LG Electronics Inc.

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SERVICE MANUAL

MODEL : DS563X(DS9313CPM)

LG Electronics Inc.

LG

DVD VIDEO PLAYER

SERVICE MANUAL

MODEL : DS563X(DS9313CPM)

CAUTION

BEFORE SERVICING THE UNIT, READ THE “SAFETY PRECAUTIONS” IN THIS MANUAL.

CONTENTS

SECTION 1

SUMMARY

CONTENTS

PRODUCT SAFETY SERVICING GUIDELINES FOR VIDEO PRODUCTS

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 YOUR BEING LIABLE FOR ANY RESULTING PROPERTY DAMAGE OR USER INJURY.

SERVICE WORK SHOULD BE PERFORMED ONLY AFTER YOU ARE THOROUGHLY FAMILIAR WITH ALL OF THE FOLLOWING SAFETY CHECKS AND SERVICING GUIDELINES. TO DO OTHERWISE, INCREASES THE RISK OF POTENTIAL HAZARDS AND INJURY TO THE USER.

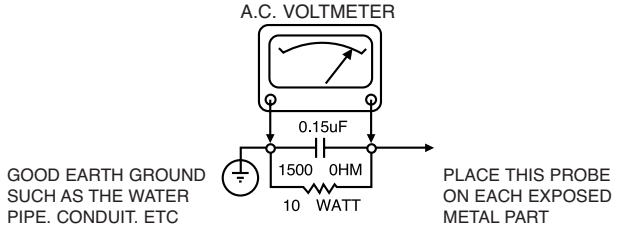
WHILE SERVICING, USE AN ISOLATION TRANSFORMER FOR PROTECTION FROM A.C. LINE SHOCK.

SAFETY CHECKS

AFTER THE ORIGINAL SERVICE PROBLEM HAS BEEN CORRCTED. A CHECK SHOULD BE MADE OF THE FOLLOWING.

SUBJECT : FIRE & SHOCK HAZARD

1. BE SURE THAT ALL COMPONENTS ARE POSITIONED IN SUCH A WAY AS TO AVOID POSSIBILITY OF ADJACENT COMPONENT SHORTS. THIS IS ESPECIALLY IMPORTANT ON THOSE MODULES WHICH ARE TRANSPORTED TO AND FROM THE REPAIR SHOP.
2. NEVER RELEASE A REPAIR UNLESS ALL PROTECTIVE DEVICES SUCH AS INSULATORS, BARRIERS, COVERS, SHIELDS, STRAIN RELIEFS, POWER SUPPLY CORDS, AND OTHER HARDWARE HAVE BEEN REINSTALLED PER 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, DAMAGED INSULATION (INCLUDING A.C. CORD). AND REPLACE IF NECESSARY FOLLOW ORIGINAL LAYOUT, LEAD LENGTH AND DRESS.
5. NO LEAD OR COMPONENT SHOULD TOUCH A RECIVING TUBE OR A RESISTOR RATED AT 1 WATT OR MORE. LEAD TENSION AROUND PROTRUNING METAL SURFACES MUST BE AVOIDED.
6. ALL CRITICAL COMPONENTS SUCH AS FUSES, FLAMEPROOF RESISTORS, CAPACITORS, ETC. MUST BE REPLACED WITH EXACT FACTORY TYPES, DO NOT USE REPLACEMENT COMPONENTS OTHER THAN THOSE SPECIFIED OR MAKE UNRECOMMENDED CIRCUIT MODIFICATIONS.
7. AFTER RE-ASSEMBLY OF THE SET ALWAYS PERFORM AN A.C. LEAKAGE TEST ON ALL EXPOSED METALLIC PARTS OF THE CABINET, (THE CHANNEL SELECTOR KNOB, ANTENNA TERMINALS. HANDLE AND SCREWS) TO BE SURE THE SET IS SAFE TO OPERATE WITHOUT DANGER OF ELECTRICAL SHOCK. DO NOT USE A LINE ISOLATION TRANSFORMER DURING THIS TEST USE AN A.C. 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. 150.V A.C TYPE CAPACITOR BETWEEN A KNOWN GOOD EARTH GROUND (WATER PIPE, CONDUIT, ETC.) AND THE EXPOSED METALLIC PARTS, ONE AT A TIME. MEASURE THE A.C. VOLTAGE ACROSS THE COMBINATION OF 1500 OHM RESISTOR AND .15 MFD CAPACITOR. REVERSE THE A.C. PLUG AND REPEAT A.C. VOLTAGE MEASUREMENTS FOR EACH EXPOSED METALLIC PART. VOLTAGE MEASURED MUST NOT EXCEED 75 VOLTS R.M.S. THIS CORRESPONDS TO 0.5 MILLIAMP A.C ANY VALUE EXCEEDING THIS LIMIT CONSTITUTES A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED IMMEDIATELY.



SUBJECT: GRAPHIC SYMBOLS

THE LIGHTNING FLASH WITH APROWHEAD SYMBOL. WITHIN AN EQUILATERAL TRIANGLE, IS INTENDED TO ALERT THE SERVICE PERSONNEL TO THE PRESENCE OF UNINSULATED "DANGEROUS VOLTAGE" THAT MAY BE OF SUFFICIENT MAGNITUDE TO CONSTITUTE A RISK OF ELECTRIC SHOCK.

THE EXCLAMATION POINT WITHIN AN EQUILATERAL TRIANGLE IS INTENDED TO ALERT THE SERVICE PERSONNEL TO THE PRESENCE OF IMPORTANT SAFETY INFORMATION IN SERVICE LITERATURE.

SUBJECT : X-RADIATION

1. BE SURE PROCEDURES AND INSTRUCTIONS TO ALL SERVICE PERSONNEL COVER THE SUBJECT OF X-RADIATION. THE ONLY POTENTIAL SOURCE OF X-RAYS IN CURRENT T.V. RECEIVERS IS THE PICTURE TUBE. HOWEVER, THIS TUBE DOES NOT EMIT X-RAYS WHEN THE HIGH VOLTAGE IS AT THE FACTORY SPECIFIED LEVEL. THE PROPER VALUE IS GIVEN IN THE APPLICABLE SCHEMATIC. OPERATION AT HIGHER VOLTAGES MAY CAUSE A FAILURE OF THE PICTURE TUBE OR HIGH VOLTAGE SUPPLY AND, UNDER CERTAIN CIRCUMSTANCES, MAY PRODUCE RADIATION IN EXCESS OF DESIRABLE LEVELS.
2. ONLY FACTORY SPECIFIED C.R.T. ANODE CONNECTORS MUST BE USED. DEGAUSSING SHIELDS ALSO SERVE AS X-RAY SHIELD IN COLOR SETS, ALWAYS RE-INSTALL THEM.
3. IT IS ESSNTIAL THAT SERVICE PERSONNEL HAVE AVAILABLE AN ACCURATE AND RELIABLE HIGH VOLTAGE METER. THE CALIBRA TION OF THE METER SHOULD BE CHECKED PERIODICALLY AGAINST A REFERENCE STANDARD, SUCH AS THE ONE AVAILABLE AT YOUR DISTRIBUTOR.
4. WHEN THE HIGH VOLTAGE CIRCUITRY IS OPERATING PROPERLY THERE IS NO POSSIBILITY OF AN X-RADIATION PROBLEM. EVERY TIME A COLOR CHASSIS IS SERVICED. THE BRIGHTNESS SHOULD BE RUN UP AND DOWN WHILE MONITORING THE HIGH VOLTAGE WITH A METER TO BE CERTAIN THAT THE HIGH VOLTAGE DOES NOT EXCEED THE SPECIFIED VALUE AND THAT IT IS REGULATING CORRECTLY, WE SUGGEST THAT YOU AND YOUR SERVICE ORGANIZATION REVIEW TEST PROCEDURES SO THAT VOLTAGE REGULATION IS ALWAYS CHECKED AS A STANDARD SERVICING PROCEDURE. AND THAT THE HIGH VOLTAGE READING BE RECORDER ON EACH CUSTOMER'S INVOICE.
5. WHEN TROUBLESHOOTING AND MAKING TEST MEASUREMENTS IN A PRODUCT WITH A PROBLEM OF EXCESSIVE HIGH VOLTAGE, AVOID BEING UNNECESSARILY CLOSE TO THE PICTURE TUBE AND THE HIGH VOLTAGE SUPPLY. DO NOT OPERATE THE PRODUCT LONGER THAN IS NECESSARY TO LOCATE THE CAUSE OF EXCES SIVE VOLTAGE.
6. REFER TO HV. B+ AND SHUTDOWN ADJUSTMENT PROCEDURES DESCRIBED IN THE APPROPRIATE SCHEMATIC AND DIAGRAMS (WHERE USED).

SUBJECT: IMPLOSION

1. ALL DIRECT VIEWED PICTURE TUBES ARE EQUIPPED WITH AN INTE GRAL IMPLOSION PROTECTION SYSTEM, BUT CARE SHOULD BE TAKEN TO AVOID DAMAGE DURING INSTALLATION, AVOID SCRATCHING THE TUBE. IF SCRATCHED REPLACE IT.
2. USE ONLY RECOMMENDED FACTORY REPLACEMENT TUBES.

SUBJECT : TIPS ON PROPER INSTALLATION

1. NEVER INSTALL ANY PRODUCT IN A CLOSED-IN RECESS, CUBBYHOLE OR CLOSELY FITTING SHELF SPACE. OVER OR CLOSE TO 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 PALCEMENT WHERE DRAPERIES MAY OBSTRUCT REAR VENTING. THE CUSTOMER SHOULD ALSO AVOID THE USE OF DECORATIVE SCARVES OR OTHER COVERINGS WHICH 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 TEST ON CUSTOMIZED INSTALLATIONS.
5. CAUTION CUSTOMERS AGAINST THE MOUNTING OF A PRODUCT ON SLOPING SHELF OR A TILTED POSITION, UNLESS THE PRODUCT IS PROPERLY SECURED.
6. A PRODUCT ON A ROLL-ABOUT CART SHOULD BE STABLE ON 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 THE USE OF A CART OR STAND WHICH HAS NOT BEEN LISTED BY UNDERWRITERS LABORATORIES, INC. FOR USE WITH THEIR SPECIFIC MODEL OF TELEVISION RECEIVER OR GENERICALLY APPROVED FOR USE WITH T.V.'S OF THE SAME OR LARGER SCREEN SIZE.
8. CAUTION CUSTOMERS AGAINST THE USE OF 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 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 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 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 whitch instruments covered by this service manual might be equipped.

5. Do not apply AC power to this DVD and/or any of its electrical assemblies unless all solid-state device heat sinks are cerrectly 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 grouned-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 protec tive 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.)

SPECIFICATIONS

• GENERAL

Power requirements:	AC 110-240 V , 50/60 Hz
Power consumption:	8W
Dimensions (Approx.):	360 x 35 x 242 mm (W x H x D) without foot
Weight (Approx.):	1.7 kg
Operating temperature:	5 °C to 35 °C (41 °F to 95 °F)
Operating humidity:	5 % to 90 %

• OUTPUTS

VIDEO OUT:	1 Vp-p 75 Ω, sync negative, RCA jack x 1 / SCART (TO TV)
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 OUT:	2.0 Vrms (1 KHz, 0 dB), 600 Ω, RCA jack (L, R) x 1 /
	SCART (TO TV)
DIGITAL OUT (COAXIAL):	0.5 V (p-p), 75 Ω, RCA jack x 1

• SYSTEM

Laser:	Semiconductor laser, wavelength 650 nm
Signal system:	PAL / NTSC
Frequency response:	DVD (PCM 96 kHz): 8 Hz to 44 kHz
	DVD (PCM 48 kHz): 8 Hz to 22 kHz
	CD: 8 Hz to 20 kHz
Signal-to-noise ratio:	More than 100 dB (ANALOG OUT connectors only)
Harmonic distortion:	Less than 0.008%
Dynamic range:	More than 95 dB (DVD/CD)

• ACCESSORIES

Remote control (1), Batteries (2)

