LG

P/NO : AFN31640745

SERVICE MANUAL

MODEL : HT502SH SH52SH-C, SH52SH-S, SH52SH-W

JANUARY, 2007

LG

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http://biz.lgservice.com

DVD/CD RECEIVER

SERVICE MANUAL

MODEL : HT502SH
SH52SH-C, SH52SH-S,
SH52SH-W

[CONTENTS]

SECTION 1. GENERAL

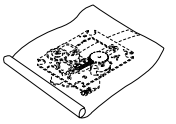
SERVICING PRECAUTIONS

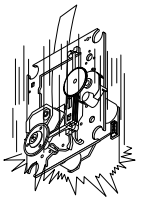
NOTES REGARDING HANDLING OF THE PICK-UP

1. Notes for transport and storage

1) The pick-up should always be left in its conductive bag until immediately prior to use.
2) The pick-up should never be subjected to external pressure or impact.

Storage in conductive bag

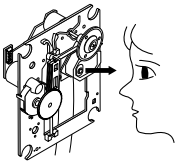




Drop impact

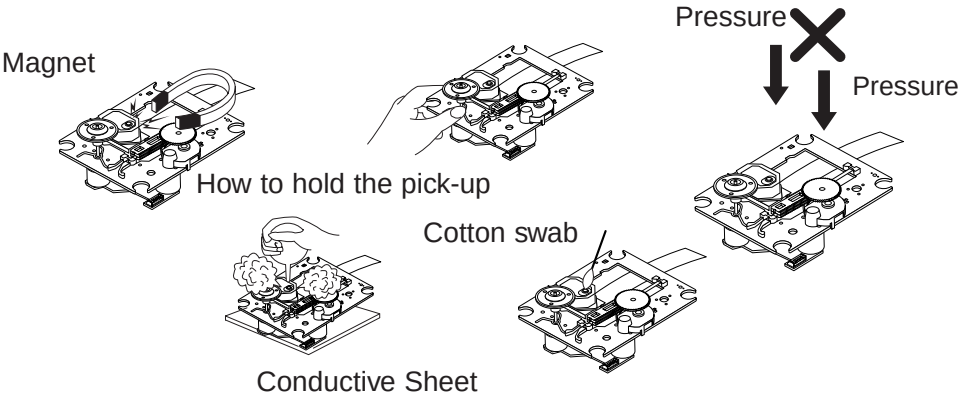
2. Repair notes

1) The pick-up incorporates a strong magnet, and so should never be brought close to magnetic materials.
2) The pick-up should always be handled correctly and carefully, taking care to avoid external pressure and impact. If it is subjected to strong pressure or impact, the result may be an operational malfunction and/or damage to the printed-circuit board.
3) Each and every pick-up is already individually adjusted to a high degree of precision, and for that reason the adjustment point and installation screws should absolutely never be touched.
4) Laser beams may damage the eyes!
   Absolutely never permit laser beams to enter the eyes!
   Also NEVER switch ON the power to the laser output part (lens, etc.) of the pick-up if it is damaged.



NEVER look directly at the laser beam, and don't allow contact with fingers or other exposed skin.

5) Cleaning the lens surface
   If there is dust on the lens surface, the dust should be cleaned away by using an air bush (such as used for camera lens). The lens is held by a delicate spring. When cleaning the lens surface, therefore, a cotton swab should be used, taking care not to distort lens.



6) Never attempt to disassemble the pick-up.
   Spring has excess pressure. If the lens is extremely dirty, apply isopropyl alcohol to the cotton swab. (Do not use any other liquid cleaners, because they will damage the lens.) Take care not to use too much of this alcohol on the swab, and do not allow the alcohol to get inside the pick-up.

