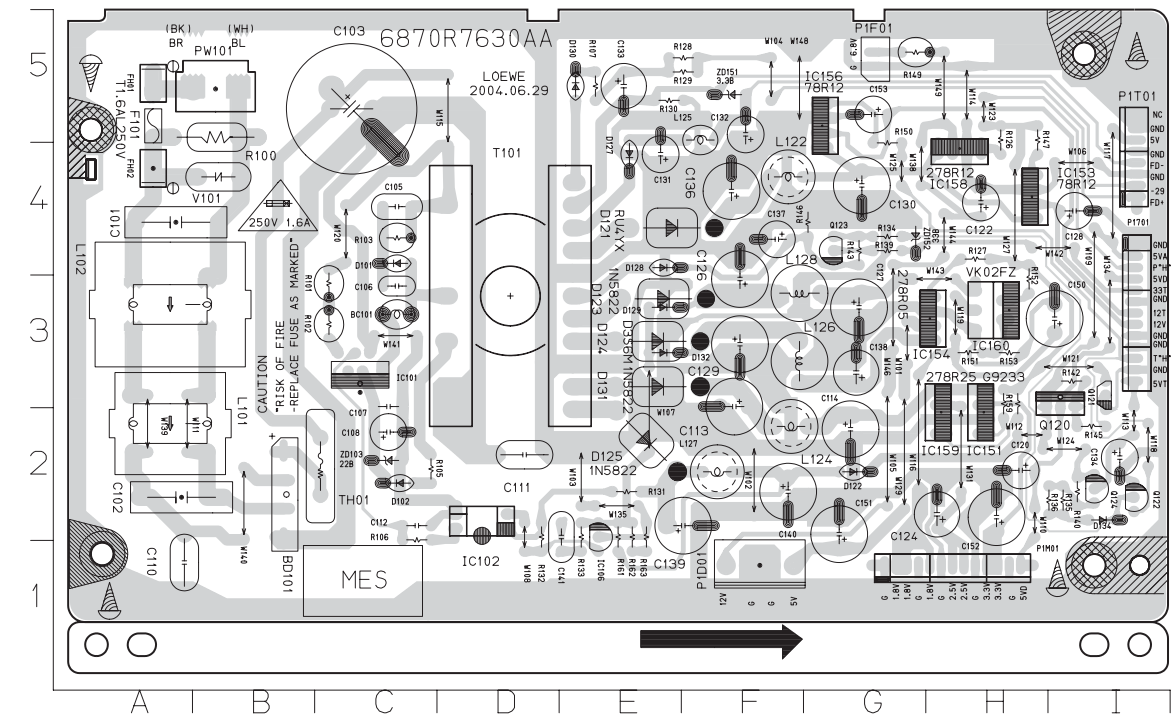
5. FRONT P.C.BOARD



6. KEY P.C.BOARD



7. POWER P.C.BOARD



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SECTION 2 CABINET & MAIN CHASSIS

SECTION 3 ELECTRICAL

SECTION 4 PARTS LIST

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SUMMARY

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NEW FUNCTIONS OF DVD-RECORDER

• SUMMARY OF PRODUCT

- RECORDING FUNCTION OF DVD-RW AND DVD-R SPECIFICATIONS
 - DVD-RW: VIDEO MODE AND VR MODE RECORD AVAILABLE
 - DVD-R :VIDEO MODE RECORD AVAILABLE
- DIGITAL DUBBING FUNCTION OF DV CAMCORDER BY USING DV TERMINAL (IEEE1394)
 - RECORD, PLAY, FF/REW FUNCTION BY REMOTE CONTROL OF DV CAMCORDER
- DVD PROGRESSIVE PLAY RESPONSE
- VARIOUS FUNCTION RESPONSE OF DVD RECORDING (DISC NAVIGATION AND CONVENIENT PLAY, EDIT FUNCTION)
- OUTSIDE INPUT AND TV RECORDING AVAILABLE
 - RECORDING SCREEN QUALITY :VR(HQ, SQ, LQ), VIDEO(HQ, SQ)
- TV RESERVE RECORDING FUNCTION (AUTO MODE SETTING AVAILABLE FOR RECORDING IN ACCORDANCE WITH THE REMAINING DISC SPACE IN RESERVATION)

SUMMARIZED EXPLANATION OF MAIN FUNCTION

- DVD RECORDING FUNCTION(VR MODE RECORD / VIDEO MODE RECORD)
- 1) VR MODE RECORD : MANUAL MODE RECORDING IN ACCORDANCE WITH VARIOUS EDITING FUNCTION, REMAINING DISC SPACE AND PROGRAM TIME DVD-RW DISC RECORDED IN THE VR MODE CAN BE PLAYED WITH A DVD PLAYER CORRESPONDING TO THE DVD-RW THERE IS ALSO A PLAYER TO BE PLAYED THROUGH FINALIZING. FOR THE DVD-RW, RECORDING AND EDITING IS AVAILABLE AT THE SAME DEVICE EVEN AFTER FINALIZING.
 - 2) VIDEO MODE RECORDING : THERE IS NO EDITING FUNCTION SUCH AS VR MODE RECORDING BUT VIDEO MODE RECORDING IS PLAYED IN A GAME DEVICE (FOR EXAMPLE, "PLAY STATION 2") WITH PC, DVD PLAY FUNCTION CORRESPONDING TO DVD PLAYER, CAR DVD, DVD-ROM. TO PLAY IN ANOTHER DEVICE, FINALIZING IS REQUIRED. RECORDING, EDITING AND EDITING IS NOT POSSIBLE AFTER FINALIZING. HOWEVER, RECORDING IS ALLOWED AT THE DVD-RW DISC IF ERASING THE TITLE FINALLY RECORDED AFTER FINALIZING.
 - 3) RECORDING MODE INITIALIZATION (A KIND OF FORMATTING): BEGINS INITIALIZATION AFTER SELECTING RECORDING MODE AS VR OR VIDEO MODE BY USING INITIALIZATION FUNCTION OF THE DISC SETTING MENU. INITIALIZES DEFAULT AS VR MODE FOR DVD-RW. RECORDS IT AS VIDEO MODE WITHOUT INITIALIZATION FOR VIDEO MODE.
 - 4) FINALIZE: BEGINS FINALIZE AT THE DISC SETTING MENU DURING STOP.

PRODUCT SAFETY SERVICING GUIDELINES FOR VIDEO PRODUCTS

IMPORTANT SAFETY NOTICE

This manual was prepared for use only by properly trained audio-video service technicians.

When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics Corporation. All components should be replaced only with types identical to those in the original circuit and their physical location, wiring and lead dress must conform to original layout upon completion of repairs.

Special components are also used to prevent x-radiation, shock and fire hazard. These components are indicated by the letter "x" included in their component designators and are required to maintain safe performance. No deviations are allowed without prior approval by LG Electronics Corporation.

Circuit diagrams may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the set is not delayed until the new service literature is printed.

CAUTION: Do not attempt to modify this product in any way. Never perform customized installations without manufacturer's approval. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury.

Service work should be performed only after you are thoroughly familiar with these safety checks and servicing guidelines.

GRAPHIC SYMBOLS



The exclamation point within an equilateral triangle is intended to alert the service personnel to important safety information in the service literature.



The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the service personnel to the presence of noninsulated "dangerous voltage" that may be of sufficient magnitude to constitute a risk of electric shock.



The pictorial representation of a fuse and its rating within an equilateral triangle is intended to convey to the service personnel the following fuse replacement caution notice:

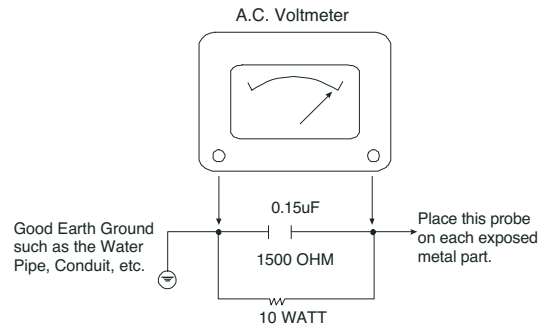
CAUTION: FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ALL FUSES WITH THE SAME TYPE AND RATING AS MARKED NEAR EACH FUSE.

SERVICE INFORMATION

While servicing, use an isolation transformer for protection from AC line shock. After the original service problem has been corrected, make a check of the following:

FIRE AND SHOCK HAZARD

1. Be sure that all components are positioned to avoid a possibility of adjacent component shorts. This is especially important on items transported to and from the repair shop.
2. Verify that all protective devices such as insulators, barriers, covers, shields, strain reliefs, power supply cords, and other hardware have been reinstalled per the original design. Be sure that the safety purpose of the polarized line plug has not been defeated.
3. Soldering must be inspected to discover possible cold solder joints, solder splashes, or sharp solder points. Be certain to remove all loose foreign particles.
4. Check for physical evidence of damage or deterioration to parts and components, for frayed leads or damaged insulation (including the AC cord), and replace if necessary.
5. No lead or component should touch a high current device or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces must be avoided.
6. After reassembly of the set, always perform an AC leakage test on all exposed metallic parts of the cabinet (the channel selector knobs, antenna terminals, handle and screws) to be sure that set is safe to operate without danger of electrical shock. **DO NOT USE A LINE ISOLATION TRANSFORMER DURING THIS TEST.** Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner: Connect a 1500 ohm, 10 watt resistor, paralleled by a .15 mfd 150V AC type capacitor between a known good earth ground water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination of 1500 ohm resistor and .15 mfd capacitor. Reverse the AC plug by using a non-polarized adaptor and repeat AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 0.75 volts RMS. This corresponds to 0.5 milliamp AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



TIPS ON PROPER INSTALLATION

1. Never install any receiver in a closed-in recess, cubbyhole, or closely fitting shelf space over, or close to, a heat duct, or in the path of heated air flow.
2. Avoid conditions of high humidity such as: outdoor patio installations where dew is a factor, near steam radiators where steam leakage is a factor, etc.
3. Avoid placement where draperies may obstruct venting. The customer should also avoid the use of decorative scarves or other coverings that might obstruct ventilation.
4. Wall- and shelf-mounted installations using a commercial mounting kit must follow the factory-approved mounting instructions. A product mounted to a shelf or platform must retain its original feet (or the equivalent thickness in spacers) to provide adequate air flow across the bottom. Bolts or screws used for fasteners must not touch any parts or wiring. Perform leakage tests on customized installations.
5. Caution customers against mounting a product on a sloping shelf or in a tilted position, unless the receiver is properly secured.
6. A product on a roll-about cart should be stable in its mounting to the cart. Caution the customer on the hazards of trying to roll a cart with small casters across thresholds or deep pile carpets.
7. Caution customers against using extension cords. Explain that a forest of extensions, sprouting from a single outlet, can lead to disastrous consequences to home and family.

SERVICING PRECAUTIONS

CAUTION : Before servicing the DVD Recorder covered by this service data and its supplements and addends, read and follow the SAFETY PRECAUTIONS. **NOTE** : if unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions in this publications, always follow the safety precautions.

Remembers Safety First:

General Servicing Precautions

1. Always unplug the DVD Recorder AC power cord from the AC power source before:
 - (1) Removing or reinstalling any component, circuit board, module, or any other assembly.
 - (2) Disconnection or reconnecting any internal electrical plug or other electrical connection.
 - (3) Connecting a test substitute in parallel with an electrolytic capacitor.
Caution : A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Do not spray chemicals on or near this DVD Recorder or any of its assemblies.
3. Unless specified otherwise in this service data, clean electrical contacts by applying an appropriate contact cleaning solution to the contacts with a pipe cleaner, cotton-tipped swab, or comparable soft applicator. Unless specified otherwise in this service data, lubrication of contacts is not required.
4. Do not defeat any plug/socket B+ voltage interlocks with which instruments covered by this service manual might be equipped.
5. Do not apply AC power to this DVD Recorder and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
6. Always connect test instrument ground lead to the appropriate ground before connection the test instrument positive lead. Always remove the test instrument ground lead last.

Insulation Checking Procedure

Disconnect the attachment plug from the AC outlet and turn the power on. Connect an insulation resistance meter(500V) to the blades of the attachment plug. The insulation resistance between each blade of the attachment plug and accessible conductive parts (Note 1) should be more than 1M-ohm.

Note 1 : Accessible Conductive Parts including Metal panels, Input terminals, Earphone jacks, etc.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field effect transistors and semiconductor chip components.

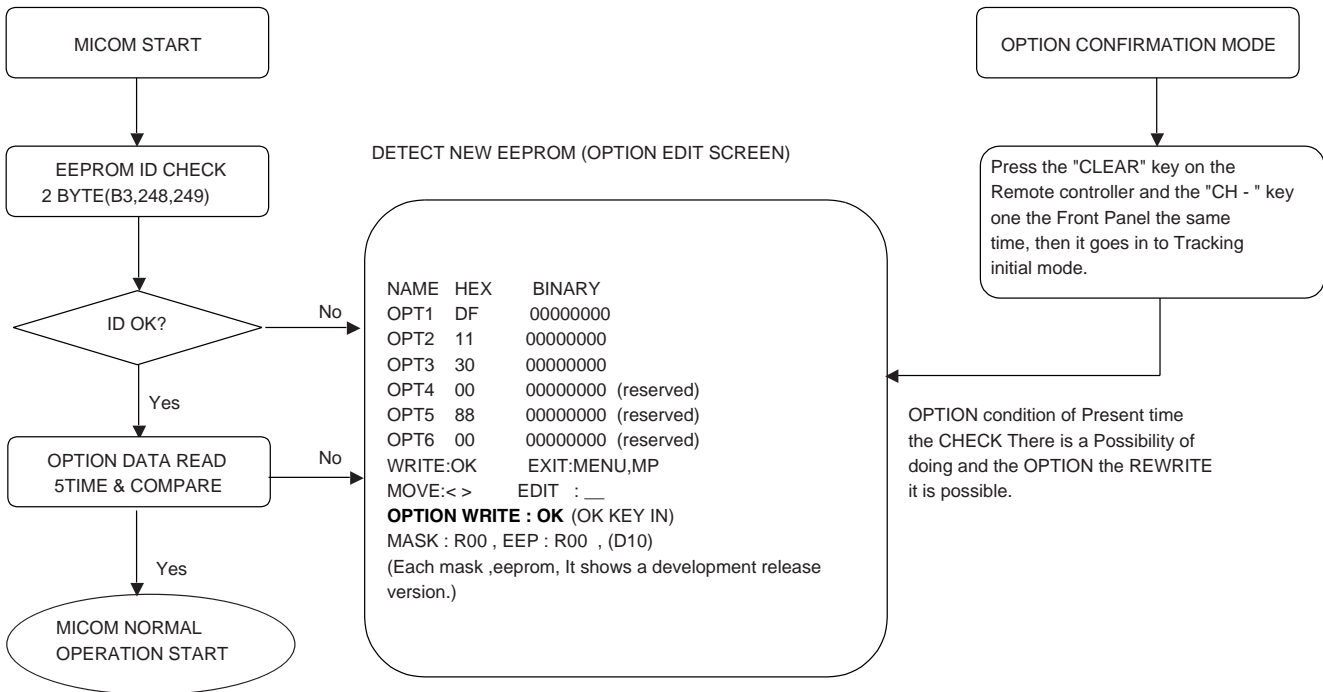
The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified a "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charge sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil, or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.

Caution : Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.

8. Minimize bodily motions when handling unpackaged replacement ES devices. (Normally harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

SERVICE INFORMATION FOR EEPROM IC SETTING



*** EEPROM INITIAL ***

- SETUP is displayed in the field if pressing the Front ch- & ch+ Key with the Remocon number "clear" key pressed in the status of powering on.
- AUTO SEARCH is done since the initial screen of ACMS is serviced if powering on.

SPECIFICATIONS

• GENERAL

Power requirements	AC 200-240V, 50/60 Hz
Power consumption	44W
Dimensions (approx.)	430 X 92 X 382.5 mm (16.9 x 3.6 x 15 inches) (w x h x d)
Mass (approx.)	6.4 kg (14.1 lbs)
Operating temperature	5°C to 35°C (41°F to 95°F)
Operating humidity	5 % to 90 %
Television system	PAL B/G colour system
Recording format	PAL

• RECORDING

Recording format	DVD VideoRecording, DVD-VIDEO
Recordable discs	DVD-ReRecordable, DVD-Recordable
Recordable time	Approx. 1 hour (HQ mode), 2 hours (SQ mode), 4 hours (LQ mode)

Video recording format

Sampling frequency	27MHz
Compression format	MPEG 2

Audio recording format

Sampling frequency	48kHz
Compression format	Dolby Digital

• DVD SPECIFICATIONS

Laser system	Semiconductor laser
Frequency response	DVD (PCM 48 kHz): 8 Hz to 22 kHz, CD: 8 Hz to 20 kHz
Signal-to-noise ratio	More than 100 dB
Harmonic distortion	Less than 0.008%
Dynamic range	More than 95 dB

• INPUTS

AERIAL IN	Aerial input, 75 ohms
VIDEO IN	1.0 Vp-p 75 ohms, sync negative, RCA jack x 2 / SCART
AUDIO IN	0 dBm more than 47 kohms, RCA jack (L, R) x 2 / SCART
DV IN	4 pin (i.LINK/IEEE 1394 standard)

• OUTPUTS

VIDEO OUT	1 Vp-p 75 Ω, sync negative, RCA jack x 1
S-VIDEO OUT	(Y) 1.0 V (p-p), 75 Ω, negative sync, Mini DIN 4-pin x 1 (C) 0.3 V (p-p) 75 Ω
COMPONENT VIDEO OUT	(Y) 1.0 V (p-p), 75 Ω, negative sync, RCA jack x 1 (Pb)/(Pr) 0.7 V (p-p), 75 Ω, RCA jack x 2
Audio output (digital audio)	0.5 V (p-p), 75 Ω, RCA jack x 1
Audio output (optical audio)	5 V (p-p), 75 Ω, Optical connector x 1
Audio output (analog audio)	2.0 Vrms (1 KHz, 0 dB), 600 Ω, RCA jack (L, R) x 1 / SCART

• ACCESSORY:

Video cable	1	Audio cable	1
RF Coaxial Cable.....	1	Blank DVD-R disc	2
Remote control	1	Batteries	2

SECTION 2
CABINET & MAIN CHASSIS

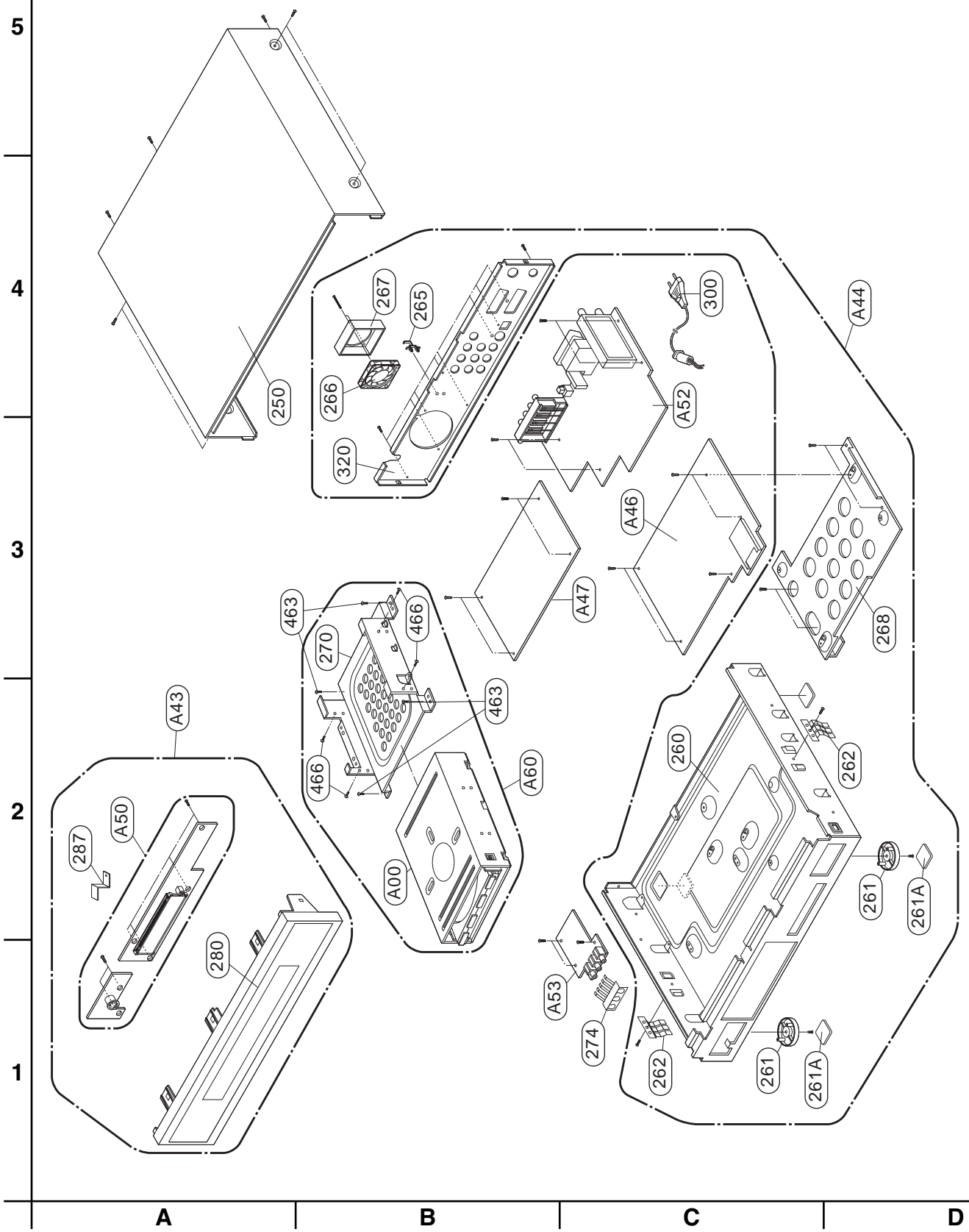
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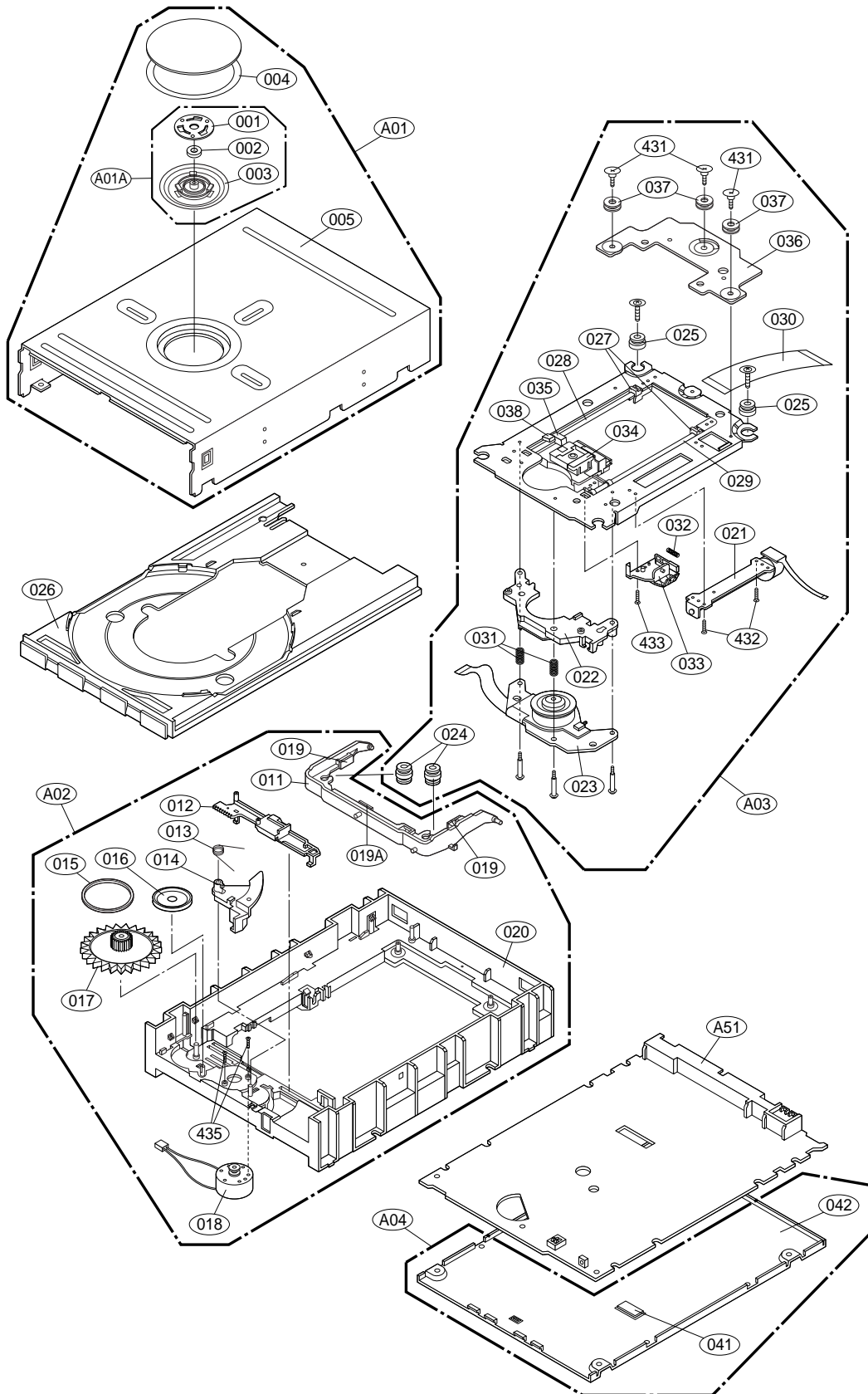
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- 3. Packing Accessory Section2-4**

EXPLODED VIEWS

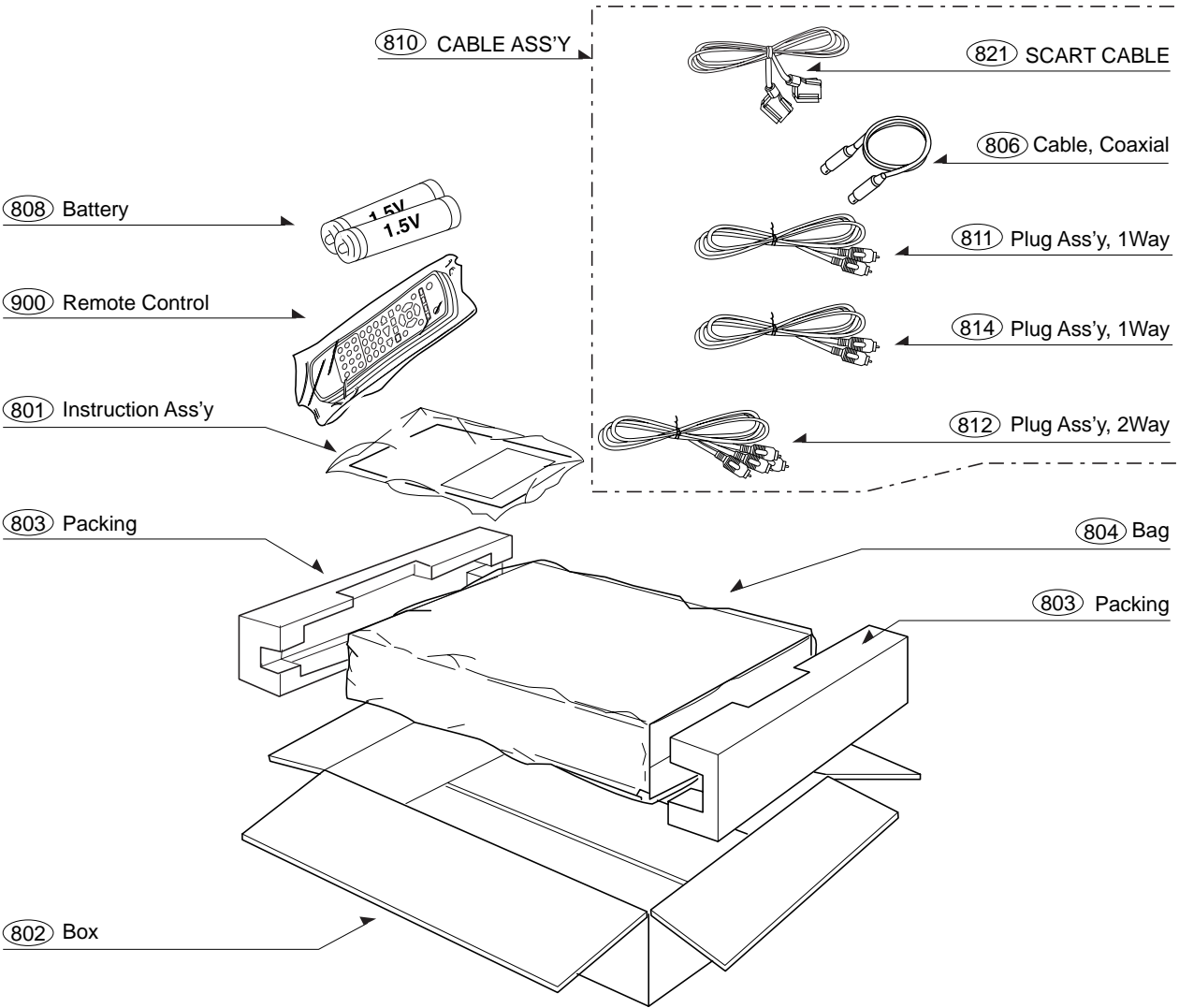
1. Cabinet and Main Frame Section



2. DECK MECHANISM SECTION(RL-01A)



3. Packing Accessory Section



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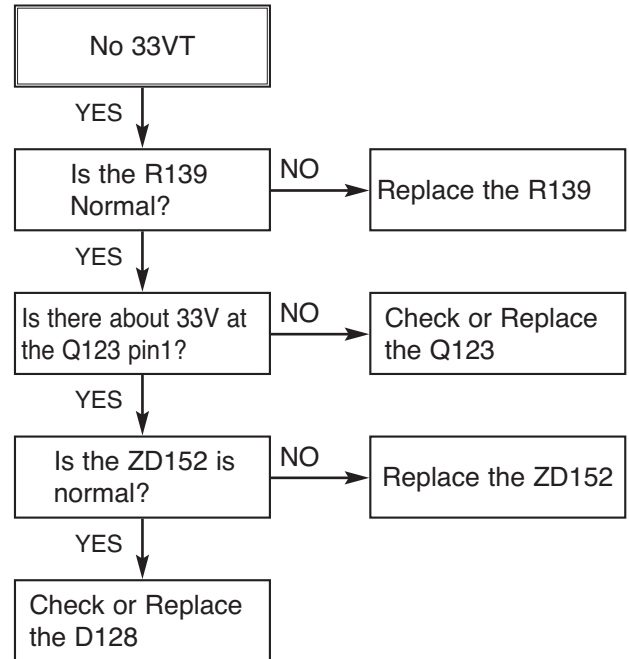
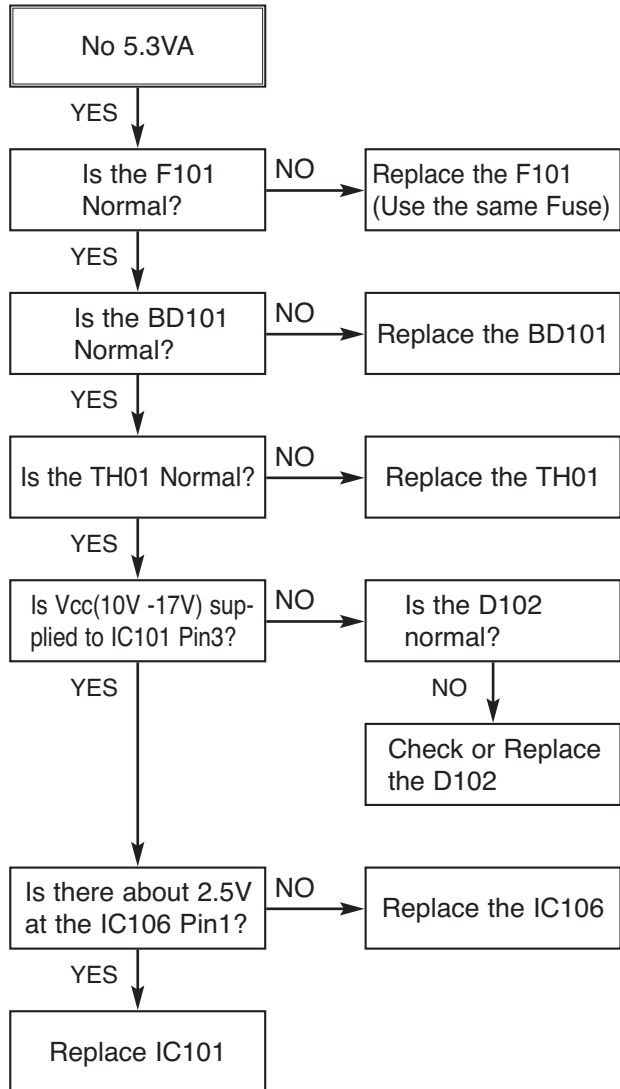
RL-01A LOADER PART