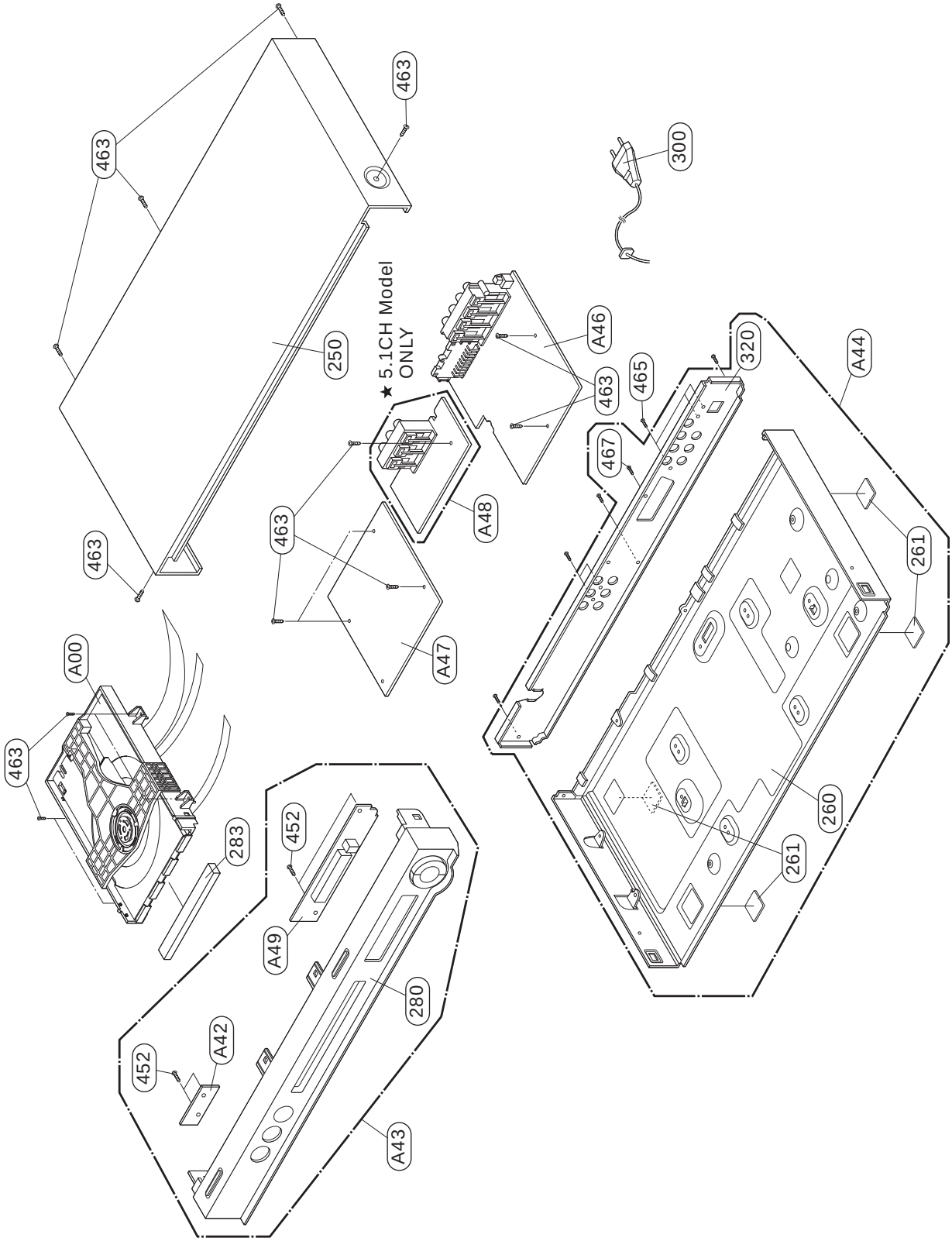
SECTION 2

CABINET & MAIN CHASSIS

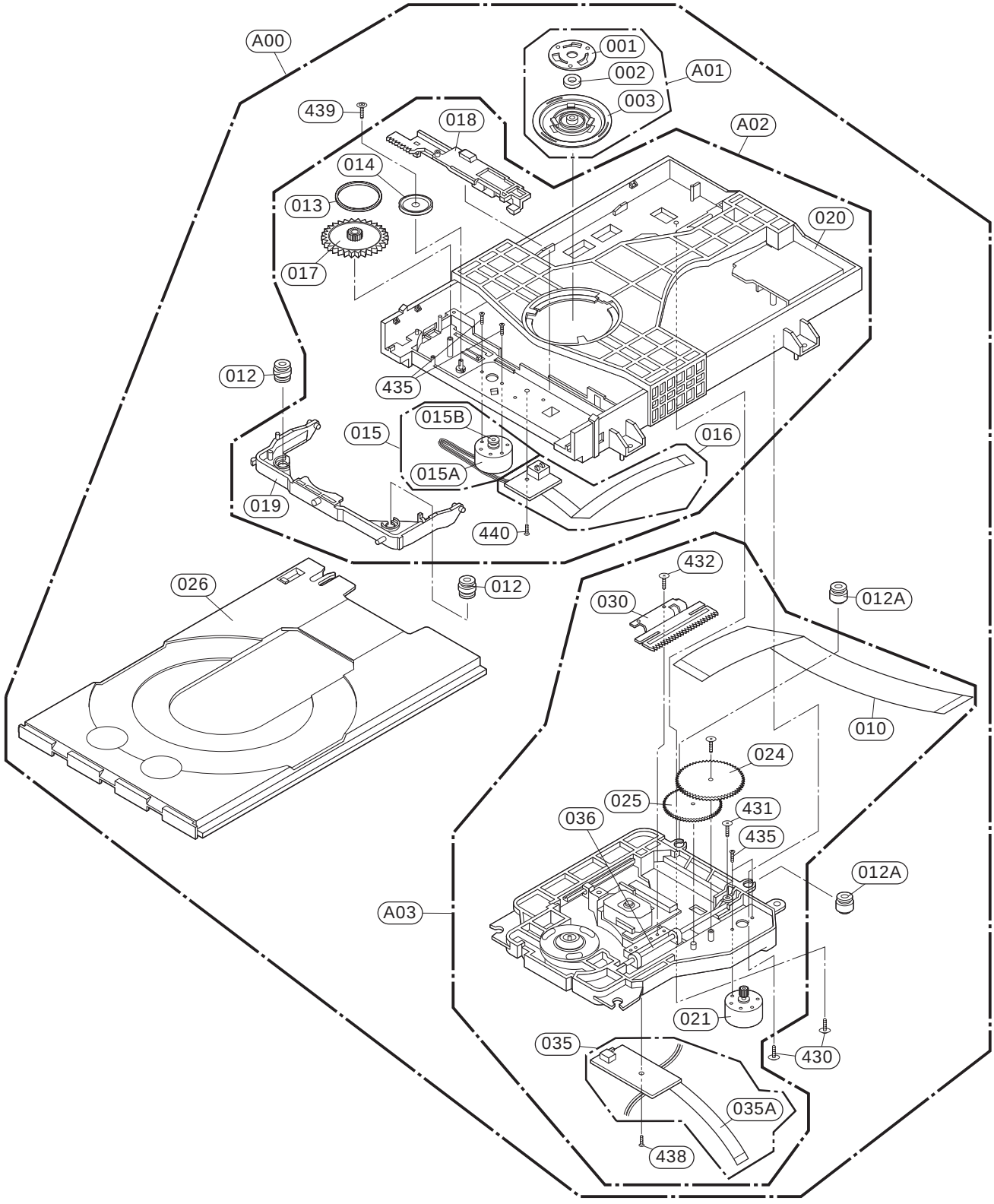
CONTENTS

EXPLODED VIEWS

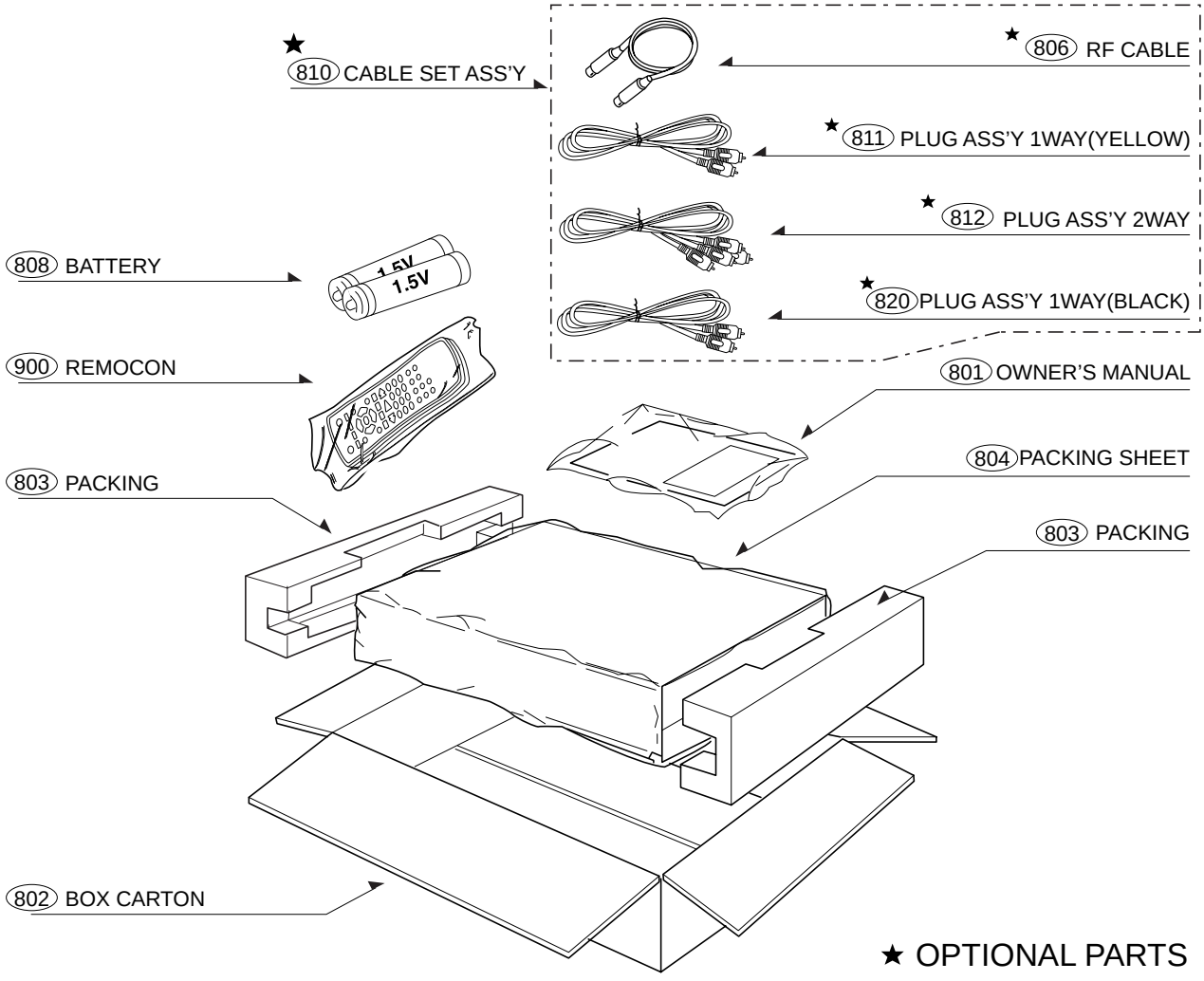
1. Cabinet and Main Frame Section



2. Deck Mechanism Section(DP-9)



3. Packing Accessory Section

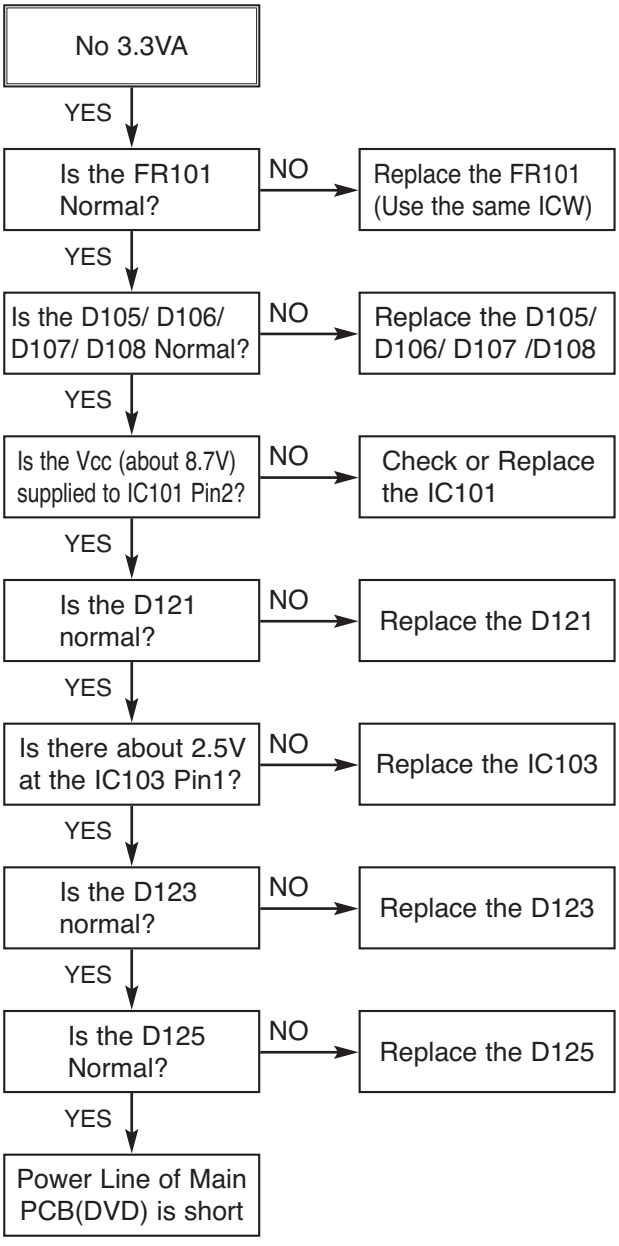


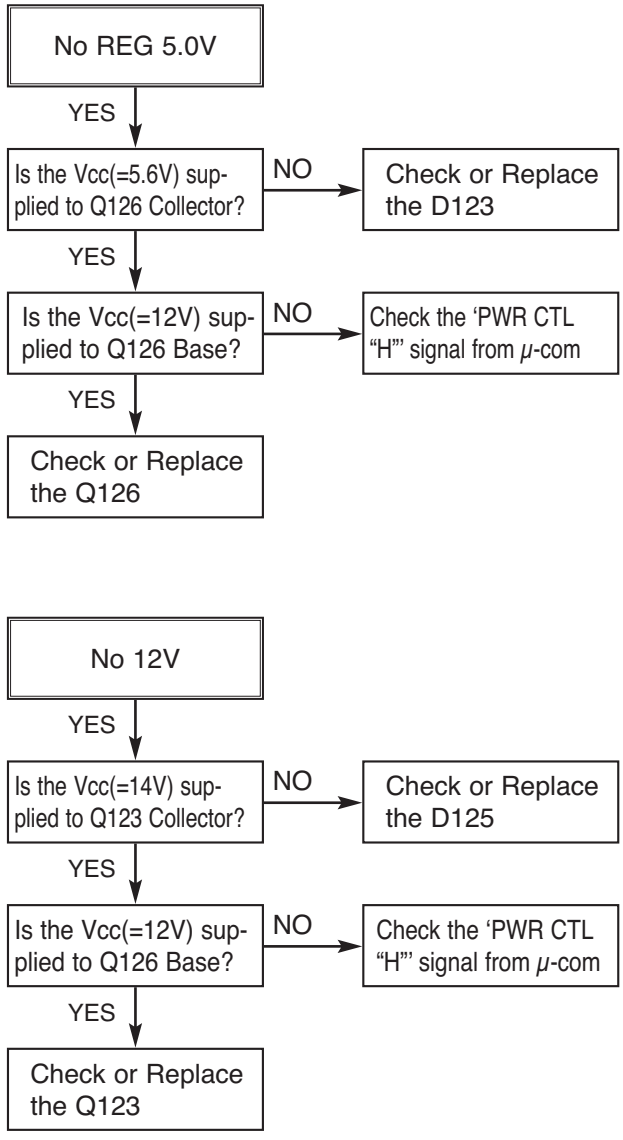
SECTION 3
ELECTRICAL

CONTENTS

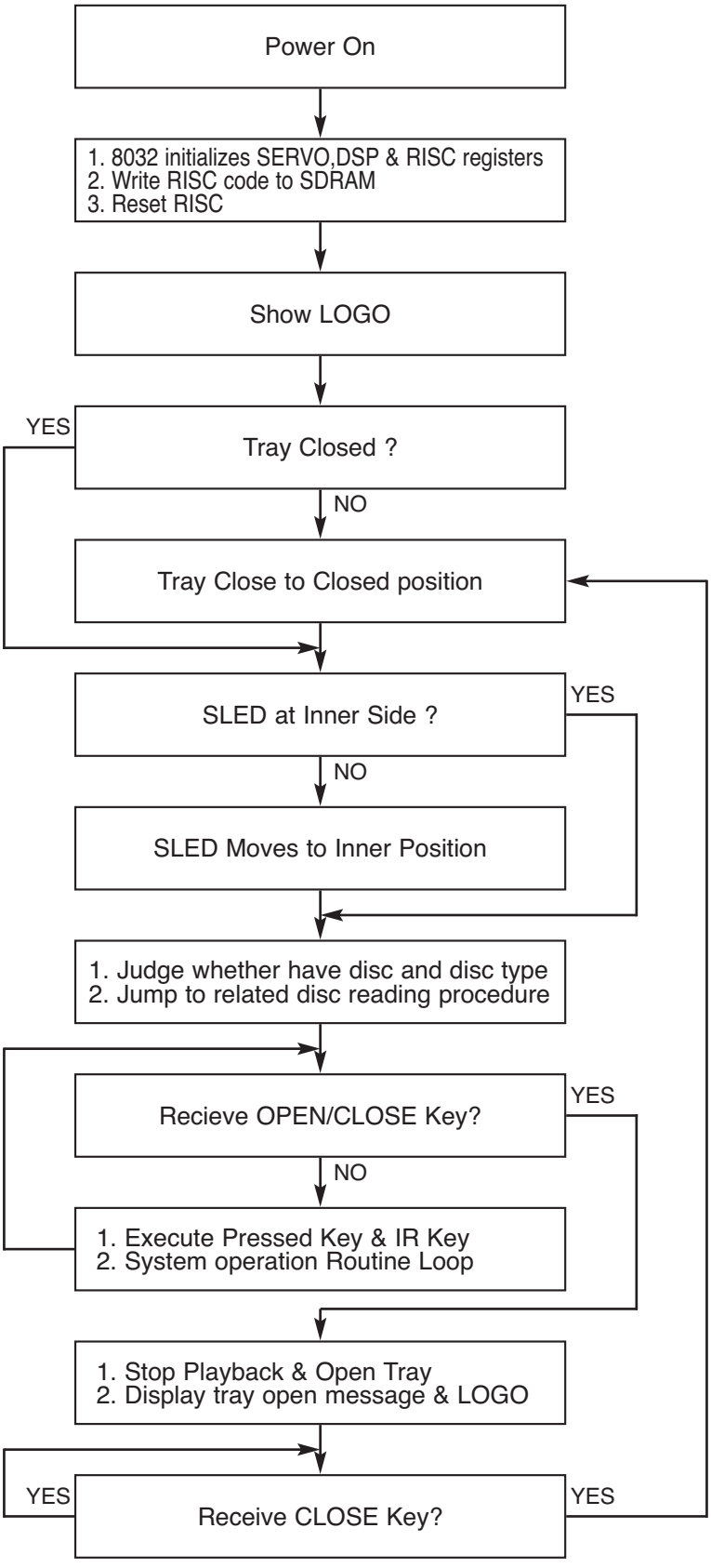
ELECTRICAL TROUBLESHOOTING GUIDE

1. Power check flow

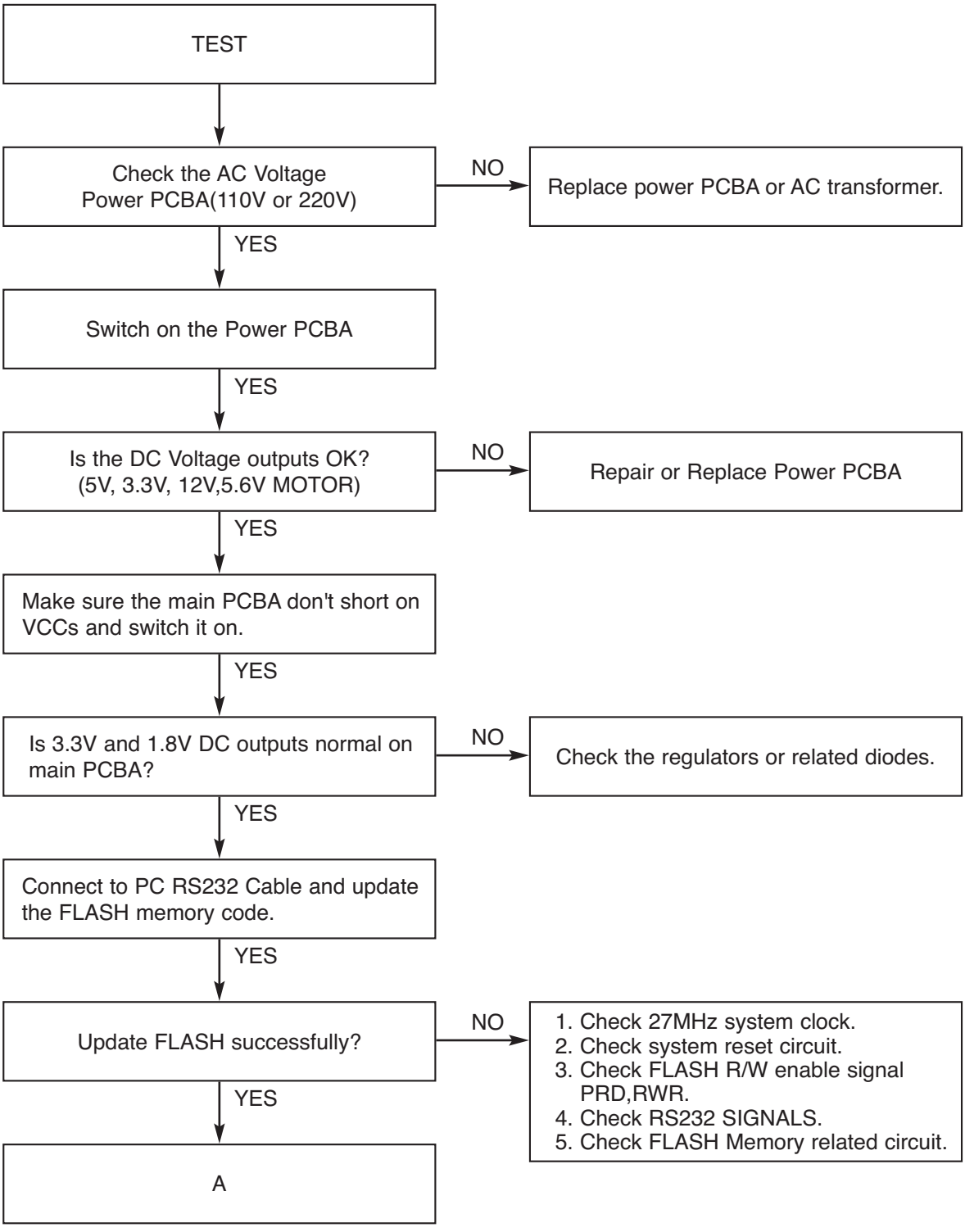


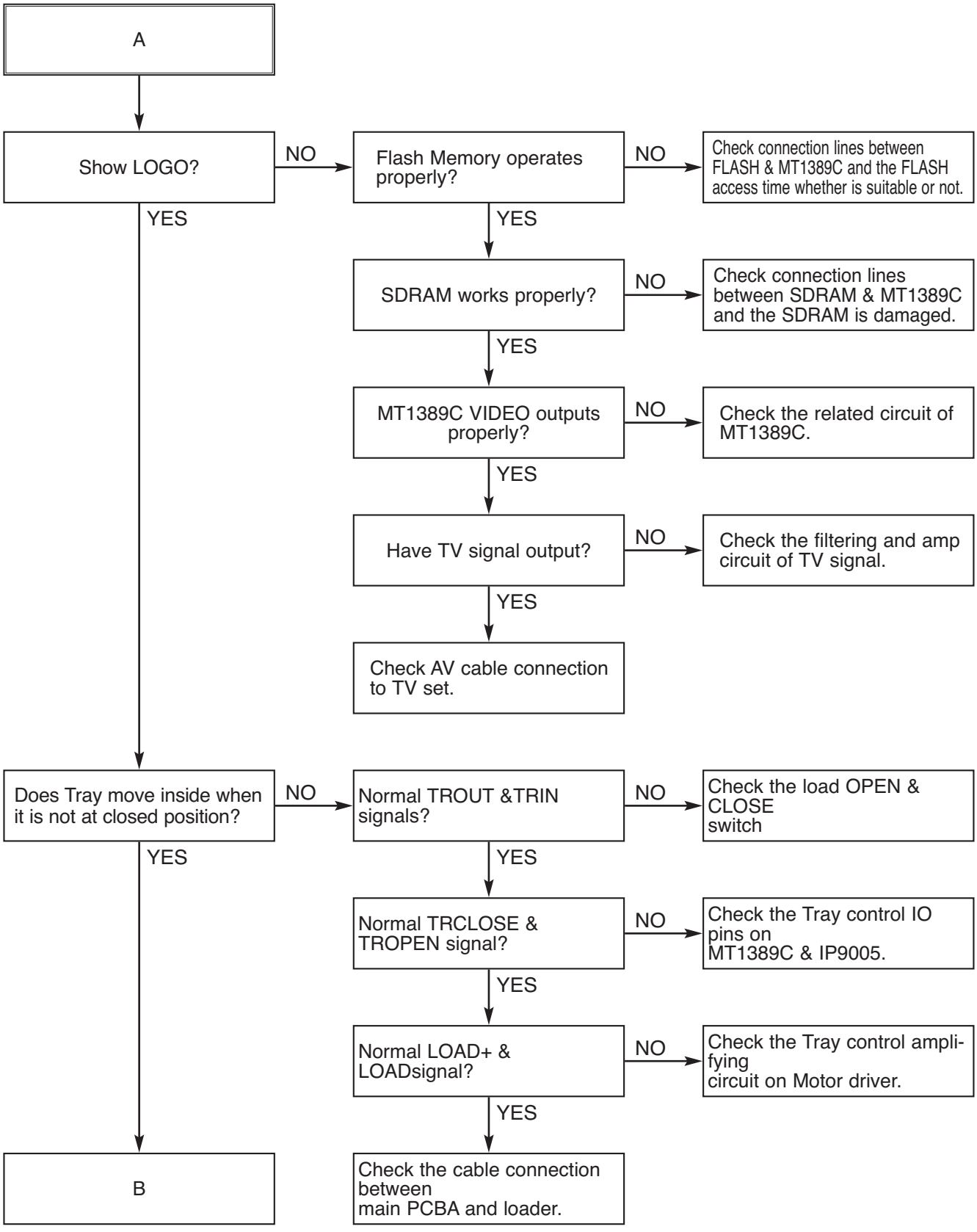


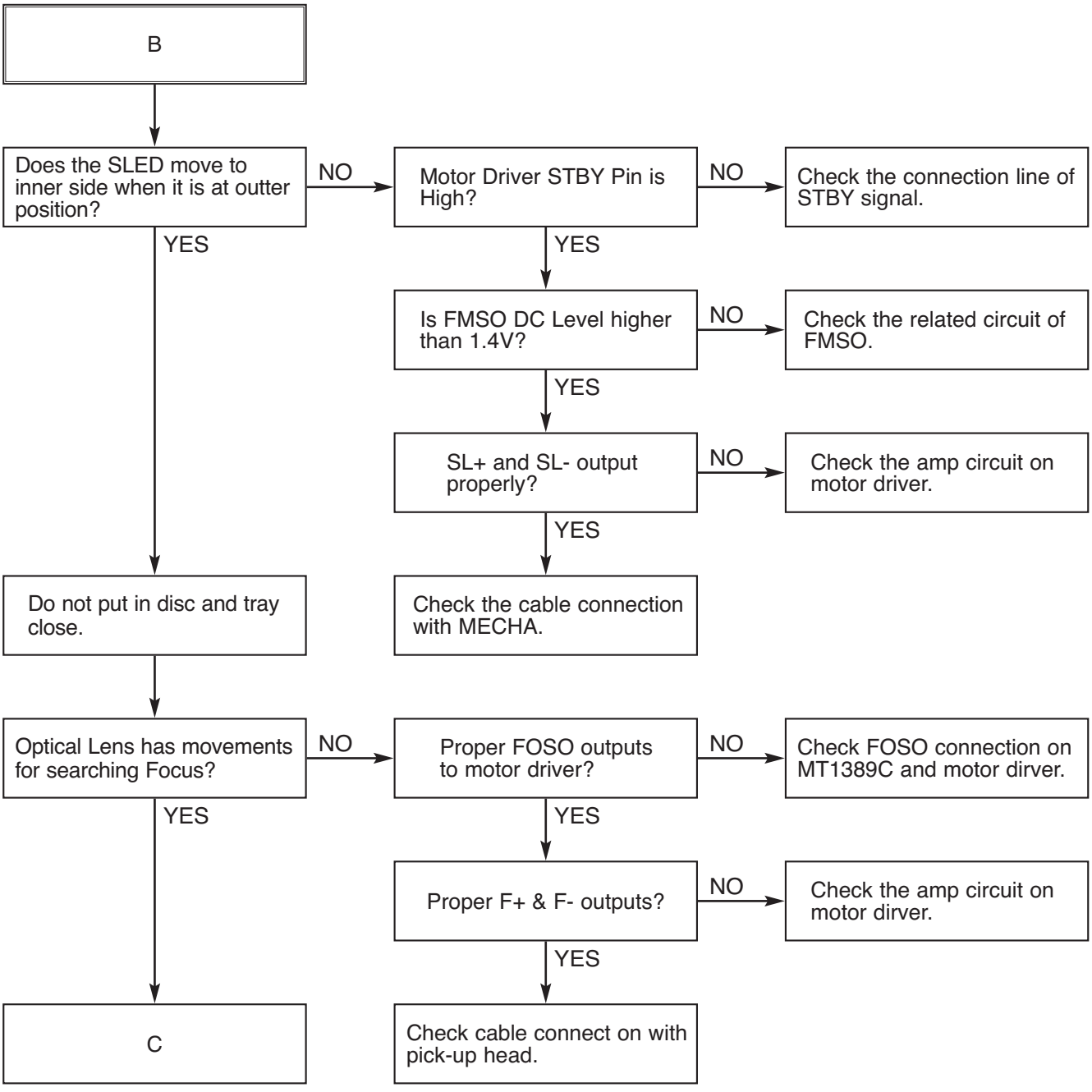
2. System operation flow

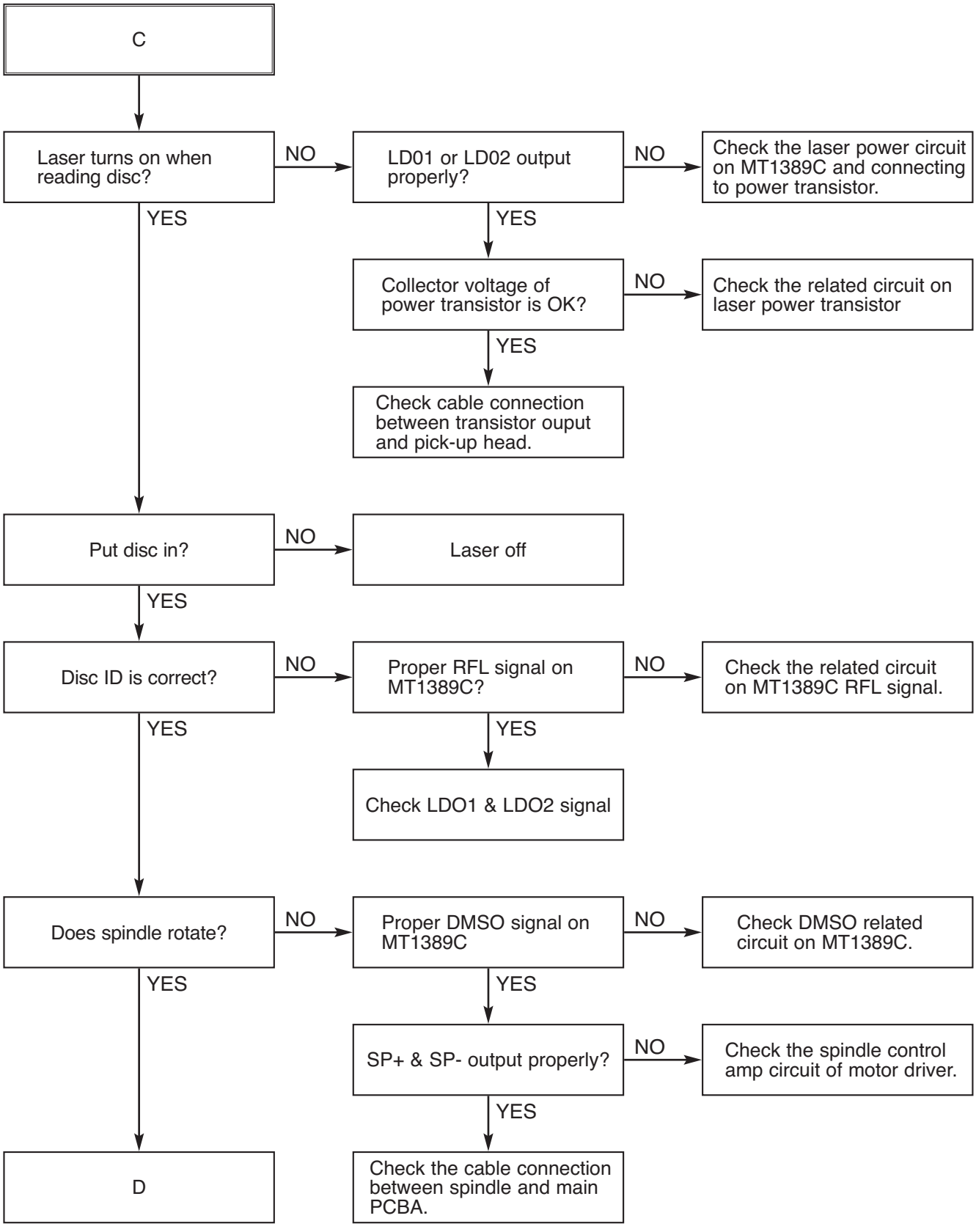


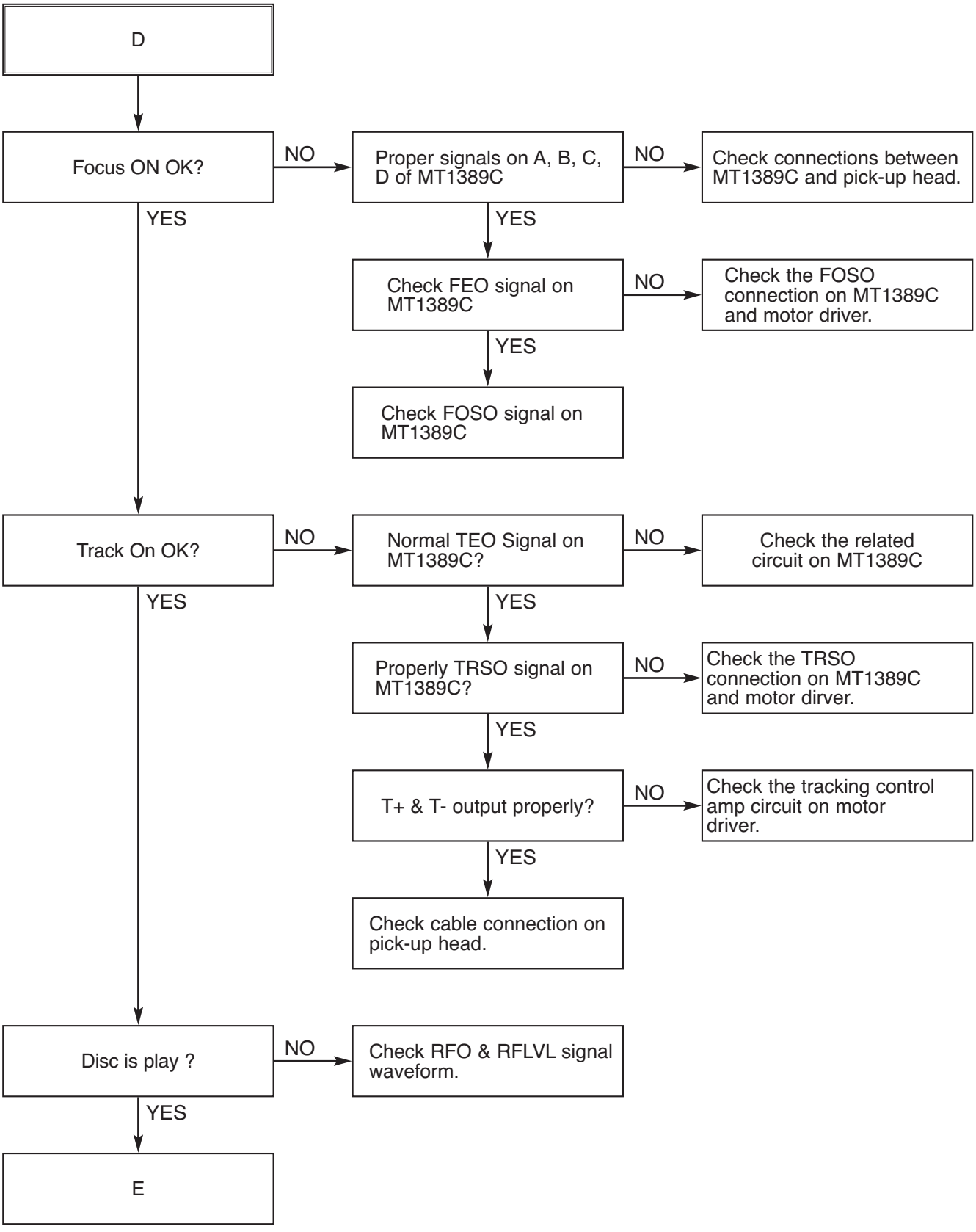
3. Test & debug flow

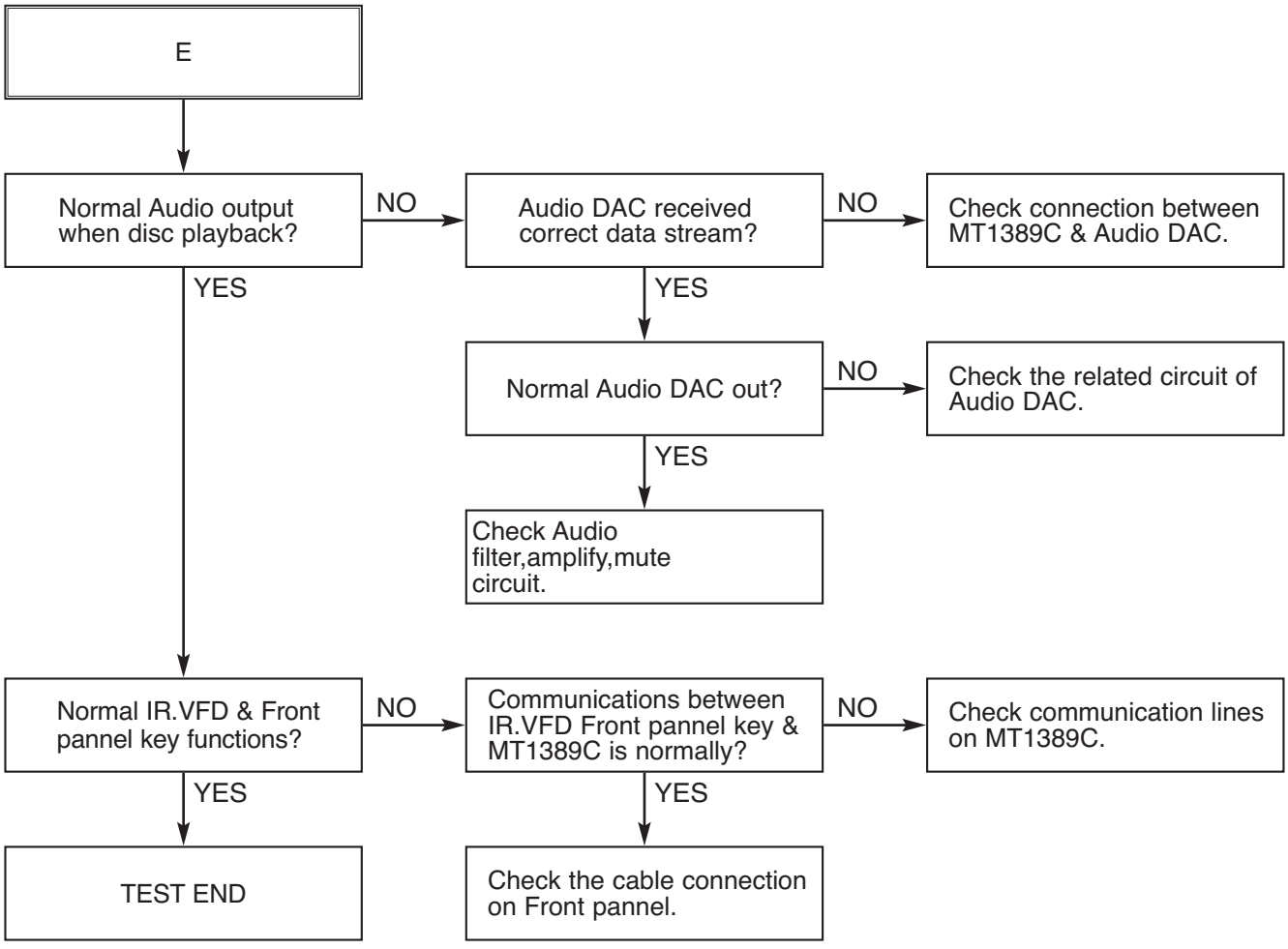



A
Show LOGO?
NO
Flash Memory operates properly?
NO
Check connection lines between FLASH & MT1389C and the FLASH access time whether is suitable or not.
YES
YES
SDRAM works properly?
NO
Check connection lines between SDRAM & MT1389C and the SDRAM is damaged.
YES
MT1389C VIDEO outputs properly?
NO
Check the related circuit of MT1389C.
YES
Have TV signal output?
NO
Check the filtering and amp circuit of TV signal.
YES
Check AV cable connection to TV set.
Does Tray move inside when it is not at closed position?
NO
Normal TROUT &TRIN signals?
NO
Check the load OPEN & CLOSE switch
YES
YES
Normal TRCLOSE & TROPEN signal?
NO
Check the Tray control IO pins on MT1389C & IP9005.
YES
Normal LOAD+ & LOADsignal?
NO
Check the Tray control amplifying circuit on Motor driver.
YES
B
Check the cable connection between main PCBA and loader.


B
Does the SLED move to inner side when it is at outter position?
NO
Motor Driver STBY Pin is High?
NO
Check the connection line of STBY signal.
YES
YES
Is FMSO DC Level higher than 1.4V?
NO
Check the related circuit of FMSO.
YES
SL+ and SL- output properly?
NO
Check the amp circuit on motor driver.
YES
Do not put in disc and tray close.
Check the cable connection with MECHA.
Optical Lens has movements for searching Focus?
NO
Proper FOSO outputs to motor driver?
NO
Check FOSO connection on MT1389C and motor dirver.
YES
YES
Proper F+ & F- outputs?
NO
Check the amp circuit on motor dirver.
YES
C
Check cable connect on with pick-up head.


C