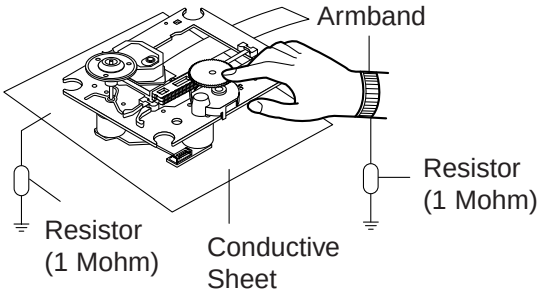
NOTES REGARDING COMPACT DISC PLAYER REPAIRS

1. Preparations

1) Compact disc players incorporate a great many ICs as well as the pick-up (laser diode). These components are sensitive to, and easily affected by, static electricity. If such static electricity is high voltage, components can be damaged, and for that reason components should be handled with care.
2) The pick-up is composed of many optical components and other high-precision components. Care must be taken, therefore, to avoid repair or storage where the temperature or humidity is high, where strong magnetism is present, or where there is excessive dust.

2. Notes for repair

1) Before replacing a component part, first disconnect the power supply lead wire from the unit
2) All equipment, measuring instruments and tools must be grounded.
3) The workbench should be covered with a conductive sheet and grounded.
   When removing the laser pick-up from its conductive bag, do not place the pick-up on the bag. (This is because there is the possibility of damage by static electricity.)
4) To prevent AC leakage, the metal part of the soldering iron should be grounded.
5) Workers should be grounded by an armband (1M Ω)
6) Care should be taken not to permit the laser pick-up to come in contact with clothing, in order to prevent static electricity changes in the clothing to escape from the armband.
7) The laser beam from the pick-up should NEVER be directly facing the eyes or bare skin.



ESD PRECAUTIONS

Electrostatically Sensitive Devices (ESD)

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive Devices (ESD). Examples of typical ESD 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 ESD 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 ESD devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ESD devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ESD devices.
6. Do not remove a replacement ESD device from its protective package until immediately before you are ready to install it. (Most replacement ESD devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive materials).
7. Immediately before removing the protective material from the leads of a replacement ESD device, touch the protective material to the chassis or circuit assembly into which the device will by installed.

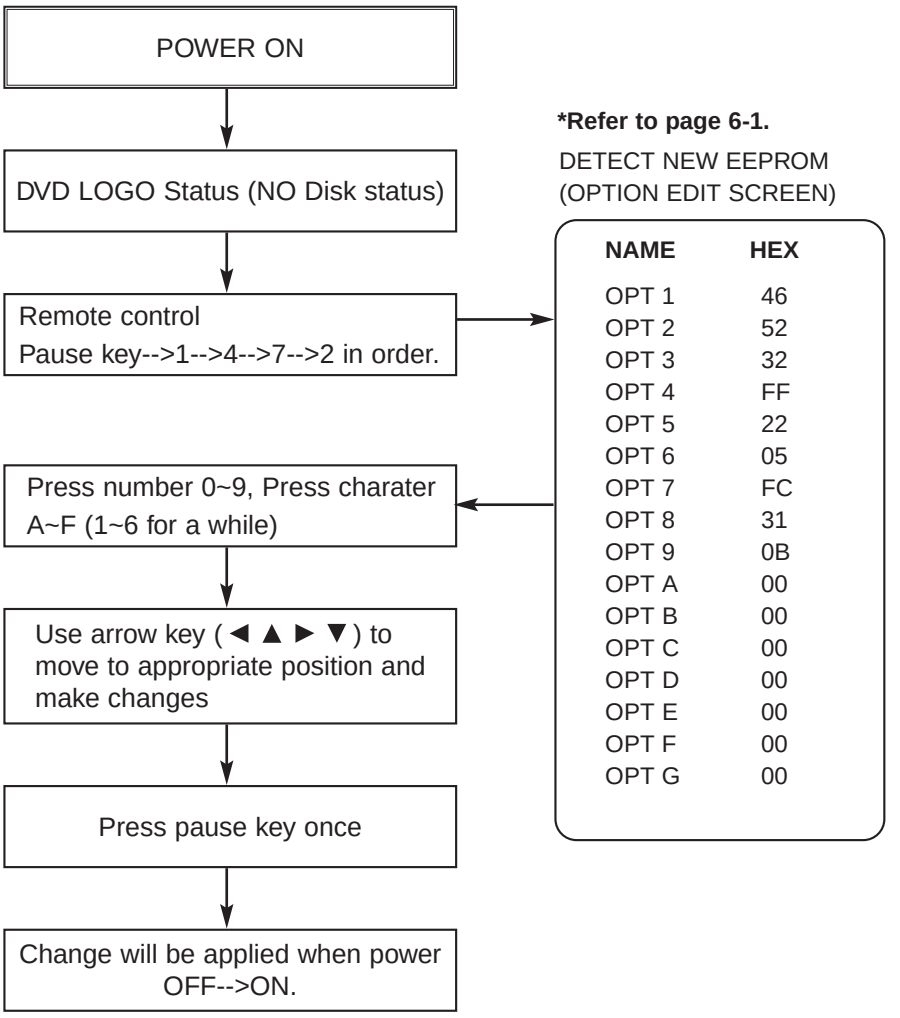
CAUTION : BE SURE NO POWER IS APPLIED TO THE CHASSIS OR CIRCUIT, AND OBSERVE ALL OTHER SAFETY PRECAUTIONS.