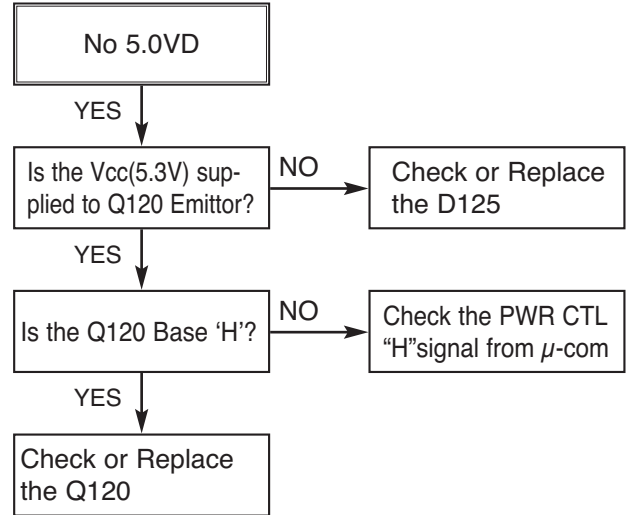
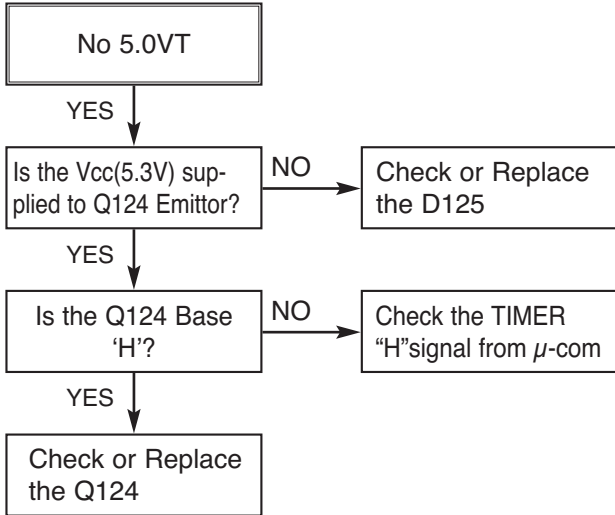
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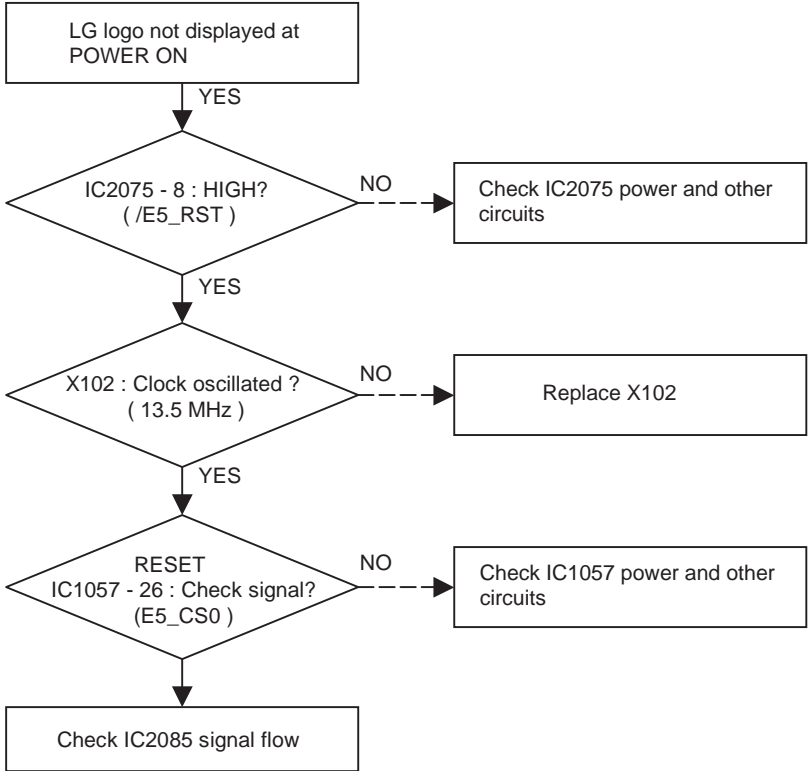
VDR PART

ELECTRICAL TROUBLESHOOTING GUIDE

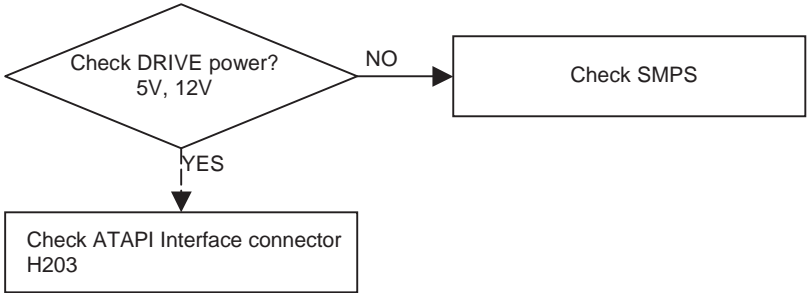




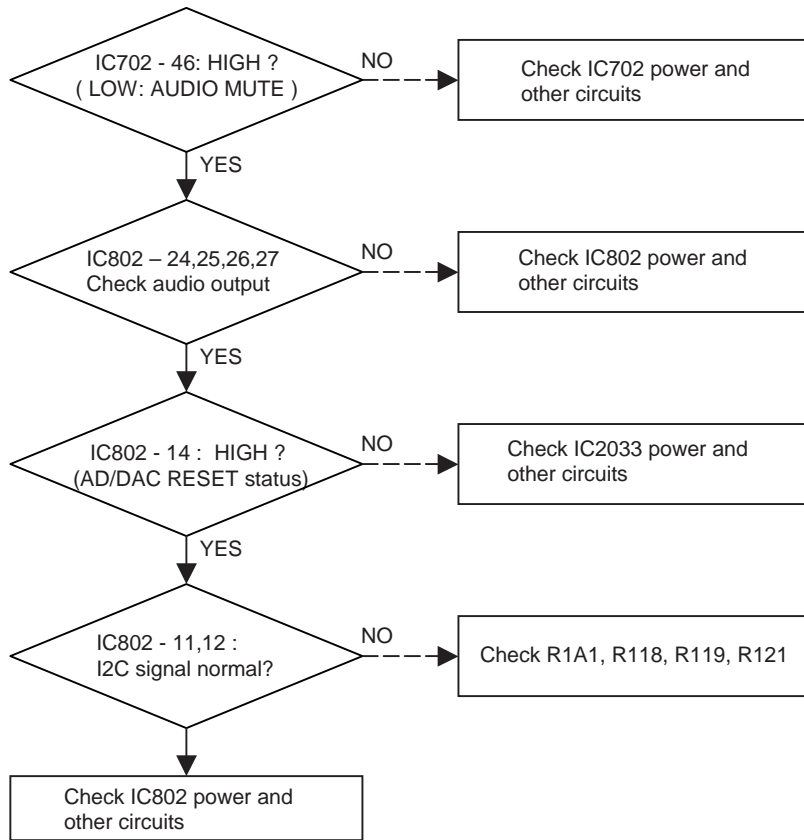
SYSTEM Section



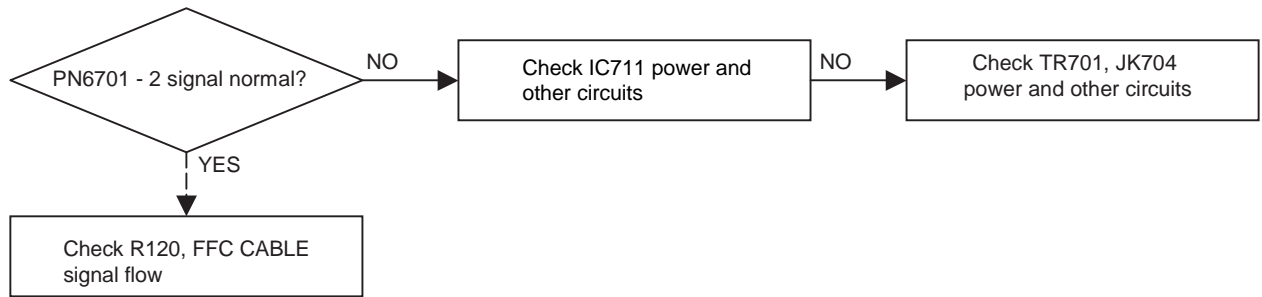
DISC not recognized



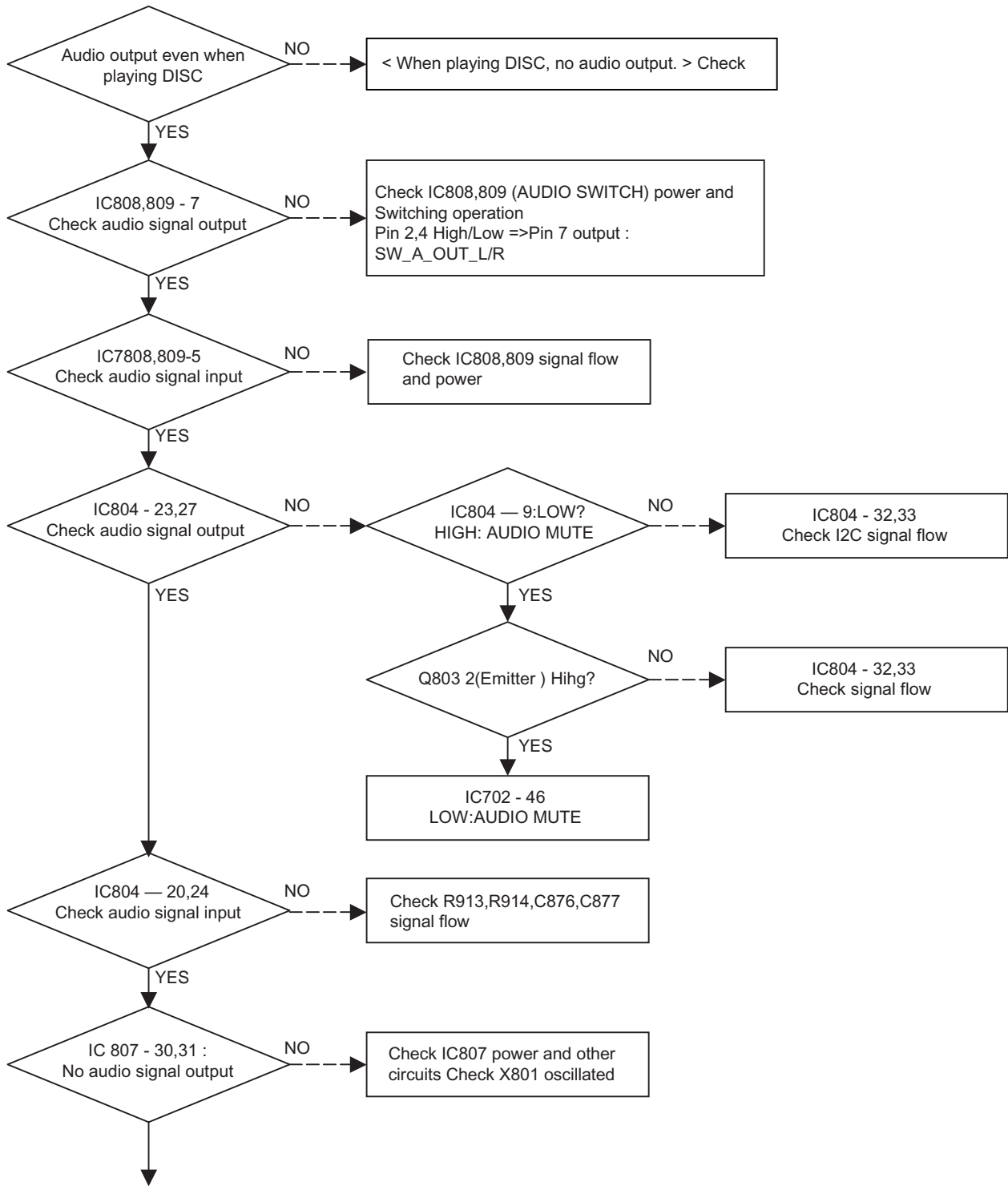
When playing DISC, no audio output

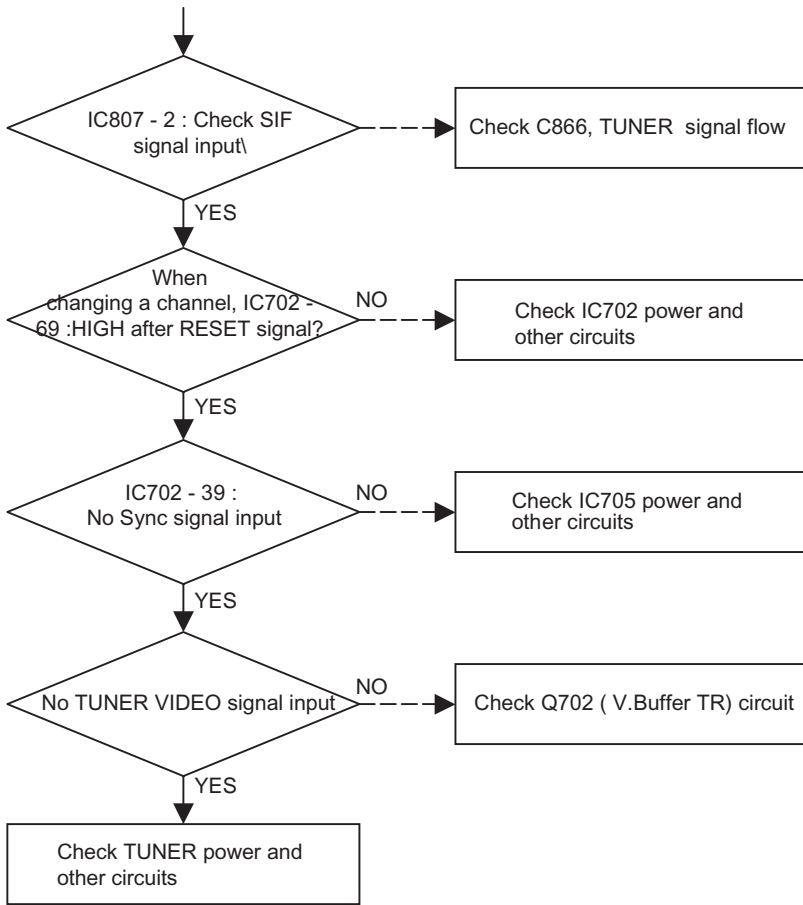


No OPTICAL / DIGITAL output

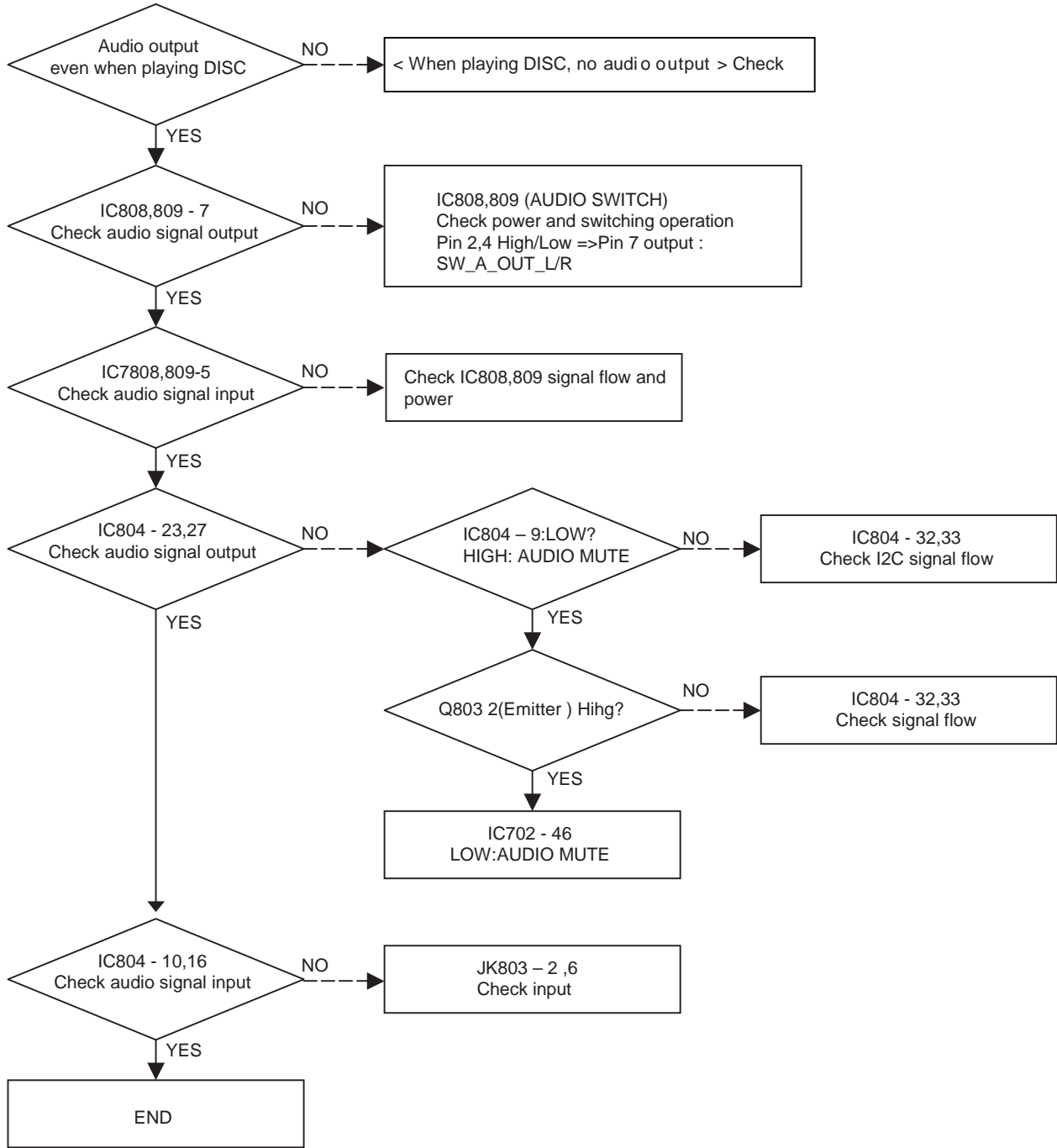


No TUNER audio output

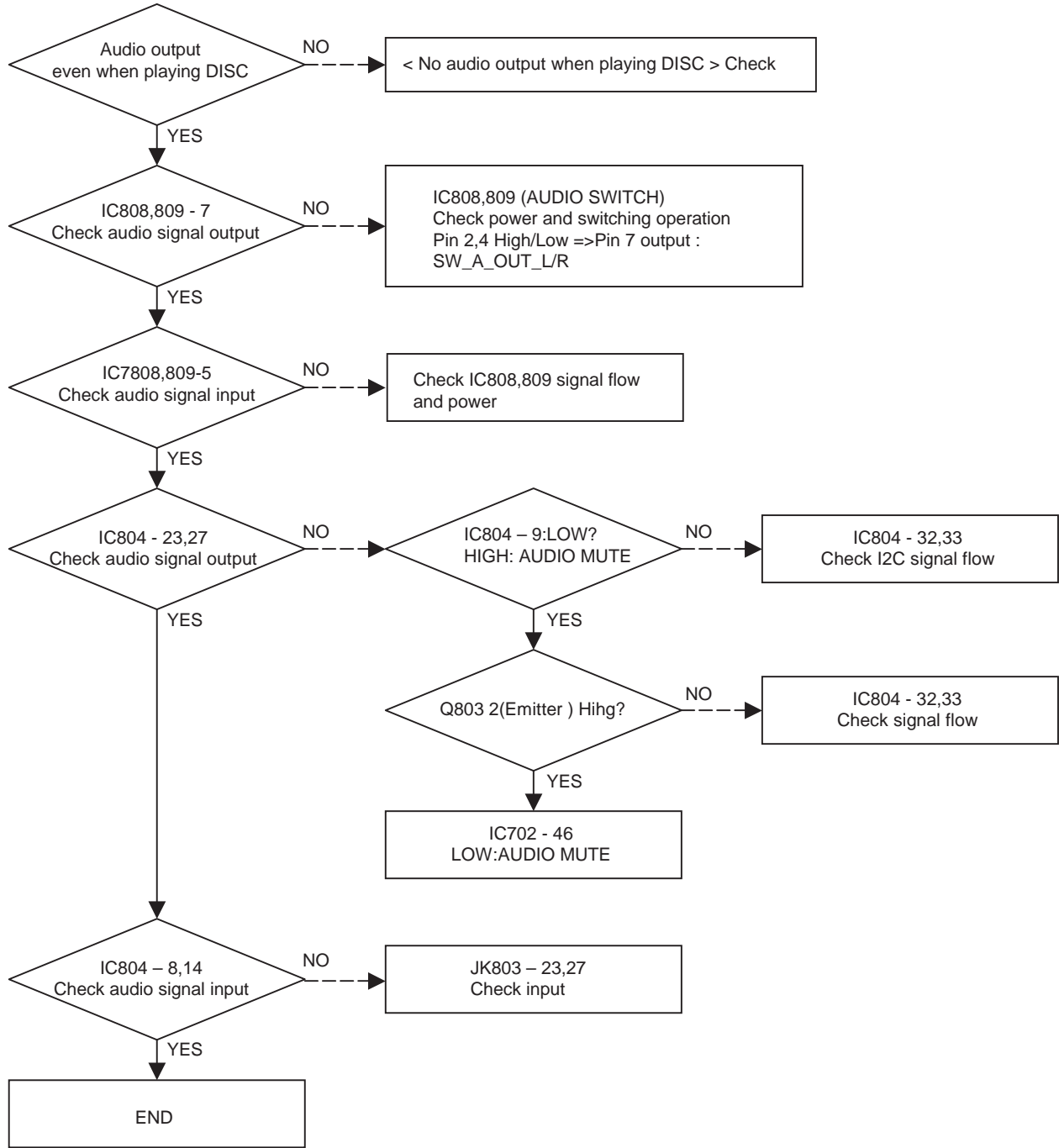




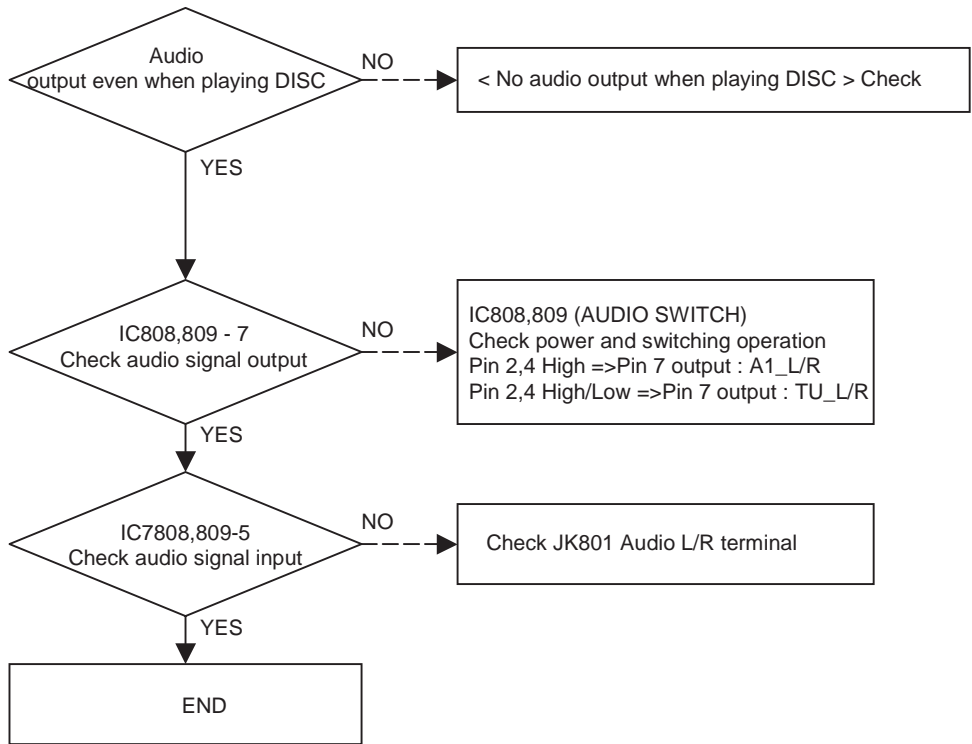
No external input 1 audio



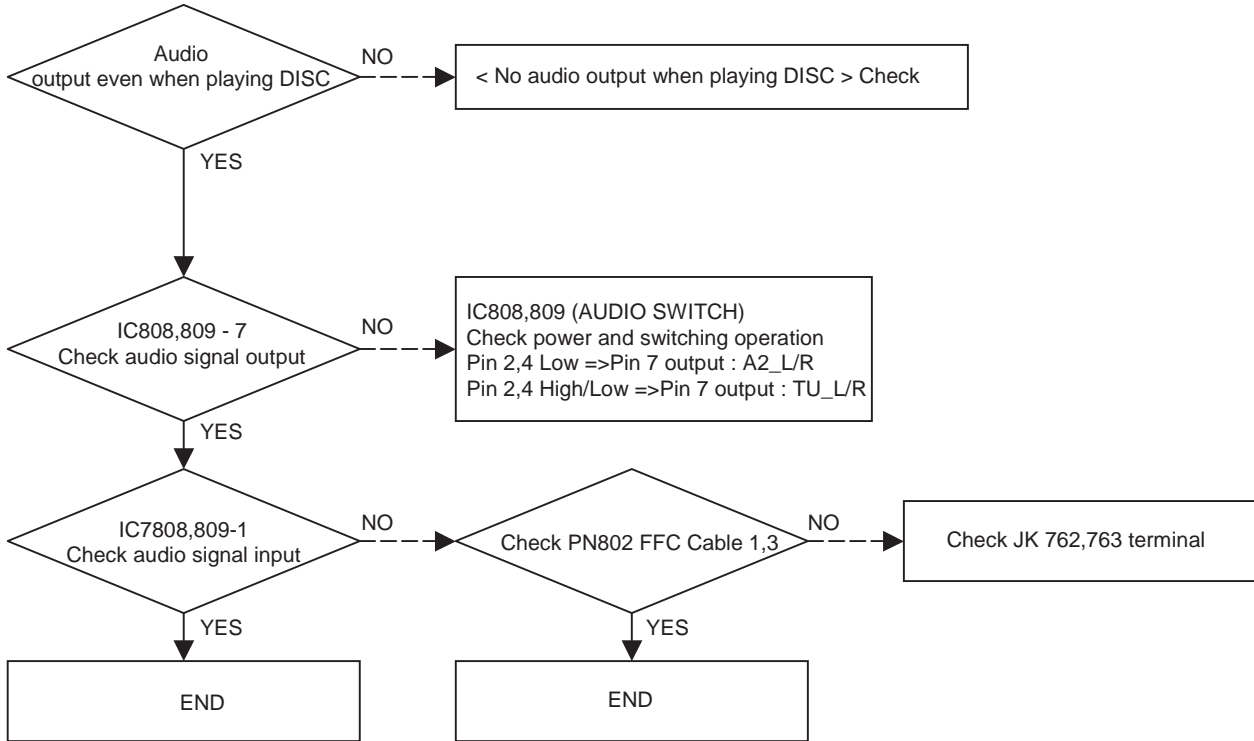
No external input 2 audio



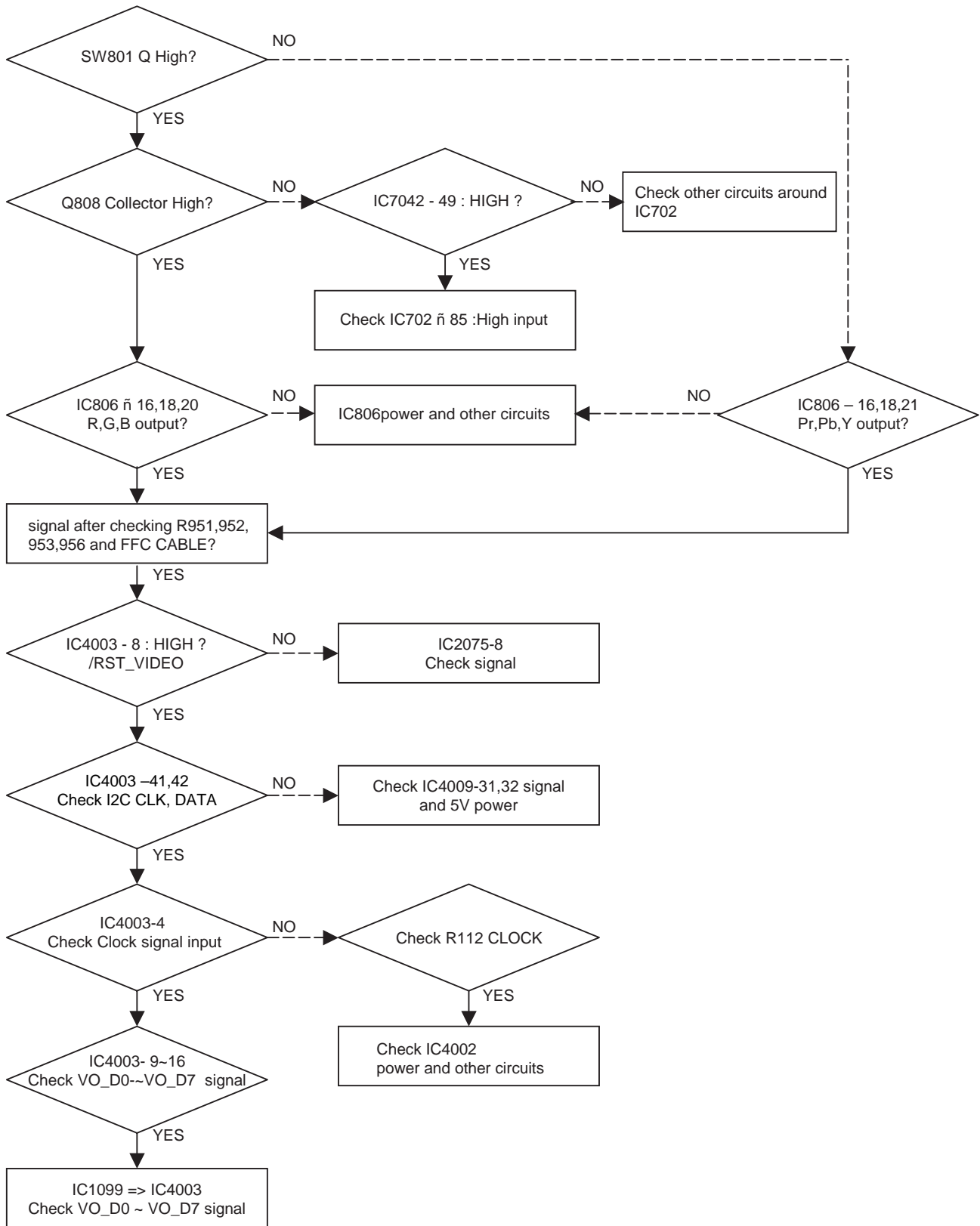
No external input 3 audio



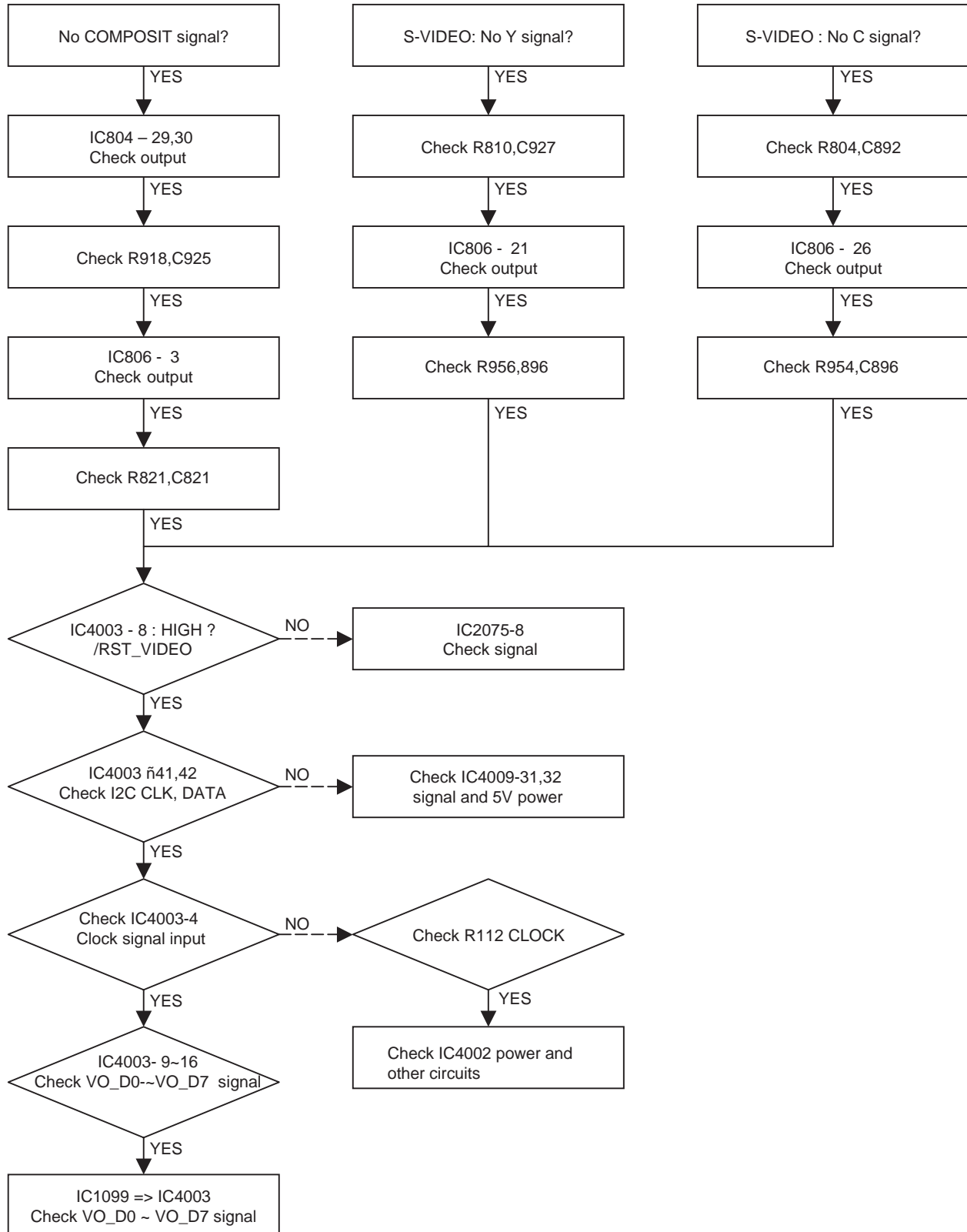
No external input 4 audio



No RGB /
Component video signal when playing DISC



No COMPOSIT / S-VIDEO signal when playing DISC



No TV , external input video signal

When connecting Tuner,
no TV video signal

YES

Check Tuner power and other
circuits

YES

Check IC804 - 28(input) and 31
(output), and then CABLE =>
IC4009 signal input

YES

No video signal of external input 1/2
(Rear Comosite input)