Laser turns on when reading disc?
NO
LD01 or LD02 output properly?
NO
Check the laser power circuit on MT1389C and connecting to power transistor.
YES
YES
Collector voltage of power transistor is OK?
NO
Check the related circuit on laser power transistor
YES
Check cable connection between transistor ouput and pick-up head.
Put disc in?
NO
Laser off
YES
Disc ID is correct?
NO
Proper RFL signal on MT1389C?
NO
Check the related circuit on MT1389C RFL signal.
YES
YES
Check LDO1 & LDO2 signal
Does spindle rotate?
NO
Proper DMSO signal on MT1389C
NO
Check DMSO related circuit on MT1389C.
YES
YES
SP+ & SP- output properly?
NO
Check the spindle control amp circuit of motor driver.
YES
D
Check the cable connection between spindle and main PCBA.

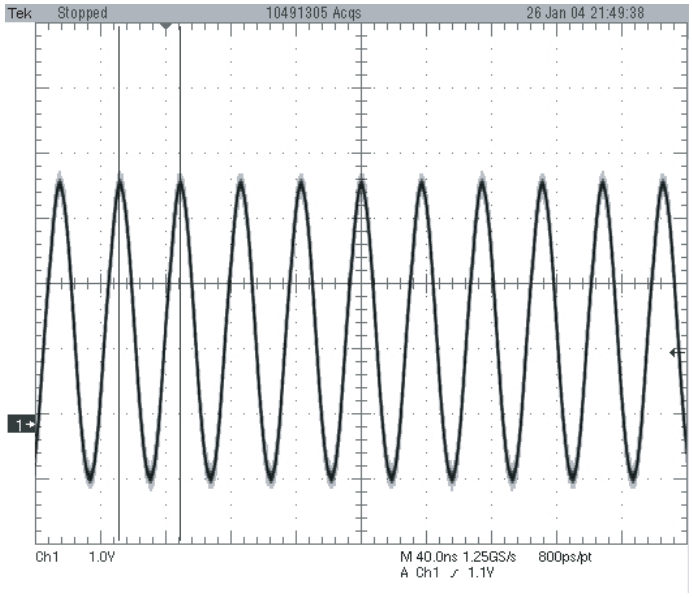

D
Focus ON OK?
NO
Proper signals on A, B, C, D of MT1389C
NO
Check connections between MT1389C and pick-up head.
YES
YES
Check FEO signal on MT1389C
NO
Check the FOSO connection on MT1389C and motor driver.
YES
Check FOSO signal on MT1389C
Track On OK?
NO
Normal TEO Signal on MT1389C?
NO
Check the related circuit on MT1389C
YES
YES
Properly TRSO signal on MT1389C?
NO
Check the TRSO connection on MT1389C and motor dirver.
YES
T+ & T- output properly?
NO
Check the tracking control amp circuit on motor driver.
YES
Check cable connection on pick-up head.
Disc is play ?
NO
Check RFO & RFLVL signal waveform.
YES
E


E
Normal Audio output when disc playback?
NO
Audio DAC received correct data stream?
NO
Check connection between MT1389C & Audio DAC.
YES
YES
Normal Audio DAC out?
NO
Check the related circuit of Audio DAC.
YES
Check Audio filter,amplify,mute circuit.
Normal IR.VFD & Front pannel key functions?
NO
Communications between IR.VFD Front pannel key & MT1389C is normally?
NO
Check communication lines on MT1389C.
YES
YES
TEST END
Check the cable connection on Front pannel.

DETAILS AND WAVEFORMS ON SYSTEM TEST AND DEBUGGING

1. SYSTEM 27MHz CLOCK,RESET,FLASH R/W SIGNAL.

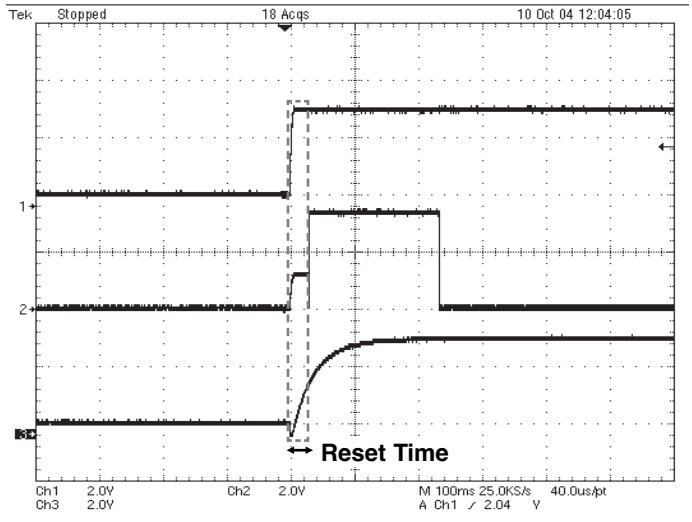
1) MT1389C main clock is at 27MHz(X501)



1.0V, 27MHz

FIG 1-1

2) MT1389 reset is low active.



3.3VA

PWR_CTL

RESET

FIG 1-2

3) RS232 waveform during procedure(Downloading)

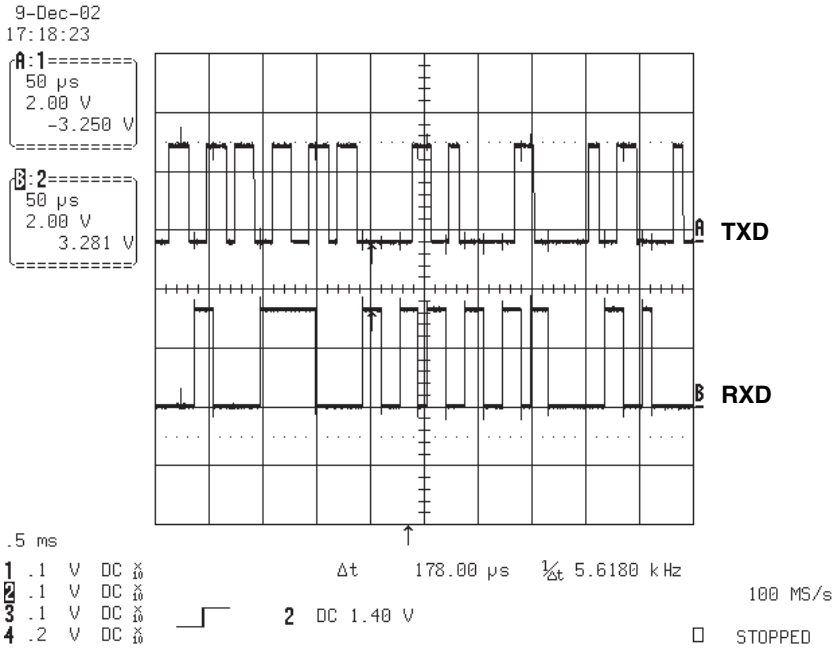


FIG 1-3

4) Flash R/W enable signal during download(Downloading)