8. Minimize bodily motions when handing unpackaged replacement ESD devices. (Otherwise 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 ESD device).

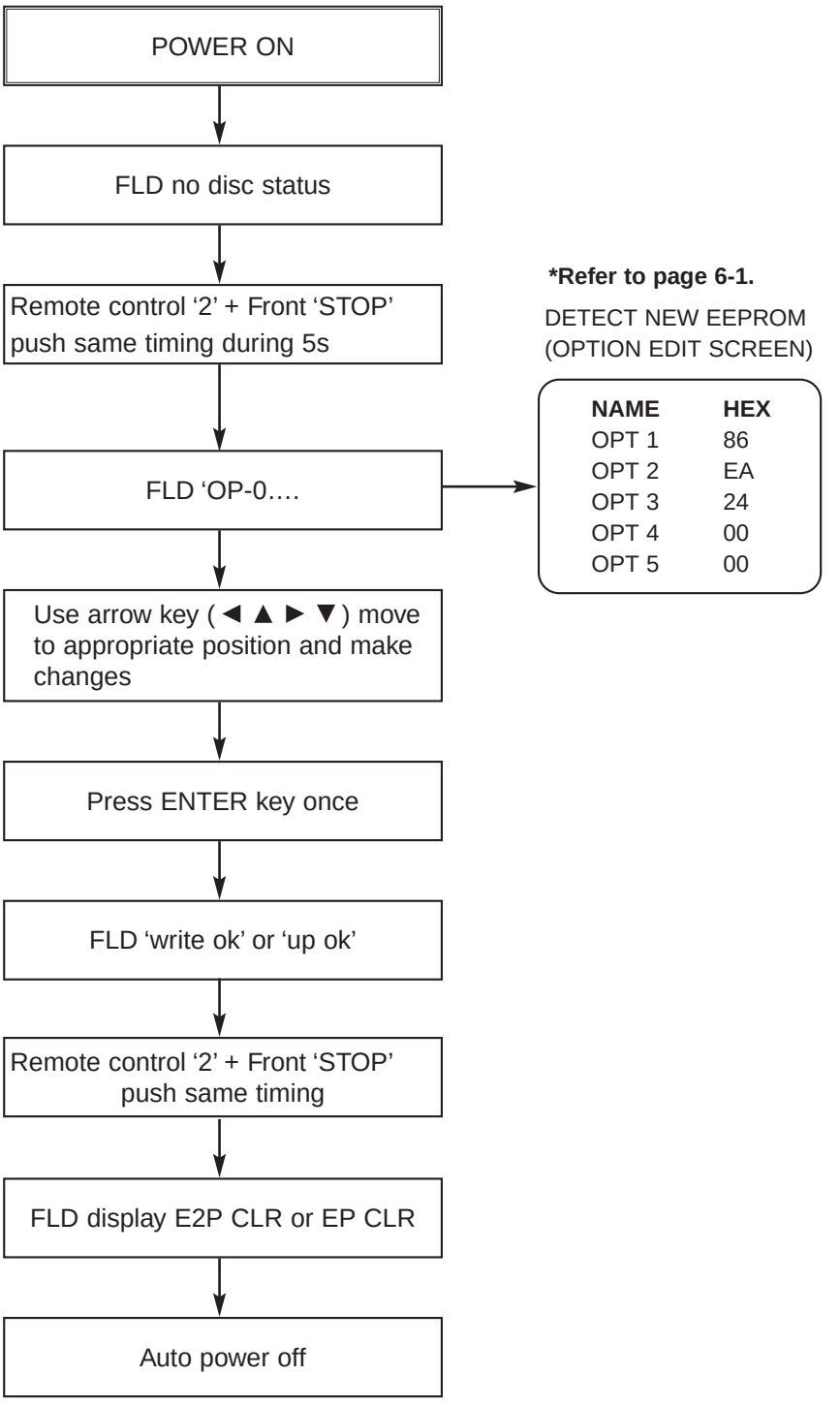
CAUTION. GRAPHIC SYMBOLS

	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.

SERVICE INFORMATION FOR EEPROM (DVD PART)



SERVICE INFORMATION FOR EEPROM (AMP PART)



SPECIFICATIONS

GENERAL

Power supply	Refer to main label.
Power consumption	Refer to main label.
Net Weight	3.6 kg
External dimensions (W x H x D)	430 x 70 x 311 mm
Operating conditions	Temperature: 5°C to 35°C, Operation status: Horizontal
Operating humidity	5% to 85%
Laser	Semiconductor laser, wavelength 650 nm

CD/DVD

Signal system	PAL 625/50, NTSC 525/60
Frequency response (audio)	200 Hz to 18 kHz
Signal-to-noise ratio (audio)	More than 75 dB (1 kHz, NOP -6 dB, 20 kHz LPF/A-Filter)
Dynamic range (audio)	More than 70 dB
Harmonic distortion (audio)	0.5 % (1 kHz, at 1W position) (20 kHz LPF)