YES

Check IC804 - 1,3(input) and 31
(output), and then CABLE =>
IC4009 signal input

YES

No video signal of external input 3/4
(Front S-VIEDO / Comosite input)

YES

JACK CABLE => IC4009
Check signal input

YES

IC4009 - 27 : HIGH ?
/RST_VIDEO

NO

Check IC2075- 8,9 signal

YES

When RESET,
check IC4009 - 31,32
I2C CLK, DATA

NO

Check IC4003- 40,41
signal and 5V LEVEL

YES

Check IC4009 — 91,94 signal?
(VI_CLK, VI_VSYNCO)

NO

Check X401 Clock oscillated

NO

Replace X401 X-TAL

YES

IC4009 => IC1099
Check VI_D0 ~ VI_D7 signal

NO

Check IC4009 power and
other circuits

YES

< When playing DISC, no COMPONENT, COMPOSIT/S-VIDEO signal > Check

No DV(IEEE 1394) input (video/audio) signal

Check DV_JACK and CABLE connection

YES

IC3048 - 42,43,44,45
Check signal input

YES

IC3048 - 78:HIGH?
(/RST_PHY)

NO

Check IC2075 -8 signal

YES

Check IC3048 - 2 Clock?
BIO_PHY_CLK

NO

Check X301 Clock
24.576 MHz

YES

IC3048 => IC1099
Check BIO_PHY_DATA/CLK
signal

NO

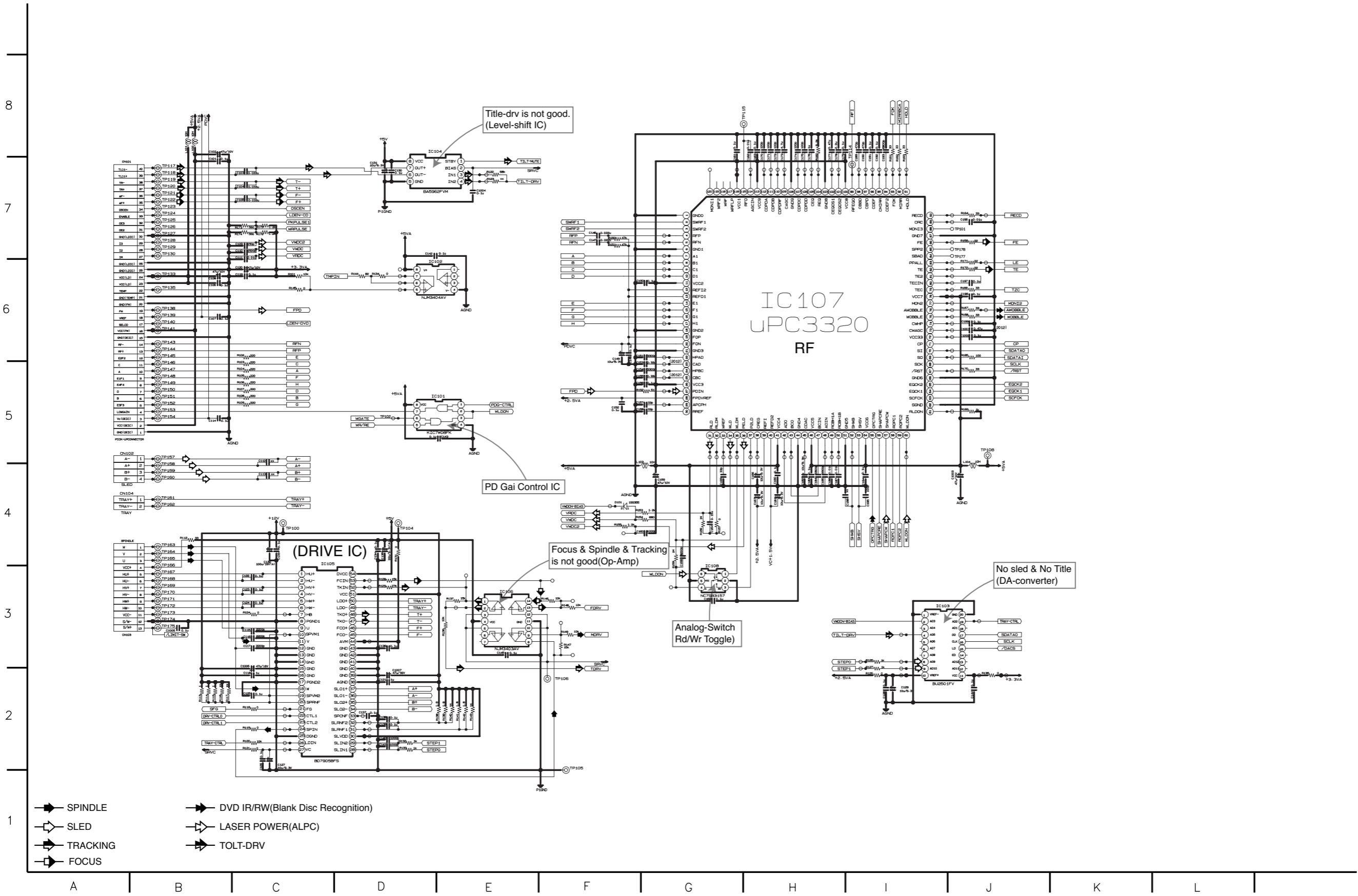
Check IC3048 power and
other circuits

YES

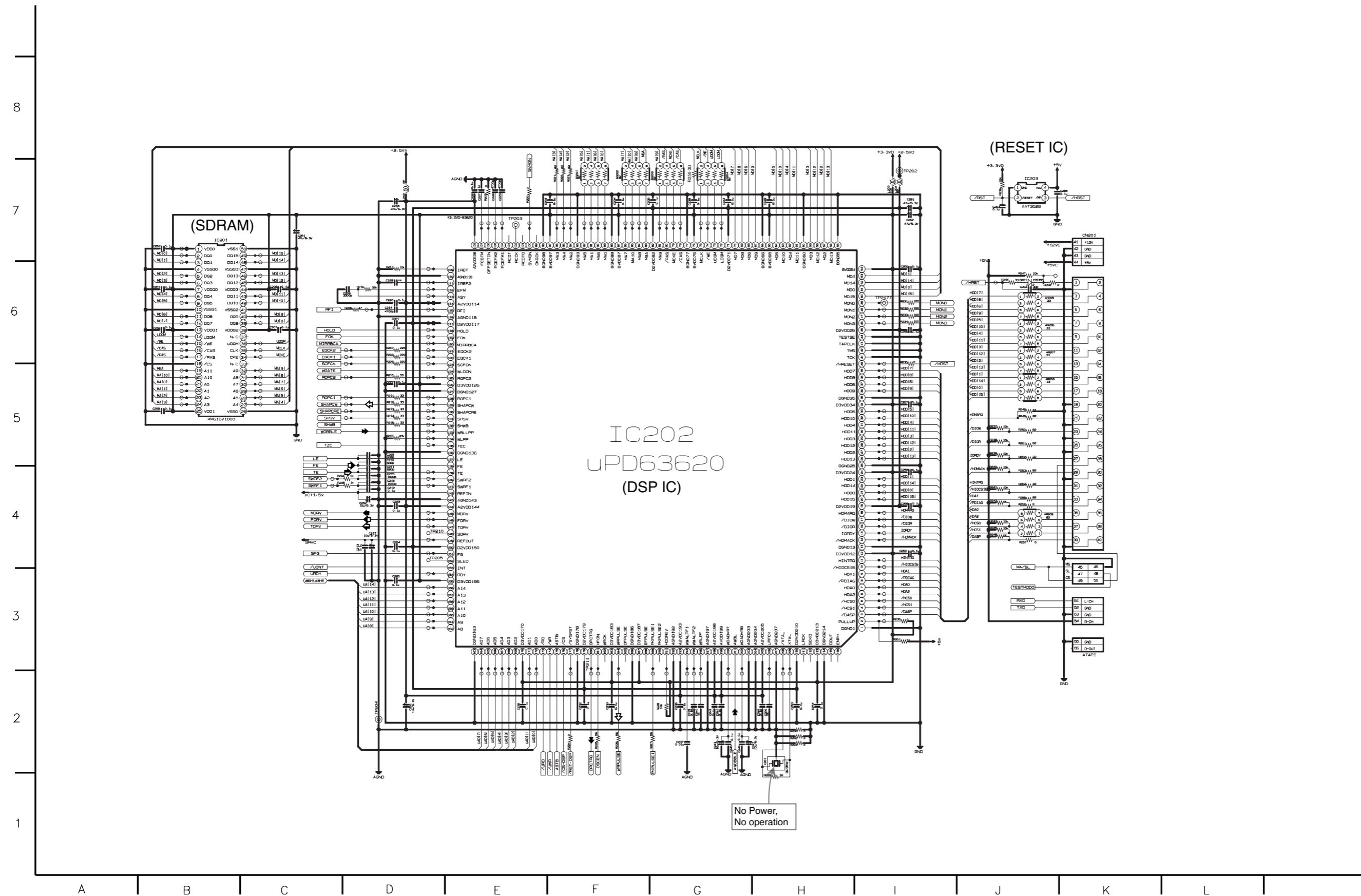
< When playing DISC, No COMPONENT, COMPOSIT/S-VIDEO signal > Check

CIRCUIT DIAGRAMS

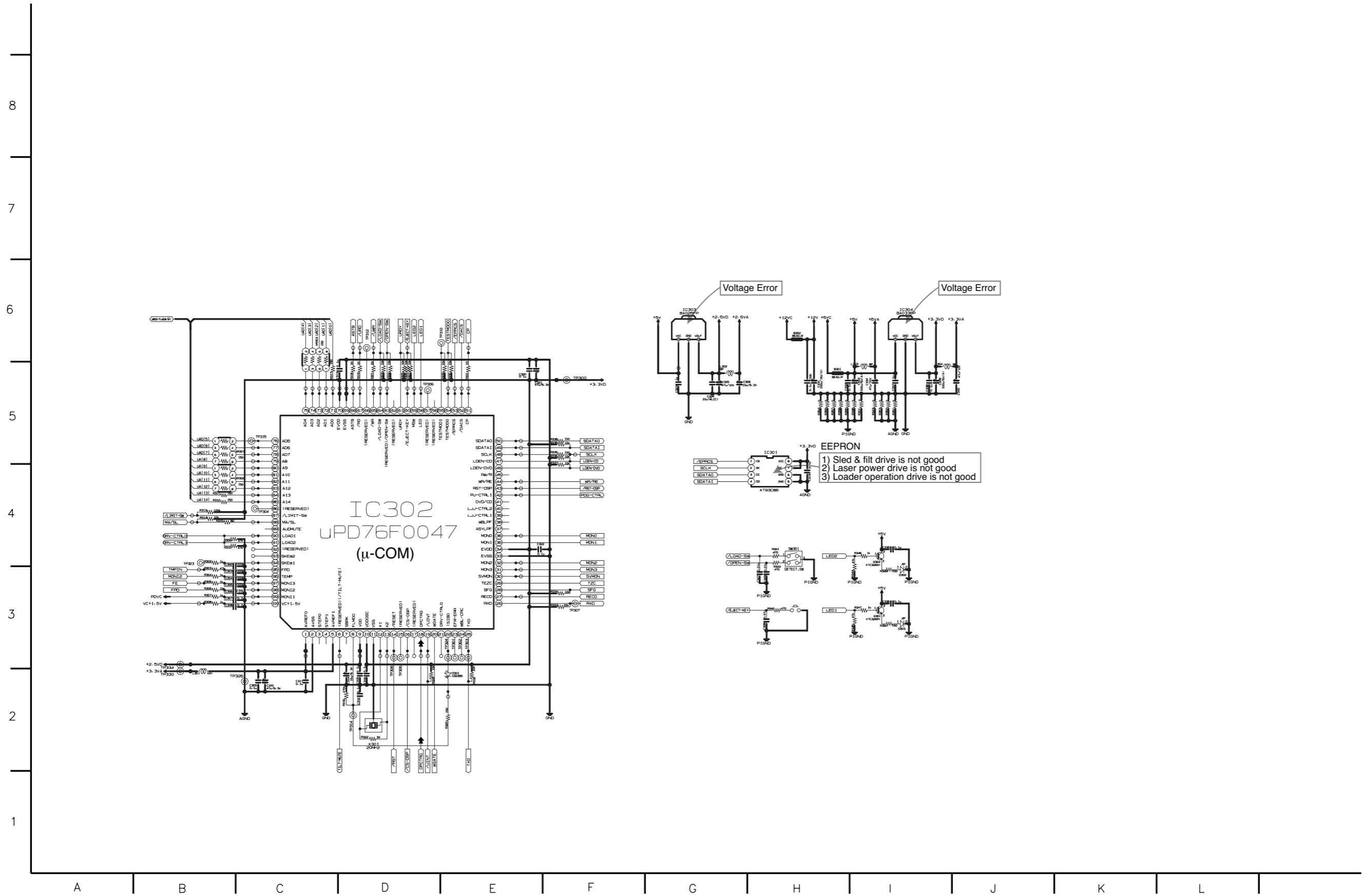
1. RF CIRCUIT DIAGRAM



2. DSP CIRCUIT DIAGRAM



3. μ -COM CIRCUIT DIAGRAM

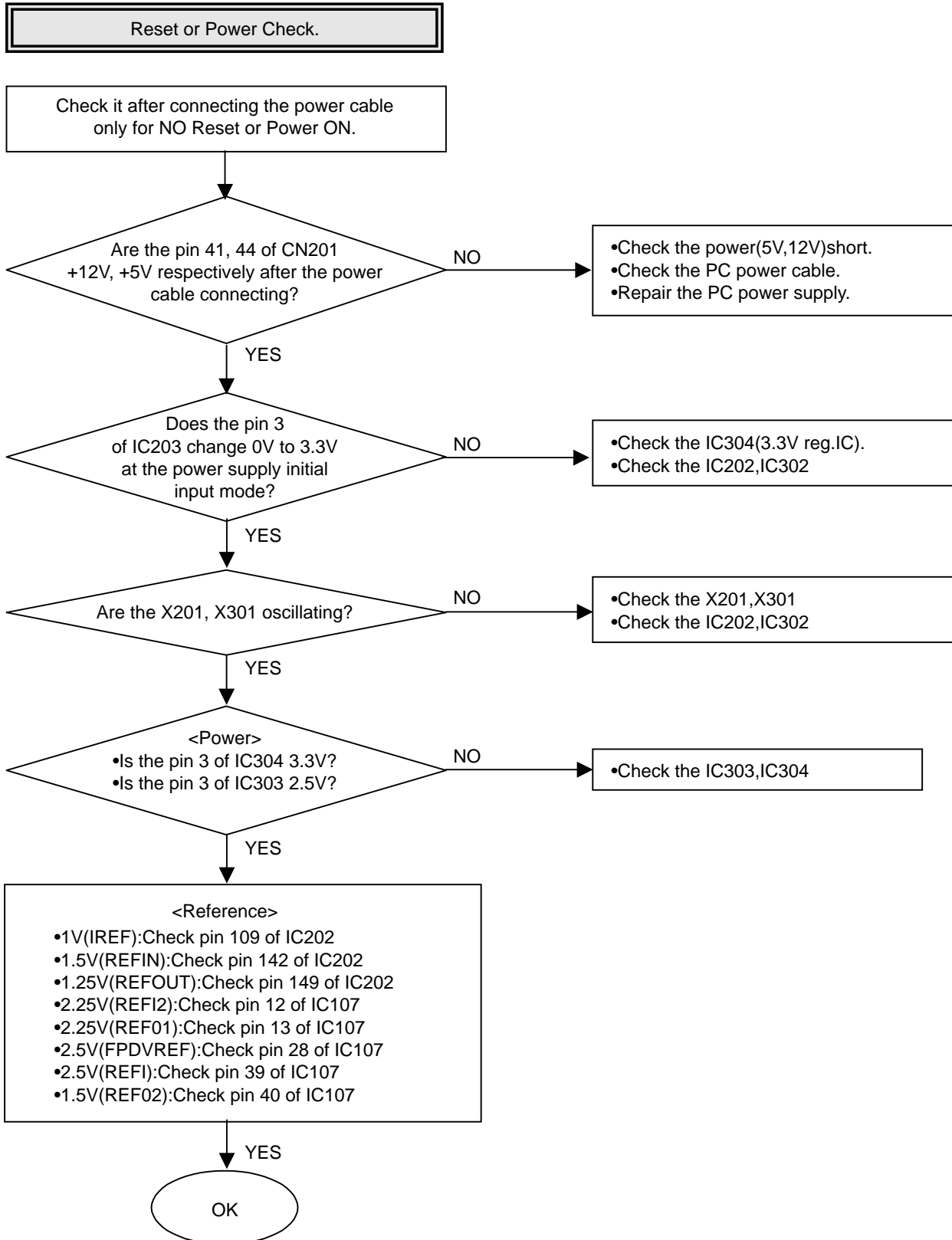


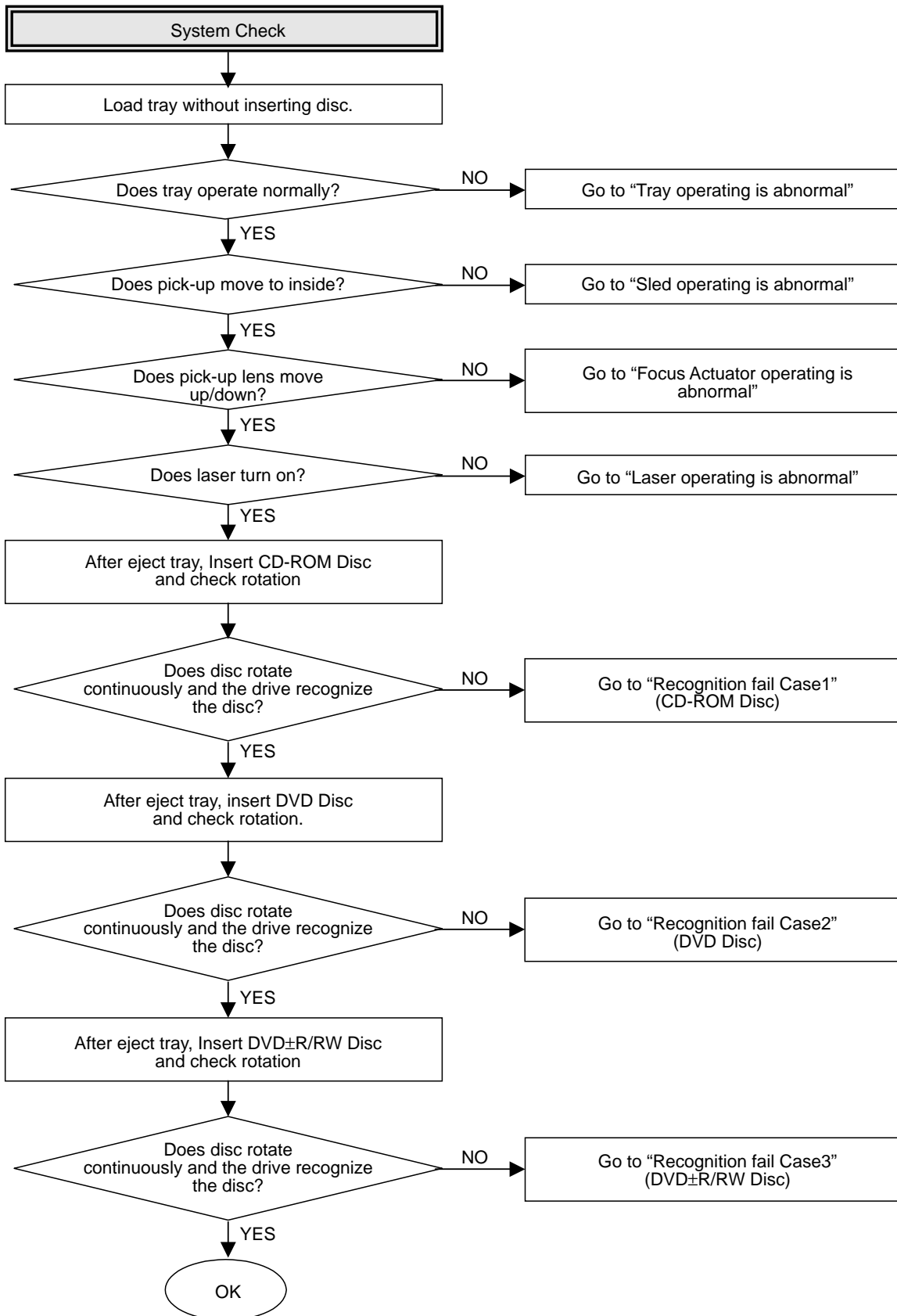
IC302
UPD76F0047
(μ -COM)

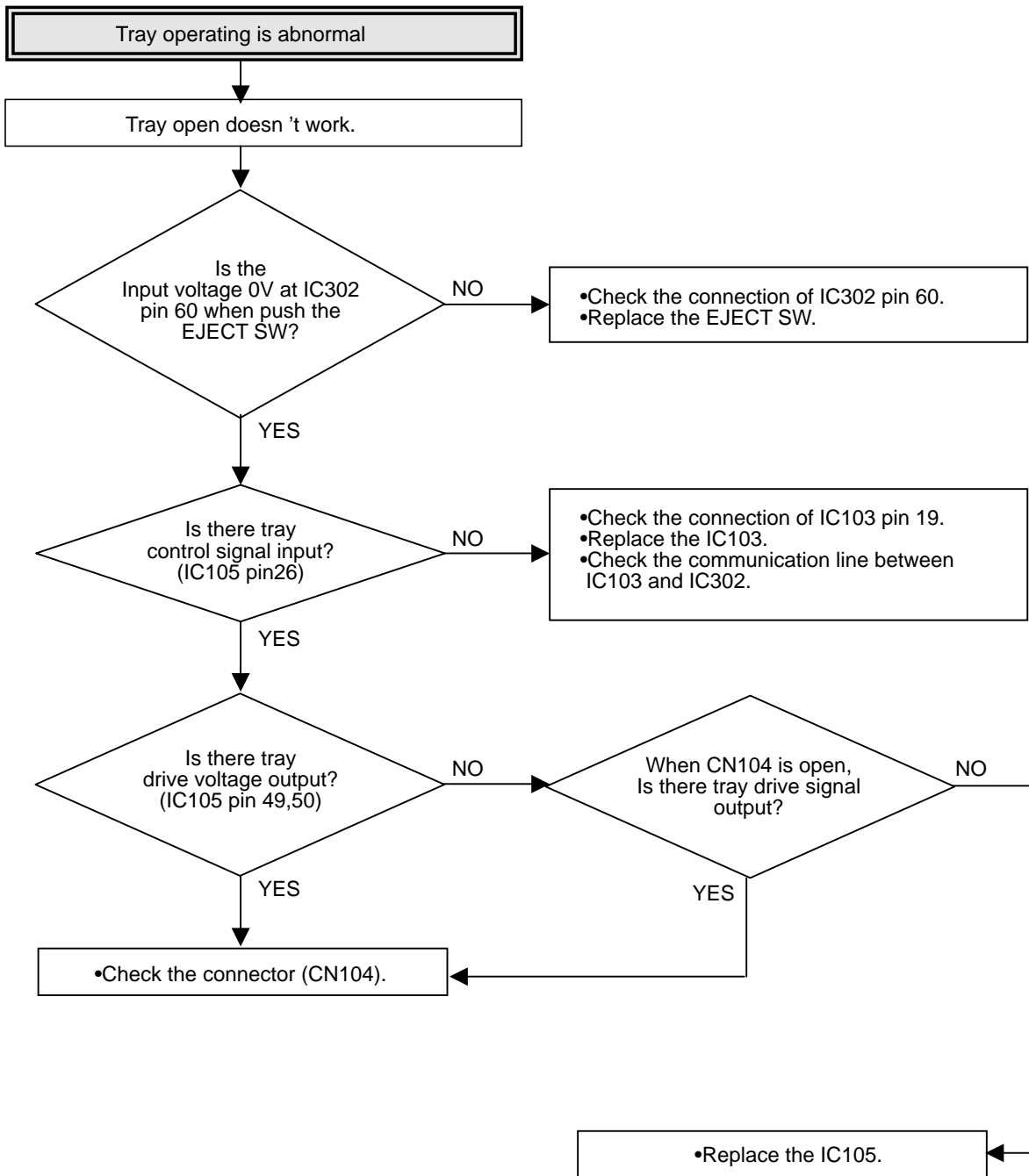
Voltage Error

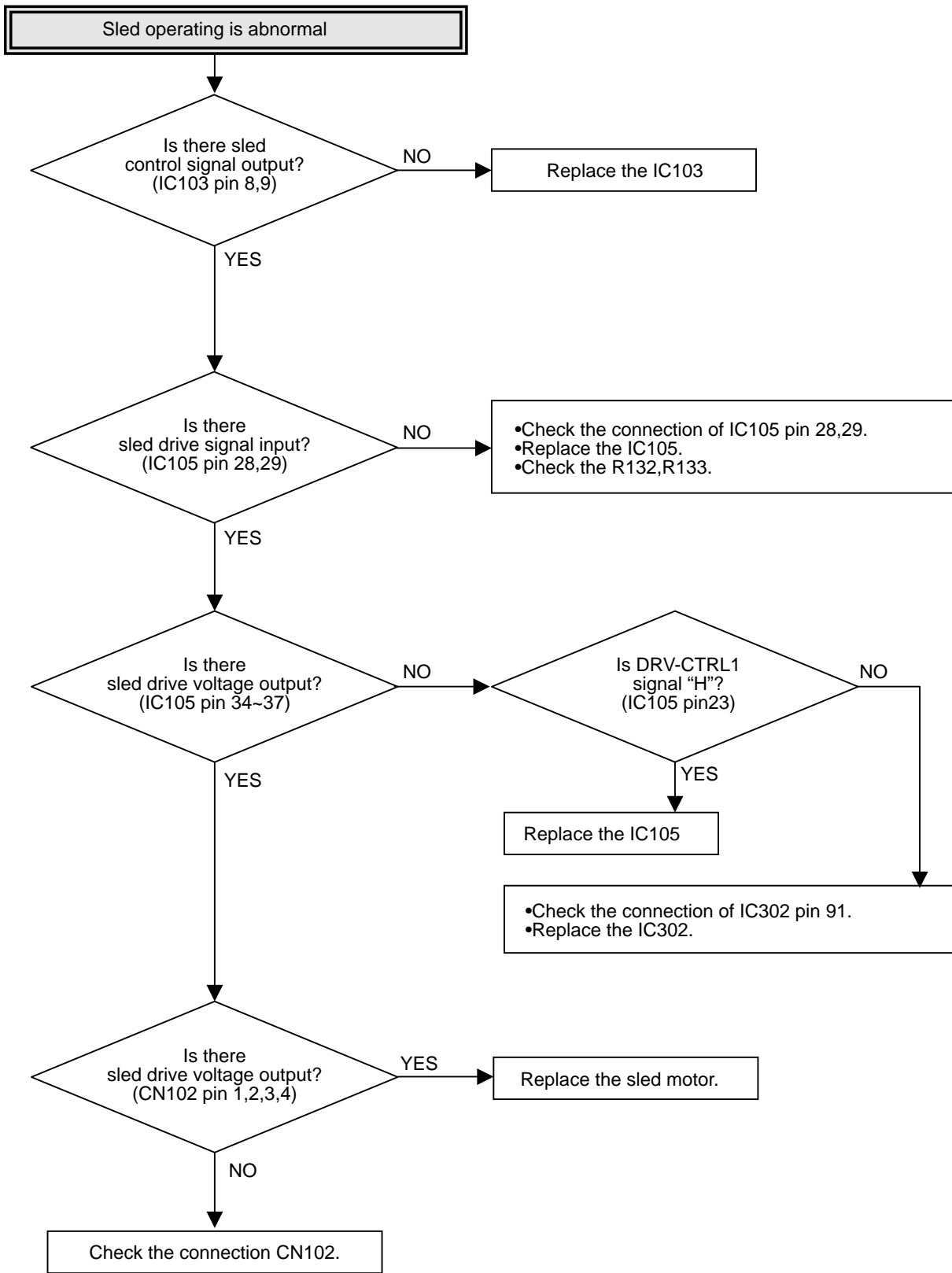
EEPROM
1) Sled & flit drive is not good
2) Laser power drive is not good
3) Loader operation drive is not good