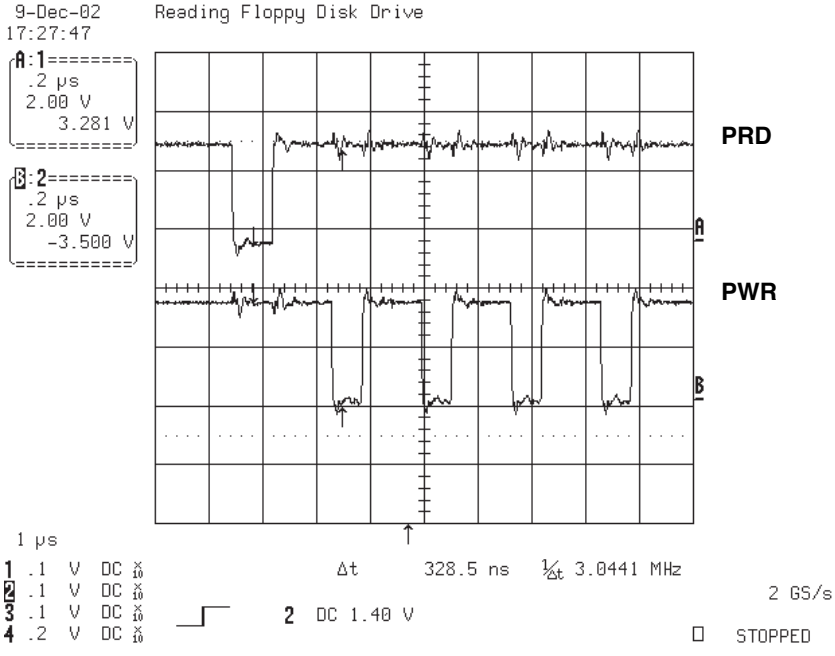


FIG 1-4

2. SDRAM CLOCK

DCLK = 128MHz, Vp-p=2.2, Vmax=2.7V

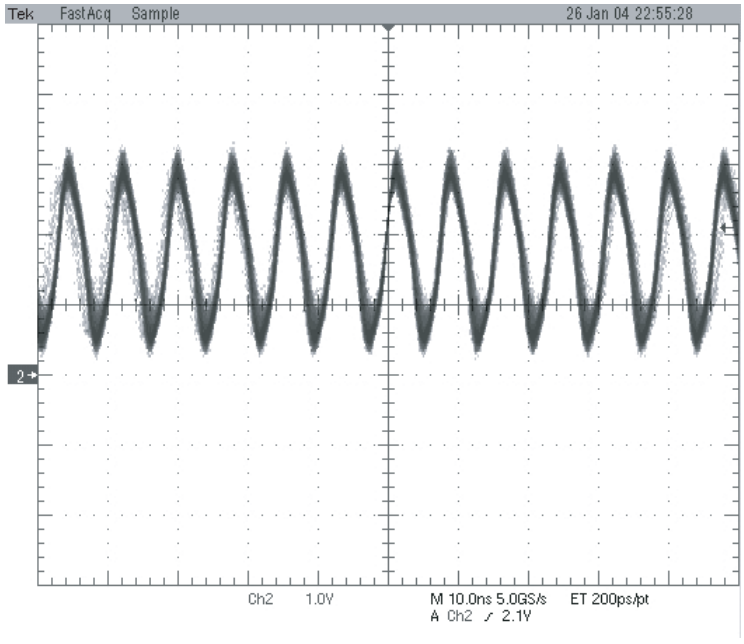
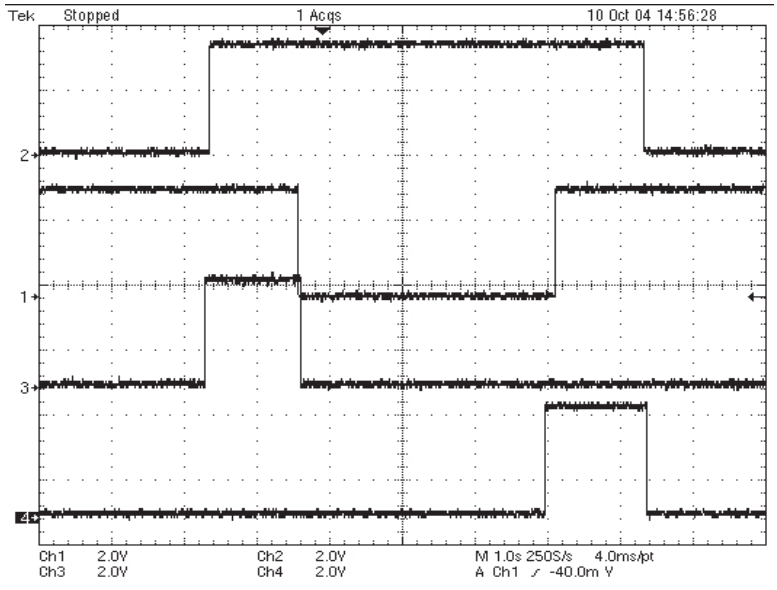


FIG 2-1

3. TRAY OPEN/CLOSE SIGNAL



TRIN

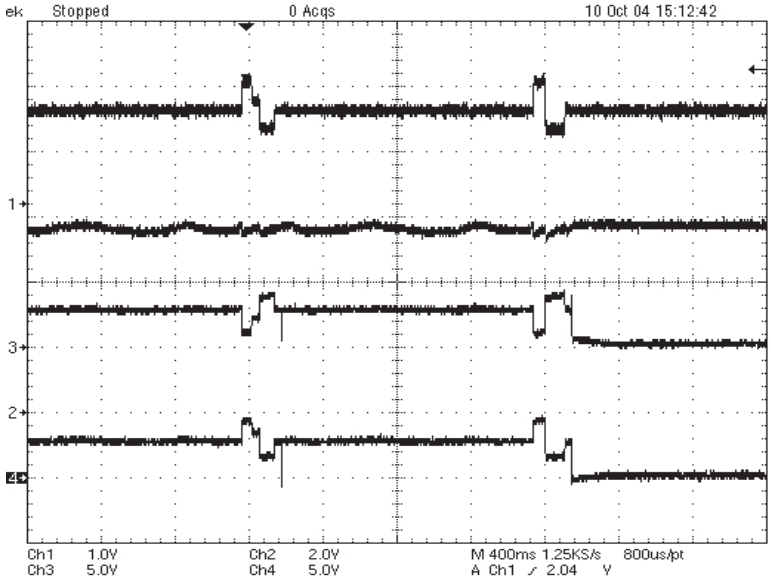
TROUT

TRCLOSE

TROPEN

FIG 3-1

4. SLED CONTROL RELATED SIGNAL (NO DISC CONDITION)



FMSO(1.9V/1.4V/1.1V)

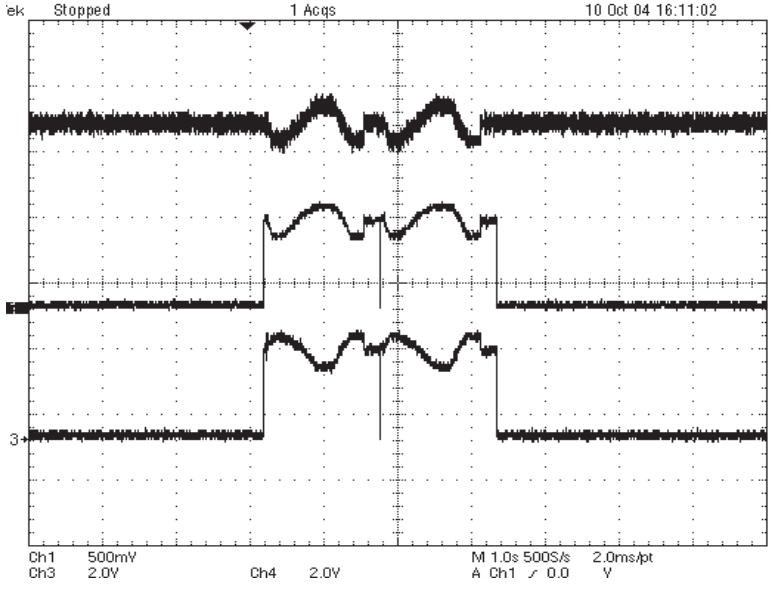
STBY(3.3V)

SL+(4.2V/2.8V/1.2V)

SL-(4.2V/2.8V/1.5V)

FIG 4-1

5. LENS CONTROL RELATED SIGNAL(NO DISC CONDITION)



FOSO(1.5V/1.4V/1.3V)

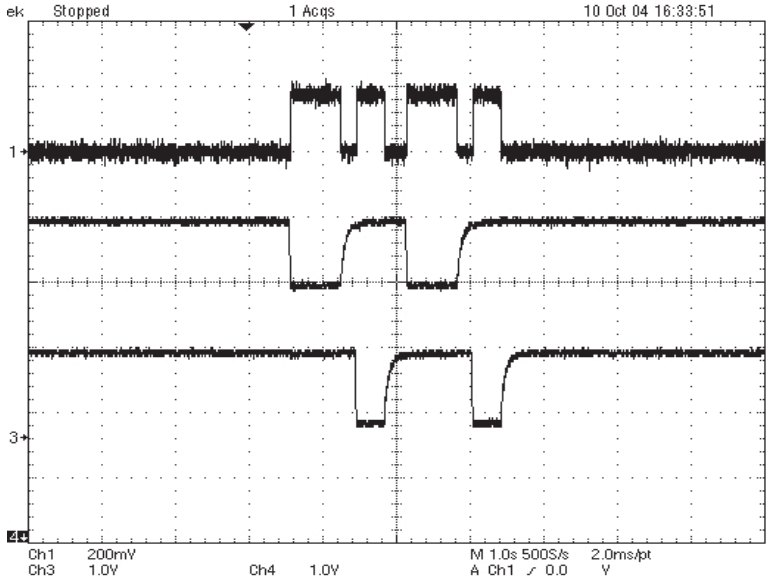
F+(3.2V/2.7V/2.2V)

F-(3.2V/2.7V/2.2V)

FIG 5-1

6. LASER POWER CONTROL RELATED SIGNAL(NO DISC CONDITION)

DCLK = 128MHz, Vp-p=2.2, Vmax=2.7V



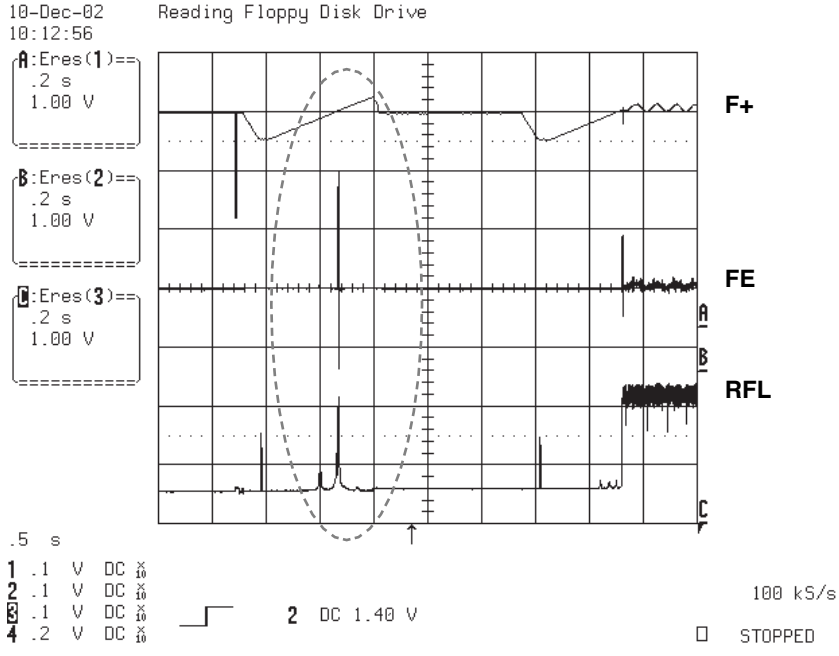
MDI1(0V/180mV)

LD01(3.3V//2.3V)

LD02(3.3V/2.3V)

FIG 7-2 (DVD)

7. DISC TYPE JUDGEMENT WAVEFORM



F+

FE

RFL

FIG 7-1

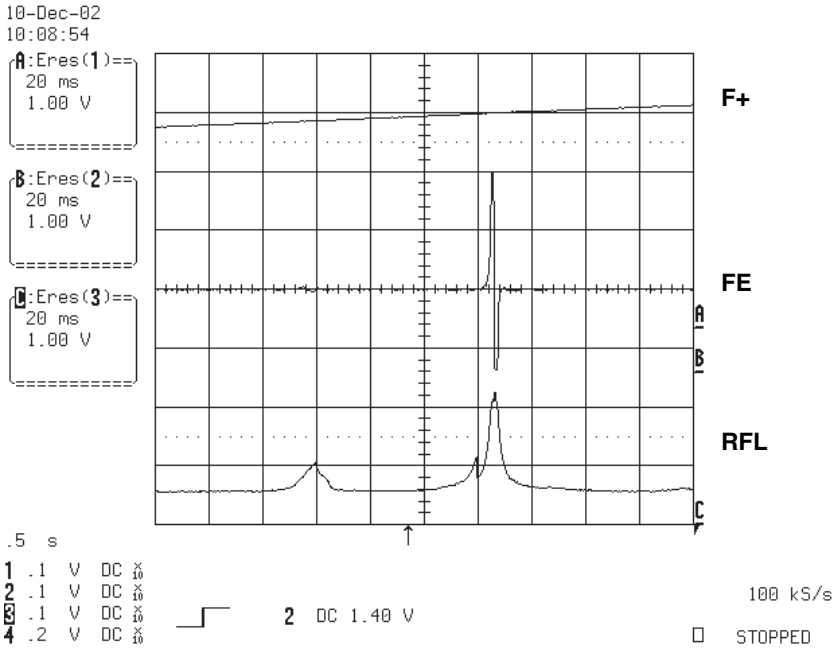


FIG 7-2 (DVD)

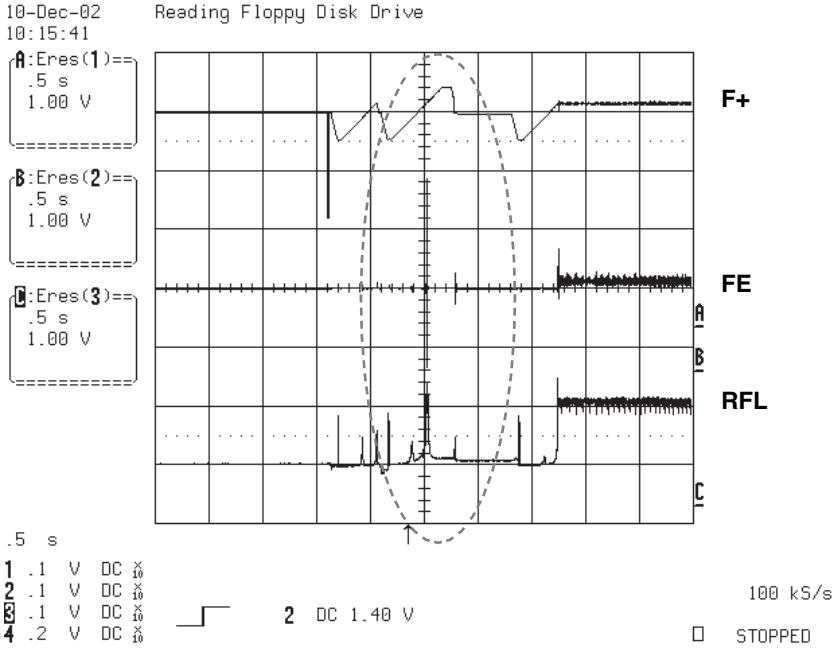


FIG 7-3 (CD)

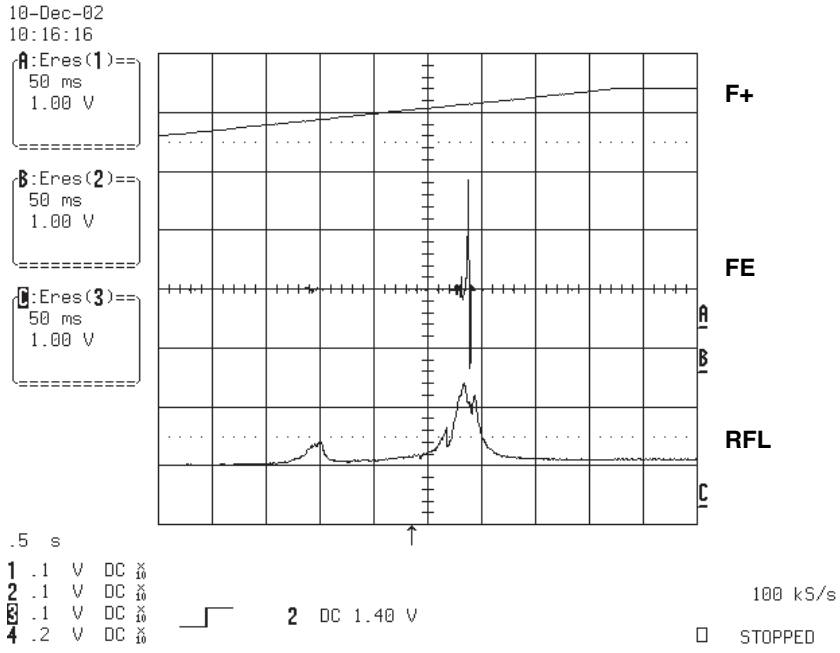


FIG 7-4 (CD)

8. FOCUS ON WAVEFORM

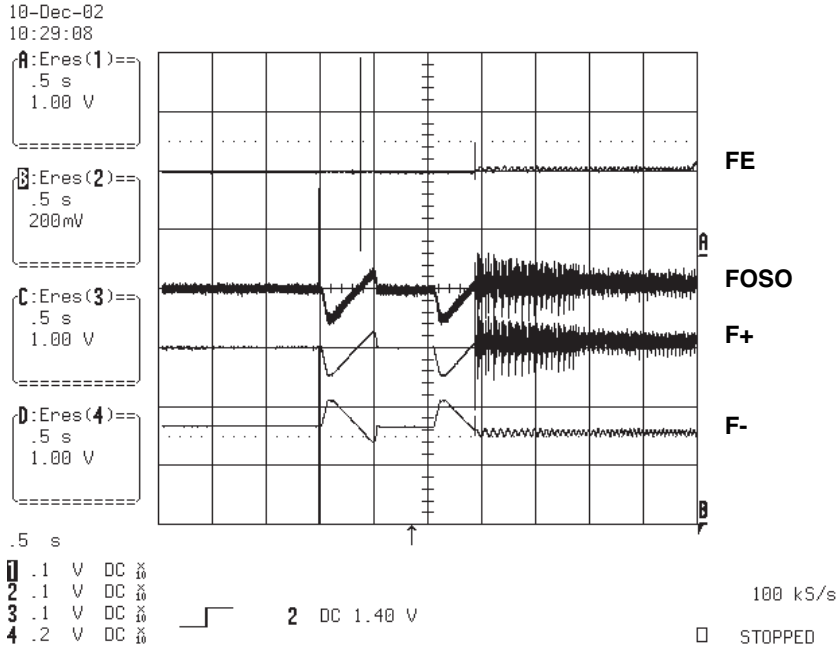


FIG 8-1 (DVD)

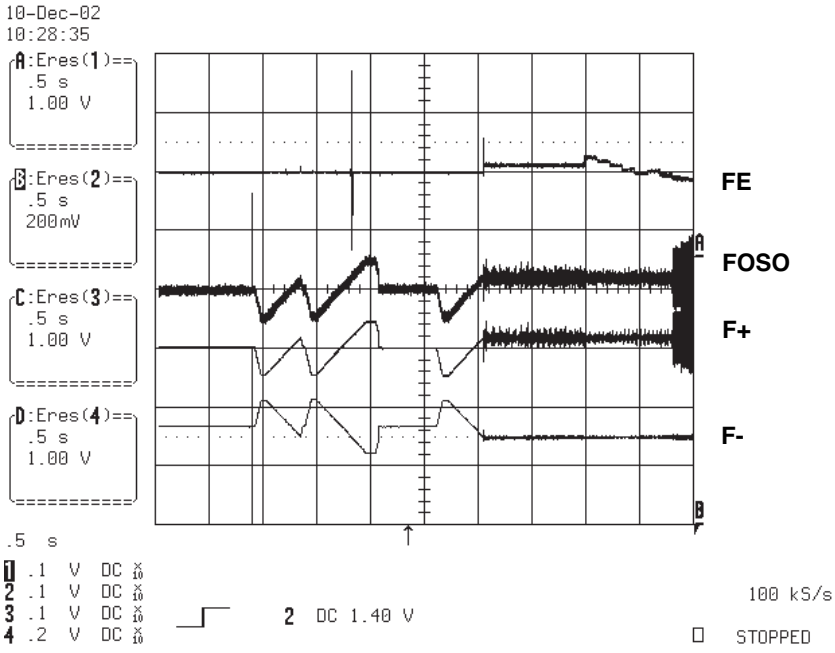


FIG 8-2 (CD)

9) SPINDLE CONTROL WAVEFORM (NO DISC CONDITION)

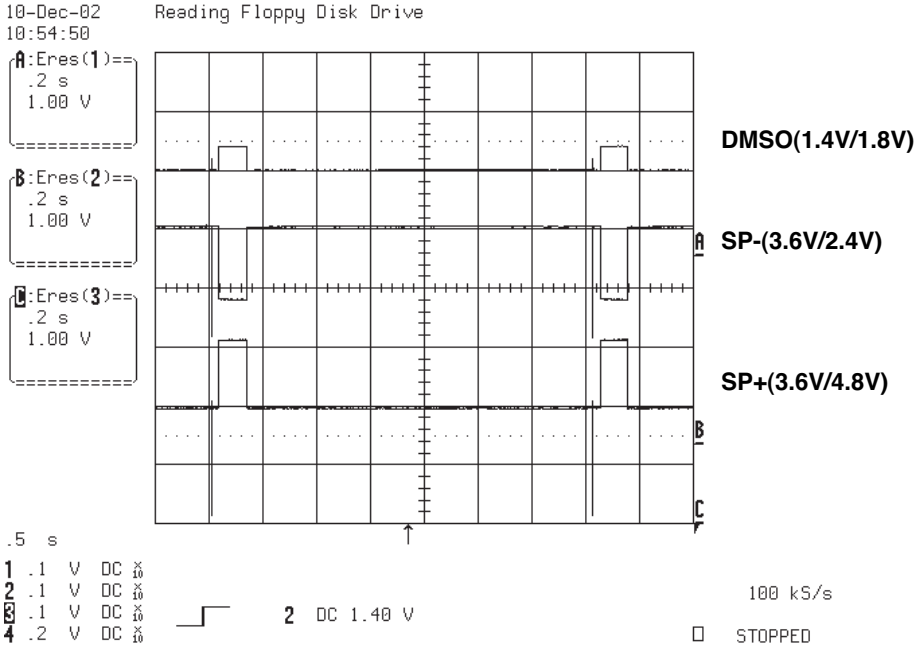


FIG 9-1

10. TRACKING CONTROL RELATED SIGNAL(System checking)

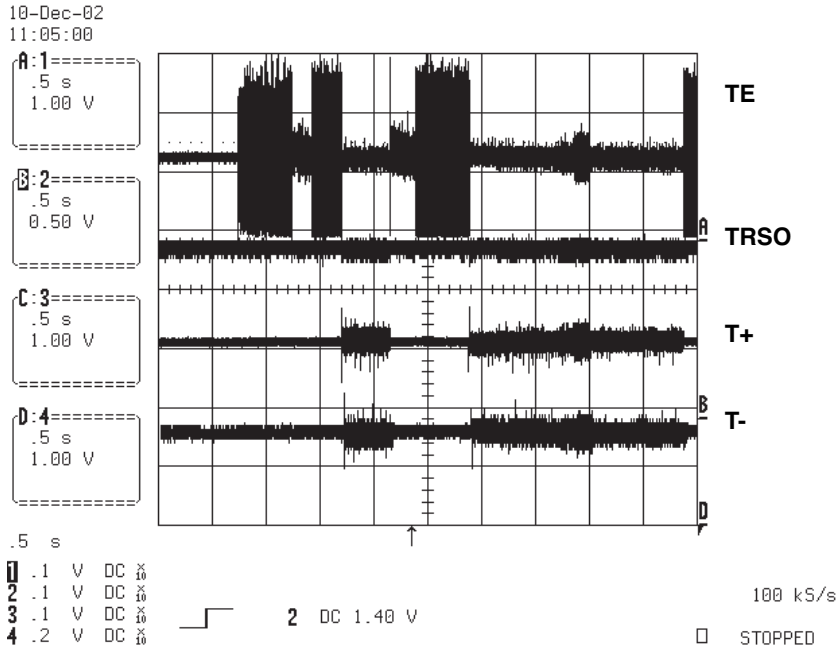


FIG 10-1 (DVD)