VIDEO

Video input	1.0 V (p-p), 75 Ω, negative sync., RCA jack x 1
Video output	1.0 V (p-p), 75 Ω, negative sync., RCA jack x 1/ SCART (TO TV)
COMPONENT VIDEO OUT	(Y) 1.0 V (p-p), 75 ohms, negative sync, RCA jack x 1 (PB)/(PR) 0.7 V (p-p), 75 ohms, RCA jack x 1

TUNER

FM

Tuning Range	87.5 - 108.0 MHz or 65.0 - 74.0 MHz, 87.5 - 108.0 MHz
Intermediate Frequency	10.7 MHz
Signal-to Noise Ratio	60 dB (Mono)
Frequency Response	140 - 8,000 Hz

AM [MW]

Tuning Range	522 - 1,620 kHz or 520 - 1,720 kHz
Intermediate Frequency	450 kHz

AMPLIFIER

Stereo mode	70 W + 70 W (4Ω at 1 kHz, THD 10 %)
Surround mode	Front: 70 W + 70 W (THD 10 %) Center*: 70 W Surround*: 70 W + 70 W (4Ω at 1 kHz, THD 10 %) Subwoofer*: 150 W (3Ω at 30 Hz, THD 10 %)
Inputs	AUDIO IN, OPTICAL IN
Outputs	MONITOR OUT, EURO AV (TO TV) OUT COMPONENT VIDEO OUT

(* Depending on the sound mode settings and the source, there may be no sound output.)