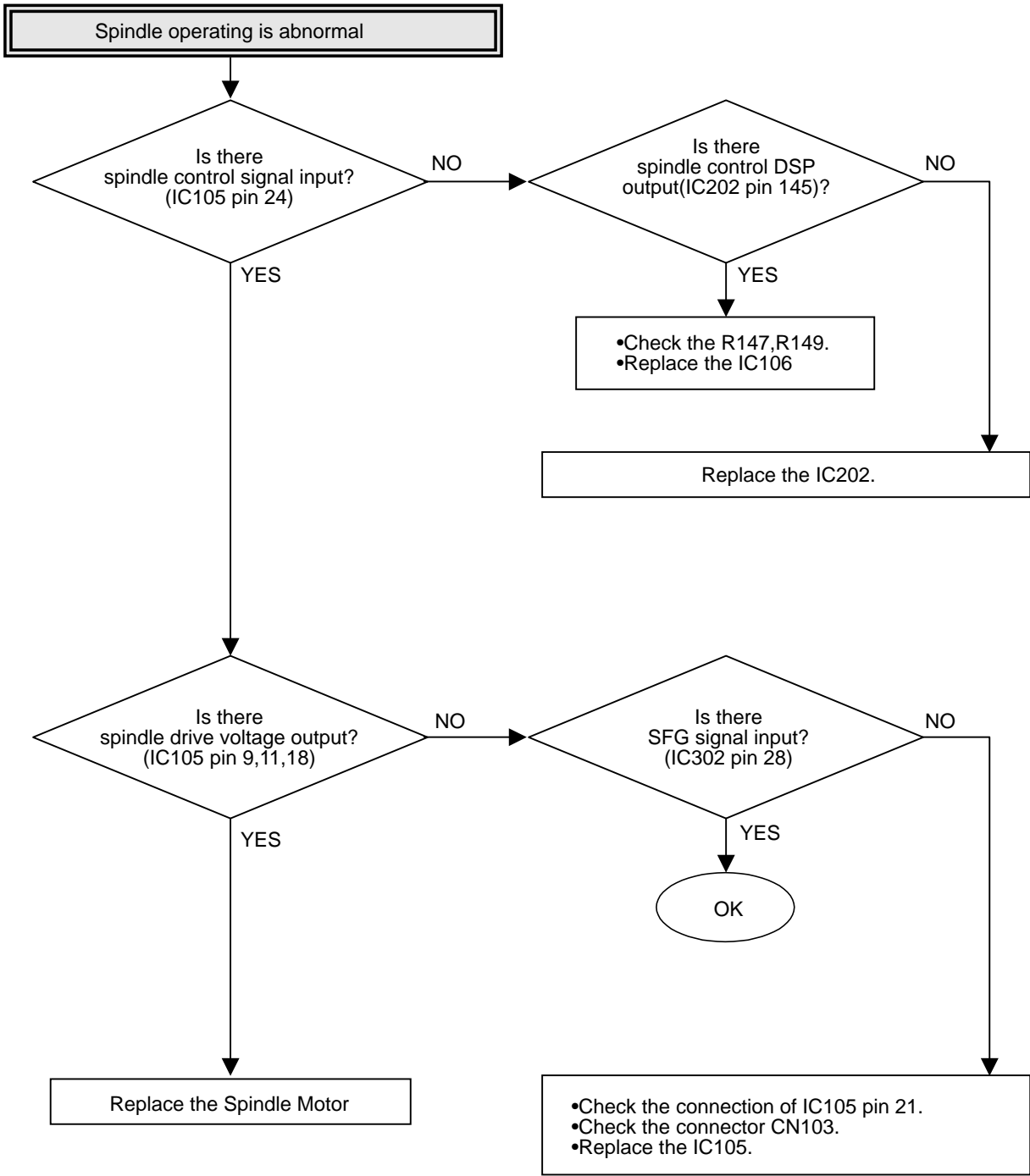
RL-01A LOADER PART ELECTRICAL TROUBLESHOOTING GUIDE

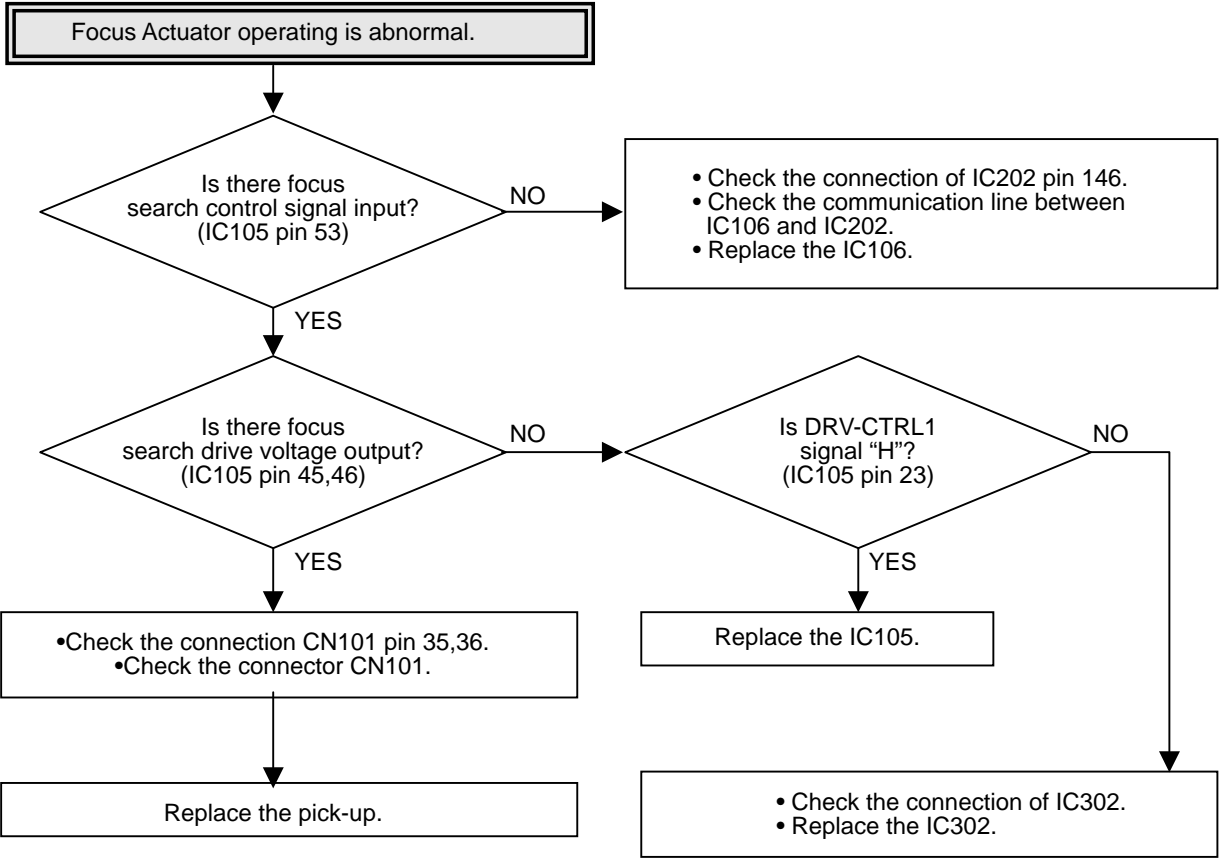
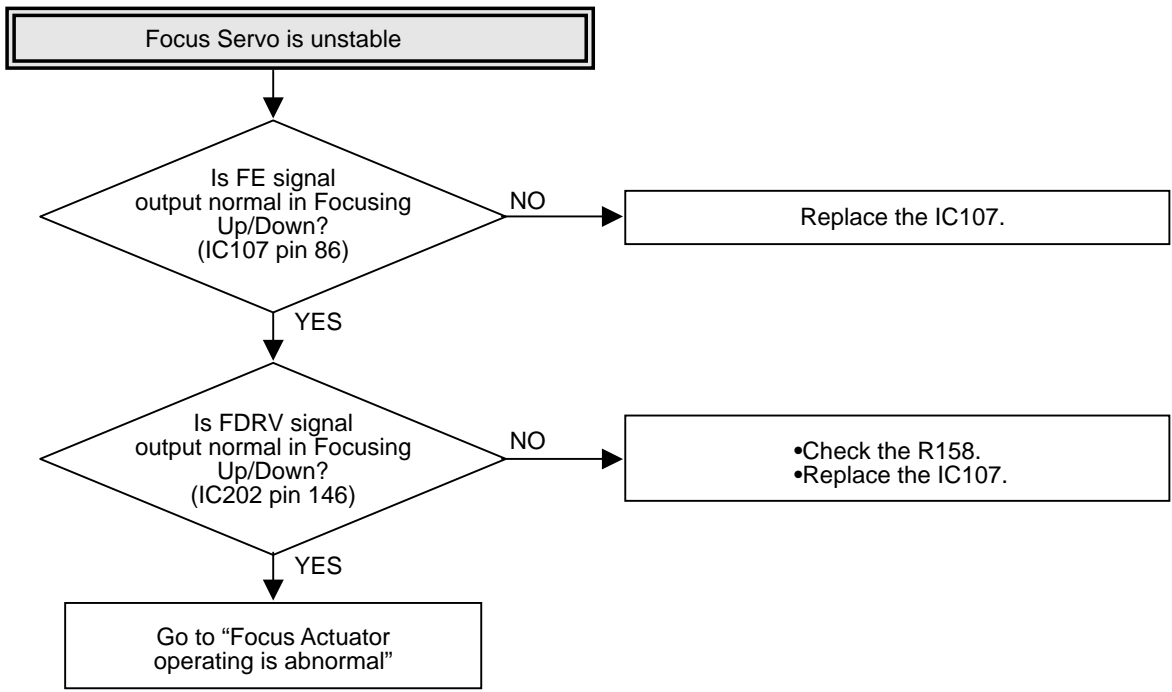


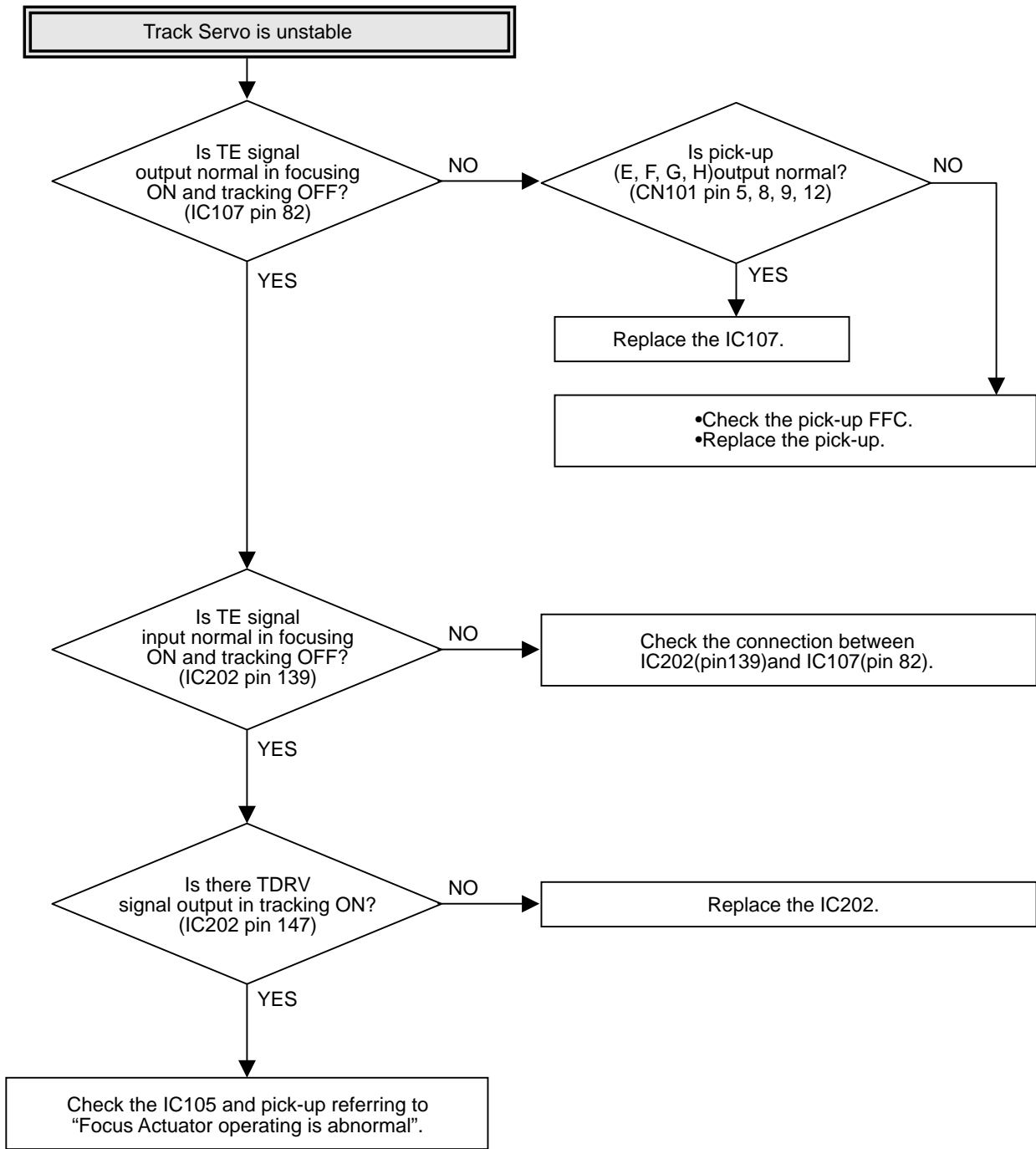


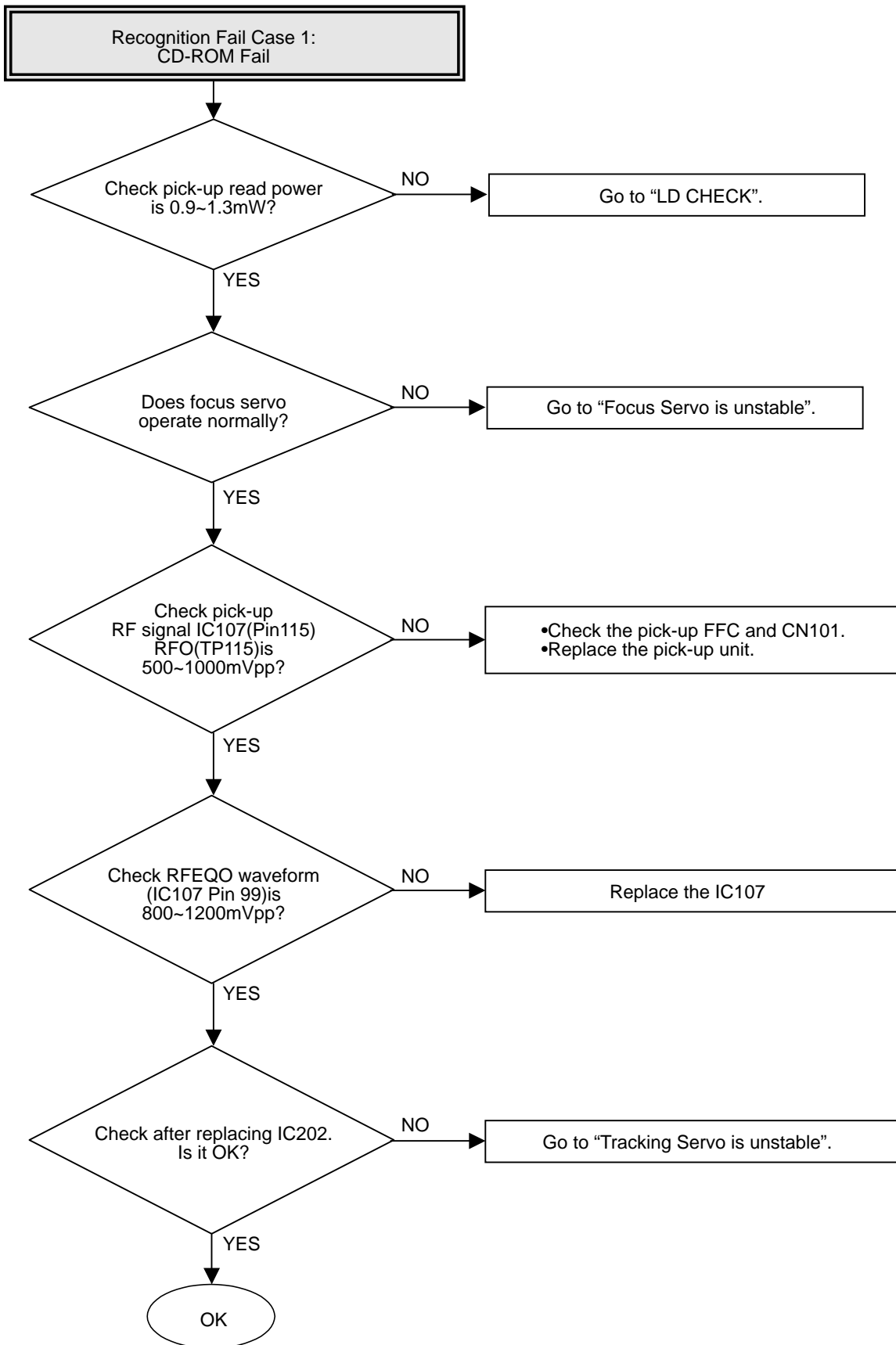


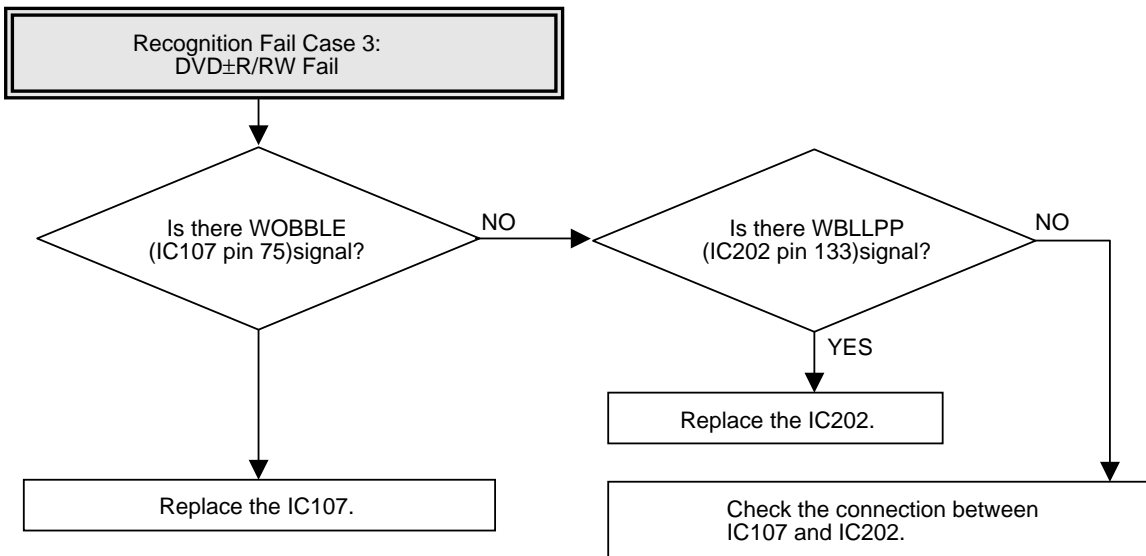
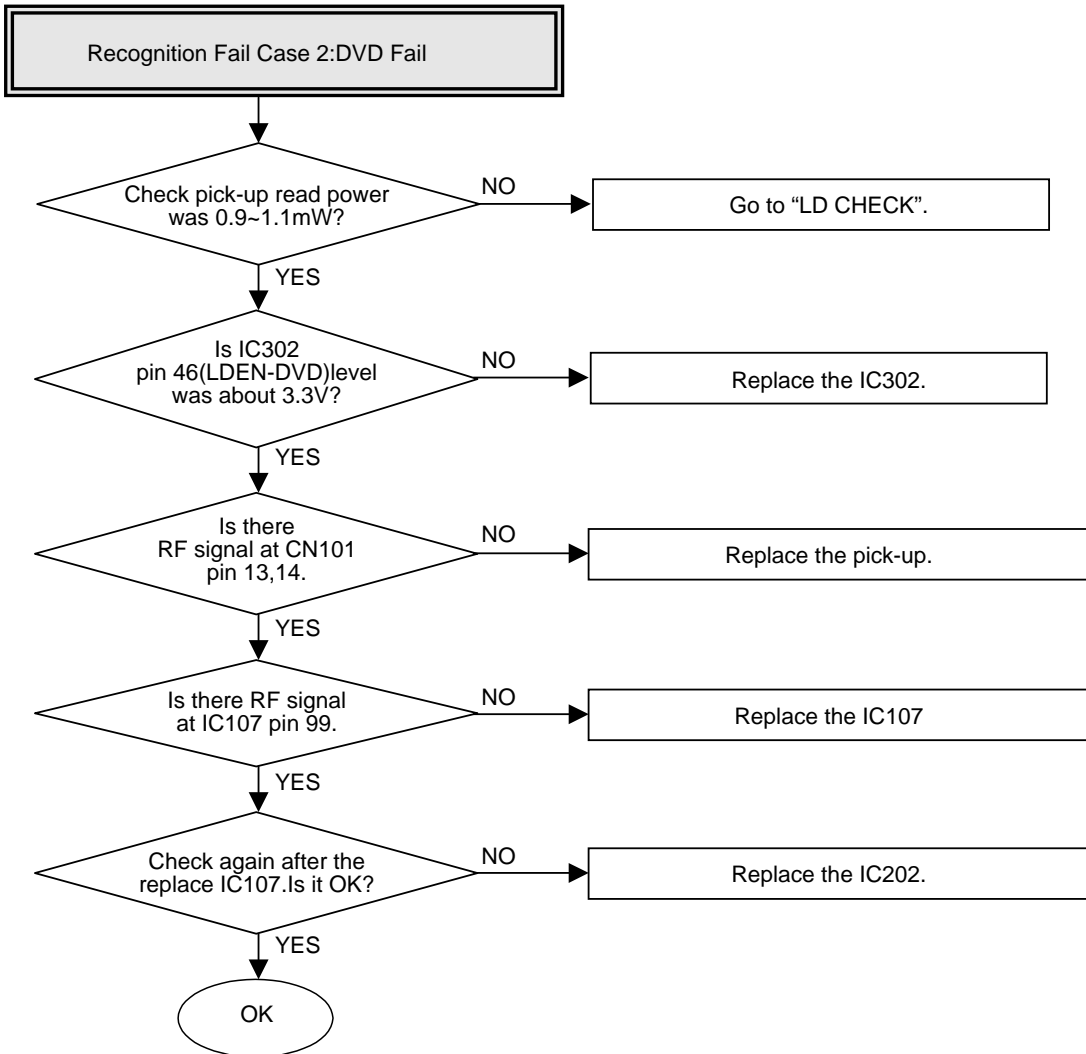


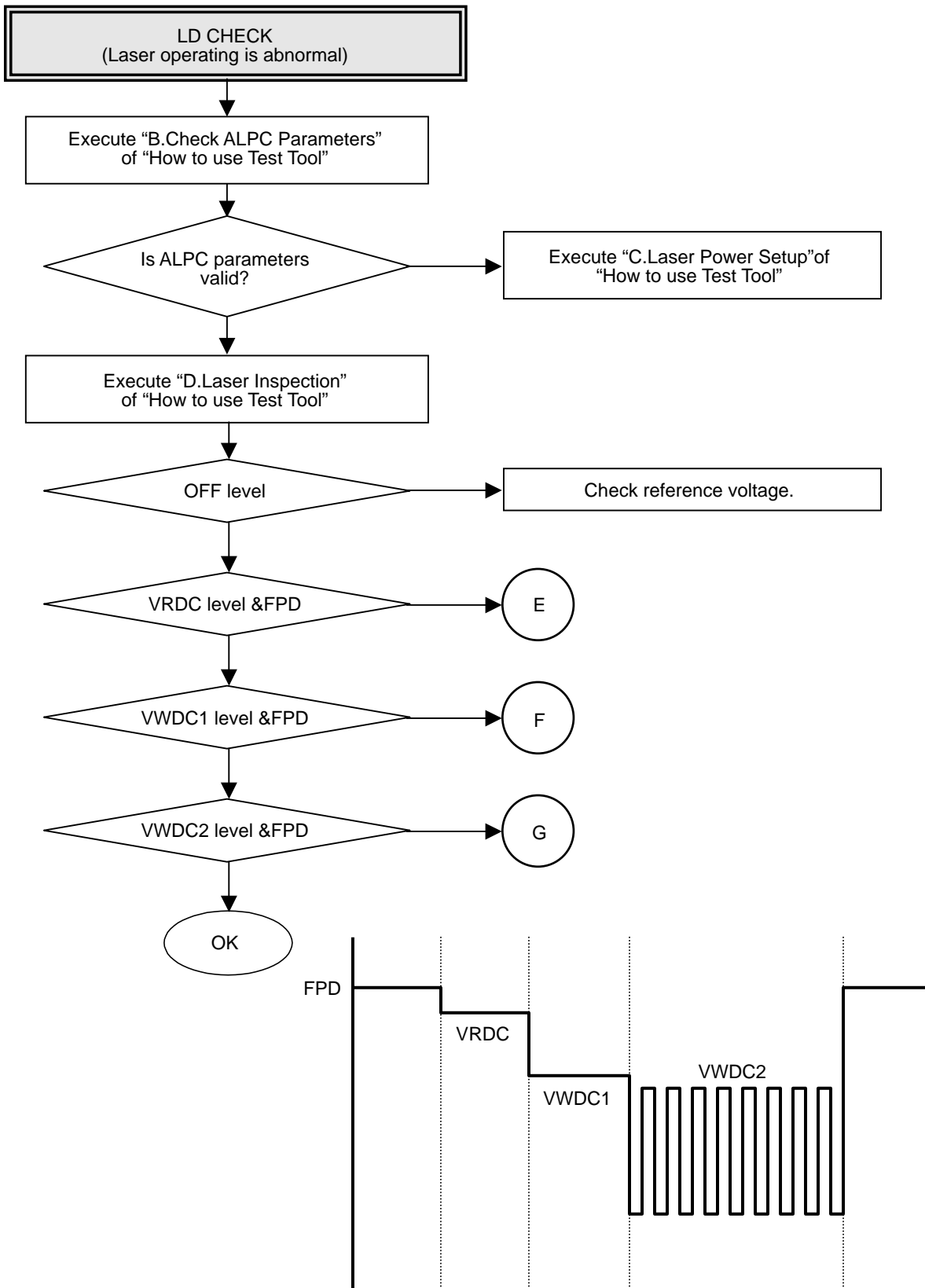


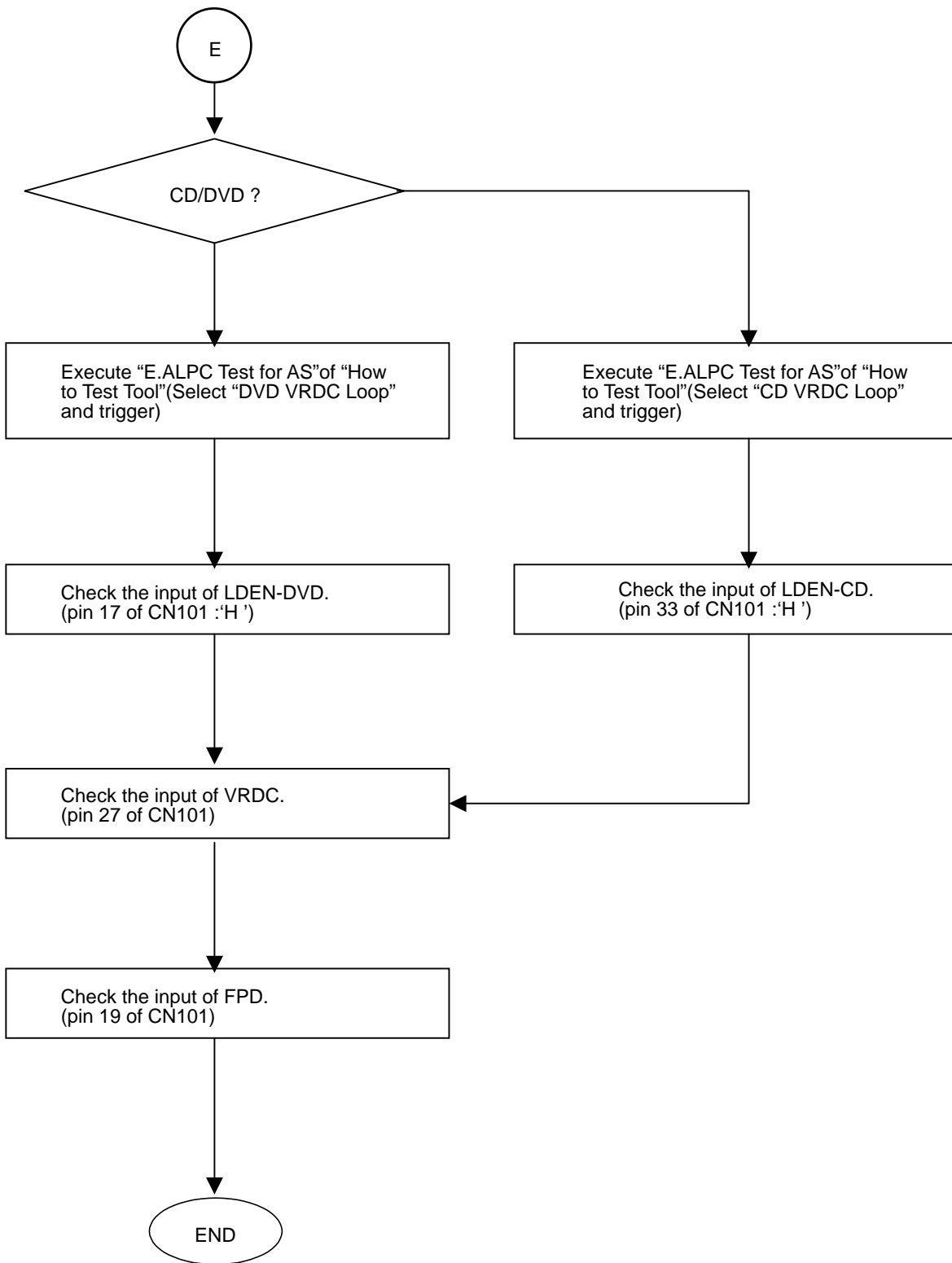


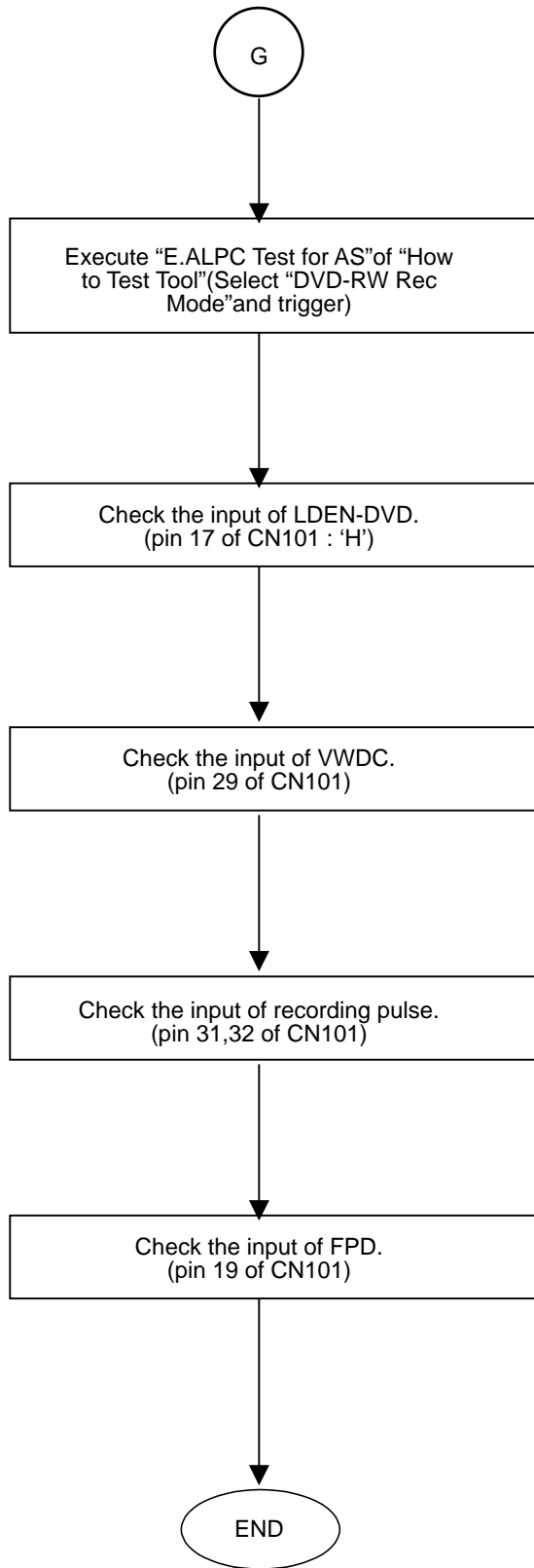
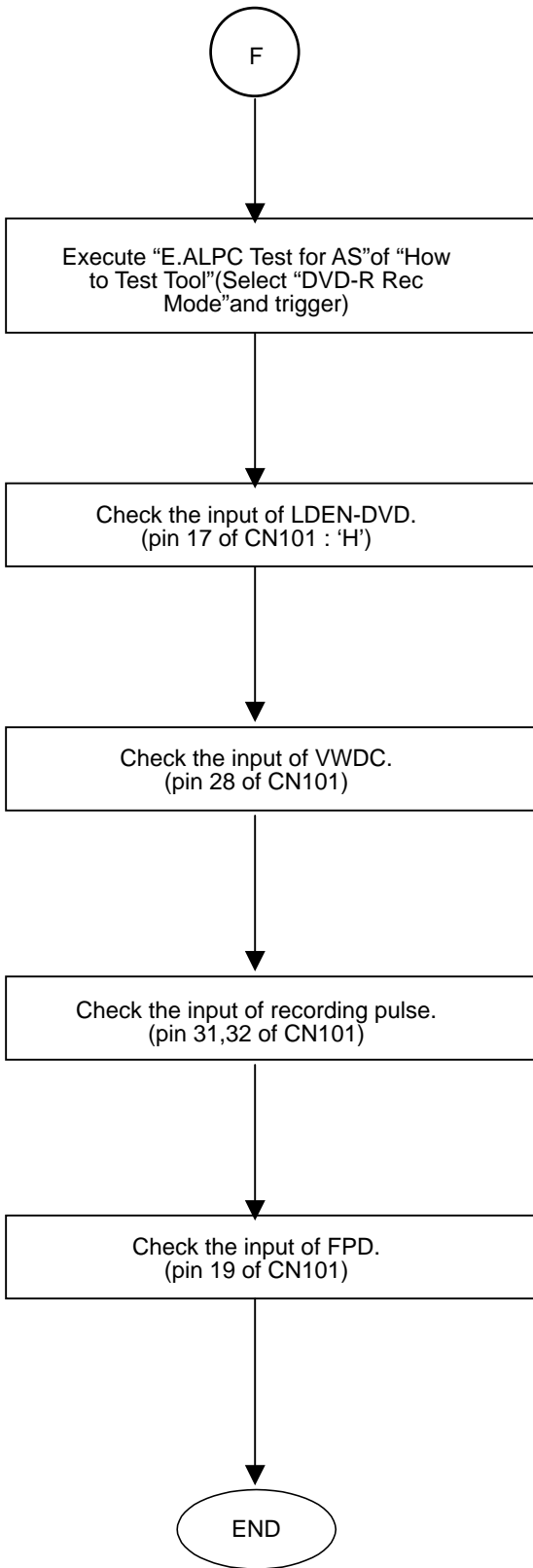












In case of writing fail.

Normal Case

Check the media
DVD ±R/RW?

NO

Check disc label.

YES

Does the disc
have any dust,scratch,
fingerprint ...?

YES

Remove the dust,fingerprint and
if the disc has long width scratch,
change it.

NO

Is the write
tool supported by
LG Drive?

NO

Use LG bundle software.

NO

Check disc information on writing tool.
[If you get some data information with
"Non Recordable Disc "message,the
disc is finalized disc:unrecordable
disc and more]

Finalized Disc?

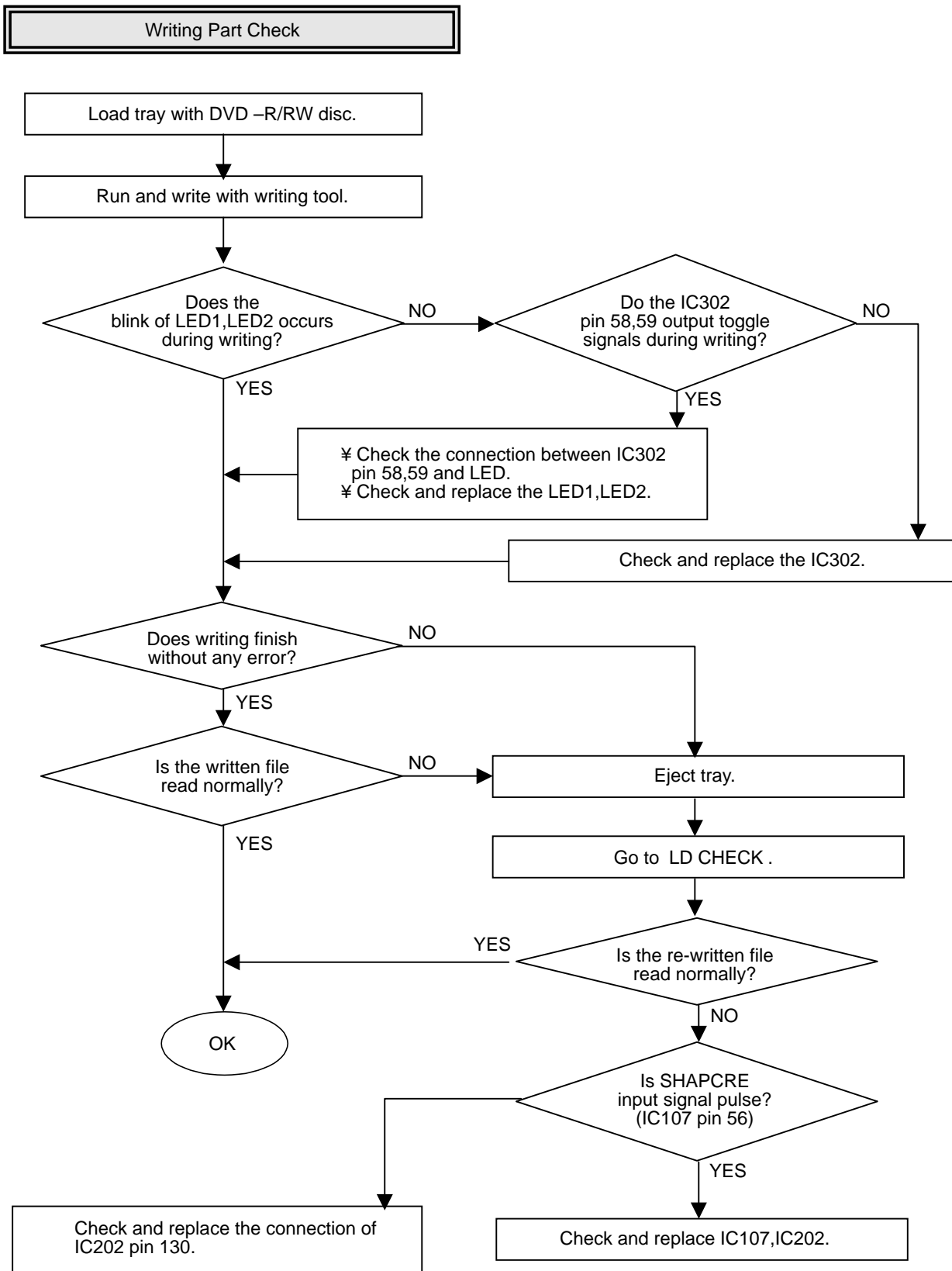
NO

Eject disc.