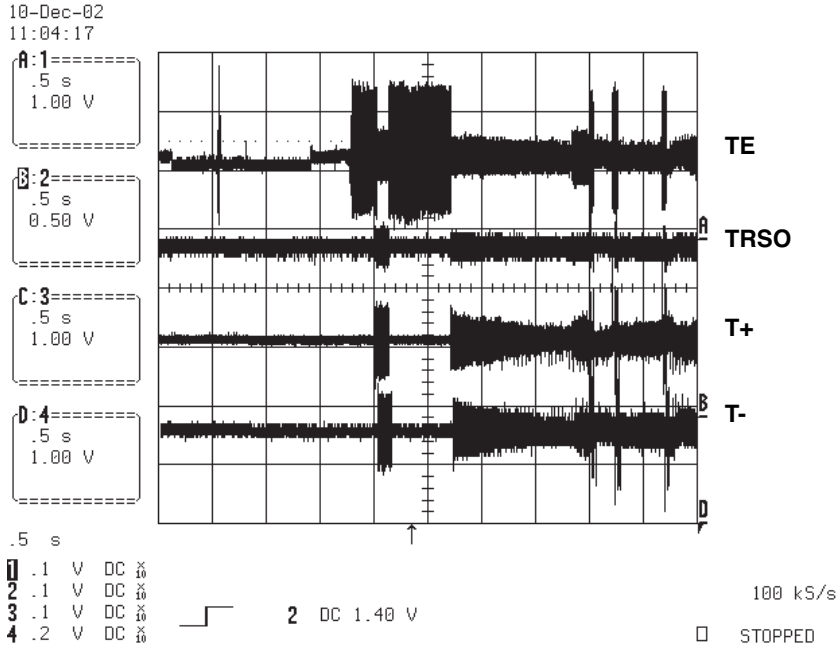


FIG 10-2 (CD)

11. MT1389C AUDIO OPTICAL AND COAXIAL OUTPUT (SPDIF)

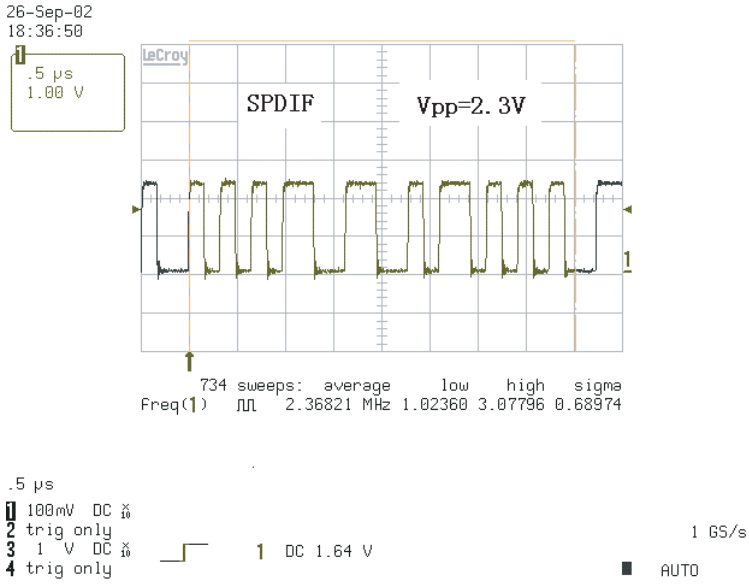


FIG 12-1

13. MT1389C VIDEO OUTPUT WAVEFORM

1) 100%

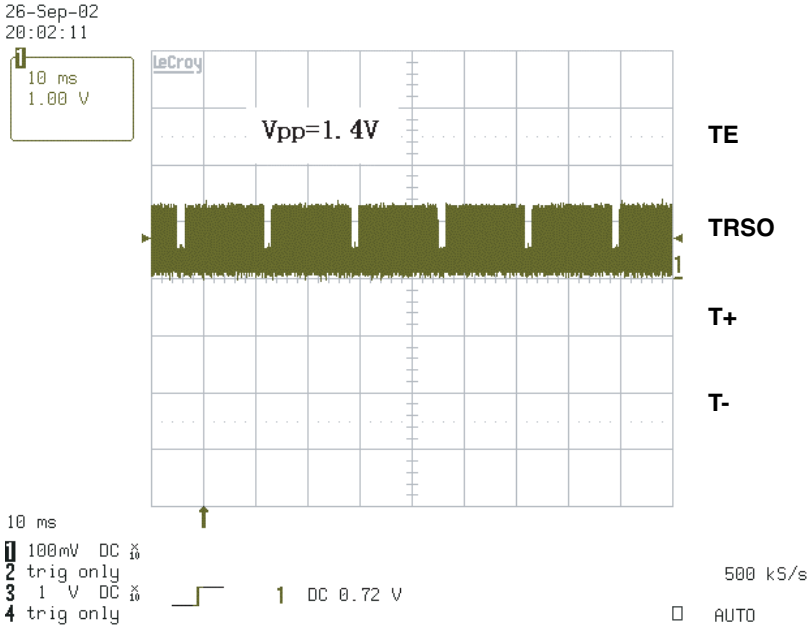


FIG 13-1

2) COMPOSITE VIDEO SIGNAL

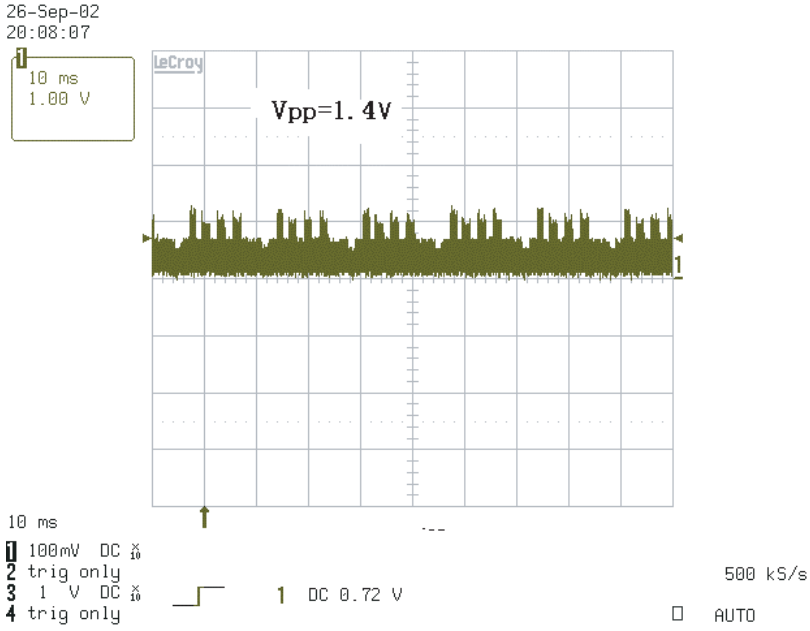


FIG 13-2

14. MT1389C AUDIO OUTPUT TO AUDIO DAC

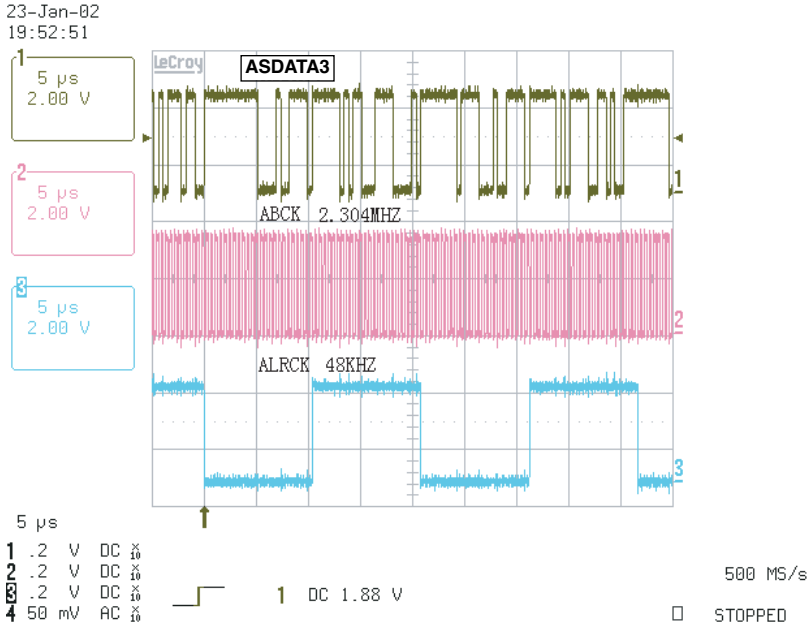


FIG 14-1

15. AUDIO OUTPUT FROM AUDIO DAC

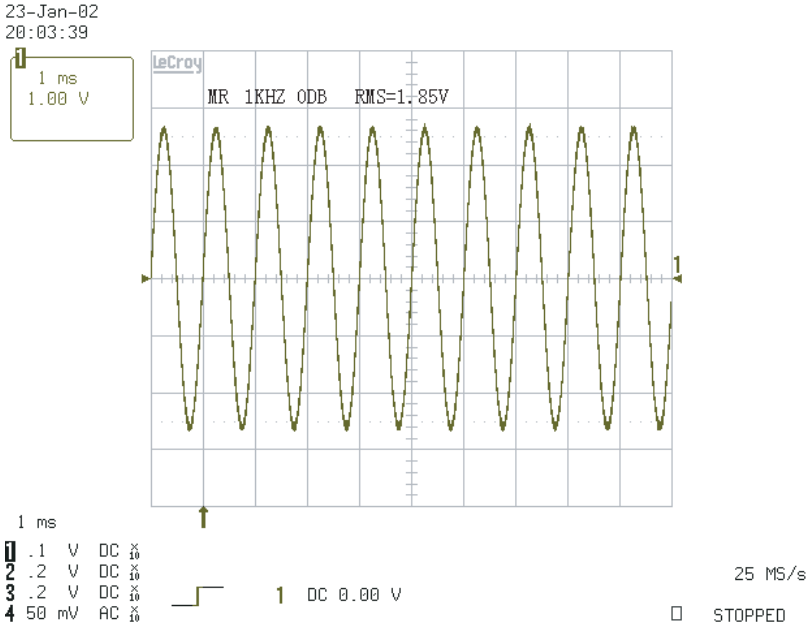
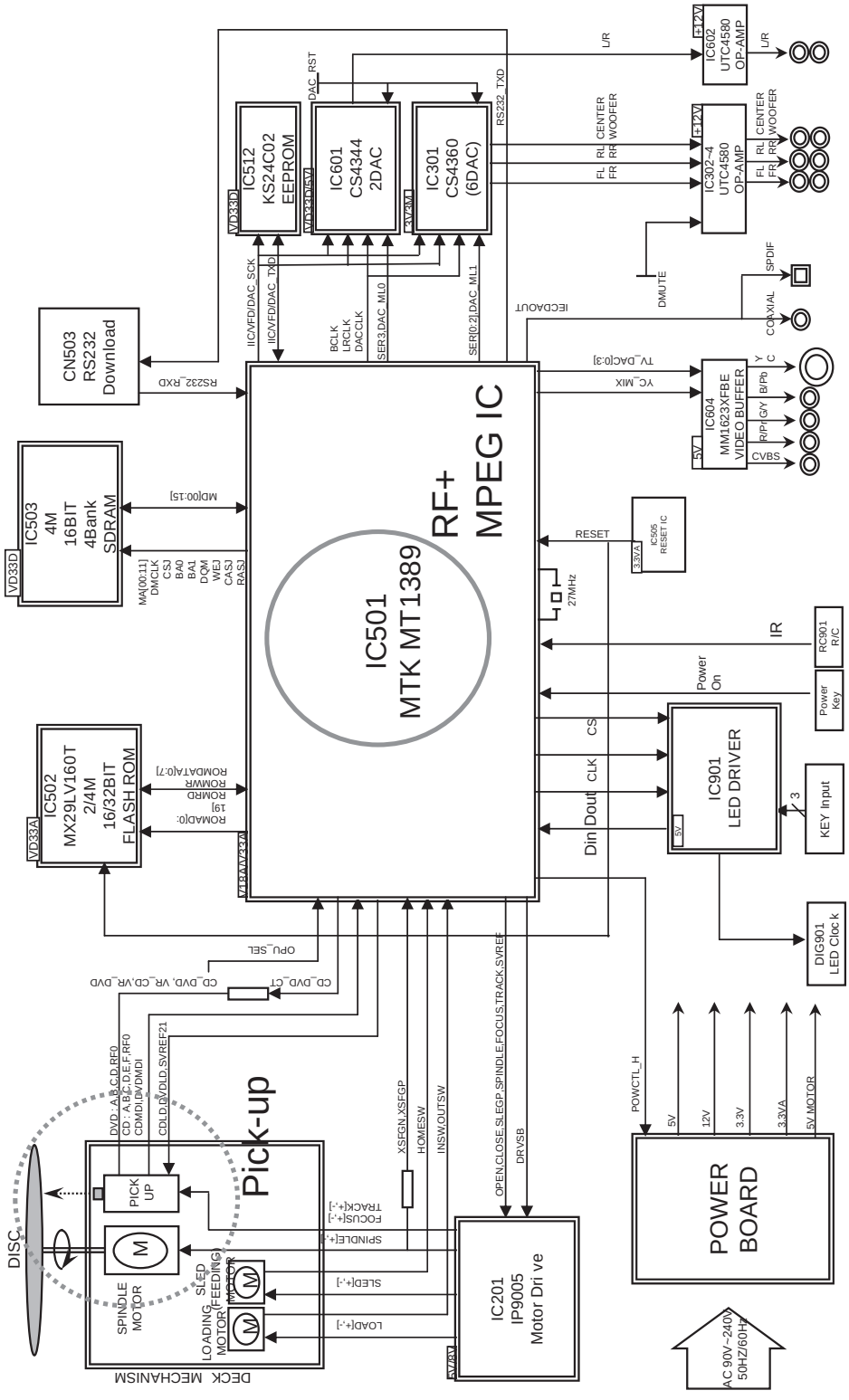