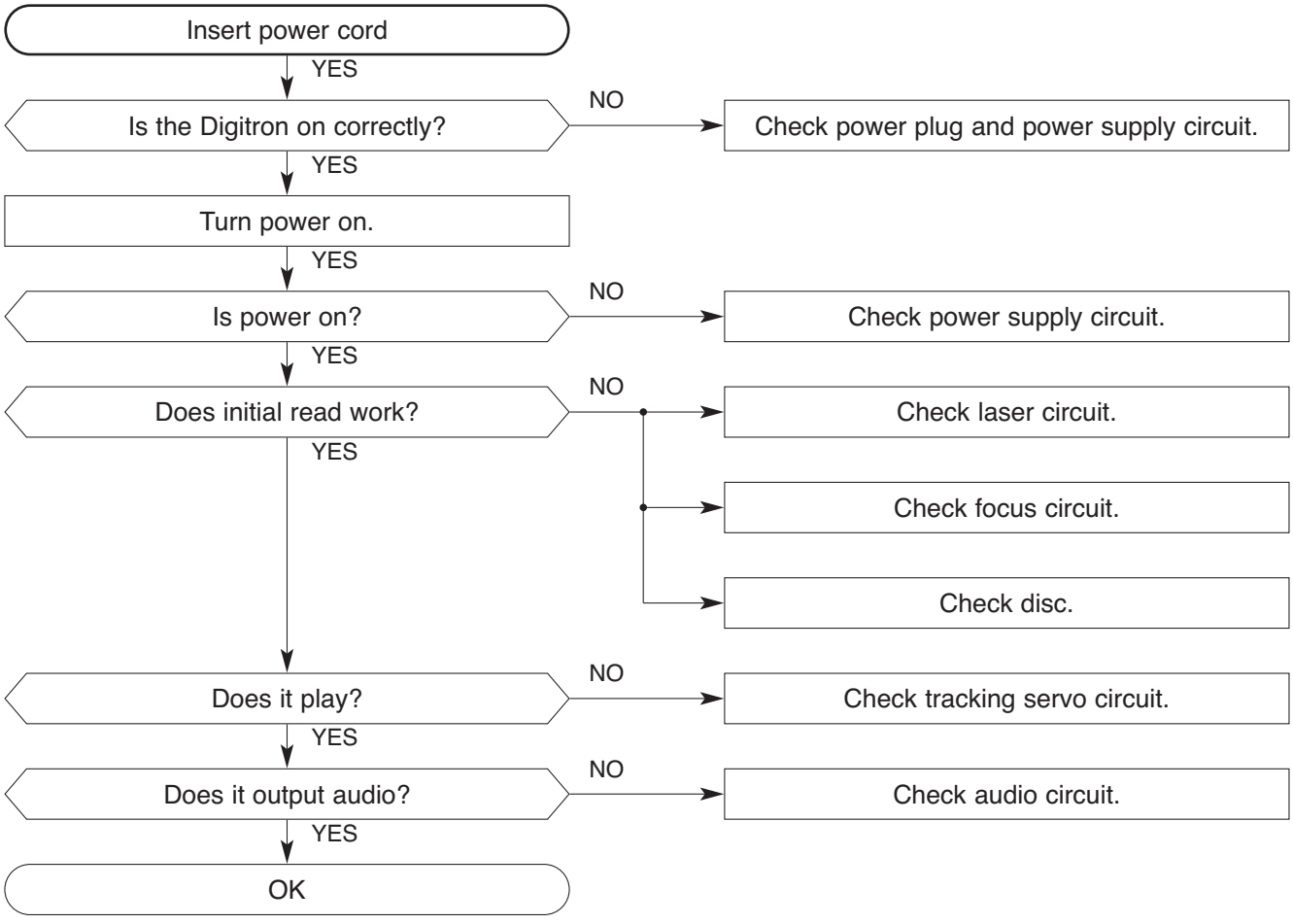
SPEAKERS (SH52SH)