YES

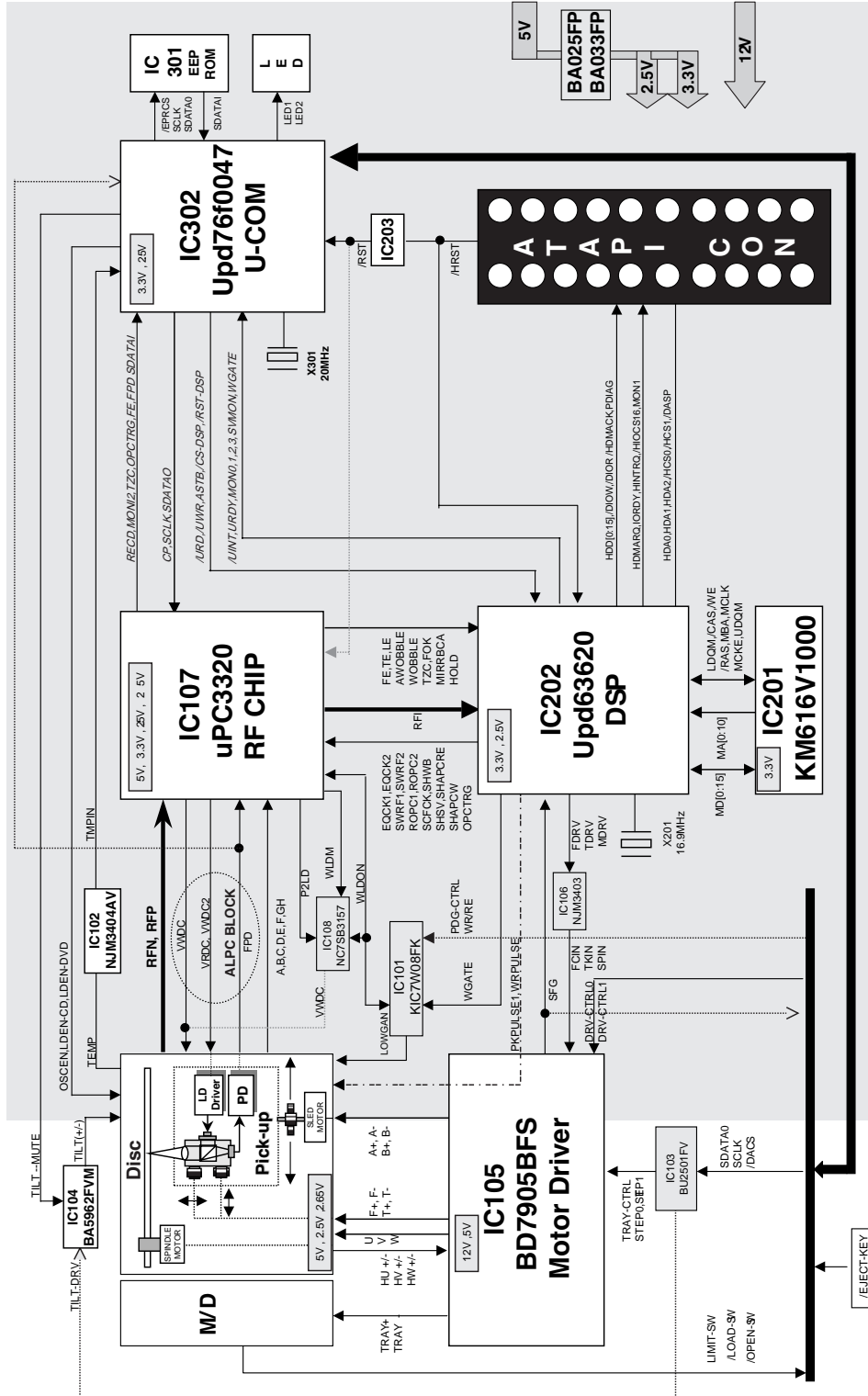
If DVD ±R disc,use new DVD ±R disc.
If DVD ±RW disc,erase the disc.

Go to "Writing Part Check".



BLOCK DIAGRAMS & DESCRIPTION

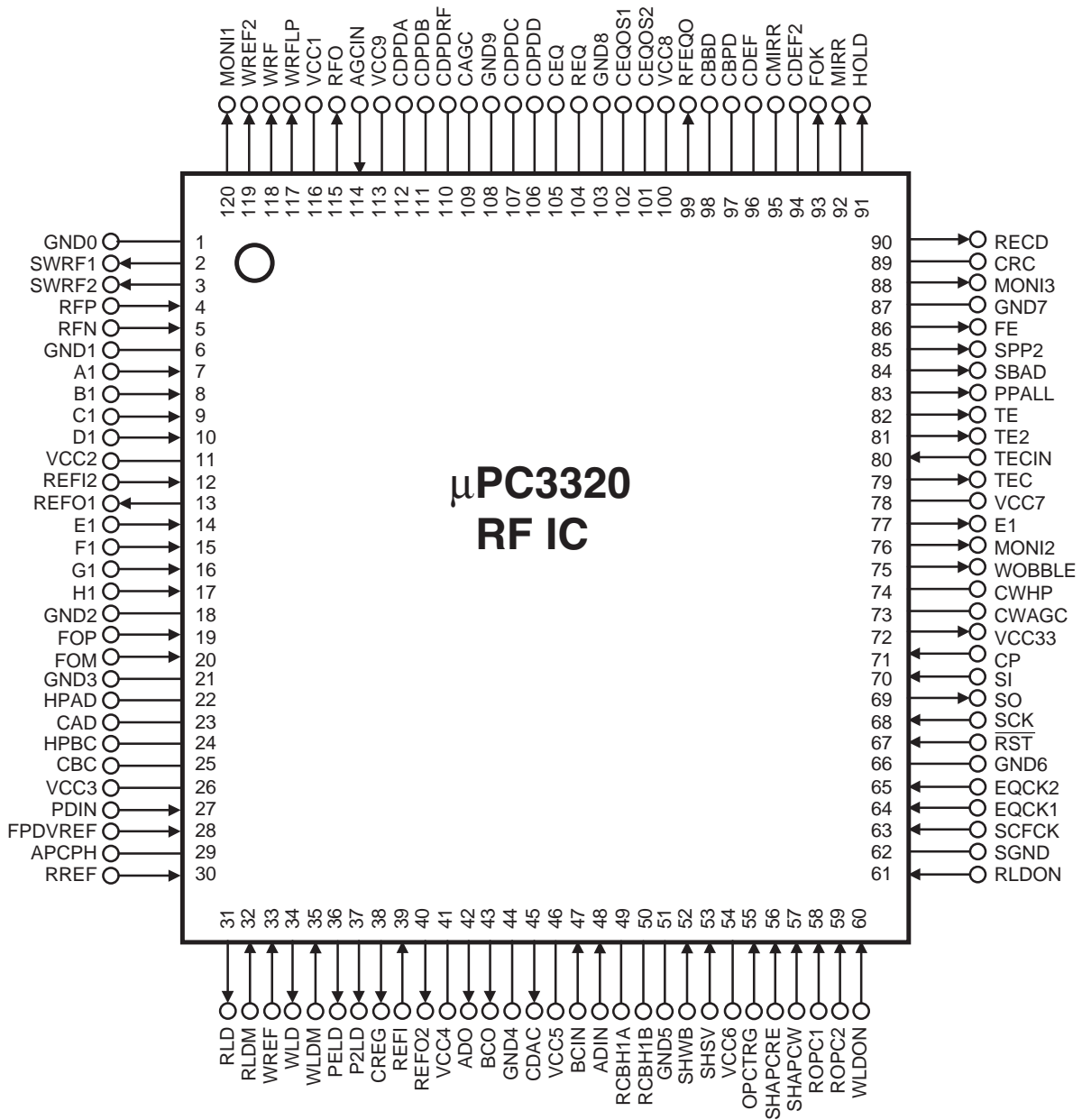
1. Overall Block Diagram



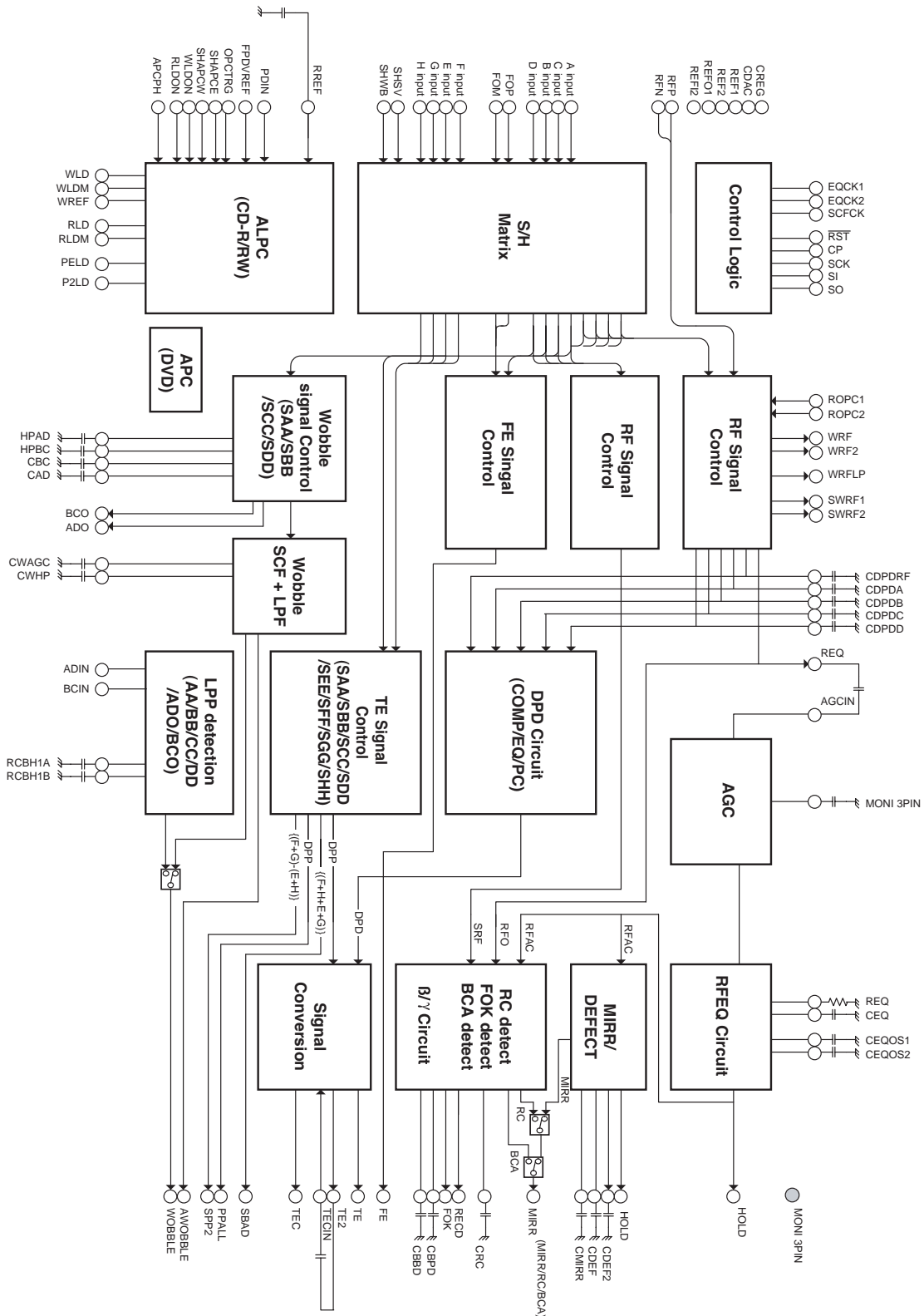
2. MAJOR IC INTERNAL BLOCK DIAGRAM AND PIN DESCRIPTION

IC101 (μ PC3320) : RF Signal Processor for CD/DVD

Pin Assignment



Block Diagram



Pin description

No.	Pin Name	Type	Description
1	GND0	-	Analog GND
2	SWRF1	OUTPUT	WRF signal sampling & hold [S/H] signal output.
3	SWRF1	OUTPUT	WRF signal sampling & hold [S/H] signal output.
4	RFP	INPUT	RF differerential signal[+] input.
5	RFN	INPUT	RF differerential signal[-] input.
6	GND1	-	Analog GND
7	A1	INPUT	Main beam signal [A1] input.
8	B1	INPUT	Main beam signal [B1] input.
9	C1	INPUT	Main beam signal [C1] input.
10	D1	INPUT	Main beam signal [D1] input.
11	VCC2	-	Analog power.
12	REFI2	INPUT	Reference voltage input pin for PDIC.
13	REFO1	OUTPUT	Pick-up internal reference voltage output[at REFI pin 2.5V: 2.25V output.]
14	E1	INPUT	Sub beam signal [E1] input.
15	F1	INPUT	Sub beam signal [F1] input.
16	G1	INPUT	Sub beam signal [G1] input.
17	H1	INPUT	Sub beam signal [H1] input.
18	GND2	-	Analog GND
19	FOP	INPUT	FO+ signal input for Focus.
20	FOM	INPUT	FO- signal input for Focus.
21	GND3	-	Analog GND
22	HPAD	-	Wobble circuit HPF band setting condenser connecting port.
23	CAD	-	Wobble circuit AGC response time setting condenser connecting port.
24	HPBC	-	Wobble circuit HPF band setting condenser connecting port.
25	CBC	-	Wobble circuit AGC response time setting condenser connecting port.
26	VCC3	-	Analog power.
27	PDIN	INPUT	Laser monitor current input.
28	FPDVREF	INPUT	Reference voltage input pin for front monitor.
29	APCPH	-	Peak-hold condenser connecting pin for ALPC .
30	RREF	-	Read ALPC Condenser connecting port.
31	RLD	OUTPUT	Read Laser drive control output.
32	RLDM	INPUT	Read Laser drive control Amp[-] input.
33	WREF	-	Write ALPC Condenser connecting port.
34	WLD	OUTPUT	Write Laser drive control output.
35	WLDM	INPUT	Write Laser drive control Amp[-] input.
36	PELD	OUTPUT	Pick power output port1.
37	P2LD	OUTPUT	Pick power output port 2.
38	CREG	OUTPUT	Regulater voltage[2.5V] output.
39	REF1	INPUT	DSP power voltage input[2.5V].
40	REFO2	OUOTPTU	DSP Reference voltage output [at REFI port 2.5V: 1.5V output].

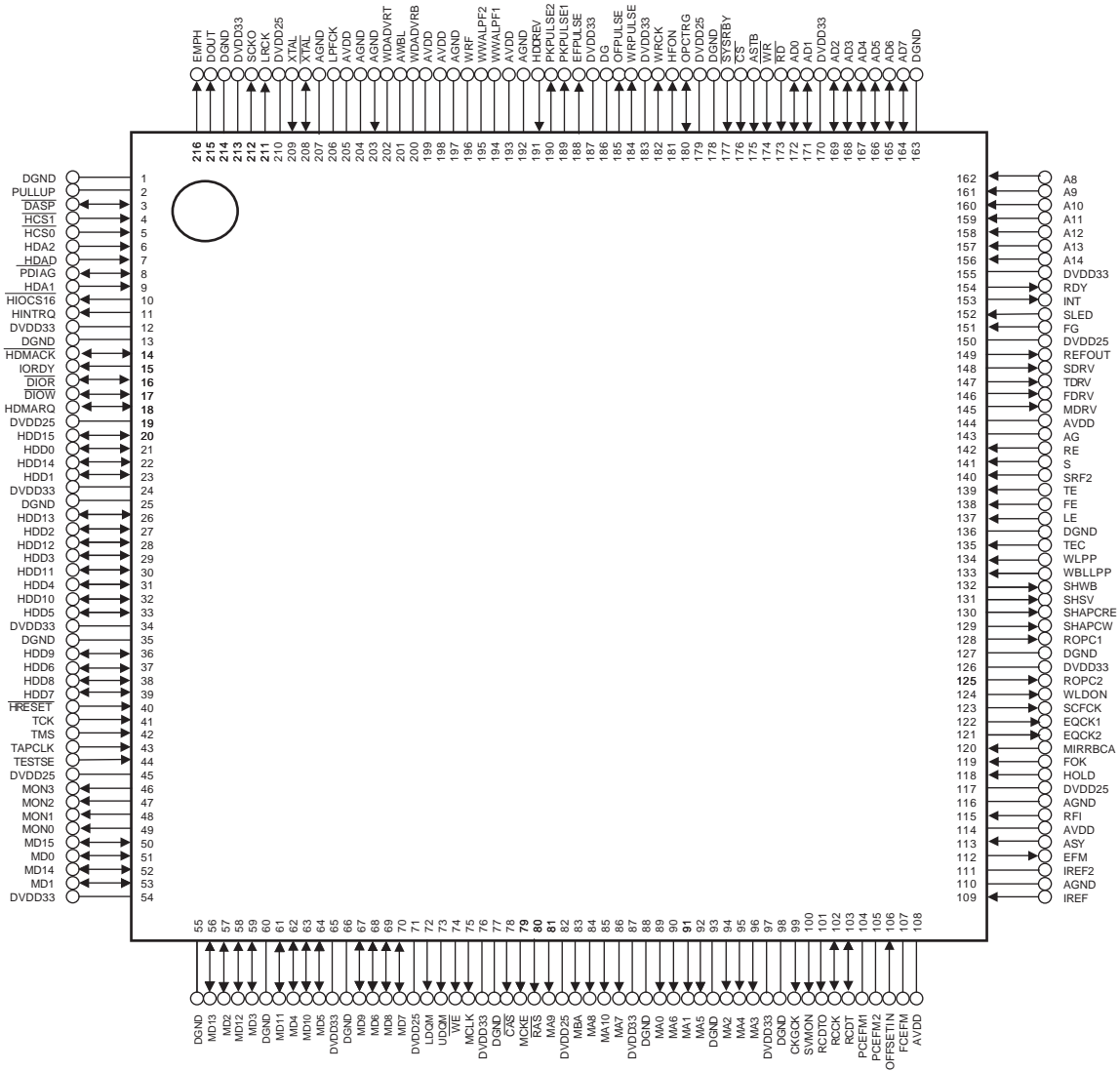
No.	Pin Name	Type	Description
41	VCC4	-	Analog power.
42	ADO	OUTPUT	Wobble circuit [A+D] signal output.
43	BCO	OUTPUT	Wobble circuit [B+C] signal output.
44	GND4	-	Analog GND
45	CDAC	OUTPUT	DAC reference voltage output.
46	VCC5	-	Digital power.
47	BCIN	INPUT	[B+C] signal input.
48	ADIN	INPUT	[A+D] signal input.
49	RCBH1A	-	RLPP circuit bottom hold condenser connecting port.
50	RCBH1B	-	RLPP circuit bottom hold condenser connecting port.
51	GND5	-	Analog GND
52	SHWB	INPUT	Sample hold pulse input for Wobble signal.
53	SHSV	INPUT	Sample hold pulse input for Servo signal.
54	VCC6	-	Digital power.
55	OPCTRG	INPUT	OPCTRG signal input.
56	SHAPCRE	INPUT	Sample hold pulse input for Read/Erase ALPC.
57	SHPCW	INPUT	Sample hold pulse input for Write ALPC.
58	ROPC1	INPUT	Sample hold pulse input 1 for WRF signal.
59	ROPC2	INPUT	Sample hold pulse input 2 for WRF signal.
60	WLDON	INPUT	Write ALPC Center signal input.
61	RLDON	INPUT	Read ALPC Center signal input.
62	SGND	-	Sub straight GND.
63	SCFCK	INPUT	SCF clock input.
64	EQCK1	INPUT	Fixed clock input.
65	EQCK2	INPUT	Equalize automatic control clock input.
66	GND6	-	Analog GND
67	RST	INPUT	Register reset input.
68	SCK	INPUT	Register setting clock input.
69	SO	OUTPUT	Serial data output.
70	SI	INPUT	Serial data input.
71	CP	INPUT	Address
72	VCC33	OUTPUT	Power voltage [3.3V monitor].
73	CWAGC	-	Wobble circuit AGC response time setting condenser connecting port.
74	CWHP	-	Wobble circuit HPF band setting condenser connecting port.
75	WOBBLE	OUTPUT	Wobble signal output [Digital signal].
76	AWOBBLE	OUTPUT	Wobble signal output [Analog signal].
77	MONI2	OUTPUT	Internal signal monitor port.
78	VCC7	-	Digital power.
79	TEC	OUTPUT	Tracking zero cross signal output.
80	TECIN	INPUT	Tracking zero cross signal input.

No.	Pin Name	Type	Description
81	TE2	OUTPUT	Tracking error signal output.
82	TE	OUTPUT	Tracking error signal output for Servo.
83	PPALL	OUTPUT	Main side push-pull signal output.
84	SBAD	OUTPUT	Sub beam signal output [(E+F+G+H) signal].
85	SPP2		Sub beam signal output [(F+G)-(E+H) signal].
86	FE	OUTPUT	Focus error signal.
87	GND7	-	Analog GND
88	MONI3	OUTPUT	Internal signal monitor port.
89	CRC	-	Radial contrast circuit condenser connecting port.
90	RECD	OUTPUT	No recording area detection.
91	HOLD	OUTPUT	Detection signal output.
92	MIRR	OUTPUT	Mirror detection/RCA signal output.
93	FOK	OUTPUT	Focus OK signal.
94	CDEF2	-	Detect circuit condenser connecting port 2.
95	CMIRR	-	Mirror circuit condenser connecting port.
96	CDEF	-	Detect circuit condenser connecting port .
97	CBPD	-	β , γ adetection[peak]condenser connecting port.
98	CBBD	-	β , γ adetection[buttom]condenser connecting port.
99	RFEQO	OUTPUT	Equalizer output.
100	VCC8	-	Analog power.
101	CEQOS2	-	RF Equalizer circuit condenser connecting port 2.
102	CEQOS1	-	RF Equalizer circuit condenser connecting port 1.
103	GND8	-	Analog GND
104	REQ	-	RF Equalizer circuit volatage setting resistance connecting port.
105	CEQ	-	Equalizer fc automatic control curcuit condenser connecting port.
106	CDPDD	-	DPD [D signal] HPF band setting condenser connecting port.
107	CDPDC	-	DPD [C signal] HPF band setting condenser connecting port.
108	GND9	-	Analog GND
109	CDPDC	-	RFAGC circuit condenser connecting port.
110	CDPDRF	-	DPD [RF signal] HPF band setting condenser connecting port.
111	CDPDRF	-	DPD [B signal] HPF band setting condenser connecting port.
112	CDPDA	-	DPD [A signal] HPF band setting condenser connecting port.
113	VCC9	-	Analog power.
114	AGCIN	INPTU	AGC input
115	RFO	OUTPUT	Read RF signal output.
116	VCC1	-	Analog power.
117	WRFLP	OUTPUT	Write RF LPF output.
118	WRF	OUTPUT	Write RF signal output.
119	WFR2	OUTPUT	Write RF2 signal output.
120	MONI1	OUTPUT	Internal signal monitor port.

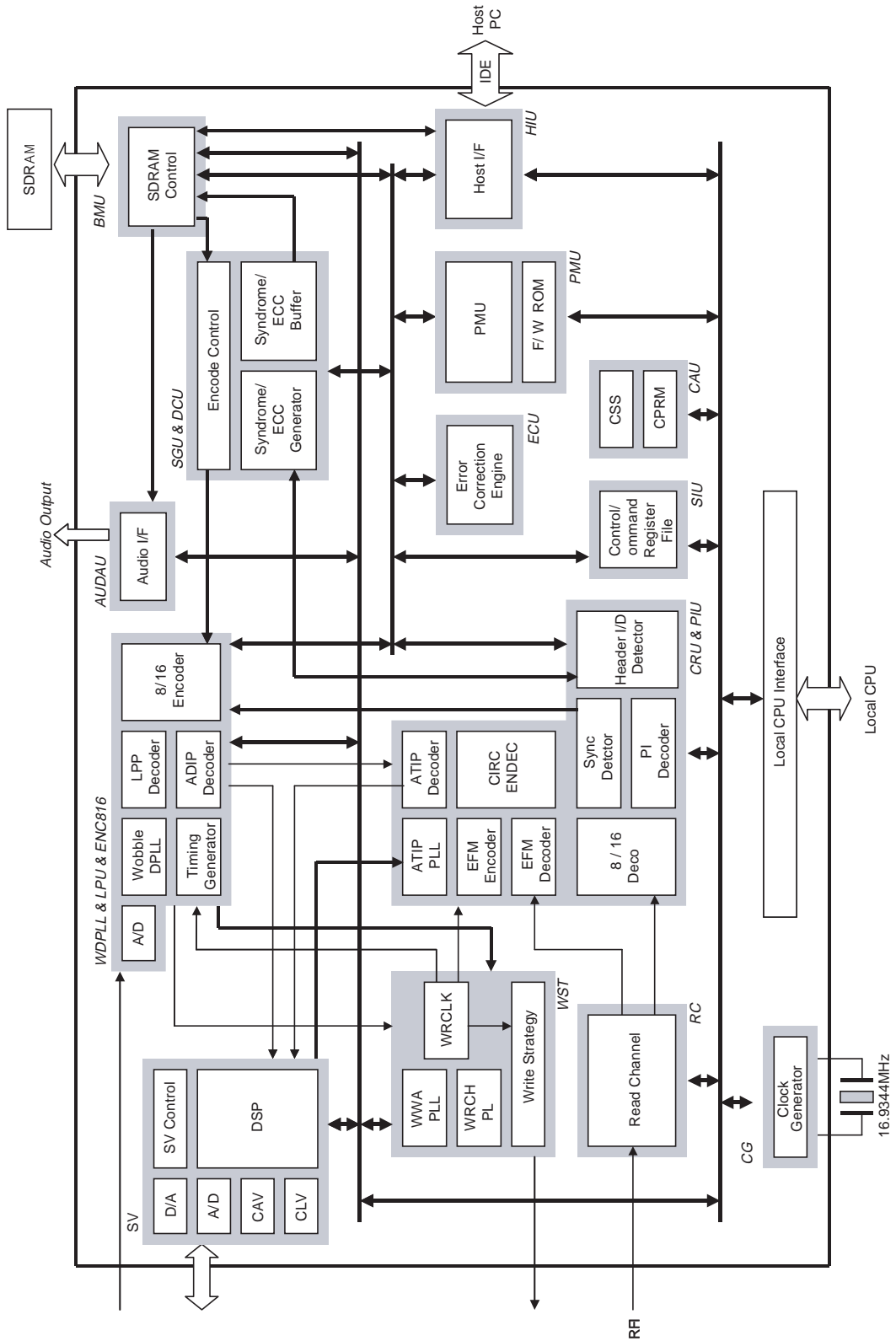
3. MAJOR IC INTERNAL BLOCK DIAGRAM AND PIN DESCRIPTION

IC201(μ PD63620) : Encoder, Decoder & DSP Signal Processor

Pin Assignment



Block Diagram



Pin description

Pin No.	Pin Name		Type		Description
1	DGND	-	-	-	Digital GND
2	PULLUP	-	-	-	Pull-up resistance connecting port.[5V or 3.3V]
3	$\overline{\text{DASO}}$	5V_tolerant	I/O	Pull-up	Drive active slave presesnt signal.[open/drain]
4	$\overline{\text{HCS1}}$	5V_tolerant	I	-	Host interface chip, pull-up selection input.
5	$\overline{\text{HCS0}}$	5V_tolerant	I	-	Host interface chip, pull-up selection input.
6	HDA2	5V_tolerant	I	-	Host interface chip, address signal input.
7	HDAO	5V_tolerant	I	-	Host interface chip, address signal input.
8	$\overline{\text{PDIAG}}$	5V_tolerant	I/O	Pull-up	Diagnostic signal [open/drain]
9	HDA1	5V_tolerant	I	-	Host interface chip, address signal input.
10	$\overline{\text{HIOCS16}}$	5V_tolerant	I	Pull-up	16 bit I/O signal [open/drain]. When Ultra DMA burst, this is 3 state port.
11	HINTRQ	5V_tolerant	O	Pull-up	Host interrupt signal output.
12	DVDD33	-	-	-	Digital power[3.3V]
13	DGND	-	-	-	Digital GND
14	$\overline{\text{HDMACK}}$	5V_tolerant	I/O	-	DMA acknowledge signal.
15	IORDY	5V_tolerant	I	Pull-up	I/O Channel ready[open/drain]. When Ultra DMA burst, this is DDMDARDY: DSTROBE signal.
16	$\overline{\text{DIOR}}$	5V_tolerant	I/O	-	Host interface read input signal. When Ultra DMA burst, this is HDMDARDY: HSTROBE signal.
17	$\overline{\text{DIOW}}$	5V_tolerant	I/O	-	Host interface write input signal. When Ultra DMA burst, this is STOP signal.
18	HDMARQ	5V_tolerant	O	Pull-up	DMA request signal output.
19	DVDD25	-	-	-	Digital power[2.5V]
20	$\overline{\text{HDD15}}$ $\overline{\text{HDD8}}$	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]
21	$\overline{\text{HDD0}}$ $\overline{\text{HDD6}}$	5V_tolerant	O	Pull-up	Host interface data bus.[within slave resistance]
22	$\overline{\text{HDD14}}$ $\overline{\text{HDD9}}$	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]
23	$\overline{\text{HDD1}}$	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]
24	DVDD33	-	-	-	Digital power[3.3V]
25	DGND	-	-	-	Digital GND
26	$\overline{\text{HDD13}}$ $\overline{\text{HDD10}}$	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]
27	$\overline{\text{HDD2}}$ $\overline{\text{HDD4}}$	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]

Pin No.	Pin Name		Type		Description
28	DGND HDD4	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance
29	HDD3 HDD3	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]
30	HDD11 HDD12	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]
31	HDD4 HDD2	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance
32	HDD7 HDD13	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance]
33	HDD7 HDD1	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance].
34	DVDD33	-	-	-	Digital power[3.3V]
35	DGND	-	-	-	Digital GND
36	HDD9 HDD14	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance].
37	HDD6 HDD0	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance].
38	HDD8 HDD15	5V_tolerant	I/O	Pull-up	Host interface data bus.[within slave resistance].
39	HDD7	5V_tolerant	I/O	Pull-up	Host interface data bus.
40	HRESET	5V_tolerant	I/O	-	Host reset input.
41	TCK	3V	I	-	Test port. It must be connected to DGND.
42	TMS	3V	I	-	Test port. It must be connected to DGND.
43	TAPCLK	3V	I	-	Test port. It must be connected to DGND.
44	TESTSE	3V	I	-	Test port. It must be connected to DGND.
45	DVDD25	-	-	-	Digital power[2.5V]
46	MON3	3V	O	L	Monitor: test signal.
47	MON2	3V	O	L	Monitor: test signal.
48	MON1	3V	I/O	L	Monitor: test signal.
49	MON0	3V	I/O	L	Monitor: test signal.
50	MD15	3V	I/O	Pull-up	Buffer memory , Interface data bus.
51	MD0	3V	I/O	Pull-up	Buffer memory , Interface data bus.
52	MD14	3V	I/O	Pull-up	Buffer memory , Interface data bus.
53	MD1	3V	I/O	Pull-up	Buffer memory , Interface data bus.
54	DVDD33	-	-	-	Digital power.[3.3V](Buffer. Memory. Block)

Pin No.	Pin Name		Type		Description
55	DGND	-	-	-	Digital GND.(Buffer. Memory. Block)
56	MD13	3V	I/O	Pull-up	Buffer memory , Interface data bus.
57	MD2	3V	I/O	Pull-up	Buffer memory , Interface data bus.
58	MD12	3V	I/O	Pull-up	Buffer memory , Interface data bus.
59	MD3	3V	I/O	Pull-up	Buffer memory , Interface data bus.
60	DGND	-	-	-	Digital GND.
61	MD11	3V	I/O	Pull-up	Buffer memory , Interface data bus.
62	MD4	3V	I/O	Pull-up	Buffer memory , Interface data bus.
63	MD10	3V	I/O	Pull-up	Buffer memory , Interface data bus.
64	MD5	3V	I/O	Pull-up	Buffer memory , Interface data bus.
65	DVD33	-	-	-	Digital power.[3.3V](Buffer. Memory. Block)
66	DGND	-	-	-	Digital GND.(Buffer. Memory. Block)
67	MD9	3V	I/O	Pull-up	Buffer memory , Interface data bus.
68	MD6	3V	I/O	Pull-up	Buffer memory , Interface data bus.
69	MD8	3V	I/O	Pull-up	Buffer memory , Interface data bus.
70	MD7	3V	I/O	Pull-up	Buffer memory , Interface data bus.
71	DVDD25	-	-	-	Digital power.[2.5V]
72	LDQM	3V	O	H	Low byte, data input/output mask control signal.
73	UDQM	3V	O	H	High byte, data input/output mask control signal.
74	WE	3V	O	H	Buffer memory , Interface write enable signal.
75	MCLK	3V	O	Pull-up	SDRAM clock output.
76	DVDD33	-	-	-	Digital power.[3.3V](Buffer. Memory. Block)
77	DGND	-	-	-	Digital GND.(Buffer. Memory. Block)
78	$\overline{\text{CAS}}$	3V	O	H	Buffer memory , Interface column address strobe control signal.
79	MCKE	3V	O	H	SDRAM clock enable control signal.
80	$\overline{\text{RAS}}$	3V	O	H	Buffer memory , Interface row address strobe control signal.
81	MA9	3V	O	L	Buffer memory , Interface address bus.
82	DVDD25	-	-	-	Digital power.[2.5V]
83	MBA	3V	O	L	Buffer memory , Interface bank address signal.
84	MA8	3V	O	L	Buffer memory , Interface data bus.
85	MA10	3V	O	L	Buffer memory , Interface data bus.
86	MA7	3V	O	L	Buffer memory , Interface data bus.
87	DVDD33	-	-	-	Digital power.[3.3V](Buffer. Memory. Block)

Pin No.	Pin Name		Type		Description
88	DGND	-	-	-	Buffer memory , Interface data bus.
89	MA0	3V	O	H	Buffer memory , Interface data bus.
90	MA6	3V	O	L	Buffer memory , Interface data bus.
91	MA1	3V	O	L	Buffer memory , Interface data bus.
92	MA5	3V	O	L	Buffer memory , Interface data bus.
93	DGND	-	-	-	Digital GND
94	MA2	3V	O	L	Buffer memory , Interface data bus
95	MA4	3V	O	L	Buffer memory , Interface data bus.
96	MA3	3V	O	L	Buffer memory , Interface data bus.
97	DVDD3	-	-	-	Digital power.[3.3V](Buffer. Memory. Block)
98	DGND	-	-	-	Digital GND (Buffer. Memory. Block)
99	CKGCK	3V	O		Clock, Generator output.
100	SVMON	3V	O	L	Servo, block monitor signal output.
101	RCDTO	3V	O	L	Read channel data output.
102	RCCK	3V	I/O	Hi-Z	Read channel clock output.
103	RCDT	3V	I/O	Hi-Z	Read channel data output.
104	PCEFM1	Analog	-	-	Read channel phase discriminator condenser connecting port.
105	PCEFM2	Analog	-	-	Read channel phase discriminator condenser connecting port.
106	OFFSETIN	Analog	-	-	Read channel phase discriminator charge pump control port.
107	FCEFM	Analog	-	-	Read channel frequency discriminator condenser connecting port.
108	AVDD	-	-	-	Analog power[2.5V]
109	IREF	Analog	o	-	Read channel analog reference voltage input.
110	AGND	-	-	-	Analog GND[EFM PLL]
111	IREF2	Analog	O	-	Non connecting port.
112	EFM	Analog	O	Pull-up	EFM comparator output.
113	ASY	Analog	O	-	EFM comparator asymmetry control voltage input.
114	AVDD	-	-	-	Analog power[2.5V]
115	RFI	Analog	O		EFM comparator RF signal input.
116	AGND	-	-	-	Analog GND[EFM]
117	DVDD25	-	-	-	Digital power.[2.5V]
118	HOLD	3v	O	-	HOLD control signal input.
119	FOK	3v	O	-	FOK signal input.
120	MIRRBCA	3V	O	-	Mirror signal or BCA signal input.