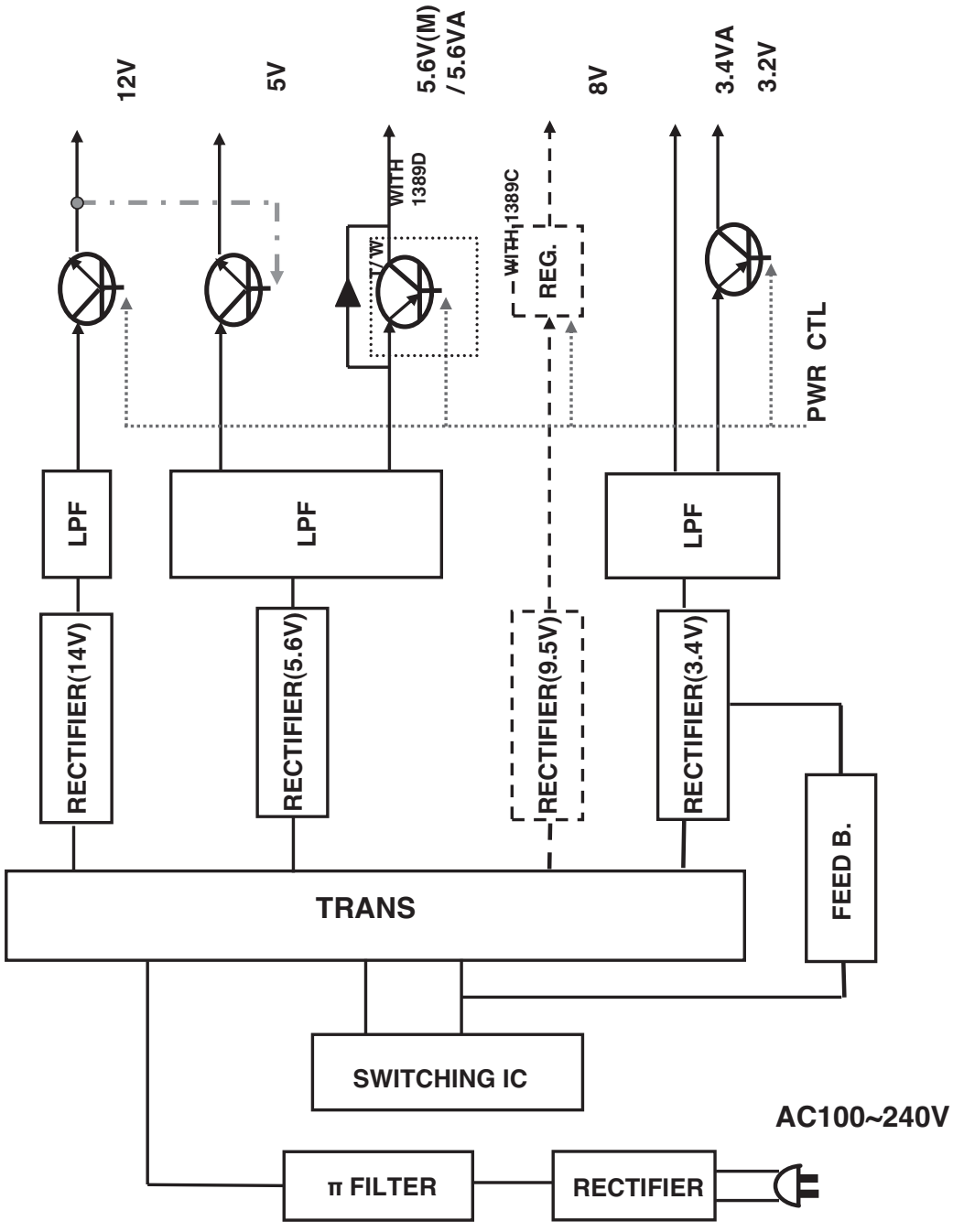
FIG 15-1

BLOCK DIAGRAMS

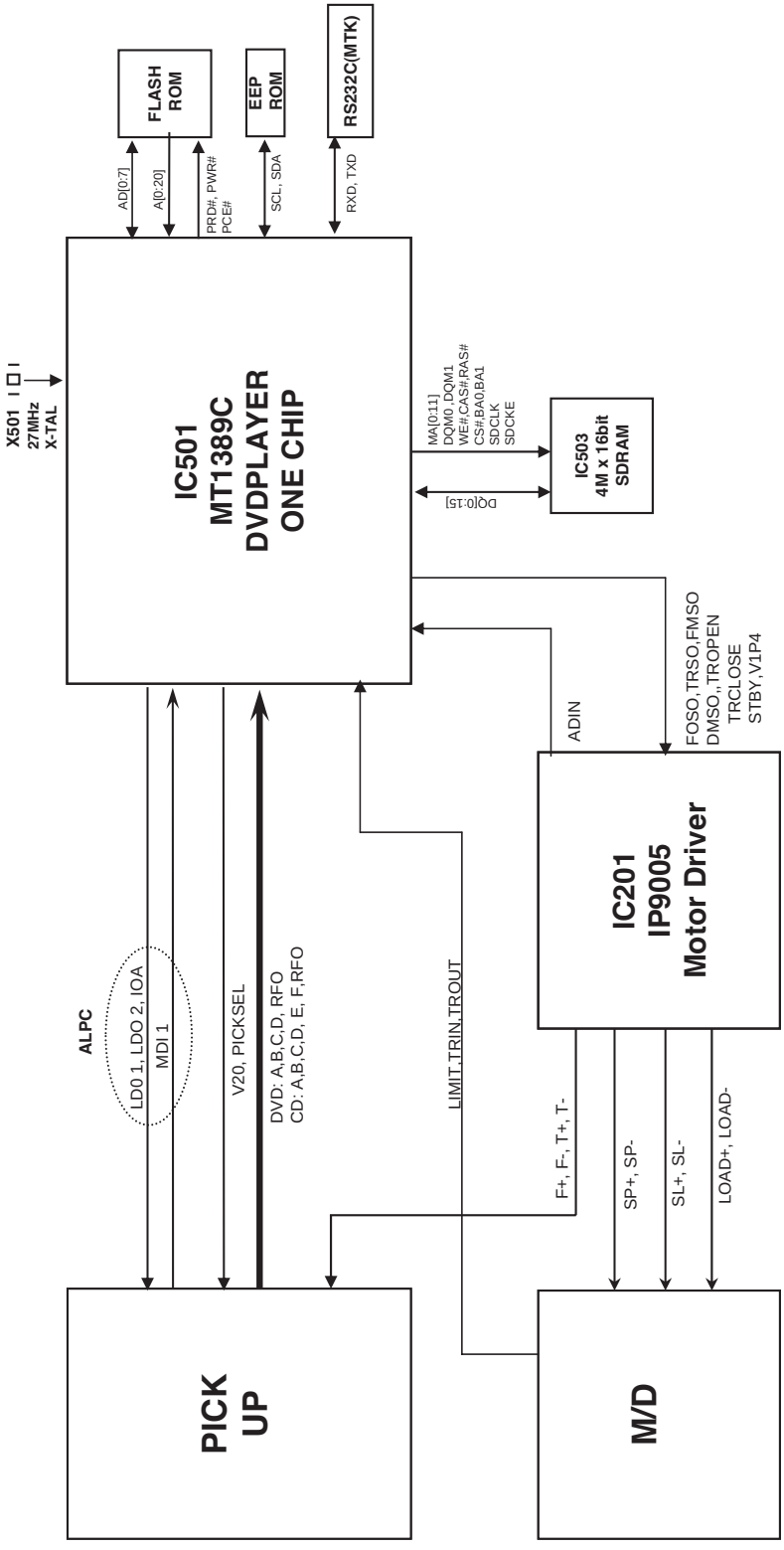
1. Overall Block Diagram



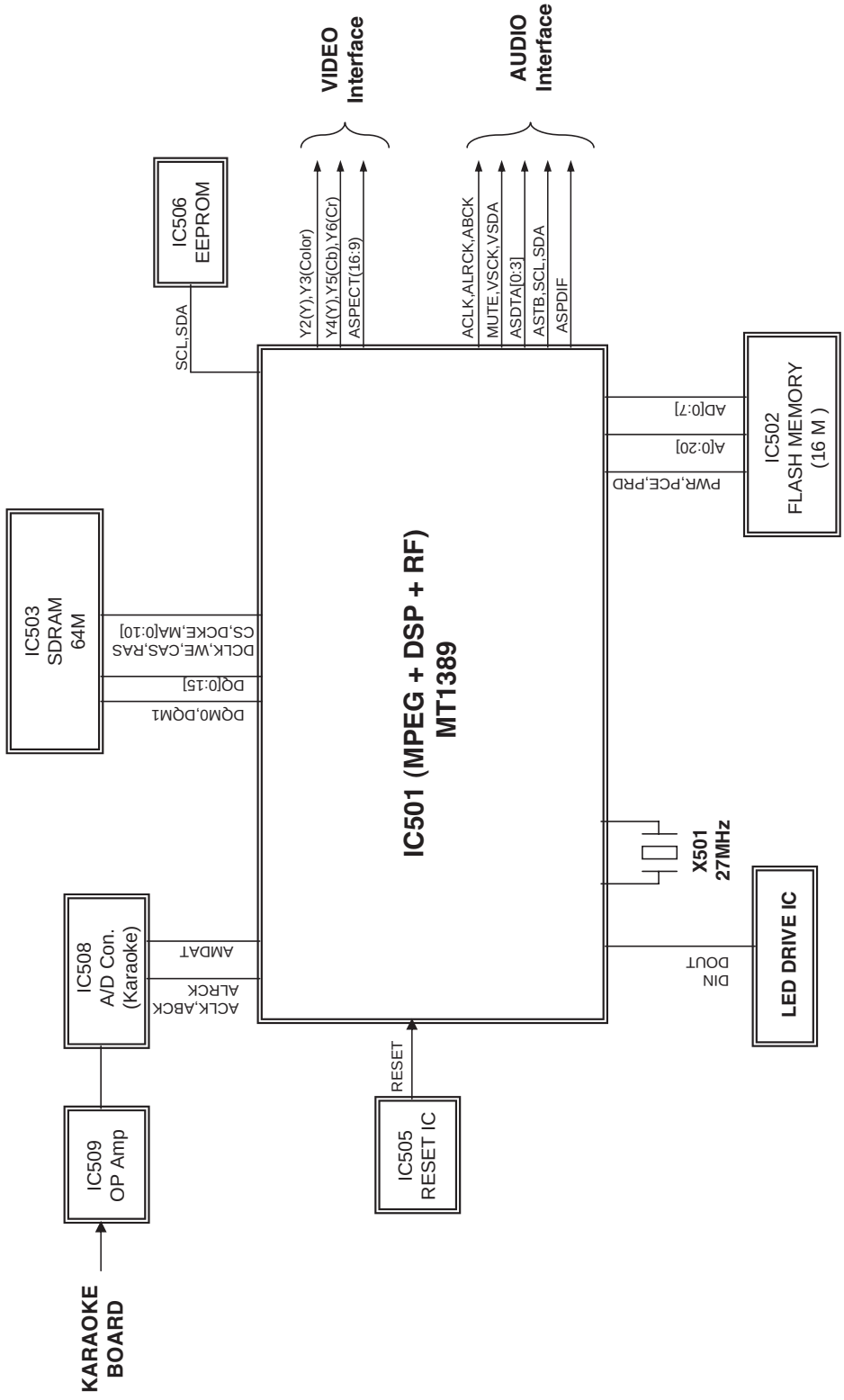
2. Power(SMPS) Block Diagram



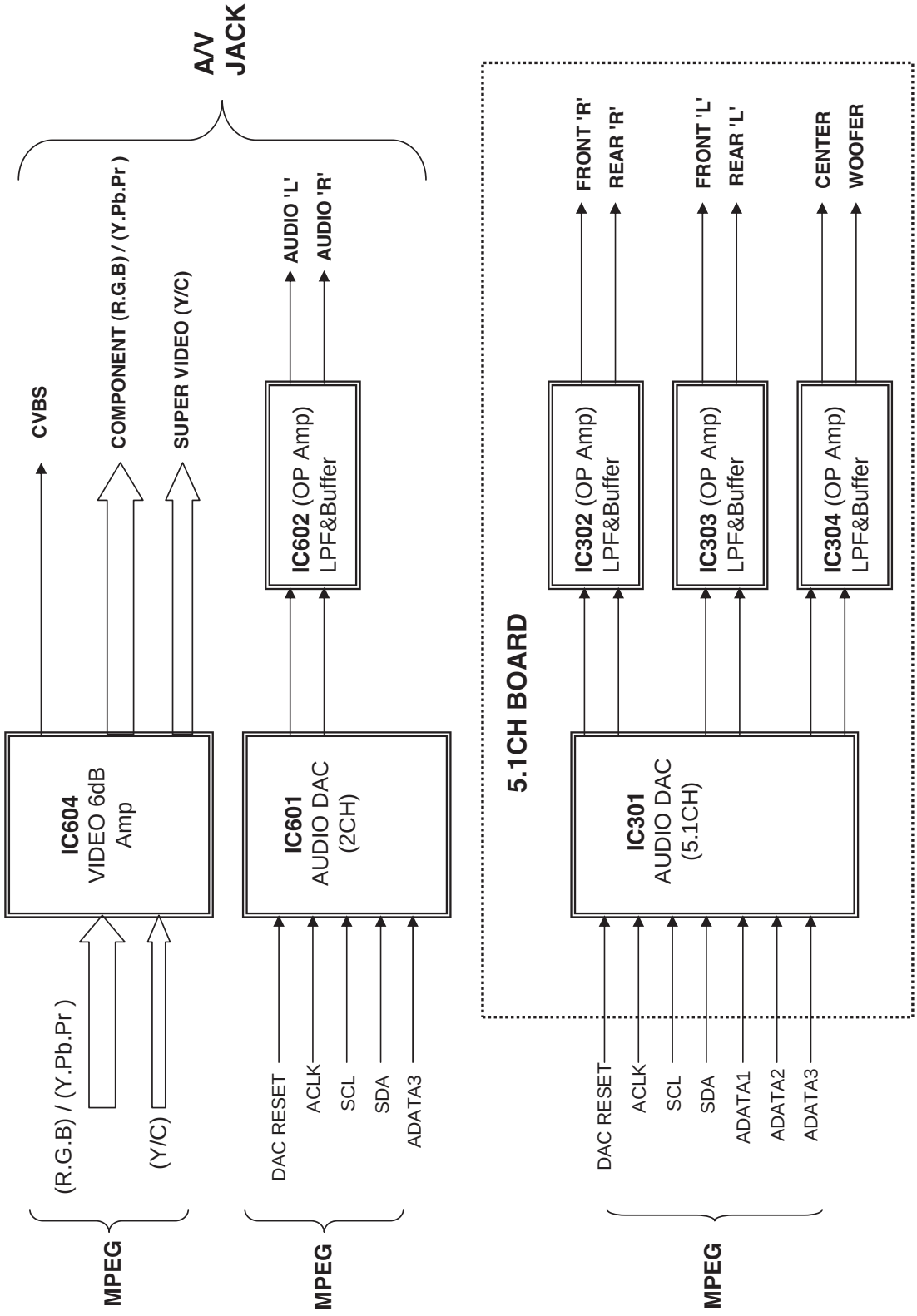
3. SERVO Block Diagram



4. MPEG & MEMORY Block Diagram



5. VIDEO & AUDIO Block Diagram



CIRCUIT DIAGRAMS

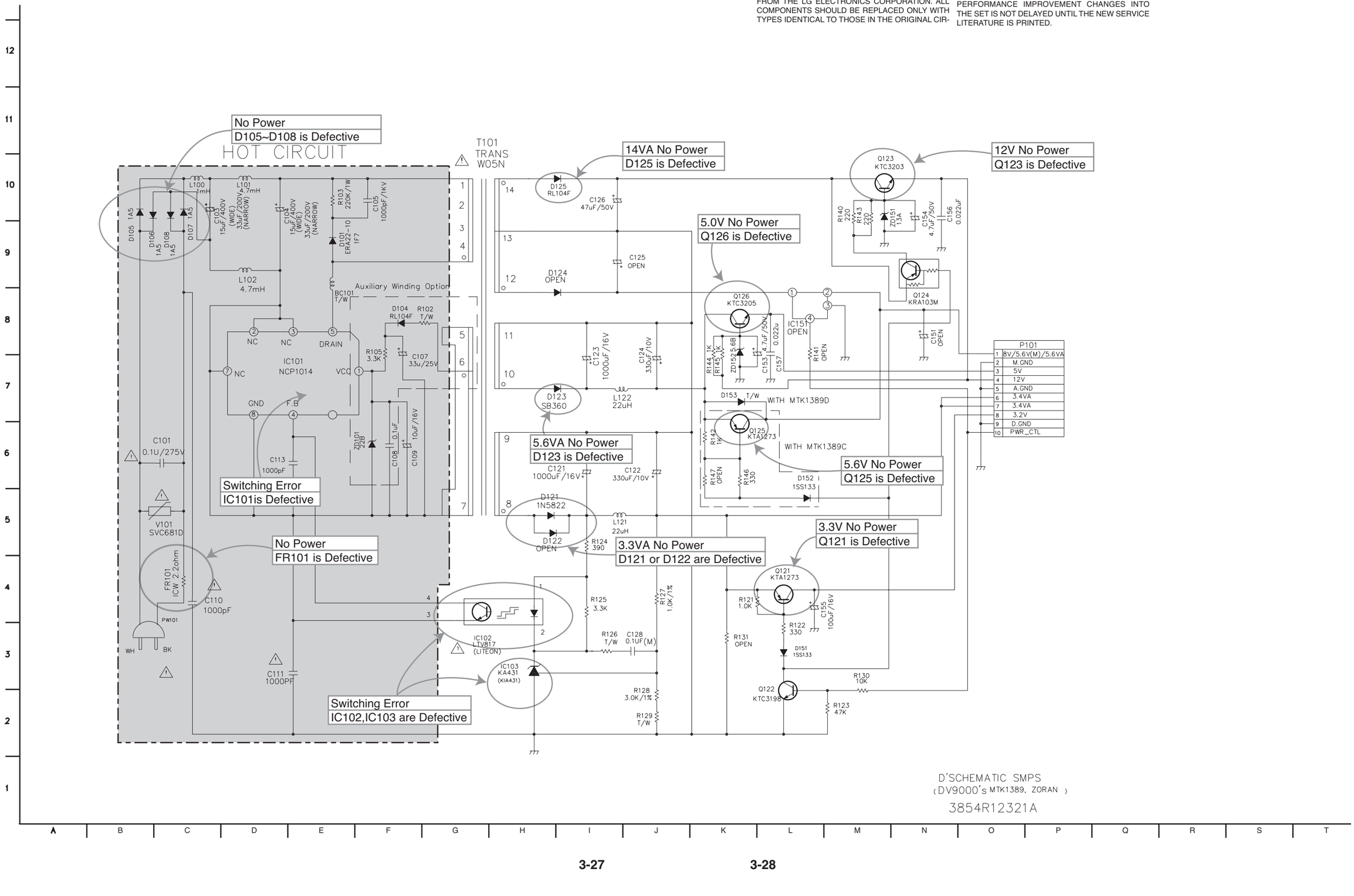
1. POWER(SMPS) CIRCUIT DIAGRAM

IMPORTANT SAFETY NOTICE

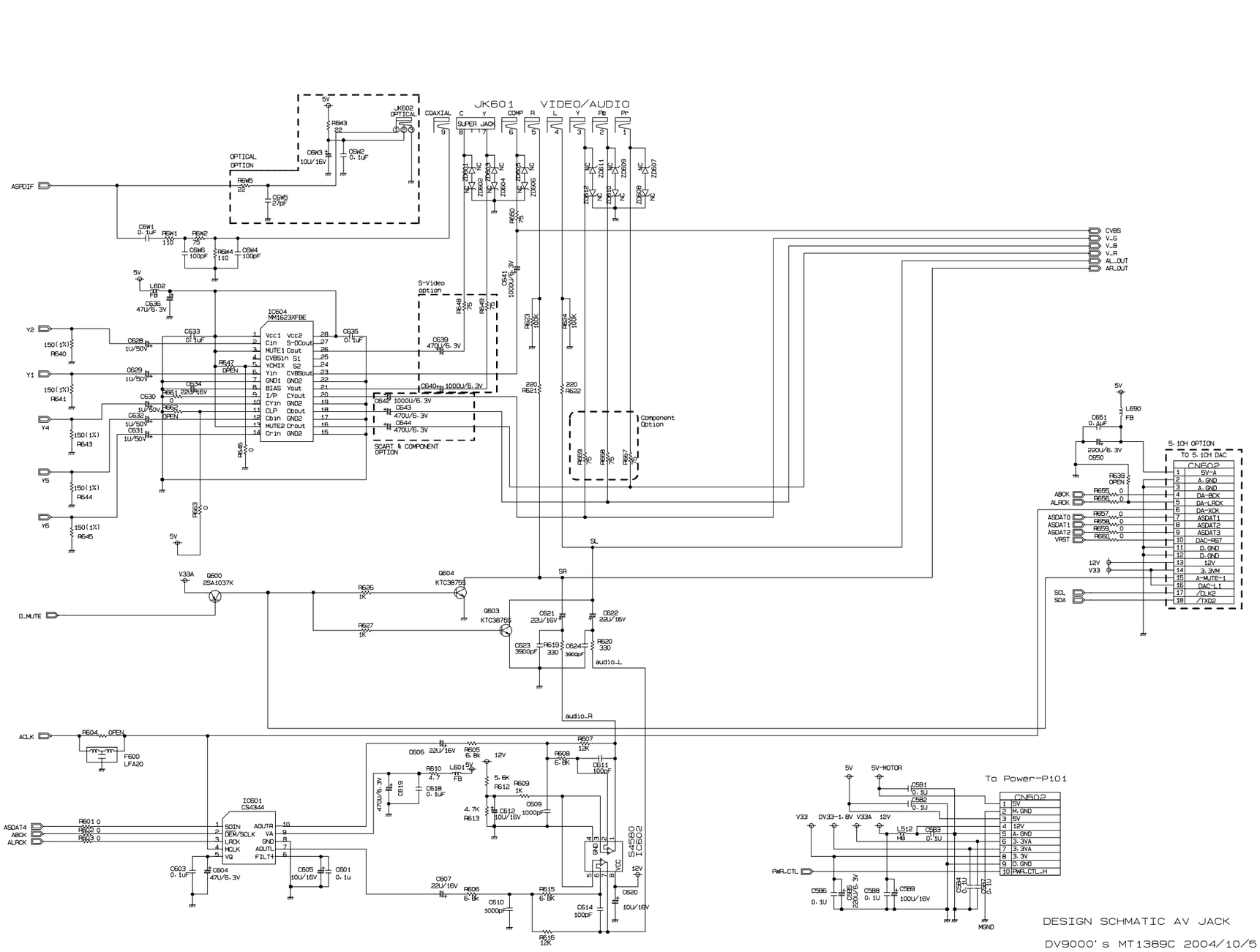
WHEN SERVICING THIS CHASSIS, UNDER NO CIRCUMSTANCES SHOULD THE ORIGINAL DESIGN BE MODIFIED OR ALTERED WITHOUT PERMISSION FROM THE LG ELECTRONICS CORPORATION. ALL COMPONENTS SHOULD BE REPLACED ONLY WITH TYPES IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT. SPECIAL COMPONENTS ARE SHADED ON THE SCHEMATIC FOR EASY IDENTIFICATION.
THIS CIRCUIT DIAGRAM 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.

NOTE :

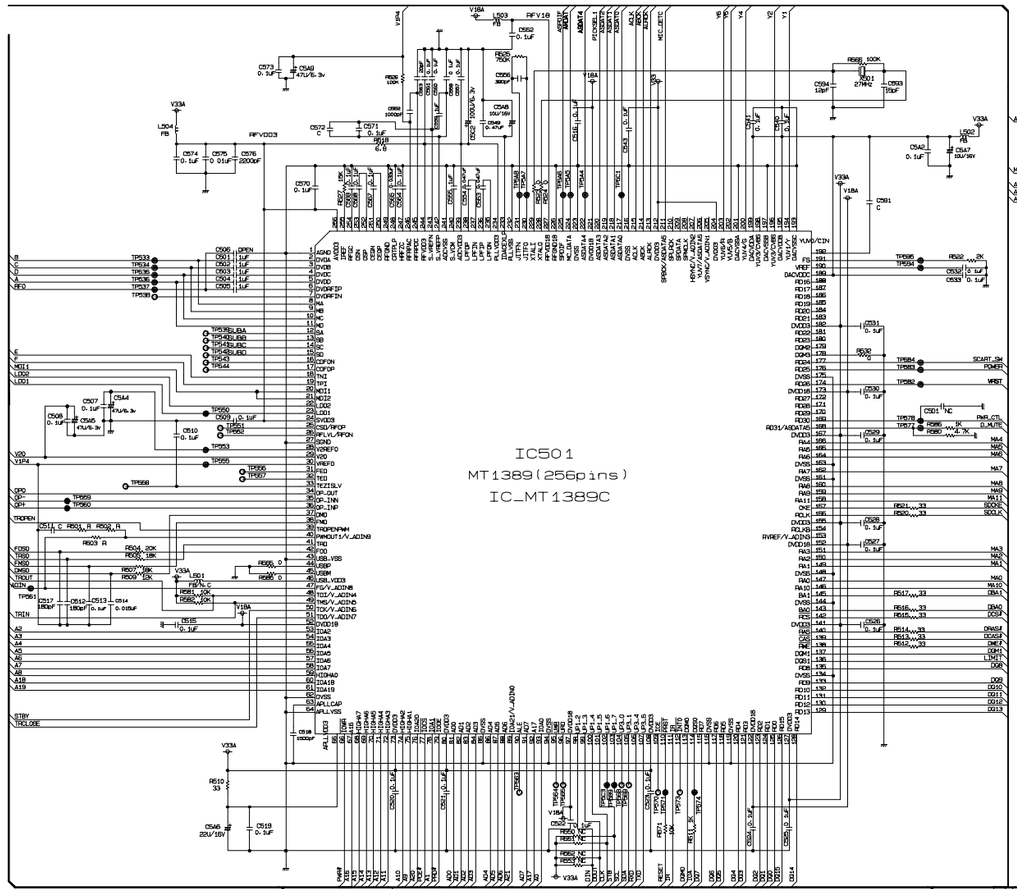
1. Shaded(■) parts are critical for safety. Replace only with specified part number.
2. Voltages are DC-measured with a digital voltmeter during Play mode.