	Front/Rear Speaker (SH52SH-S)	Center speaker (SH52SH-C)	Passive Subwoofer (SH52SH-W)
Type	1 Way 1 Speaker	1 Way 2 Speaker	1 Way 1 Speaker
Impedance	4 Ω	4 Ω	3 Ω
Frequency Response	130 - 20000 Hz	130 - 20000 Hz	40 - 1500 Hz
Sound Pressure Level	82 dB/W (1m)	82 dB/W (1m)	80 dB/W (1m)
Rated Input Power	70 W	70 W	150 W
Max. Input Power	140 W	140 W	300 W
Net Dimensions (W x H x D)	114 x 208.5 x 83 mm	330 x 86 x 121 mm	212 x 395 x 341 mm
Net Weight	0.55 kg	1.15 kg	6.0 kg

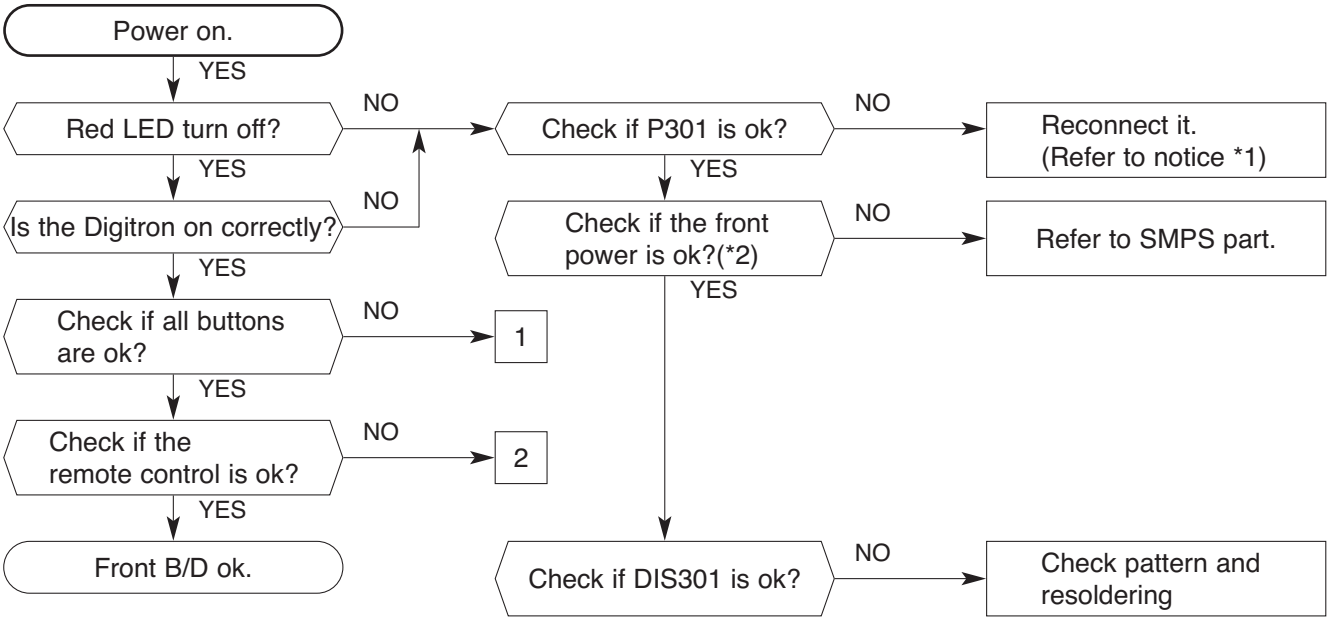
SECTION 2. AUDIO PART

AUDIO TROUBLESHOOTING GUIDE

1. POWER SUPPLY CIRCUIT



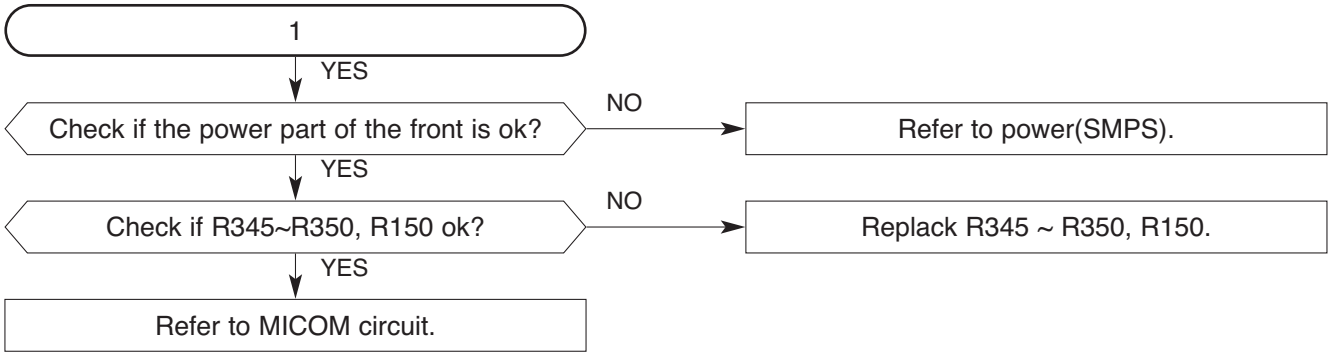
2. FRONT CIRCUIT (1/2)

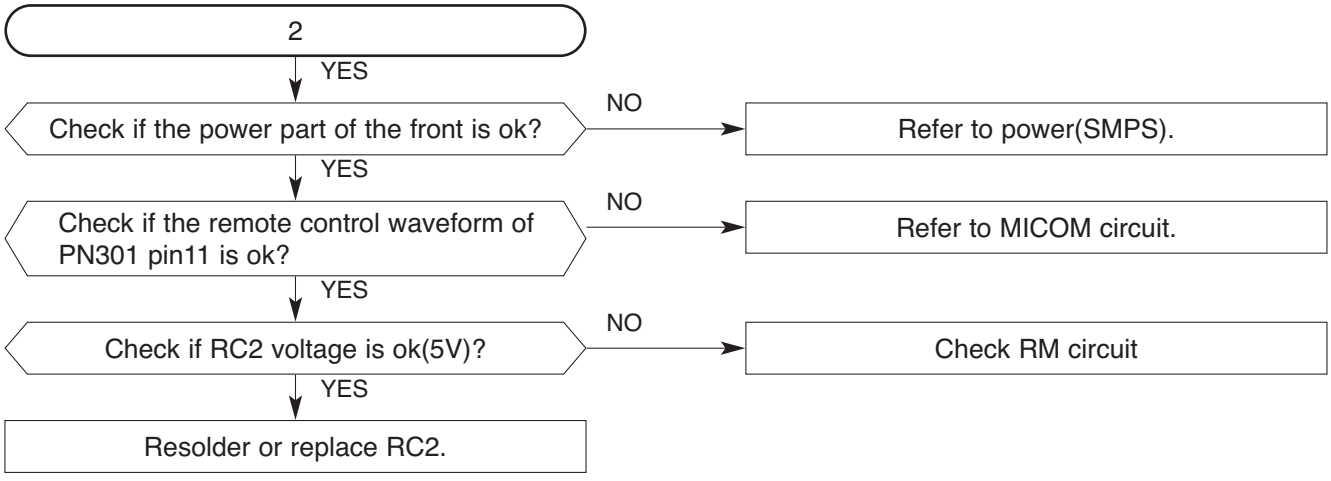


*1 : When it is needed to reconnected FFC cable into PN301
Short 1pin of PN103 with 18pin of CN901 in amp part