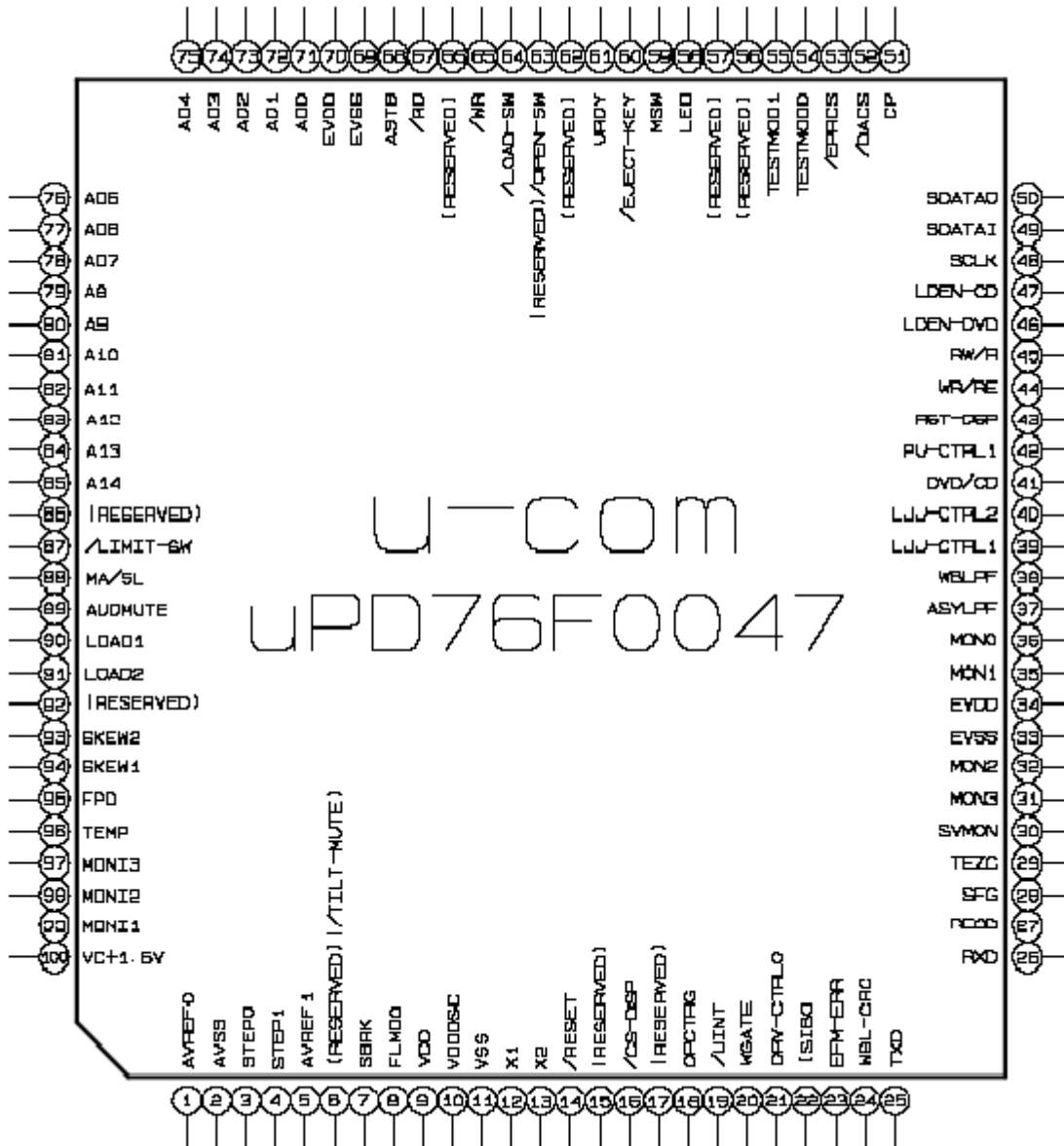
Pin No.	Pin Name		Type		Description
121	MIRRBCA	3V	O	Pull-up	RF AMP PC3320 RF equalizer automatic follow-up clock output.
122	EQCK1	3V	O	Pull-up	RF AMP PC3320 RF equalizer fixed clock output.
123	SCFCK	3V	O	P	RF AMP PC3320 RF equalizer automatic follow-up clock output.
124	WLDON	3V	O	L	Laser, Driver write laser control signal.
125	ROPC2	3V	O	L	Running OPC,sample hold signal.
126	DVDD33	-	-	-	Digital power.[3.3V]
127	DGND	-	-	-	Digital GND
128	ROPC1	3V	O	L	Running OPC,sample hold signal.
129	ROPC1	3V	O	L	APC write, sample hold signal.
130	SHAPCRE	3V	O	H	APC read/erase, sample hold signal.
131	SHSV	3V	O	H	Servo, sample hold signal.
132	SHWB	3V	O	H	Wobble, sample hold signal.
133	WBLPP	3V	I	-	CD: 2 direct Wobble signal input, DVD: RLPP signal input.
134	TEC	3V	I	-	Test port. It must be connected to DGND.
135	TEC	3V	I	-	Tracking, zero, cross signal input.
136	DGND	-	-	-	Digital GND
137	LE	Analog	I	-	Lens error signal input [A/D convertor].
138	FE	Analog	I	-	Focus error signal input [A/D convertor].
139	TE	Analog	I	-	Tracking error signal input [A/D convertor].
140	SWRF2	Analog	I	-	WRF sample hold signal input [A/D convertor].
141	SWRF1	Analog	i	-	WRF sample hold signal input [A/D convertor].
142	REFIN	Analog	I	-	Reference voltage input [A/D convertor].
143	AGND	-	-	-	Analog GND[Servo A/D, D/A block]
144	AVDD	-	-	-	Analog power 2.5V[Servo A/D, D/A block].
145	MDRV	Analog	O		Spindle drive output [D/A convertor output].
146	FDRV	Analog	O		Focus drive output [D/A convertor output].
147	TDRV	Analog	O		Trackng drive output [D/A convertor output].
148	SDRV	Analog	O		Sled drive output [D/A convertor output].
149	REFOUT	Analog	O	1/2AVDD	Reference voltage output.
150	DVDD25	-	-	-	Digital power[2.5V]
151	FG	5V_tolerant	I	-	FG signal input
152	SLED	5V_tolerant	O	-	Sled position sensor input.
153	INT	5V_tolerant	O	L	Interrupted request signal output to Local CPU

Pin No.	Pin Name		Type		Description
154	RDY	5V_tolerant	I	-	Access control signal output from Local CPU to SDRAM.
155	DVDD33	-	-	-	Digital power[3.3V]
156	A14	5V_tolerant	I	-	Local CPU Address bus.
157	A13	5V_tolerant	I	-	Local CPU Address bus.
158	A12	5V_tolerant	I	-	Local CPU Address bus.
159	A11	5V_tolerant	I	-	Local CPU Address bus.
160	A10	5V_tolerant	I	-	Local CPU Address bus.
161	A9	5V_tolerant	I	-	Local CPU Address bus.
162	A8	5V_tolerant	I	-	Local CPU Address bus.
163	DGND	-	-	-	Digital GND
164	AD7	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
165	AD6	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
166	AD5	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
167	AD4	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
168	AD3	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
169	AD2	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
170	DVDD33	-	-	-	Digital power[3.3V]
171	AD1	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
172	AD0	5V_tolerant	I/O	-	Local CPU Address/data mux bus.
173	RD	5V_tolerant	I	-	Read strobe signal input.
174	WR	5V_tolerant	I	-	Write strobe signal input.
175	ASTB	5V_tolerant	I	-	Address strobe input.
176	$\overline{\text{CS}}$	5V_tolerant	I	-	Chip selector input from Local CPU.
177	$\overline{\text{SYSRST}}$	5V_tolerant	I	-	Reset input.
178	DGND	-	-	-	Digital GND.
179	DVDD25	-	-	-	Digital power[2.5V]
180	OPCTRG	3V	I/O	-	Wobble FM demodulation data output. DVD mode: OPCTRG signal output.
181	HFON	3V	O	H	Laser, Driver high-frequency control signal.
182	WRCK	-	-	L	Write Clock.
183	DVDD33	-	-	-	Digital power[3.3V]
184	WRPULSE	3V	O	L	Write pulse [write laser/driver control signal]
185	OPPULSE	3V	O	H	Write pulse [write laser/driver control signal]
186	DGND	-	-	-	Digital GND.

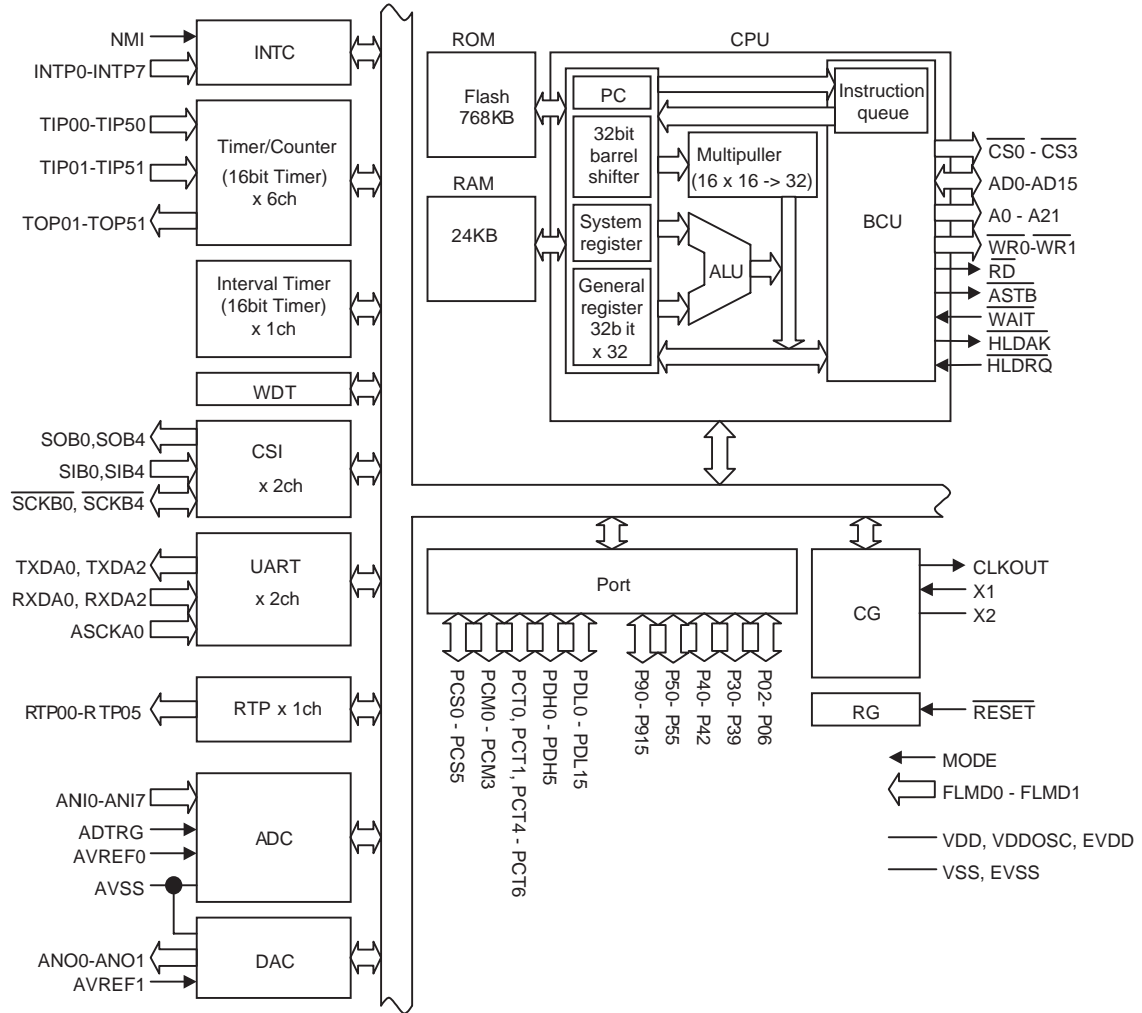
Pin No.	Pin Name		Type		Description
187	DVDD33	-	-	-	Digital power[3.3V]
188	EFPULSE	3V	O	L	OFF pluse output[write laser/driver control signal].
189	PKPULSE1	3V	O	L	Peak pluse output[write laser/driver control signal].
190	PKPULSE2	3V	O	L	Peak pluse output[write laser/driver control signal].
191	HDDREV	3V	I	-	Host interface data bus selector.[H: general, L: reverse]
192	AGND	-	-	-	Analog GND[WWAPLL]
193	AVDD	-	-	-	Analog power 2.5V [WWAPLL]
194	WWALPF1	Analog	-	-	WWAPLL condenser connecting port.
195	WWALPF2	Analog	-	-	WWAPLL condenser connecting port.
196	WRLPF	Analog	-	-	WST DLL condenser connecting port.
197	AGND	-	-	-	Analog GND[WST DLL block]
198	AVDD	-	-	-	Analog power 2.5V [WST DLL block]
199	AVDD	-	-	-	Analog power 2.5V [WDPLL A/D block]
200	WDADVRT	Analog	-	-	WDPLL block A/D convertor condenser connecting port.
201	AWBL	Analog	I	-	Analog wobble signal input port.
202	WDADVRB	Analog	-	-	WDPLL block A/D convertor condenser connecting port.
203	AGND	-	-	-	Analog GND[WDPLL A/D block]
204	AGND	-	-	-	Analog GND[PLL block]
205	AVDD	-	-	-	Analog power 2.5V [PLL block]
206	LPFCK	Analog	-	-	Test port. It must be connected to AGND.
207	AGND	-	-	-	Analog GND[Crystal block]
208	$\overline{\text{XTAL}}$	-	I/O	-	Crystal oscillator connecting port.
209	XTAL	-	I	-	Crystal oscillator connecting port.
210	DVDD25	-	-	-	Digital power[2.5V]
211	LRCK	3V	O	Pull-up	DOUt serial audio data.
212	SCKO	3V	O	Pull-up	Serial audio data synchronizing clock output port.
213	DVDD33	-	-	-	Digital power[3.3V]
214	DGND	-	-	-	Digital GND
215	DOUt	3V	O	Pull-up	Serial audio data output port.
216	EMPH	3V	O	Pull-up	Emphasis distinguish signal.

4. IC302(uPD76f0047):MICOM

Pin Assignment



Block Diagram



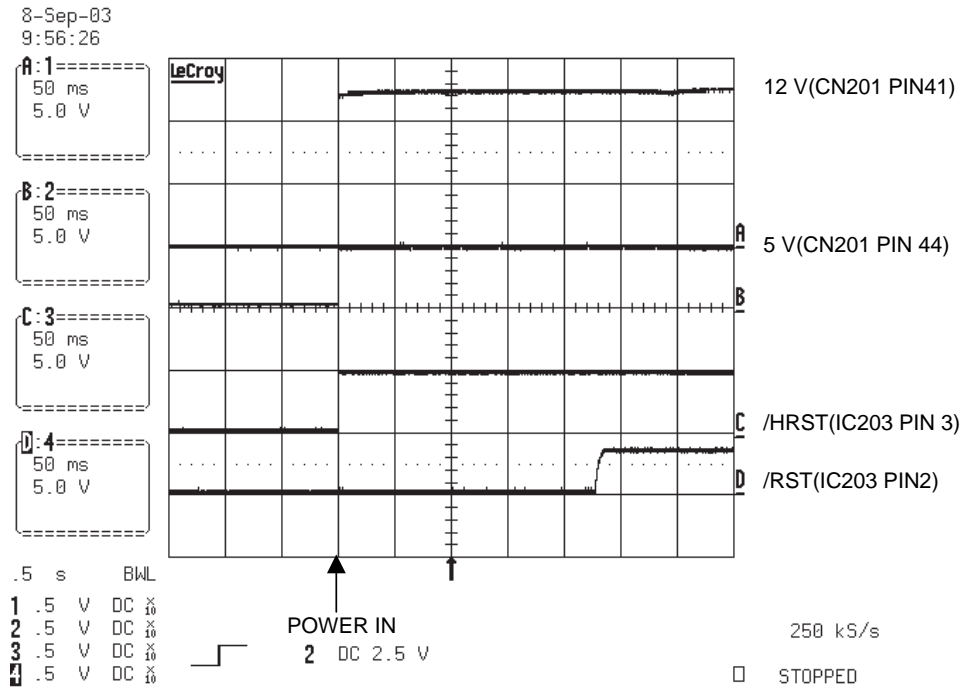
Pin description

Pin No.	Pin Name	Type	Des cription
1	AVREF0	I	A/D CONVERTER REFERENCE VOLTAGE INPUT
2	AVSS	-	A/D,D/A CONVERTER POTENTIAL
3	STEP0	O	STEPPTING MOTOR CONTROL SIGNAL
4	STEP1	O	STEPPTING MOTOR CONTROL SIGNAL
5	AVREF1	I	D/A CONVERTER REFERENCE VOLTAGE INPUT
6	TILT-MUTE	O	TILT DRIVE MUTE SIGNAL
7	SBRK	O	EXTERNAL MEMORY ADDRESS BUS
8	FLMD0	I	FLASH PROFLAMING MODE
9	VDD	-	I NTERNAL CONSTANT POWER
10	VDDOSC	-	CONSTANT POWER
11	VSS	-	INTERNAL GROUND POTENTIAL
12	X1	I	MAIN CLOCK
13	X2	-	MAIN CLOCK
14	/RESET	I	SYSTEM RESET
15	(RESERVED)	-	-
16	/CS-DSP	O	CHIP SELECTOR OUPUT
17	(RESERVED)	-	-
18	OPCTRГ	I/O	WOBBLE FM DE M ODUL ATI ON DATA
19	/UINT	I	INTERRUPTED REQUEST SIGNAL INPUT
20	WGATE	I	DRIVER WRITER LASER CONTROL SIGNAL
21	DRV-CTRL0	-	-
22	SIB0	I	SERIAL CLOCK
23	EFM-ERR	-	-
24	WBL-CRC	-	-
25	TXD	O	SERIAL CLOCK
26	RXD	I	SERIAL CLOCK
27	RECD	I	NO RECODRDING AREA DETECTION
28	SFG	I	FG SIGNAL INPUT
29	TEZC	I	TRACK ZERO CROSS SIGNAL INPUT
30	SVMON	I	SERVO BLOCK MONITOR SIGNAL
31	MON3	I	M ONI TOR TEST SINGNAL
32	MON2	I	M ONI TOR TEST SINGNAL
33	EVSS	-	EXTERNAL CONSTANT POWER
34	EVDD	-	EXTERNAL CONSTANT POWER
35	MON1	I	MONITOR TEST SINGNAL
36	MON0	I	MONITOR TEST SINGNAL
37	ASYLPF	-	-
38	WBLPF	-	-
39	LJJ-CTRL1	-	-
40	LJJ-CTRL2	-	-
41	DV D/CD	-	-
42	PU-CTRL1	O	PD IC GAIN CONTROL SIGNAL
43	RST-DSP	O	RESET OUT
44	WR/RE	O	PD IC GAIN COTTROL SI NAL(WRITE/READ)
45	RW/R	-	-
46	LDEN-DVD	O	PICK-UP LD ENABLE SIGNAL (DV D)
47	LDEN-CD	O	PIC K-UP LD ENABLE SIGNAL (C D)
48	SCLK	O	REGISTER SETTING CLOCK
49	SDATAI	I	REGISTER SETTING DATA INPUT
50	SDATAO	O	REGISTER SETTING DATA OUTPUT

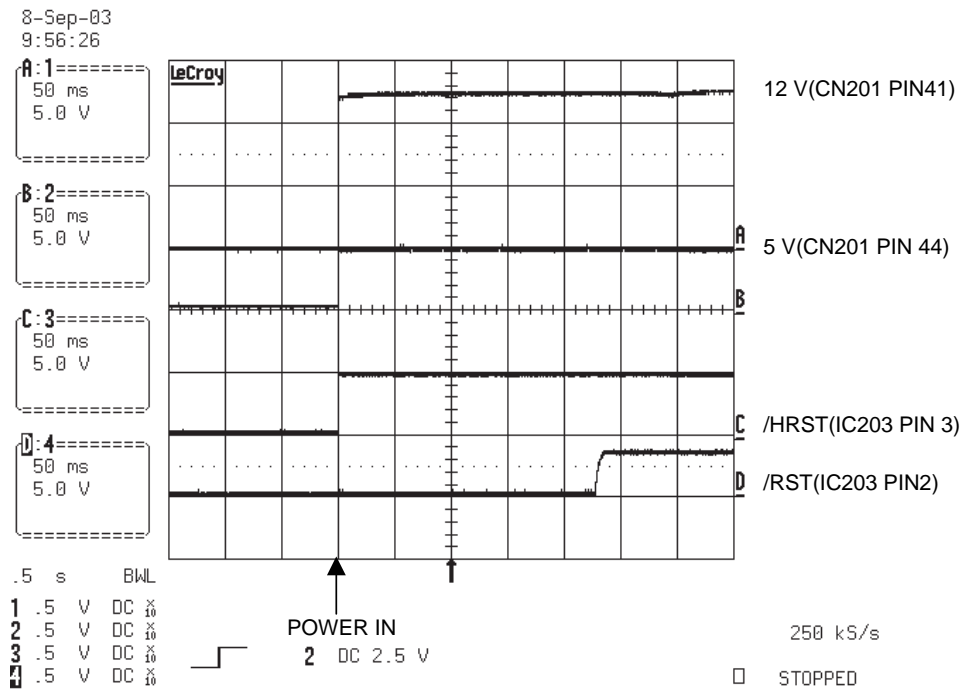
Pin No.	Pin Name	Type	Des cription
51	CP	O	REGISTER ADDRESS OUPUT
52	/DACS	O	CHIP SELECTOR
53	/BPRCS	O	EEPROM COMM UNICATON LINE
54	TEST MOD0	-	-
55	TEST MOD1	-	-
56	(RESERVED)	-	-
57	(RESERVED)	-	-
58	LED	O	LED ENABLE LINE
59	MSW	O	LED ENABLE LINE
60	/EJECT-KEY	O	TRAY OPE N LINE
61	URDY	O	ACCESS CONTROL SIGNAL INPUT FRON CPU TO SDRAM
62	(RESERVED)	-	-
63	/OPEN-SW	I	OPEN S/W INPUT
64	/LOAD-SW	I	LOAD S/W INPUT
65	/WR	O	WRITE STROBE SIGNAL OUTPUT
66	(RESERVED)	-	-
67	/RD	O	READ STROBE SIGNAL OUPUT
68	ASTB	O	ADDRESS STROBE OUPUT
69	EVSS	-	EX TERNAL CONSTANT POWER
70	EVDD	-	EX TERNAL CONSTANT POWER
71	AD0	I/O	PORT DL 16BIT INPUT/OUTPUT
72	AD1	I/O	PORT DL 16BIT INPUT/OUTPUT
73	AD2	I/O	PORT DL 16BIT INPUT/OUTPUT
74	AD3	I/O	PORT DL 16BIT INPUT/OUTPUT
75	AD4	I/O	PORT DL 16BIT INPUT/OUTPUT
76	AD5	I/O	PORT DL 16BIT INPUT/OUTPUT
77	AD6	I/O	PORT DL 16BIT INPUT/OUTPUT
78	AD7	I/O	PORT DL 16BIT INPUT/OUTPUT
79	A8	I/O	PORT DL 16BIT INPUT/OUTPUT
80	A9	I/O	PORT DL 16BIT INPUT/OUTPUT
81	A10	I/O	PORT DL 16BIT INPUT/OUTPUT
82	A11	I/O	PORT DL 16BIT INPUT/OUTPUT
83	A12	I/O	PORT DL 16BIT INPUT/OUTPUT
84	A13	I/O	PORT DL 16BIT INPUT/OUTPUT
85	A14	I/O	PORT DL 16BIT INPUT/OUTPUT
86	(RESERVED)	I/O	PORT DL 16BIT INPUT/OUTPUT
87	/LIMIT-SW	I	TRAY LIMIT S/W INPUT
88	MA/SL	I	MASTER/SLAVE MODE SELECTOR
89	AUDMUTE	-	-
90	LOAD1	O	STANDBY/BRAKE CONTROL SIGNAL
91	LOAD2	O	STANDBY/BRAKE CONTROL SIGNAL
92	(RESERVED)	-	-
93	SKEW2	-	-
94	SKEW1	-	-
95	FPD	I	TEMPERATURE MONITOR CURRENT INPUT
96	TEMP	I	MONITOR TEST SINGNAL
97	MONI3	I	FOCUS ERROR INPUT
98	MONI2	I	LASER MONITOR CURRENT INPUT
99	MONI1	I	PDIC REFERNEC VOLTAGE
100	VC+1.5V	I	VCC 1.5V INPUT

WAVEFORMS

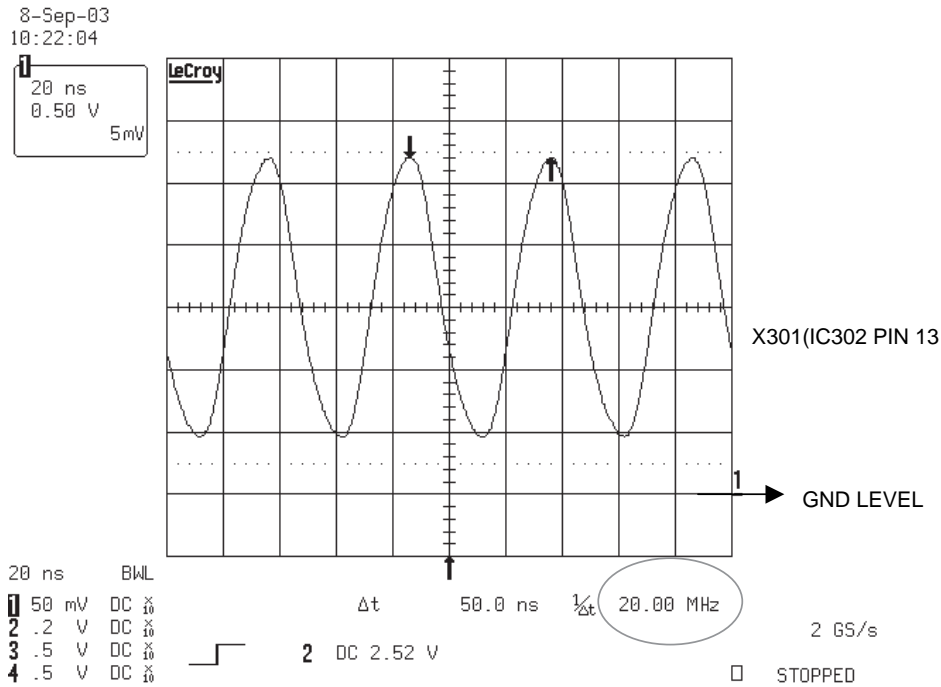
1. POWER & RESET Signal



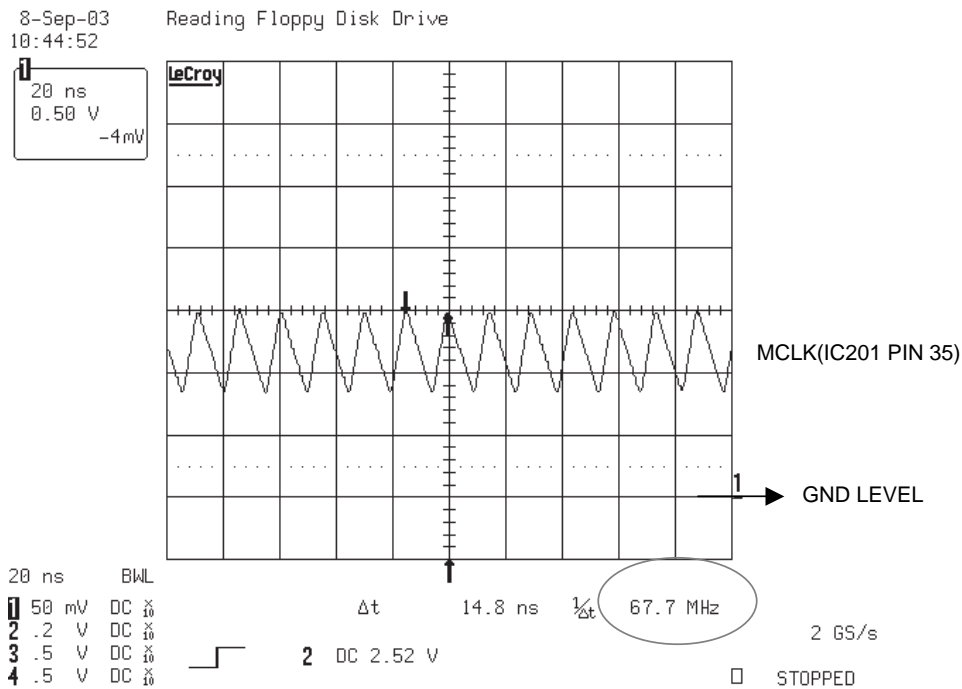
2. Main Clock1 for IC202 (16.9MHz)