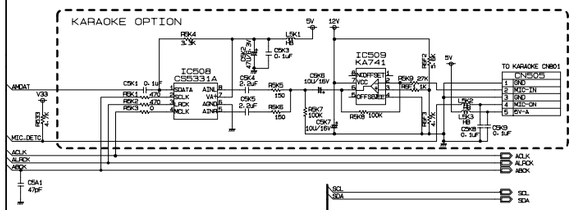


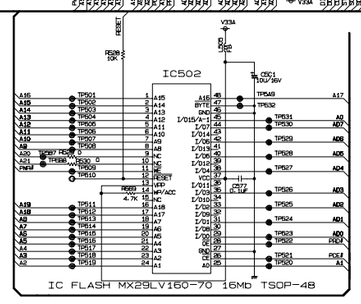
2. AV/JACK CIRCUIT DIAGRAM

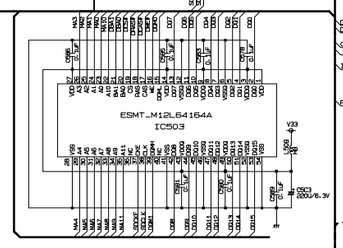


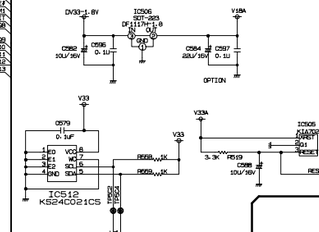
3. SYSTEM CIRCUIT DIAGRAM

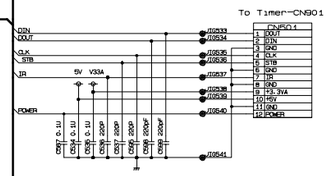


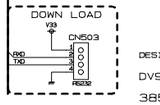










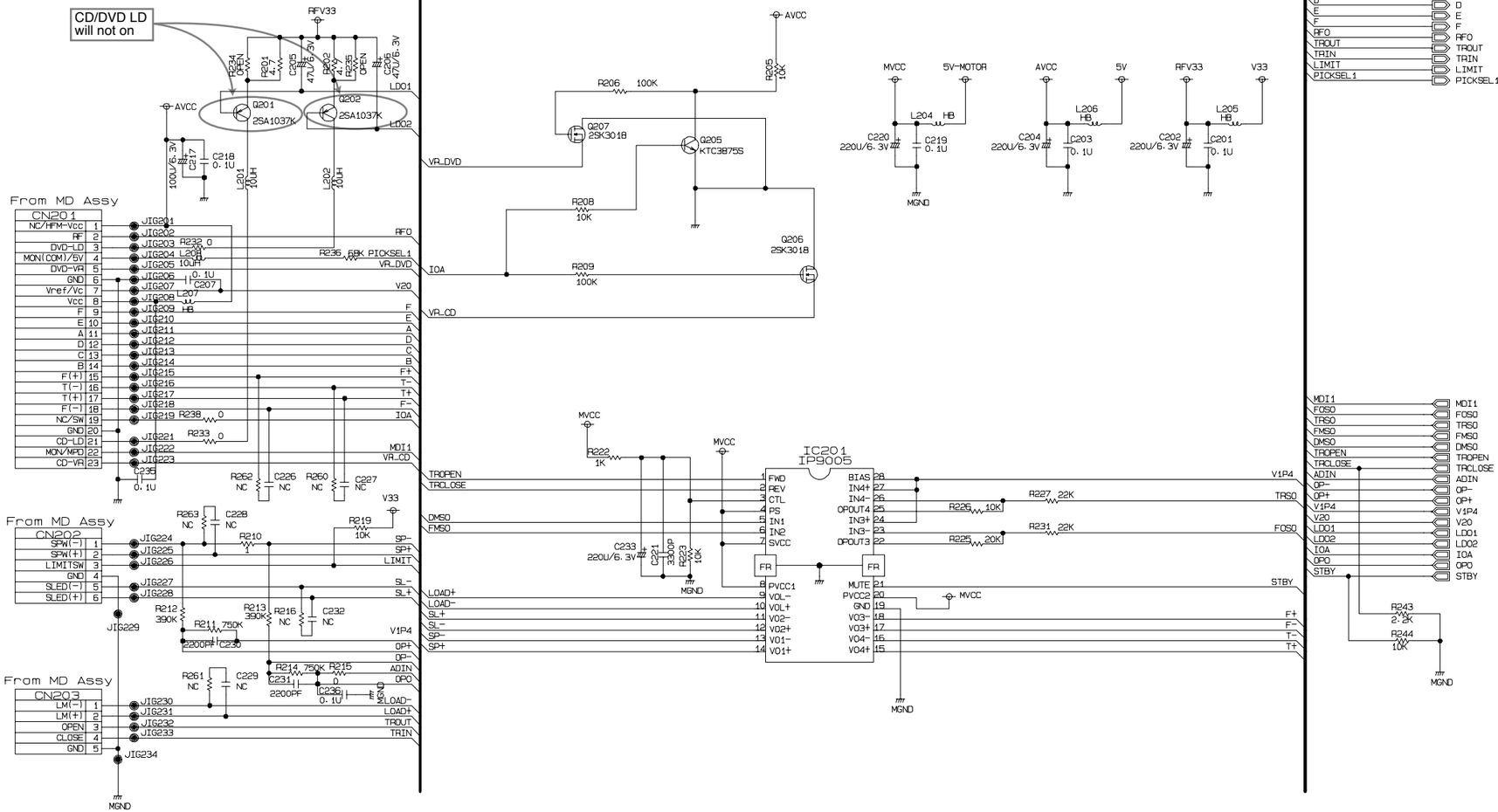


DESIGN SCHEMATIC SYSTEM(ZHU LIBIN)

DV9000'S MTK1389C 2004/10/5

3854R16001B (1.12)

4. DRIVER CIRCUIT DIAGRAM

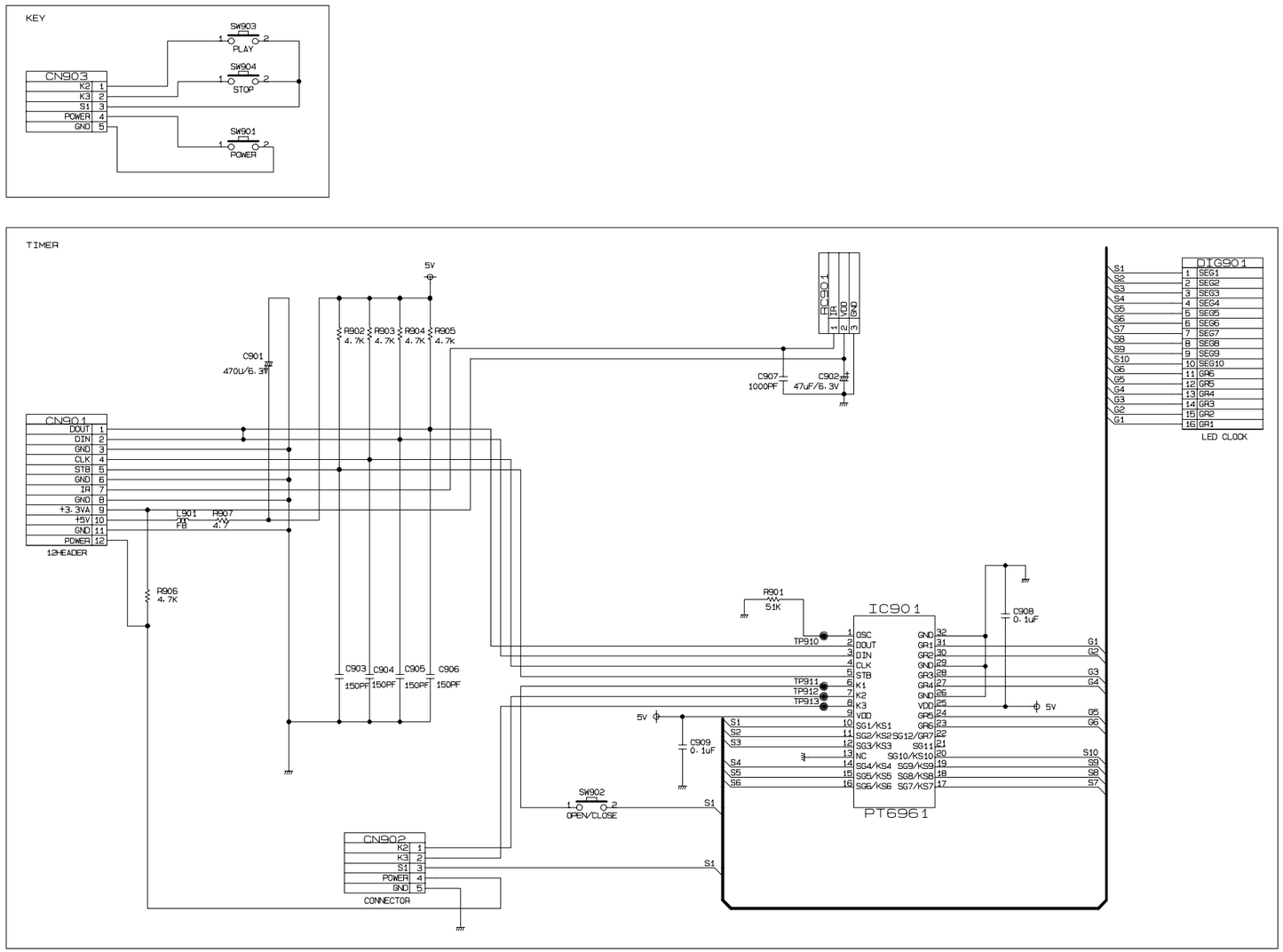


DESIGN SCHMATIC SERVO (LU JINGXIN)

DV9000'S MTK 2004/8/28

3854R16002B (1.10)

5. TIMER CIRCUIT DIAGRAM

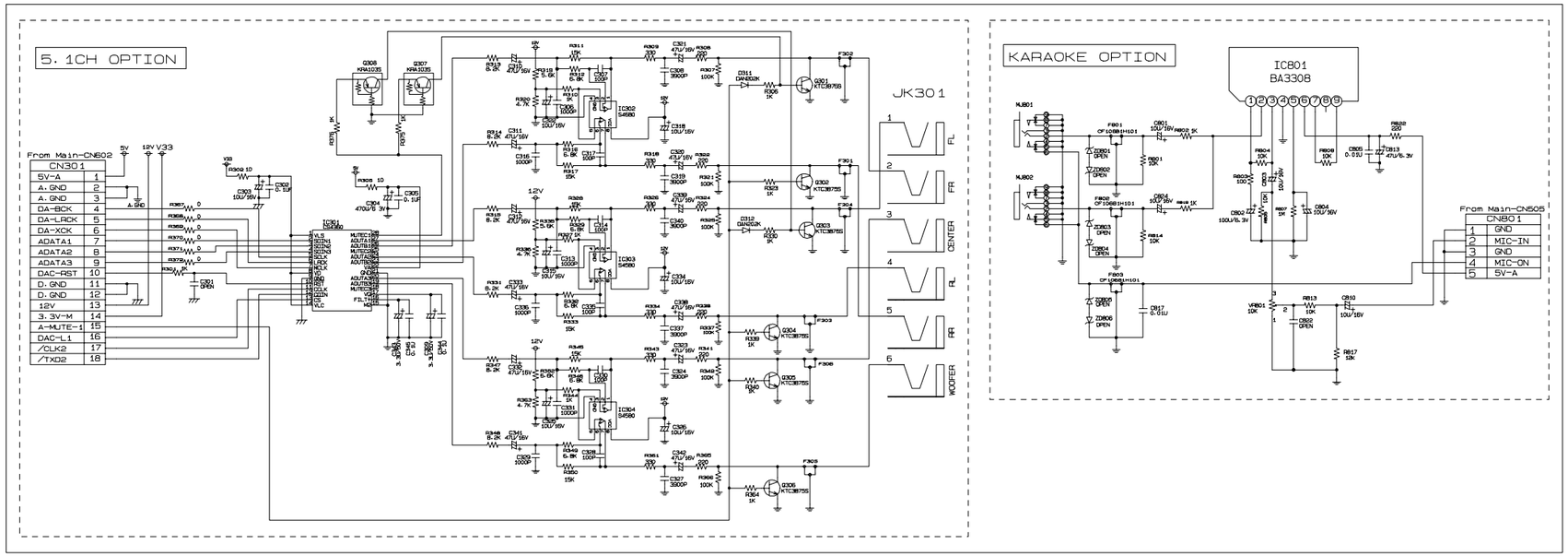


DESIGN SCHMATIC TIMER (ZHANG YU)

DV9000'S MTK1389C 2004/10/5

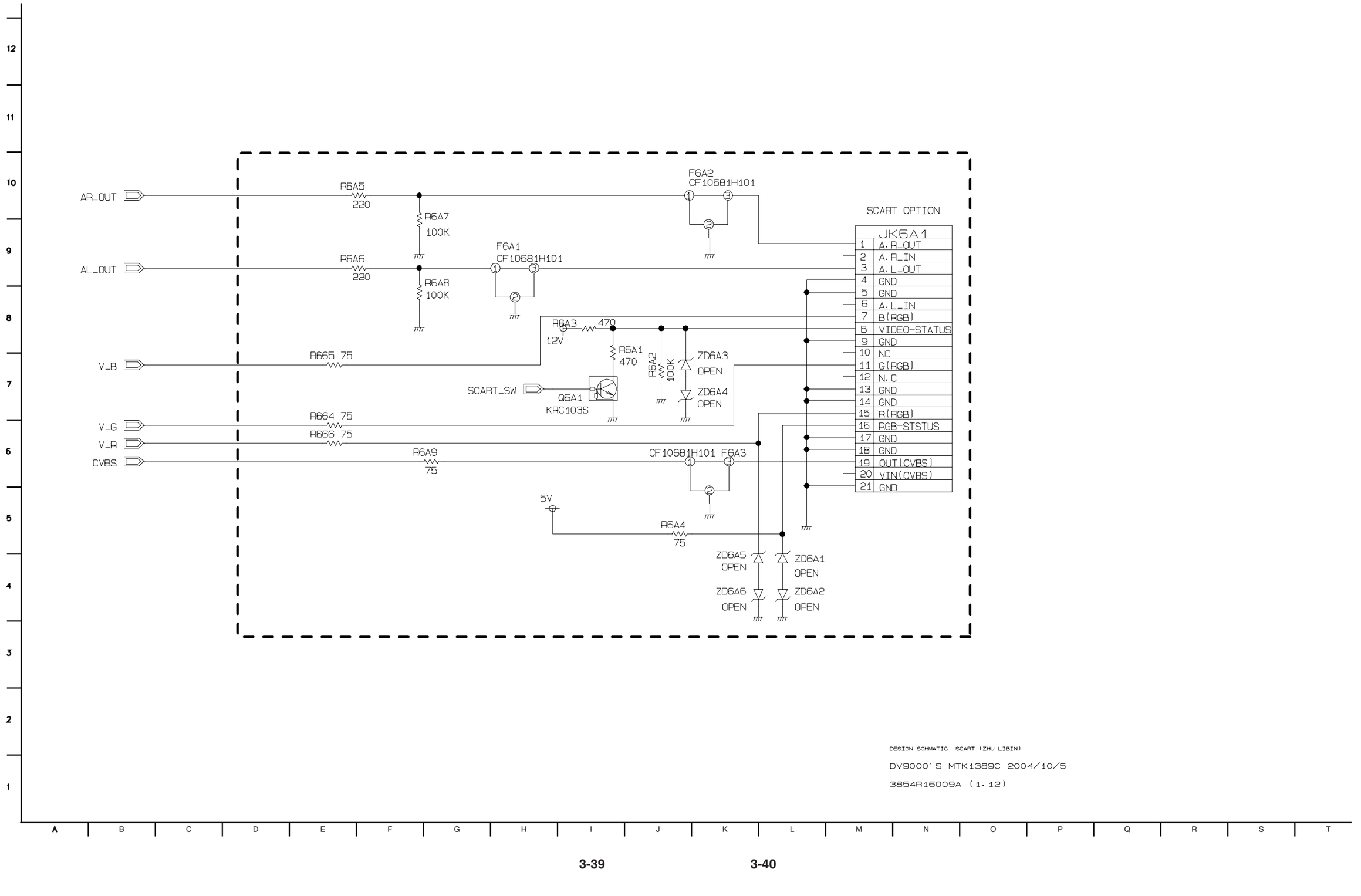
3854R16005A(1.12)

6. 5.1CH & KARAOKE(KARAOKE MODEL ONLY) CIRCUIT DIAGRAM



DESIGN SCHMATIC KARAOKE&5.1CH
DV9000'S MTK1389C 2004/8/28
3854R1600BA(1.08)