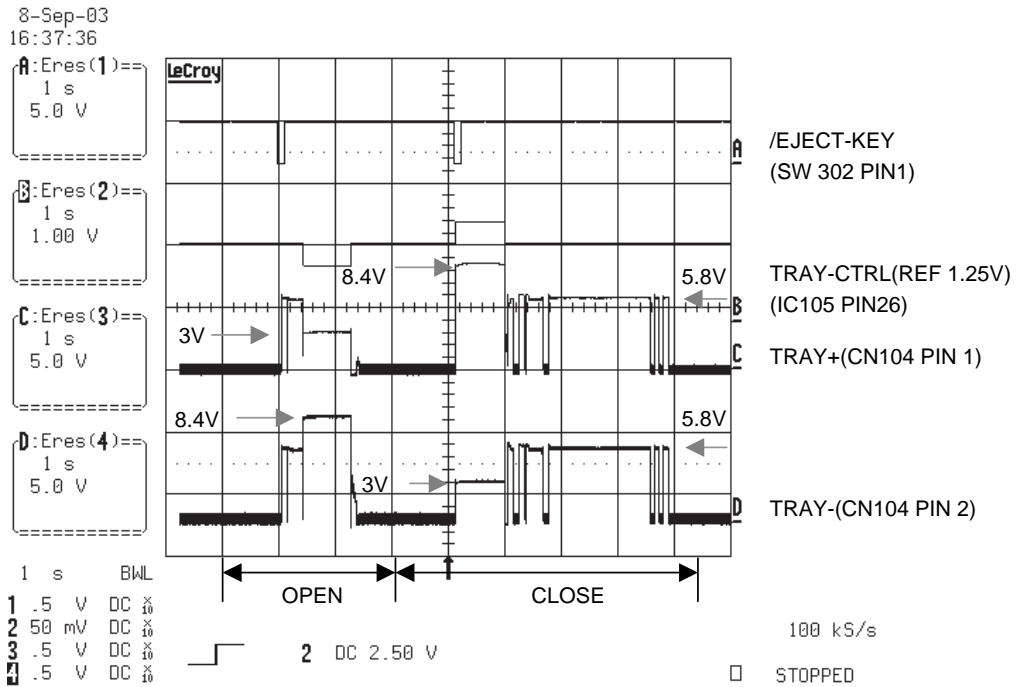
3. Main Clock2 for IC302 (20MHz)



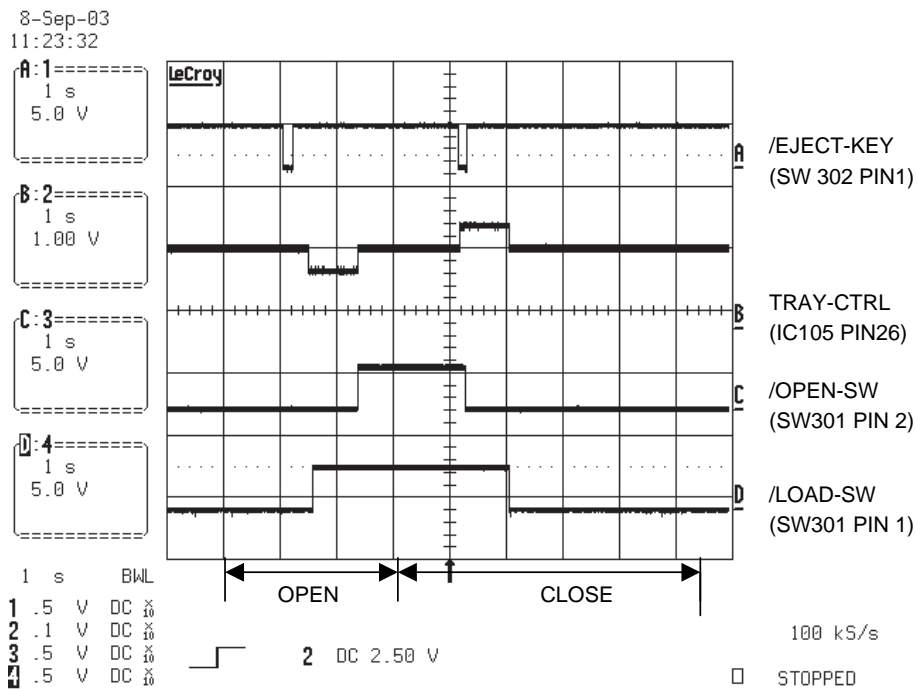
4. SDRAM Clock



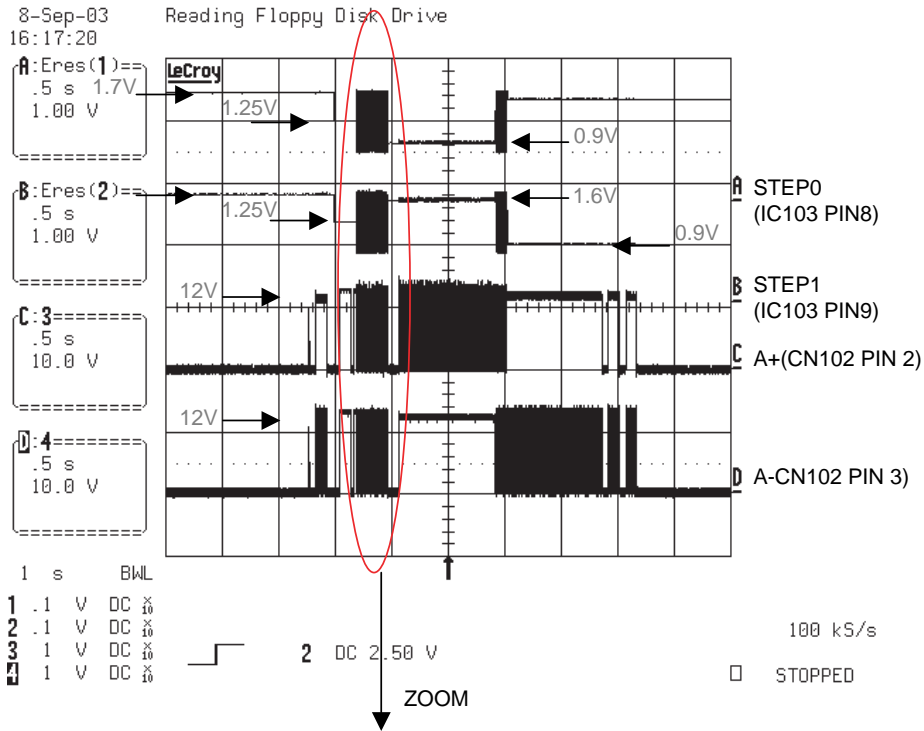
5. TRAY OPEN/CLOSE SIGNAL 1



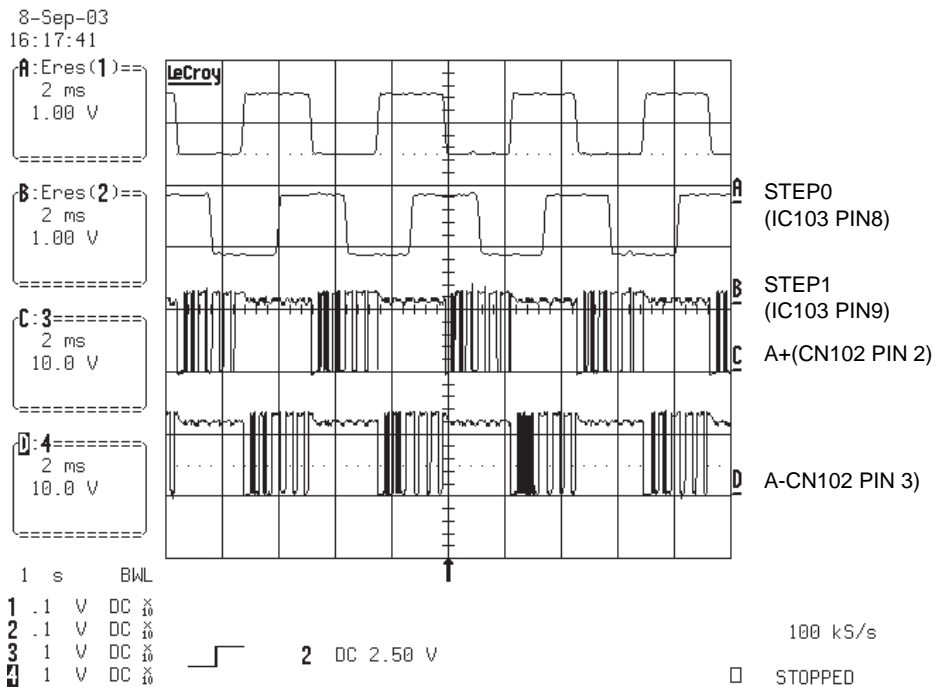
6. TRAY OPEN/CLOSE SIGNAL 2



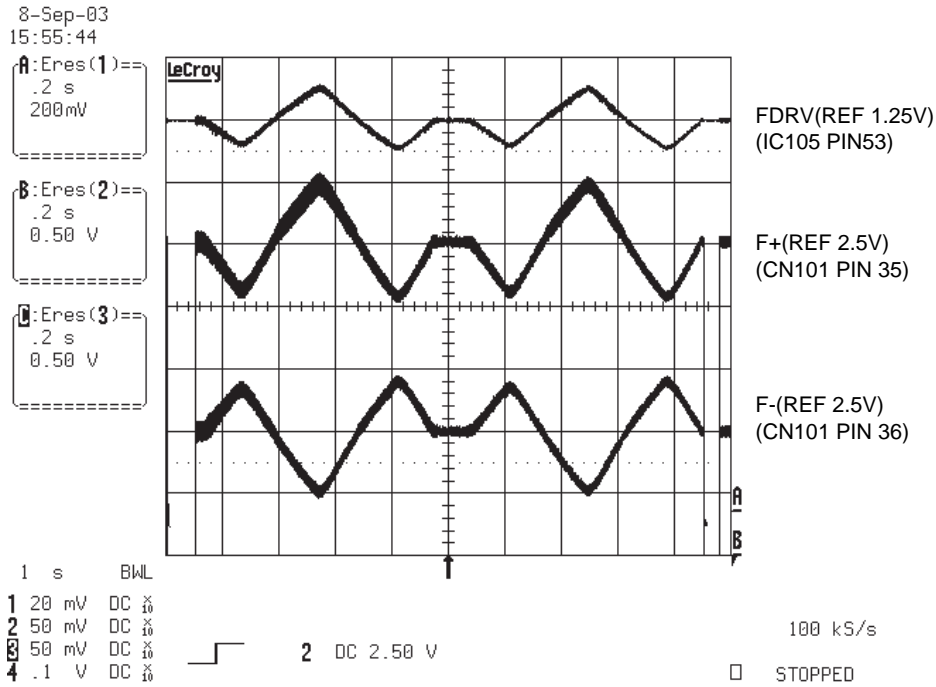
7. SLED MOVE SIGNAL 1



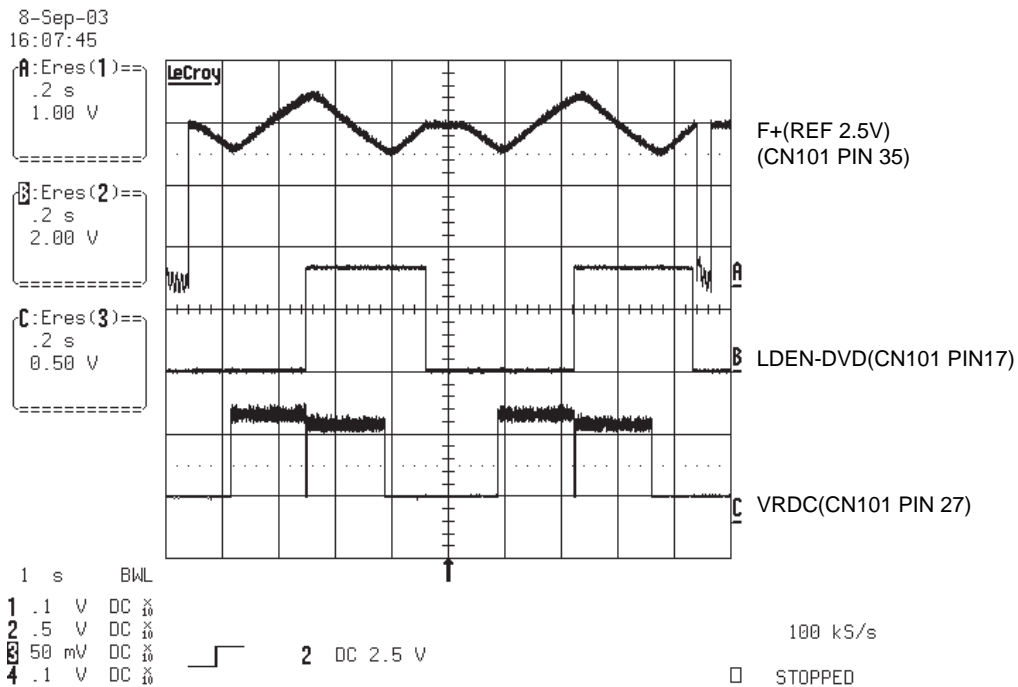
8. SLED MOVE SIGNAL 2



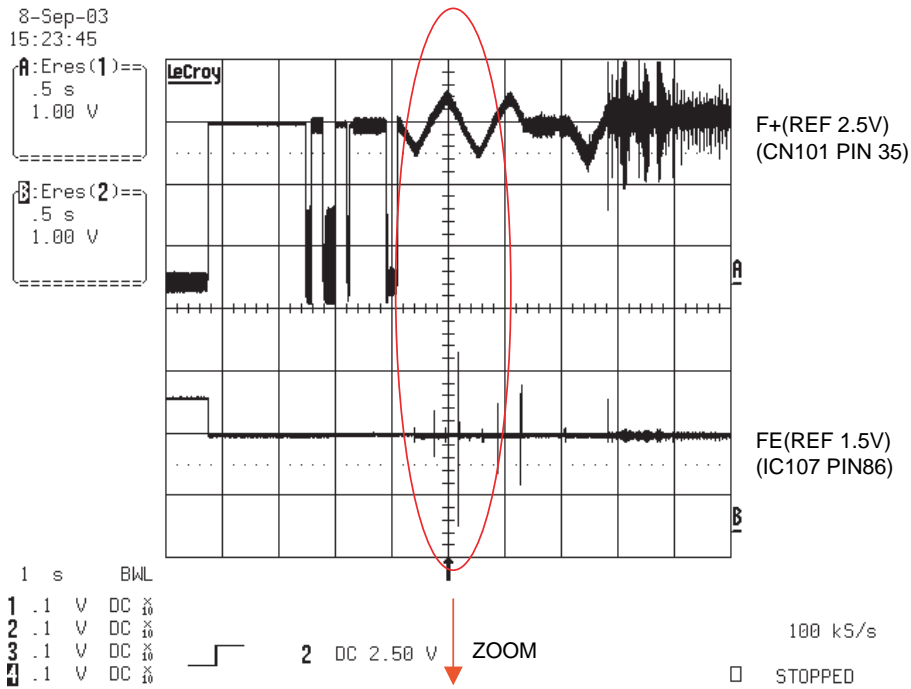
9. FOCUS SEARCH SIGNAL



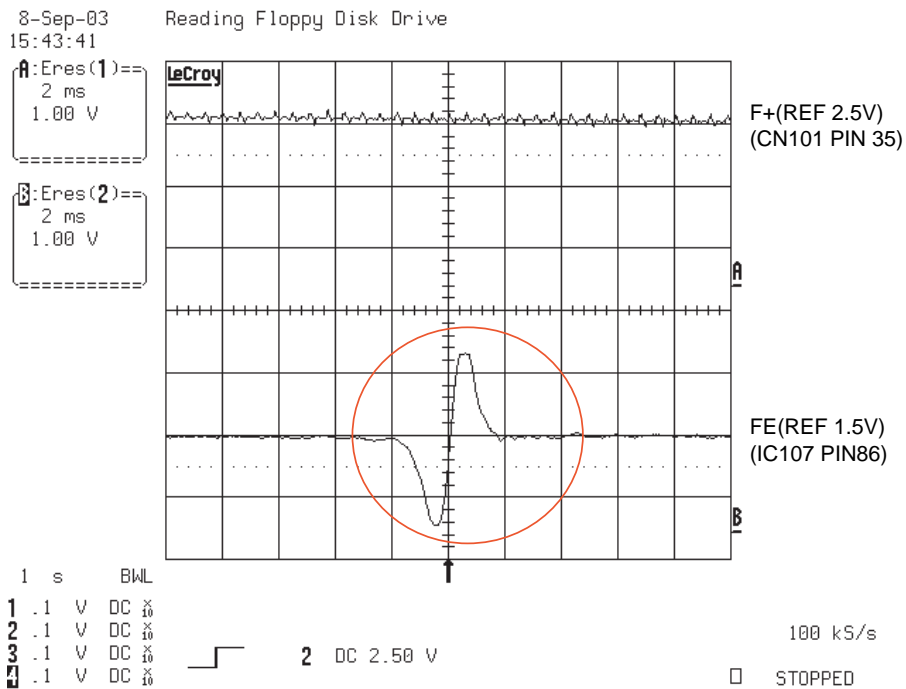
10. LASER TURN ON SIGNAL



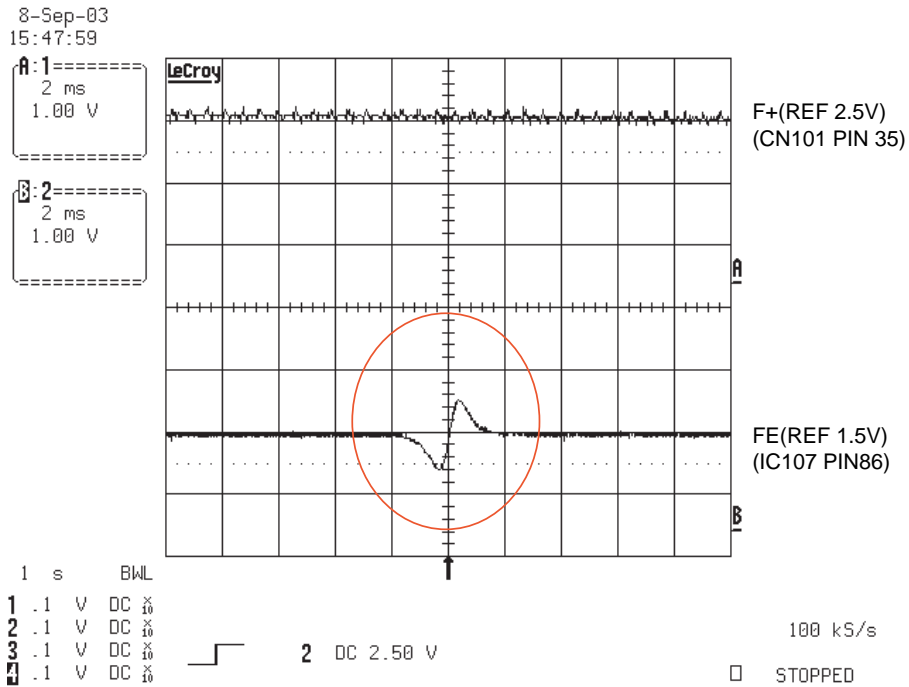
11. DISC TYPE JUDGEMENT WAVEFORM (CD SERIES)



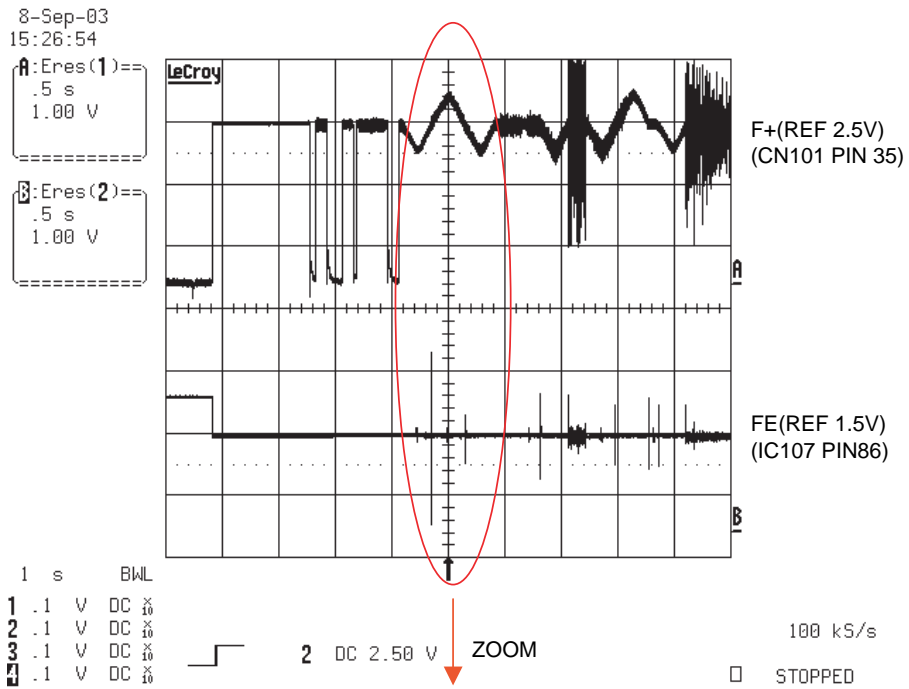
12. DISC TYPE JUDGEMENT WAVEFORM (CD&CD-R)



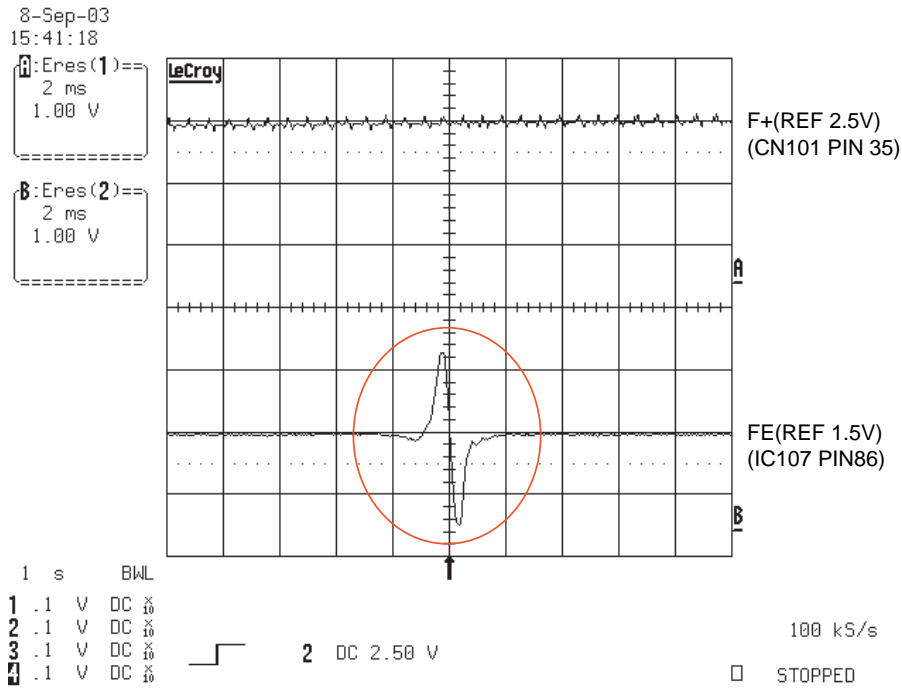
13. DISC TYPE JUDGEMENT WAVEFORM (CD-RW)



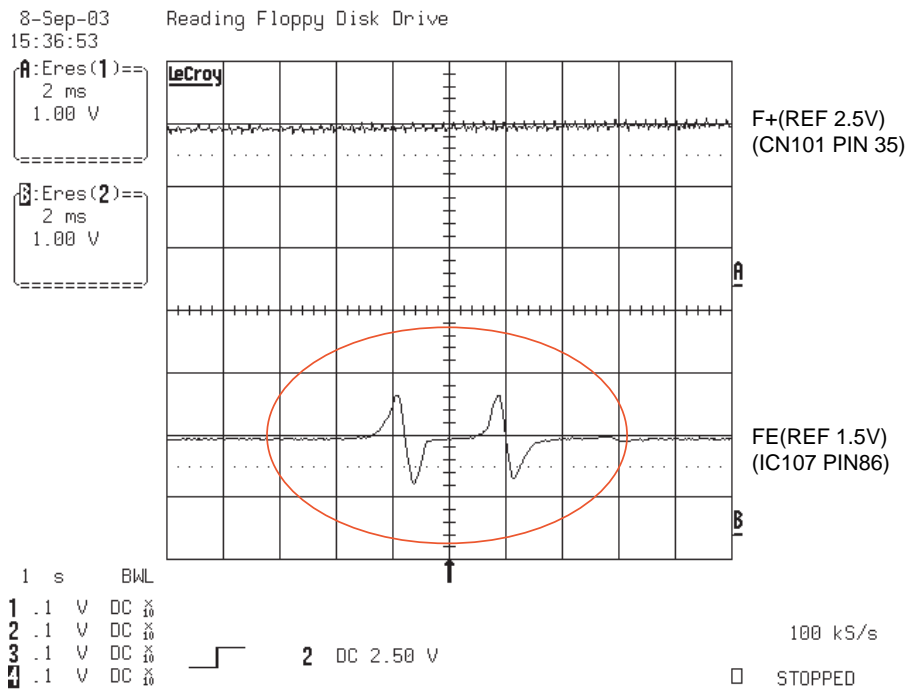
14. DISC TYPE JUDGEMENT WAVEFORM (DVD SERIES)



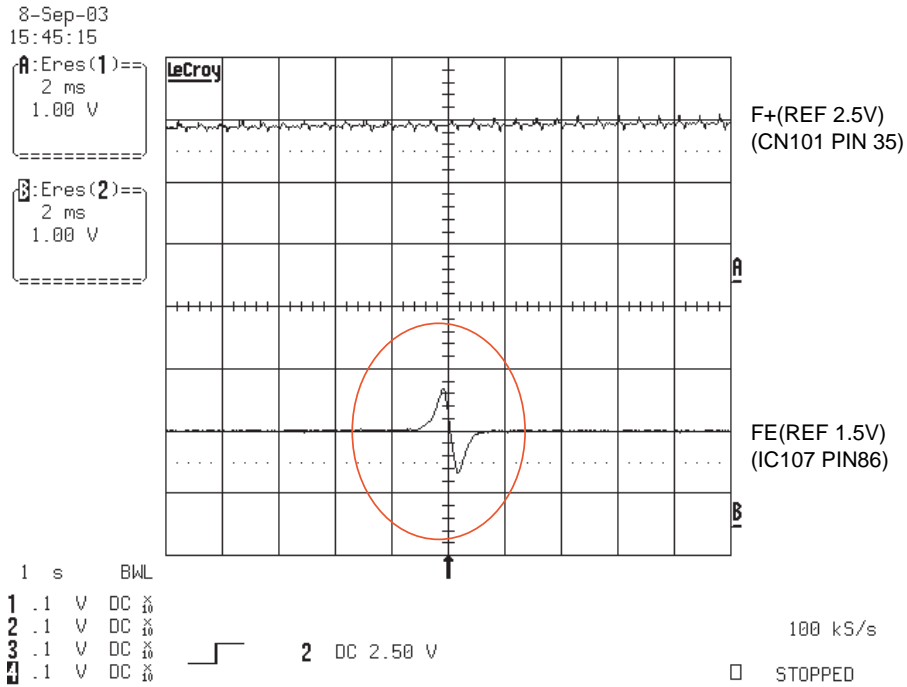
15. DISC TYPE JUDGEMENT WAVEFORM (DVD_SINGLE&R)



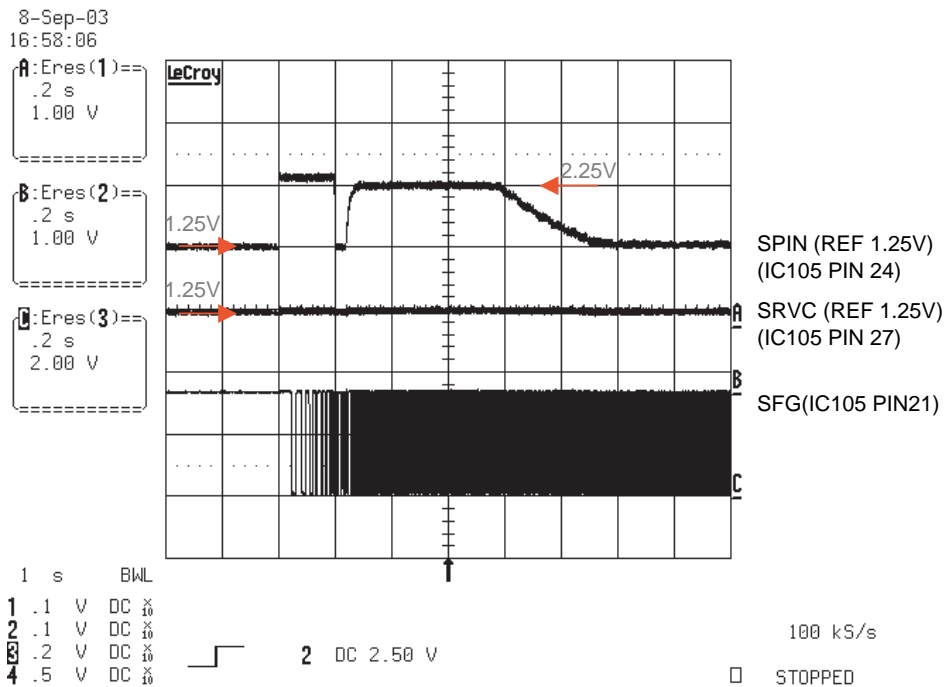
16. DISC TYPE JUDGEMENT WAVEFORM (DVD_DUAL)



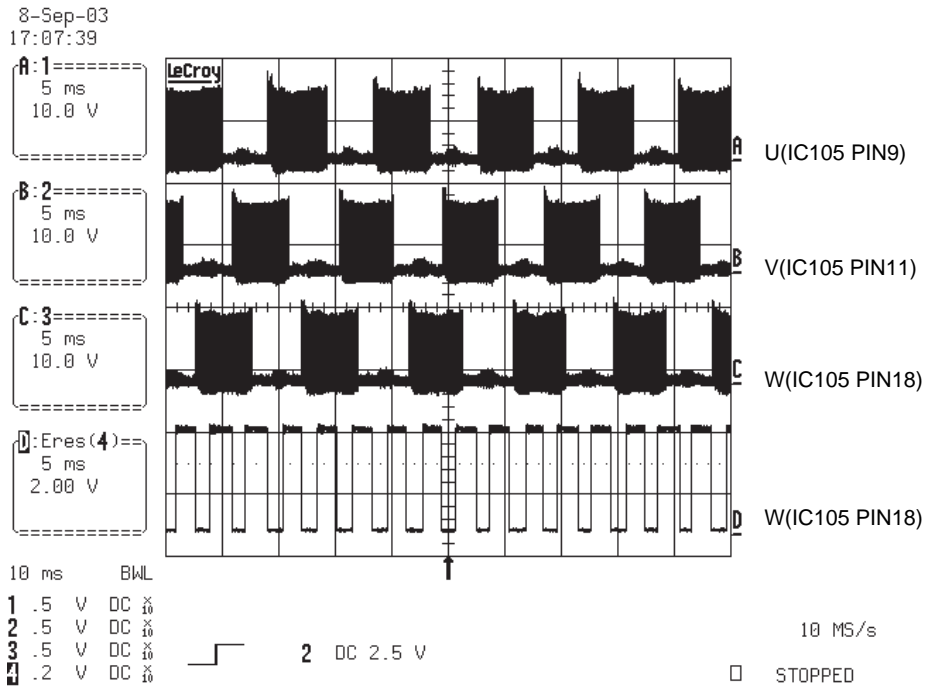
17. DISC TYPE JUDGEMENT WAVEFORM (DVDRW)