7. SCART CIRCUIT DIAGRAM

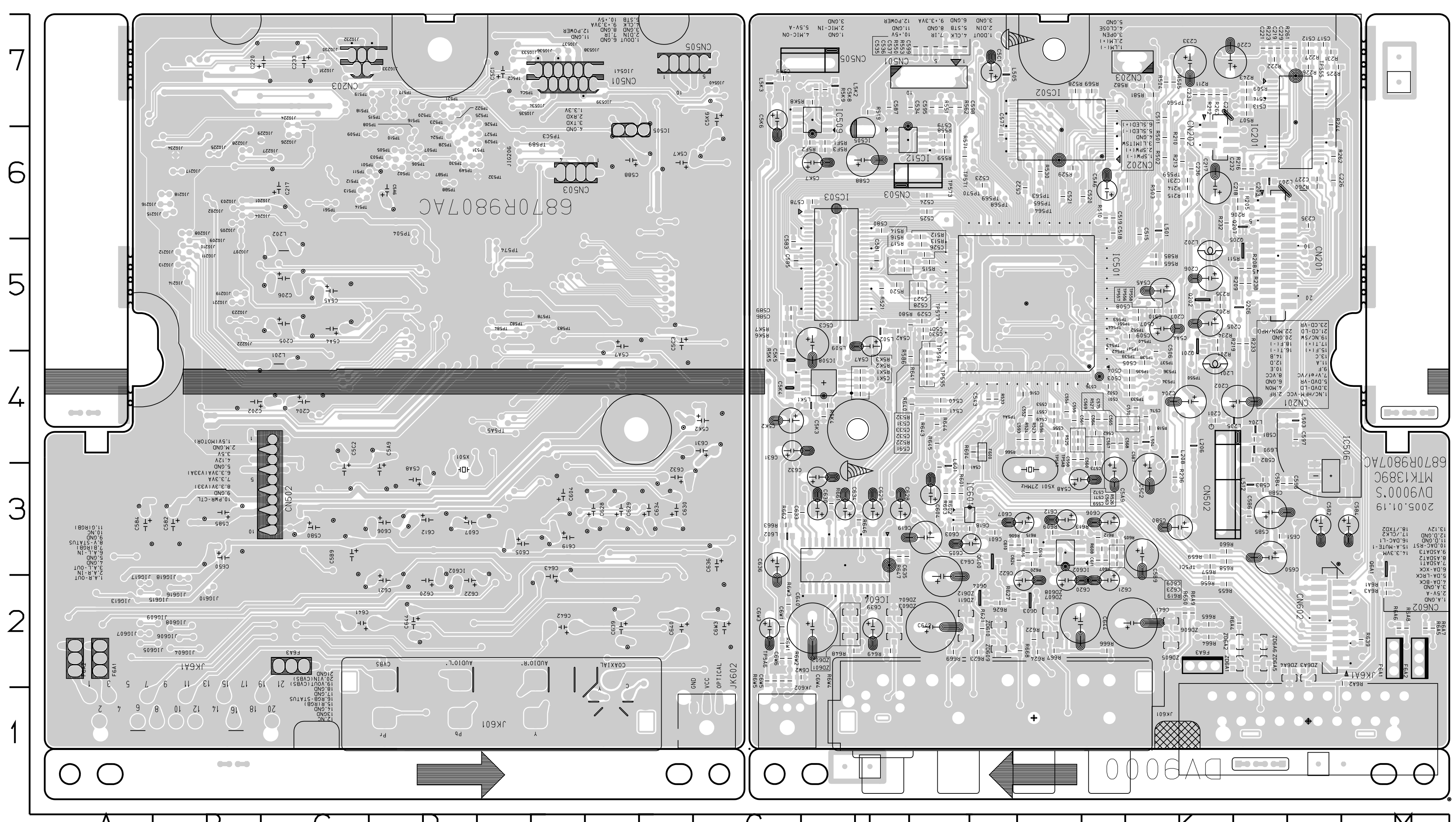


• CIRCUIT VOLTAGE CHART

MODE / PIN NO.	STOP	PLAY
IC201(9005)		
1	0	0
2	0	0
3	5.01	5.04
4	5.52	5.55
5	1.8	1.76
6	1.42	1.42
7	5.52	5.55
8	5.52	5.54
9	0	0
10	0	0
11	2.65	2.69
12	2.61	2.63
13	1.2	1.46
14	4.08	3.85
15	2.66	2.69
16	2.66	2.68
17	2.68	2.71
18	2.63	2.66
19	0	0
20	5.53	5.56
21	3.29	3.29
22	1.43	1.43
23	1.43	1.43
24	1.43	1.43
25	1.42	1.43
26	1.43	1.43
27	1.43	1.43
28	1.43	1.43
IC501		
1	0	0
2	1.73	0
3	1.73	1.73
4	1.73	1.73
5	1.73	1.73
6	1.75	1.73
7	2.15	1.74
8	2.2	2.21
9	2.18	2.18
10	2.16	0
11	2.14	2.14
12	1.74	1
13	1.04	1
14	1.03	1
15	0.12	1
16	0.13	0
17	0.12	1
18	0.13	2.05
19	2.05	0
20	2.05	0
21	2.05	0
22	2.38	0
23	3.29	0
24	3.3	3.3
25	0.21	1
26	2.34	0
27	0	0
28	2.8	2.8
29	2	0
30	1.4	0
31	1.52	0
32	1.38	0
33	1.38	0
34	2.62	0
35	2.62	2.73
36	2.25	0
37	2.2	2.11
38	1.37	1.36
38	0	0
40	1.4	0
41	1.43	0
42	1.4	141
43	0	0
44	0	0
45	0	0
46	3.3	3.3
47	2.64	0
48	3.32	0
49	0.01	0
50	3.3	0
51	0	0
52	1.76	1.8
53	2.13	0
54	2.14	2.12
55	2.13	1.74
56	1.81	1.34
57	2.12	0
58	1.83	1.52
59	0	1.63
60	0	2.99
61	0	0
62	0	0
63	0	2.05
64	0	0
65	3.3	3.3
66	3.3	3.32
67	1.29	0
68	2.36	0.32
69	0	0.37
70	0.56	0.46
71	0	3.2
72	1.27	1.42
73	3.3	3.3
74	2.23	1.93
75	1.39	0
76	0	0
77	0	0
78	2.06	0
79	0	0
80	3.3	3.3
81	1.2	1.07
82	0	0.82
83	1.17	0.77
84	0.64	0.54
85	0	0
86	1.44	0.53
87	1.65	1.77
88	1.4	1.53
89	0	0
90	1.21	1.2
91	1.02	1.03
92	0	0
93	2.06	1.93
94	0	0
95	3	2.74
96	3.28	3.25
97	1.8	1.8
98	3	2.7
99	3	2.7
100	2.97	2.67
101	0	2.68
102	3.33	3.32
103	3.33	3.32
104	3	2.7
105	5.18	5.18
106	3.32	3.31
107	2.76	2.75
108	3.3	3.3
109	0	0
110	5.2	5.2
111	2.67	2.92
112	3.14	3.18
113	2.28	1.6
114	0	0
115	1.06	0.85
116	0	0
117	1.04	1.09
118	1.28	0.94
119	0	0
120	1.18	1.65
121	1.36	1.7
122	1.8	1.75
123	1.26	1.51
124	1.23	1.4
125	1.28	1.16
126	0	0.86
127	3.3	3.3
128	2.35	1.28
129	1.8	1.05
130	0	1.1
131	1.39	1.25
132	1.37	1.27
133	1.31	1.3
134	0	0
135	1.33	1.37
136	3.3	3.3
137	2.63	1.65
138	3.27	3.1
139	3	2.63
140	3.2	3.1
141	3.3	3.3
142	2.9	2.38
143	1.59	1.7
144	0	0
145	1.38	1.55
146	0.07	0
147	0.31	0.78
148	0	0
149	1.51	1.95
150	1.49	1.93
151	1.49	1.62
152	1.8	1.75
153	0	0
154	0	0
155	3.3	3.3
156	1.72	1.72
157	0.92	2.29
158	0	0
159	0	0
160	0	0
161	0	0
162	1.56	1.4
163	0	0
164	2.36	1.54
165	2.32	1.61
166	1.49	1.61
167	3.3	3.3
168	3.25	3.24
169	3.3	3.27
170	0	0
171	0	0
172	0	0
173	1.8	1.8
174	3.33	3.3
175	0	0
176	2.73	2.73
177	0	0
178	3.32	3.32
179	2.75	0
180	0	0
181	0	0
182	3.3	3.3
183	0	0
184	0	0
185	0	0
186	0	0
187	0	0
188	0	0
189	3.3	3.3
190	1.24	1.24
191	1.25	1.24
192	2.26	2.25
193	0	0
194	0.46	0.47
195	3.3	3.3
196	0.7	0.7
197	0	0
198	3.28	3.29
199	3.3	3.3
200	0.42	0.43
201	0	0
202	0.57	0.38
203	0	0.42
204	3.3	3.3
205	0.25	2.62
206	2.72	2.64
207	2.71	2.63
208	0	0
209	0	0
210	0	0
211	0.1	3.3
212	3.3	3.3
213	1.31	1.66
214	1.67	1.64
215	1.58	1.57
216	0	0
217	0	1.24
218	0	1.1
219	0	0
220	0	0
221	1.76	1.76
222	0	1.24
223	0	0
224	0	0
225	1.66	1.65
226	0	0
227	1.8	1.76
228	3.3	3.3
229	3.3	3.3
230	0.85	0.86
231	0.81	0.82
232	0	0
233	0.83	0.89
234	3.19	3.18
235	1.74	1.72
236	1.71	1.71
237	1.71	1.71
238	1.72	1.75
239	3.19	3.18
240	0	0
241	0	0
242	0	0
243	0	0
244	3.19	3.19
245	1.55	1.55
246	1.39	1.39
247	1.45	1.44
248	1.93	1.94
249	0	0
250	0	0
251	0	0
252	1.75	1.75
253	1.71	1.71
254	1.37	1.37
255	0.94	0.94
256	3.3	3.3
IC502 (MX29LV160-70)		
1	3.2	3.17
2	0	3.17
3	3.2	3.17
4	3.2	0.97
5	3.2	3.16
6	3.2	3.16
7	0	3.16
8	0	3.16
9	0	3.16
10	0	1.02
11	3.2	3.16
12	5.25	5.25
13	0	2.73
14	1.54	3.19
15	1.33	1.71
16	3.2	2.43
17	3.2	3.17
18	3.2	3.16
19	1.7	3.17
20	2.2	3.17
21	0	3.17
22	0	3.17
23	0	0
24	0	0
25	0	0
26	0	0
27	0	0
28	3.2	3.17
29	3.2	3.17
30	0	0
32	0	0
33	0	0
34	0	0
35	3.2	0
36	0	0
37	3.2	3.23
38	3.26	0
39	3.2	3.17
40	0	0
41	3.2	3.17
42	0	0
43	0	3.17
44	0	0
45	0	0
46	0	0
47	0	0
48	3.2	3.17
IC503 (M12L64164A)		
1	3.25	3.23
2	2.85	2.86
3	3.25	3.22
4	2.87	2.87
5	2.85	2.5
6	0	0
7	2.81	2.1
8	2.9	2.04
9	3.25	3.22
10	2.85	2.1
11	2.87	2.91
12	1.9	0
13	2.8	
14	3.25	3.22
15	0	0
16	3.18	3.1
17	3.07	2.58
18	3.14	0.61
19	2.95	2.97
20	2.9	2.96
21	2.6	0.32
22	2.81	2.83
23	0.05	0.06
24	0.16	0.18
25	0.16	0.18
26	0.16	0.17
27	3.26	3.24
28	0	0.59
29	0.16	0.17
30	0.15	0.53
31	0.16	0.53
32	0.12	0.5
33	0.05	0.16
34	0.05	0.17
35	0.04	0.5
36	2.85	0.08
37	3.26	3.236
38	1.79	1.78
39	0	0
40	2.7	0.1
41	2.7	0
42	2.9	2
43	3.26	3.23
44	2.92	1.95
45	2.92	2.01
46	0	0
47	2.92	2.03
48	2.94	2.17
49	3.26	3.23
50	2.91	2
51	2.94	2
52	0	0
53	2.9	1.85
54	0	0
IC601		
1	0	1.23
2	1.65	1.64
3	1.65	1.65
4	1.64	1.63
5	2.37	2.382
6	4.7	4.69
7	2.4	2.39
8	0	0
9	4.79	1.91
10	2.38	1.72
IC604(MM1623)		
1	5.17	5.16
2	2.52	2.47
3	5.17	5.16
4	1.36	1.27
5	0	0
6	1.68	1.55
7	0	0
8	2.52	2.51
9	0	0
10	1.68	1.53
11	0	0
12	2.49	2.47
13	5.17	5.16
14	2.5	2.47
15	0	0
16	2.53	2.52
17	0	0
18	2.51	2.51
19	0	0
20	2.18	2
21	2.16	2.05
22	0	0
23	2.16	1.96
24	0.25	0.42
25	0.23	0.42
26	2.51	2.51
27	0.53	0.8
28	5.17	5.16
IC901		
1	2.16	2.15
2	4.83	4.8
3	4.83	4.8
4	4.83	4.81
5	3.84	4.2
6	0	0.01
7	0	0.01
8	0	0.01
9	4.84	4.8
10	2.3	4.75
11	1.81	2.7
12	1.96	2.39
13	0	0
14	2.1	2.56
15	2.32	2.13
16	2.35	2.16
17	2.1	1.96
18	0.9	0.93
19	1.58	1.58
20	1.25	2.21
21	0.94	0.92
22	0.95	0.92
23	1.5	1.62
24	1.59	1.79
25	4.84	4.82
26	0	0
27	1.44	1.6
28	2.04	1.76
29	0	0
30	1.36	1.54
31	1.32	1.5
32	0	0
Q201		
Emitter	0	0
Collector	0	5.09
Base	0.68	0
Q202		
Emitter	0	0
Collector	0	0
Base	0	5.04
Q203		
Emitter	0	0
Collector	0	0.19
Base	5.04	0
Q204		
Emitter	5.14	4.34
Collector	0	2.42
Base	5.08	3.64
Q205		
Emitter	5.14	5.1
Collector	0.5	0
Base	5.08	5.05
Q501		
Emitter	0	0
Collector	0	0
Base	0.83	0.83
Q600		
Emitter	5.17	0
Collector	0	0
Base	5.11	0.74
Q604		
Emitter	0	0
Collector	0	0
Base	0.75	0.16
Q603		
Emitter	0	0
Collector	0	0
Base	0.75	0
Q605		
Emitter	0	0
Collector	0.13	0
Base	0	0.74

PRINTED CIRCUIT DIAGRAMS

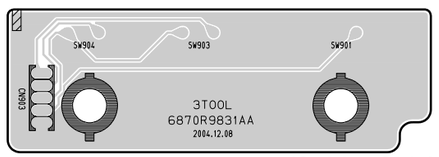
1. MAIN P.C.BOARD



LOCATION GUIDE

JIG201	B6	JIG615	B2	C201	K4	C529	I5	C591	I4	C618	I3	IC512	H6	R222	L7	R553	I7	R643	I4	TP551	K5
JIG202	B6	JIG616	B2	C202	L4	C530	I5	C593	J4	C619	I3	IC601	I3	R223	L7	R558	I6	R644	I4	TP552	K5
JIG203	B6	JIG617	A2	C203	L6	C531	I4	C594	J4	C620	J2	IC602	J3	R225	L7	R559	I6	R645	I4	TP553	J5
JIG204	B6	JIG618	B2	C204	K4	C532	I4	C595	I7	C621	J2	IC604	H3	R226	L7	R562	I7	R646	H3	TP555	L7
JIG205	B6	TP501	D6	C205	K5	C533	I4	C596	L3	C622	J2	JK601	J1	R227	L7	R565	K5	R647	H3	TP556	K5
JIG206	E6	TP502	D6	C206	K5	C534	I7	C597	L4	C623	J3	JK602	G1	R231	L7	R566	J4	R648	H2	TP557	K5
JIG207	B5	TP503	D6	C207	K5	C535	I7	C598	I7	C624	J3	JK6A1	L1	R232	K6	R569	J7	R649	H2	TP558	K5
JIG208	B6	TP504	D6	C217	K6	C536	I7	C599	I7	C628	H3	L201	K4	R233	L5	R571	I6	R650	K2	TP559	K6
JIG209	B5	TP505	D6	C218	L6	C537	I7	C5A1	I3	C629	H3	L202	K5	R234	K5	R580	I5	R655	K2	TP560	K7
JIG210	B5	TP506	D6	C219	L7	C540	I4	C5A2	H5	C630	H3	L204	L4	R235	K5	R581	K7	R656	K2	TP563	J6
JIG211	B5	TP507	D6	C220	K7	C541	I4	C5A4	K5	C631	G4	L205	L4	R236	K3	R582	K7	R657	K3	TP564	J6
JIG212	B5	TP508	D6	C221	L7	C543	I4	C5A5	K5	C632	H3	L206	K4	R238	L5	R585	K5	R658	K3	TP565	J6
JIG213	B5	TP509	C6	C226	L6	C549	J4	C5A6	J6	C633	H3	L207	L6	R243	L7	R586	I4	R659	K3	TP568	I6
JIG214	B5	TP510	D6	C227	L6	C552	J4	C5A7	H5	C634	H3	L208	K4	R244	L7	R5F1	H6	R660	K3	TP569	I6
JIG215	B6	TP511	D6	C228	K7	C553	J4	C5A8	J3	C635	H3	L501	K6	R260	L6	R5F2	H6	R661	H3	TP570	I6
JIG216	B6	TP512	C6	C229	L7	C554	J4	C5A9	J3	C636	G3	L502	H5	R261	L7	R5F3	H6	R662	G3	TP571	I6
JIG217	B6	TP513	C6	C230	K7	C555	J4	C5B0	K3	C639	H2	L503	L4	R262	L6	R5K1	H4	R663	G3	TP573	I6
JIG218	B6	TP514	C6	C231	K6	C556	J4	C5B1	L4	C640	H2	L504	K4	R263	K7	R5K2	H4	R664	K2	TP577	I5
JIG219	B5	TP515	D7	C232	L6	C557	J4	C5B2	L4	C641	K2	L505	I7	R501	K6	R5K3	H4	R665	K2	TP594	I4
JIG221	B5	TP516	D7	C233	K7	C558	J4	C5B3	L3	C642	I2	L509	H5	R502	K6	R5K4	H4	R666	J2	TP595	I4
JIG222	B5	TP517	D7	C235	L6	C559	J4	C5B4	L3	C643	I2	L512	L3	R503	K6	R5K5	G4	R667	J2	TP5A4	I4
JIG223	B5	TP518	D7	C236	K6	C560	J4	C5B5	L3	C644	J2	L5K1	H4	R504	K7	R5K6	G5	R668	J2	TP5A6	G2
JIG224	C7	TP519	D7	C501	K4	C561	J4	C5B6	L3	C650	L3	L5K2	H7	R505	K7	R5K7	G5	R669	I2	TP5A7	J4
JIG225	B6	TP520	D7	C502	K4	C562	J4	C5B7	K4	C651	L3	L5K3	G7	R507	L7	R5K8	H7	R6A1	M2	TP5A8	J4
JIG226	C6	TP521	D7	C503	K4	C563	J4	C5B8	L3	C6W1	G2	L601	I3	R509	L7	R5K9	H7	R6A2	M2	TP5C1	K3
JIG227	C6	TP522	D7	C504	K4	C564	J4	C5B9	K3	C6W2	H2	L602	G3	R510	J6	R601	I3	R6A3	M2	X501	J3
JIG228	B6	TP523	D6	C505	K4	C565	J4	C5C1	I7	C6W3	G2	L690	L4	R511	L5	R602	I3	R6A4	L2	ZD601	H2
JIG229	C6	TP524	D6	C506	K4	C567	J4	C5C2	K3	C6W4	G2	Q201	K5	R512	I6	R603	I3	R6A5	M2	ZD602	H2
JIG230	C7	TP525	D7	C507	K5	C568	J4	C5C3	H5	C6W5	G2	Q202	K5	R513	I5	R604	I4	R6A6	M2	ZD603	H2
JIG231	C7	TP526	E7	C508	K5	C569	J4	C5D1	I5	C6W6	G2	Q205	L5	R514	H5	R605	J3	R6A7	M2	ZD604	H2
JIG232	C7	TP527	E6	C509	K5	C570	K4	C5K1	H4	CN201	L5	Q206	L5	R515	I5	R606	J3	R6A8	M2	ZD605	K2
JIG233	D7	TP528	D6	C510	K5	C571	J4	C5K2	G4	CN202	K6	Q207	L6	R516	H5	R607	J3	R6A9	K2	ZD606	K2
JIG234	B6	TP529	E6	C511	K7	C572	J4	C5K3	H4	CN203	K7	Q600	I3	R517	H5	R608	J3	R6W1	G2	ZD607	J2
JIG533	E7	TP530	D6	C512	L7	C573	J3	C5K4	G4	CN501	I7	Q603	J2	R518	K4	R609	J3	R6W2	G2	ZD608	J2
JIG534	E7	TP531	E6	C513	L7	C574	K4	C5K5	G4	CN502	K4	Q604	I2	R519	H7	R610	I3	R6W3	G2	ZD609	I2
JIG535	E7	TP532	E6	C514	L7	C575	K4	C5K6	G7	CN503	H6	Q6A1	M3	R520	H5	R612	J3	R6W4	G2	ZD610	I2
JIG536	E7	TP561	C6	C515	K6	C576	J4	C5K7	H6	CN505	H7	R201	K5	R521	H5	R613	J3	R6W5	G2	ZD611	I2
JIG537	E7	TP574	E5	C516	J4	C577	I6	C5K8	H7	CN602	L2	R202	K5	R522	I4	R615	J3	TP533	K4	ZD612	I2
JIG538	E7	TP578	E5	C517	L7	C578	H6	C5K9	G7	F600	I4	R205	L6	R523	J4	R616	J3	TP534	K4	ZD6A1	L2
JIG539	F7	TP582	E5	C518	J6	C579	I6	C601	I3	F6A1	M2	R206	L6	R524	J4	R619	J3	TP535	K4	ZD6A2	L2
JIG540	G7	TP583	E5	C519	J6	C580	H6	C603	I3	F6A2	M2	R208	L5	R525	J4	R620	J3	TP536	K4	ZD6A3	L2
JIG541	F7	TP584	E5	C520	J6	C581	H5	C604	I3	F6A3	K2	R209	L5	R526	J4	R621	I2	TP537	K4	ZD6A4	L2
JIG604	B2	TP5A5	E4	C521	J6	C582	L3	C605	I3	IC201	L7	R210	K6	R527	K4	R622	J2	TP538	K4	ZD6A5	L2
JIG605	B2	TP5A9	D6	C522	J6	C583	G5	C606	J3	IC501	J5	R211	K7	R528	J7	R623	I2	TP539	K4	ZD6A6	L2
JIG606	B2	TP5B7	D6	C523	I6	C584	M3	C607	J3	IC502	J6	R212	K7	R529	J6	R624	J2	TP540	K5		
JIG607	A2	TP5B8	D6	C524	I6	C585	G5	C609	J3	IC503	H5	R213	K6	R530	J6	R626	I2	TP541	K5		
JIG608	B2	TP5B9	E6	C525	I6	C586	G5	C610	I3	IC505	H6	R214	K6	R532	I5	R627	I2	TP542	J5		
JIG609	B2	TP5C2	E7	C526	I5	C587	H7	C611	J3	IC506	L3	R215	K6	R533	I4	R639	M2	TP543	J5		
JIG610	B2	TP5C3	E6	C527	I5	C588	H6	C612	J3	IC508	H4	R216	L6	R550	I7	R640	I4	TP544	J5		
JIG613	A2	TP5C4	E7	C528	I5	C589	G5	C614	J3	IC509	H7	R219	L5	R551	I7	R641	I4	TP550	K4		

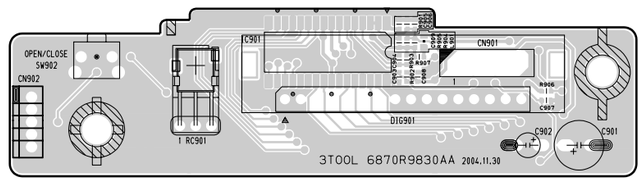
2. KEY P.C.BOARD



(Solder Side)

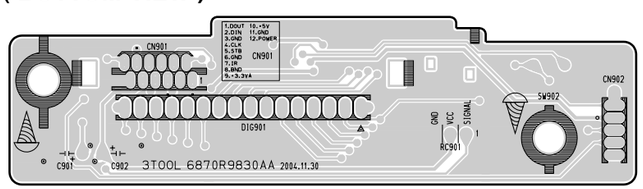
3. TIMER P.C.BOARD

(TOP VIEW)



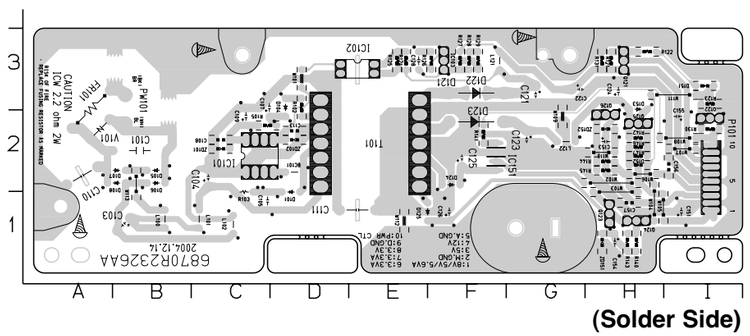
(Solder Side)

(BOTTOM VIEW)



(Solder Side)

4. SMPS P.C.BOARD



(Solder Side)

LOCATION GUIDE

BC101	D2	C155	I2	IC151	F2	R125	E3
C101	B2	C156	I2	L100	B1	R126	F3
C103	B1	C157	H1	L101	C1	R127	F3
C104	C2	D101	D1	L102	C1	R128	F3
C105	C1	D104	D3	L121	F3	R129	F3
C107	C3	D105	B2	L122	G2	R130	I2
C108	C2	D106	B2	P101	I1	R131	H3
C109	C2	D107	B2	PW101	B3	R140	H1
C110	A2	D108	B2	Q121	H3	R141	F2
C111	E1	D121	F3	Q122	I2	R142	H2
C113	D2	D122	F3	Q123	H1	R143	H1
C121	G3	D123	F2	Q124	H1	R144	H2
C122	G3	D124	F2	Q125	H2	R145	H2
C123	G2	D125	F1	Q126	H2	R146	H2
C124	H3	D151	I3	R102	D3	R147	H2
C125	F2	D152	H2	R103	C1	T101	E2
C126	F1	D153	H3	R105	C2	V101	A2
C128	E3	FR101	A3	R121	H3	ZD101	C2
C151	I1	IC101	C2	R122	H3	ZD102	D2
C153	H2	IC102	E3	R123	I3	ZD151	H1
C154	H1	IC103	F3	R124	E3	ZD152	H2

MEMO

MEMO