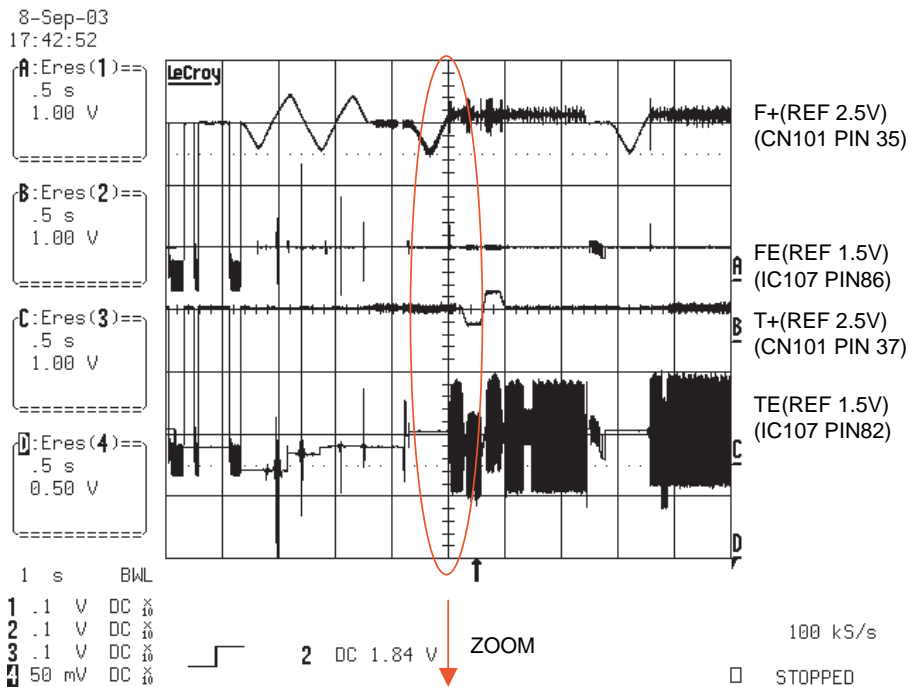
18. SPINDLE WAVEFORM1



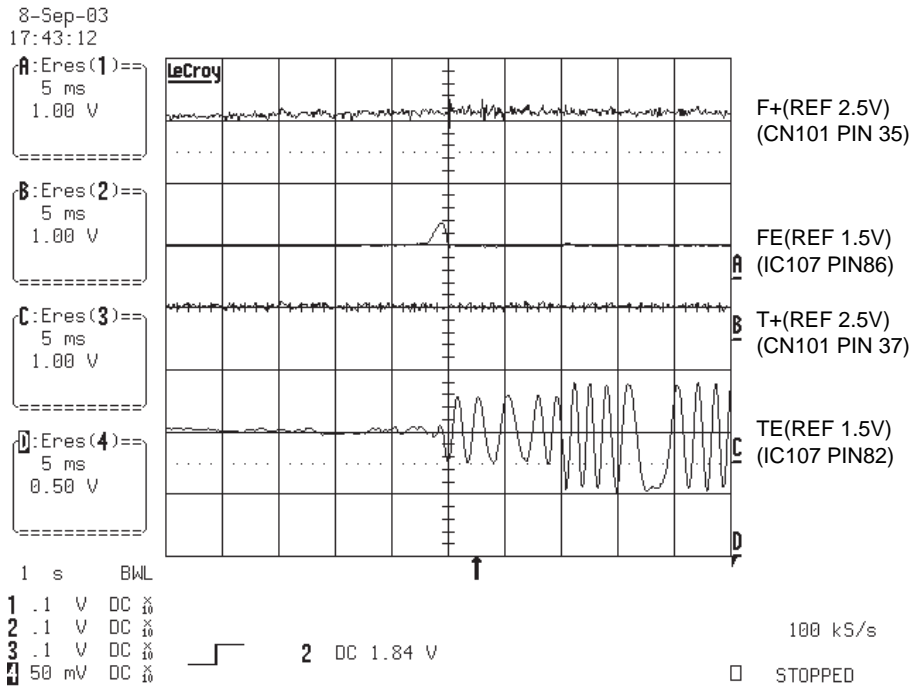
19. SPINDLE WAVEFORM2



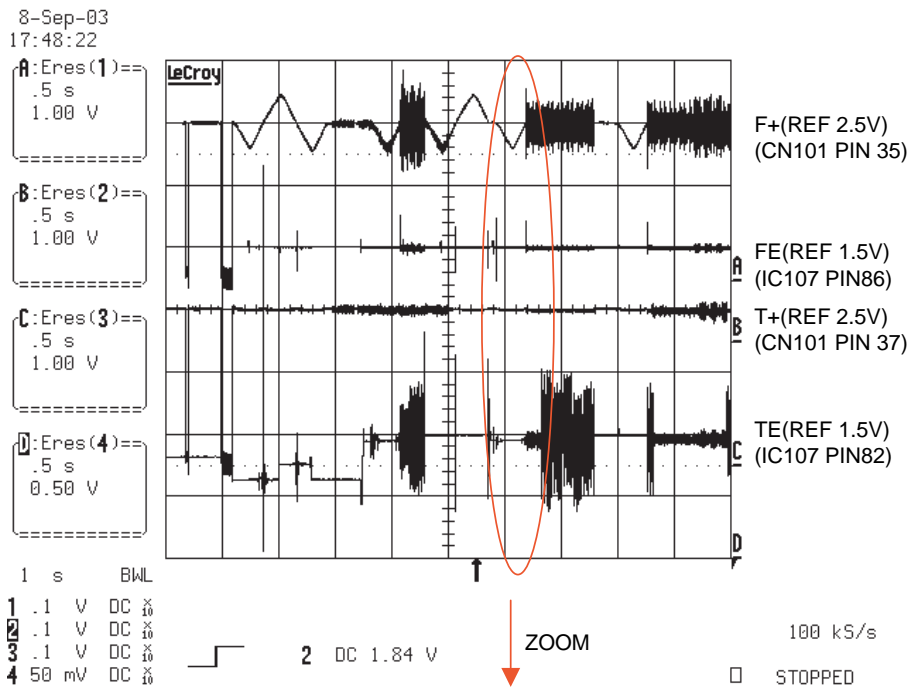
20. FOCUS ON SIGNAL(CD)



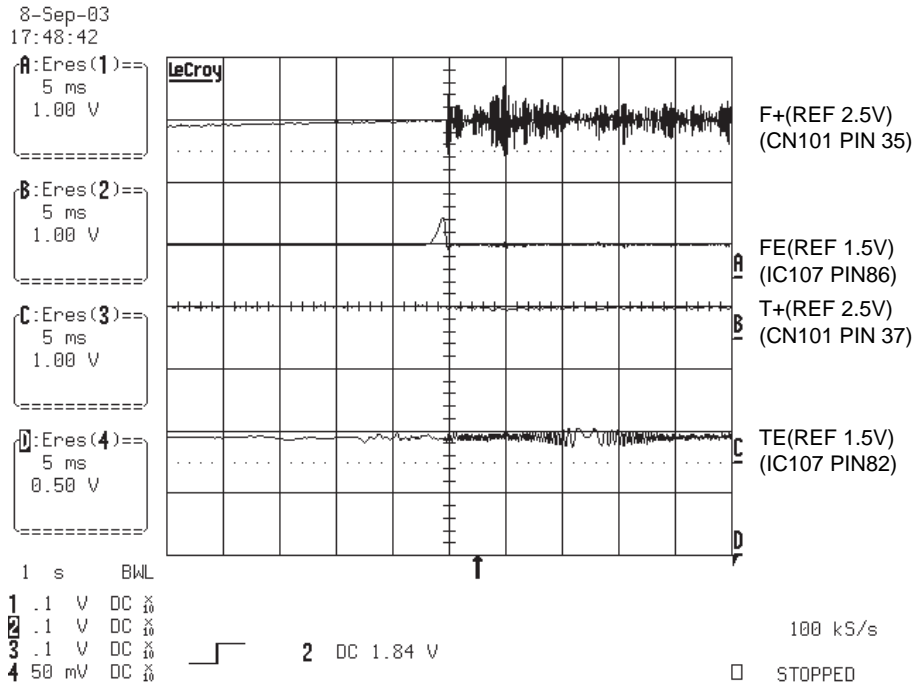
21. FOCUS ON SIGNAL(CD)



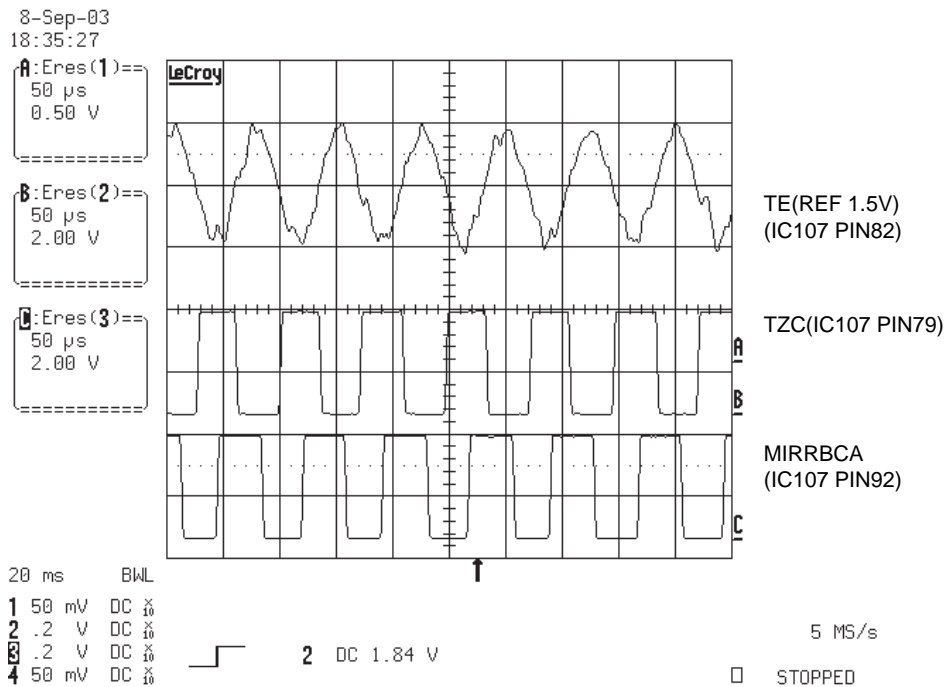
22. FOCUS ON SIGNAL(DVD)



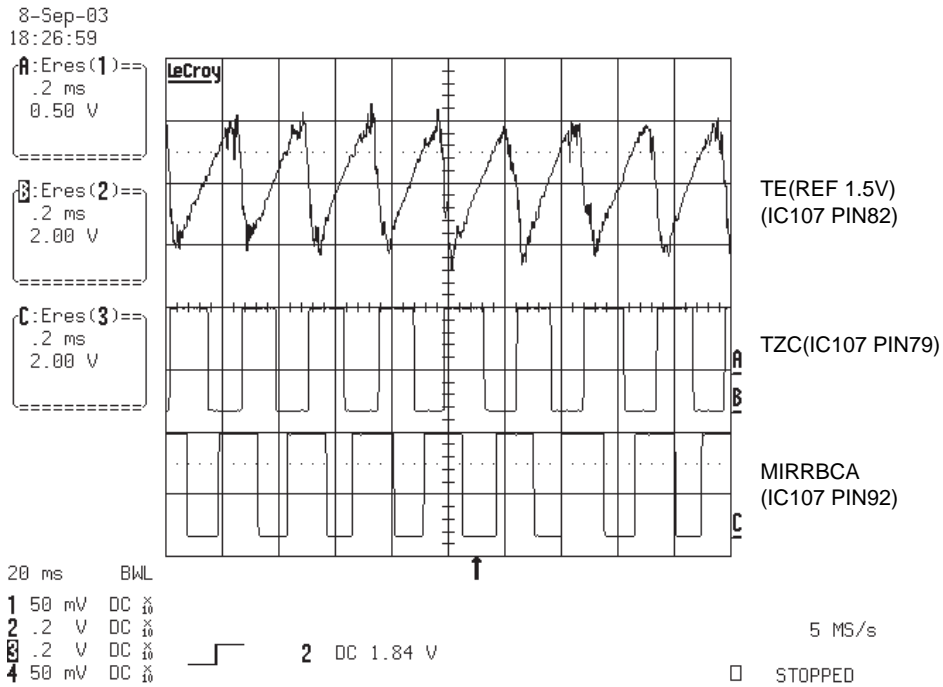
23. FOCUS ON SIGNAL (DVD)



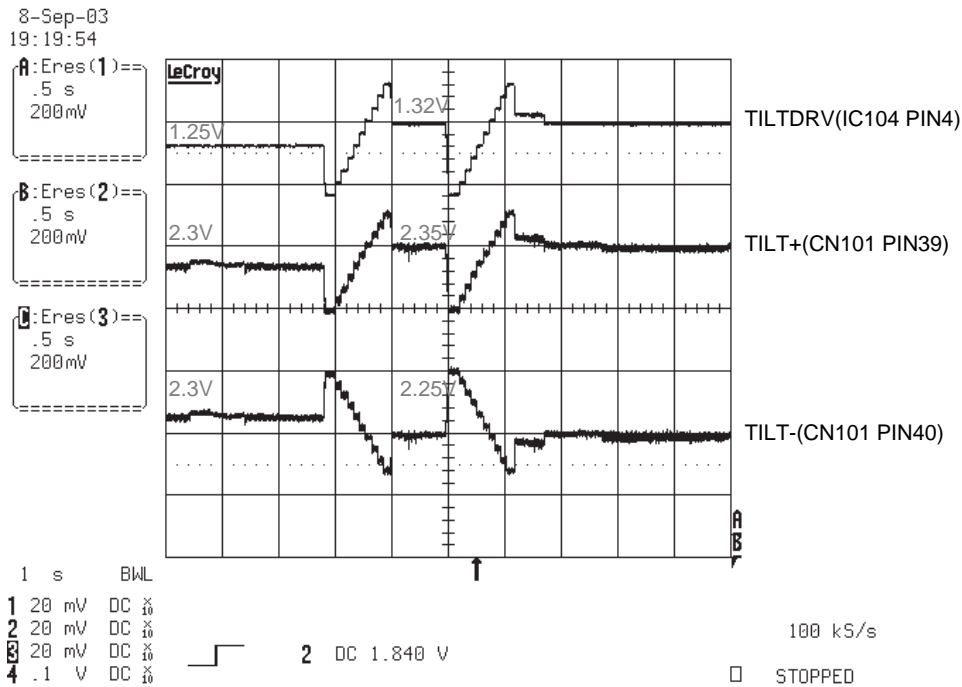
24. TRACK OFF SIGNAL(CD)



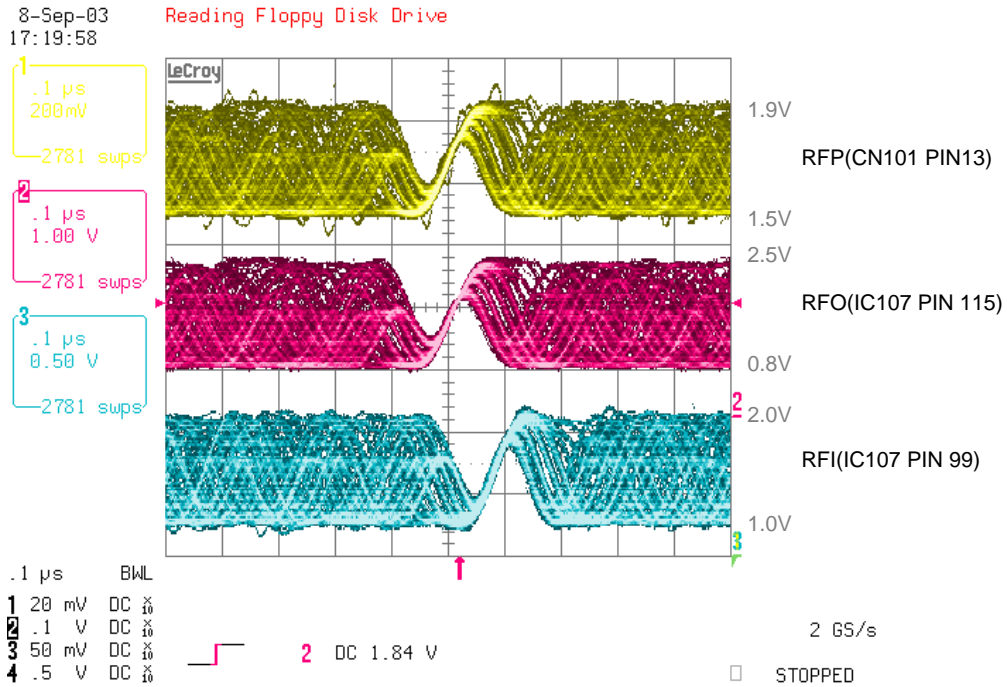
25. TRACK OFF SIGNAL(DVD)



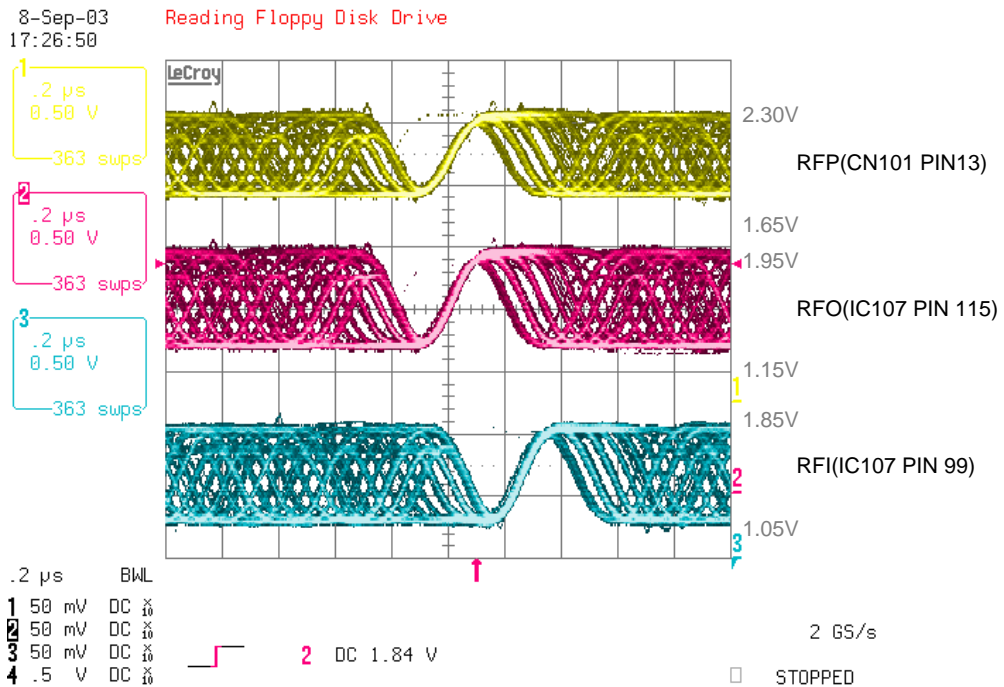
26. Tilt Driver signal(Disc reading)



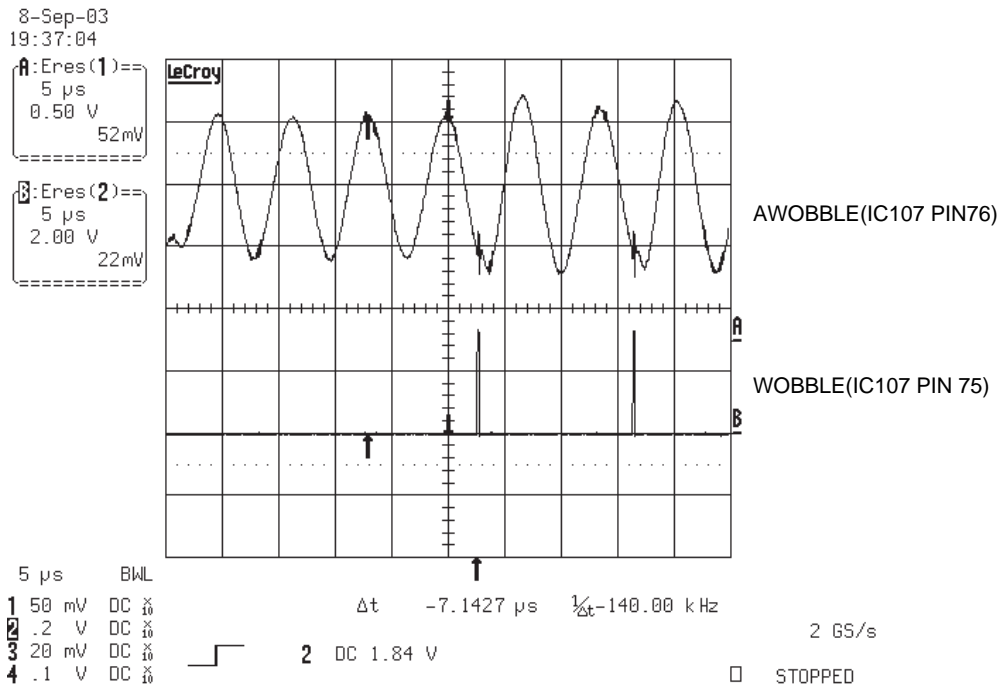
27. RF WAVEFORM(DVD)



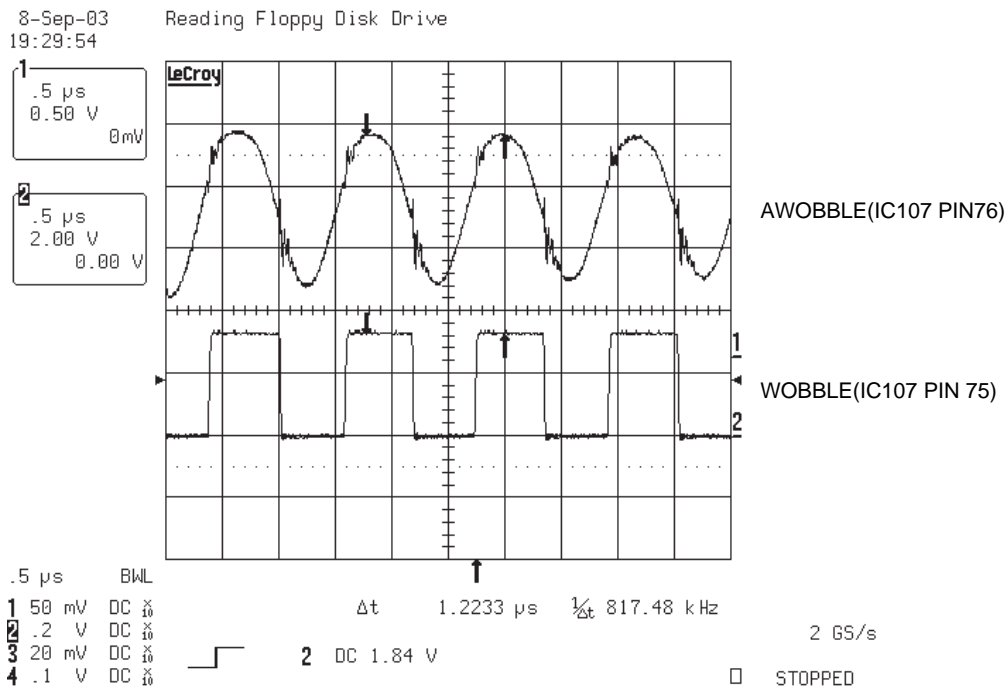
28. RF WAVEFORM(CD)



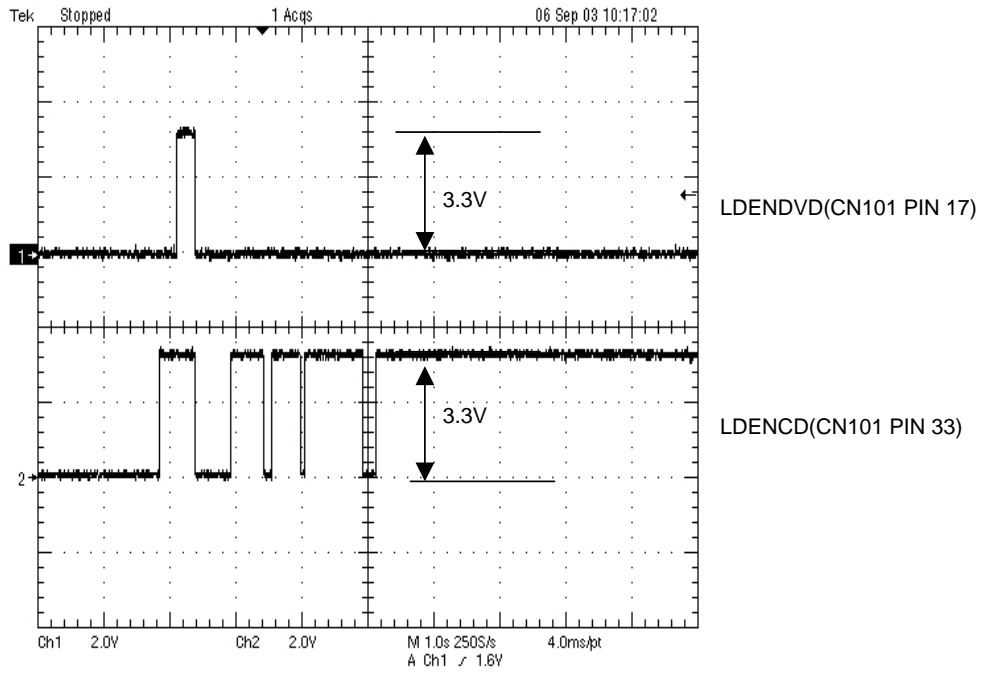
29. WOBBLE(DVD-R/RW)_READING



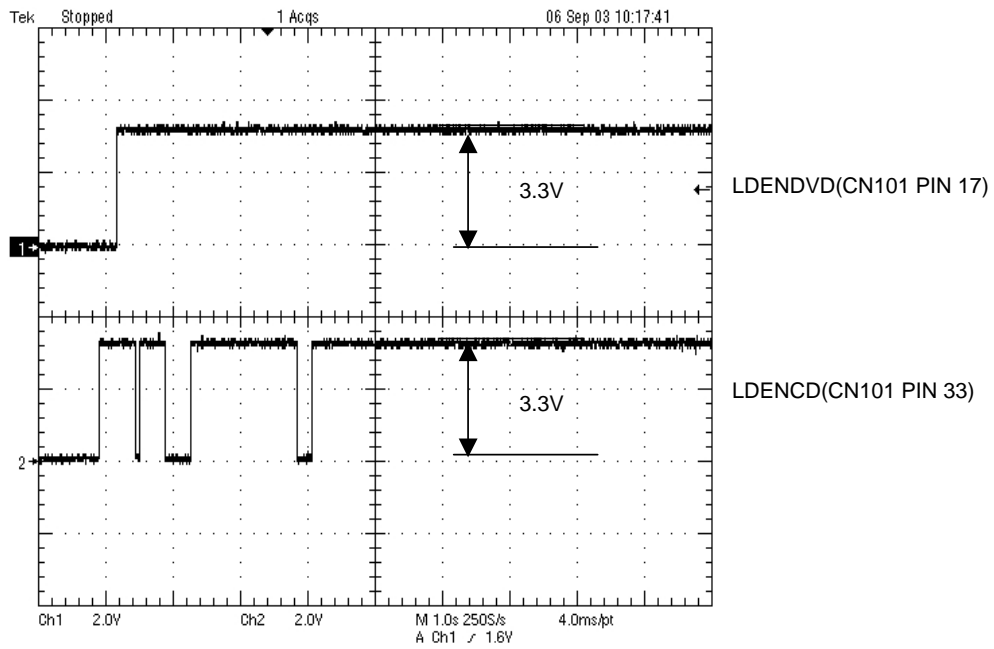
30. WOBBLE(DVD+R/RW)_READING&WRITING =>X1 SPEED



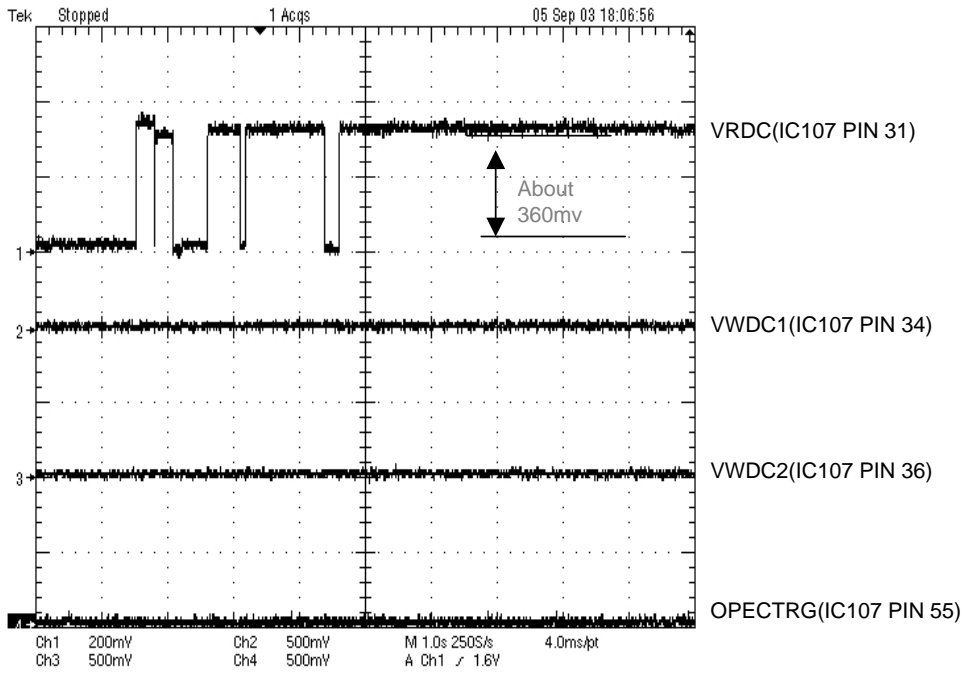
31. LD Enable(DVD)



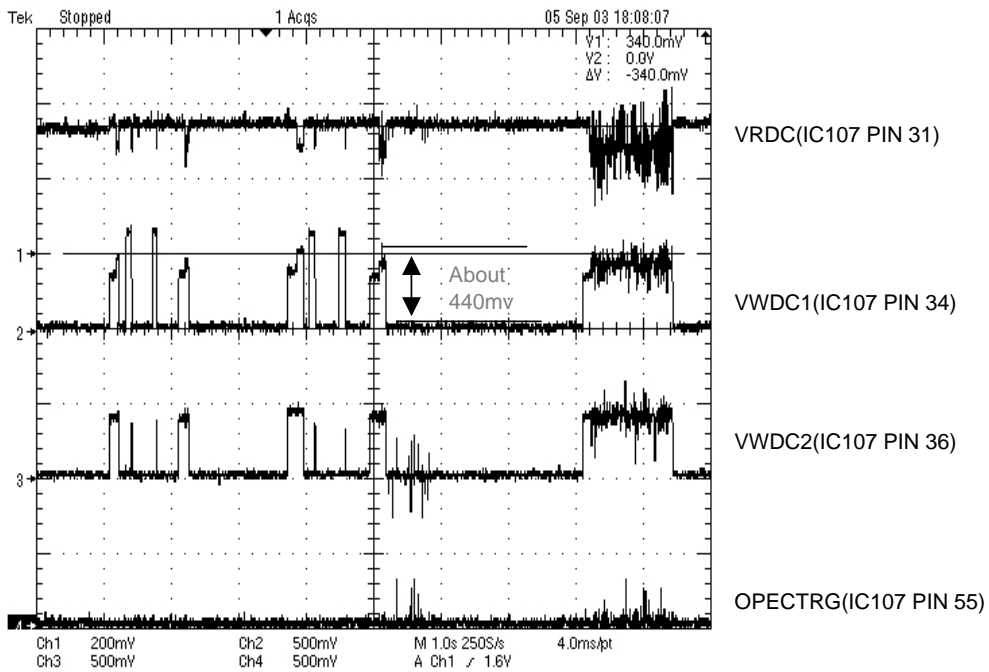
32. LD Enable(CD)



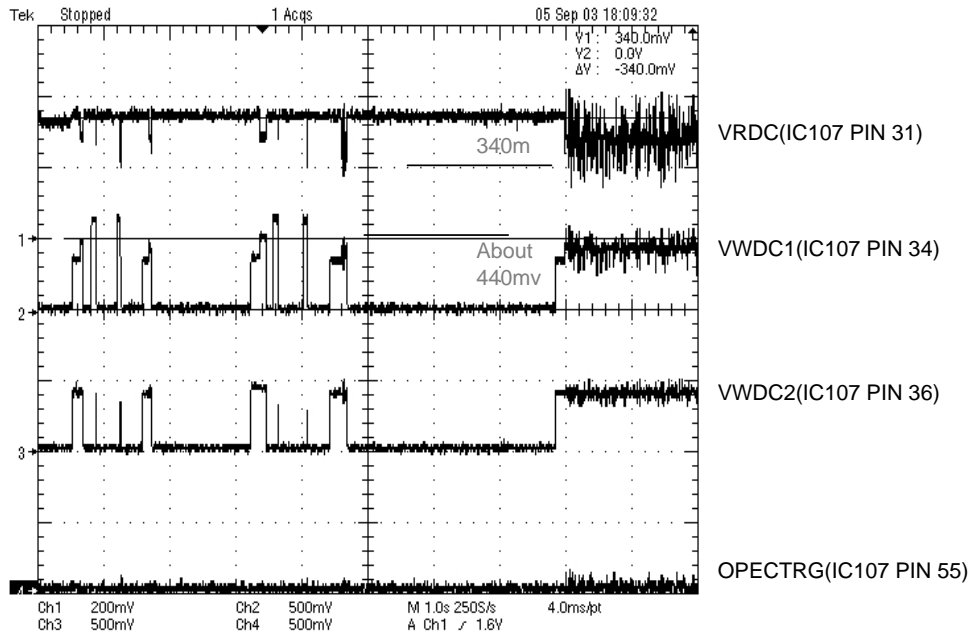
33. Laser Power(reading)_DVD+RW



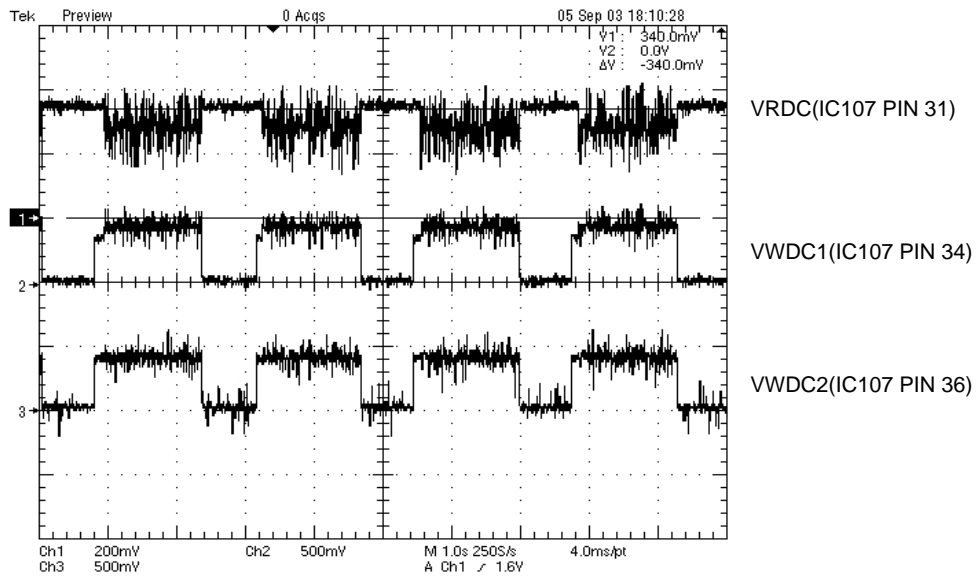
34. Laser Power(Erase)_DVD+RW



35. Laser Power(Writing)_initial state



36. Laser Power(Writing)_Processing



MEMO

A series of horizontal dotted lines for writing.