*2 : PN603 Pins.
PIN1 : -35 VKK
PIN2 : -30 FL+
PIN3 : -33 FL-
PIN7 : +5V
PIN13 : +5VA

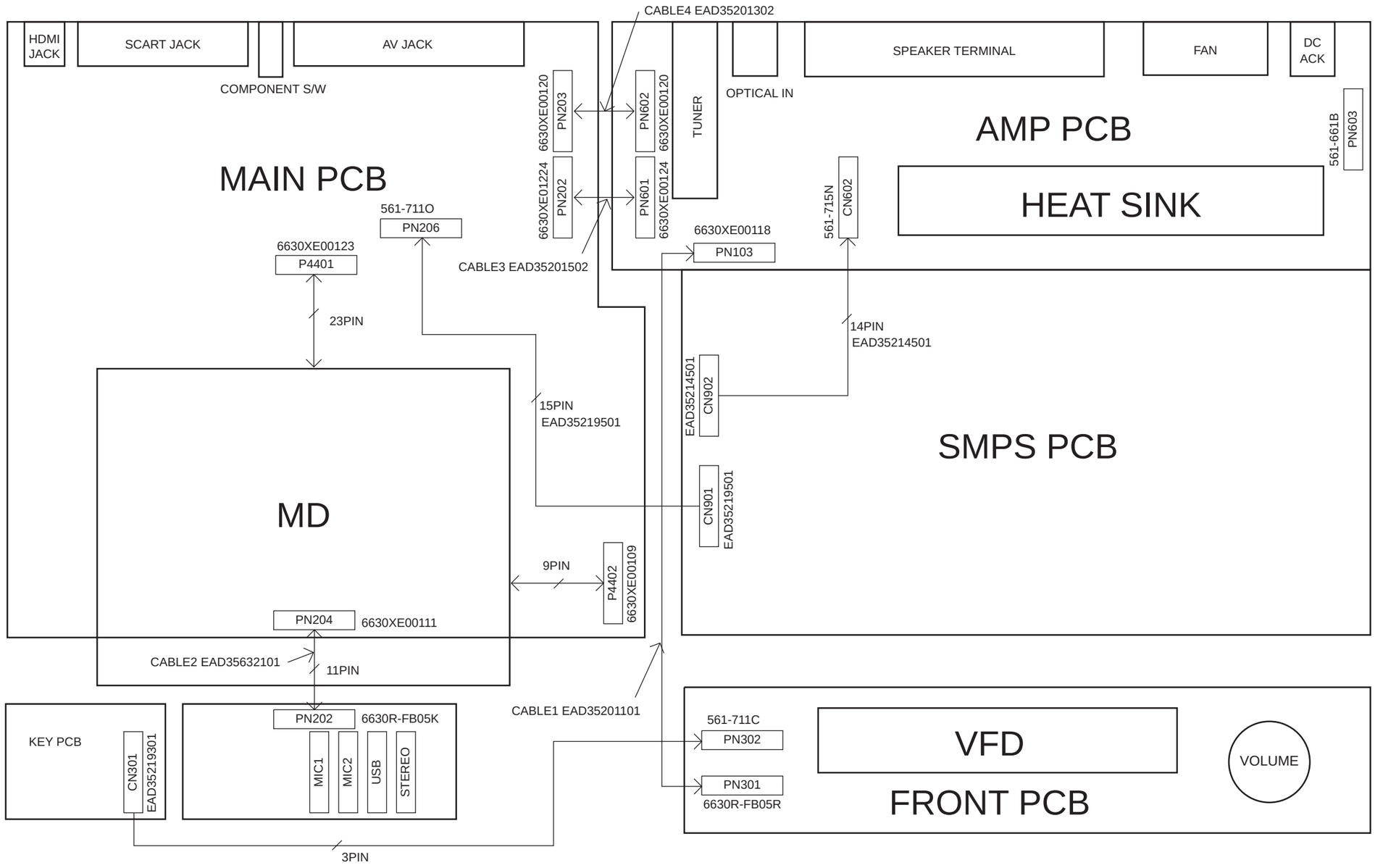
3. FRONT CIRCUIT (2/2)



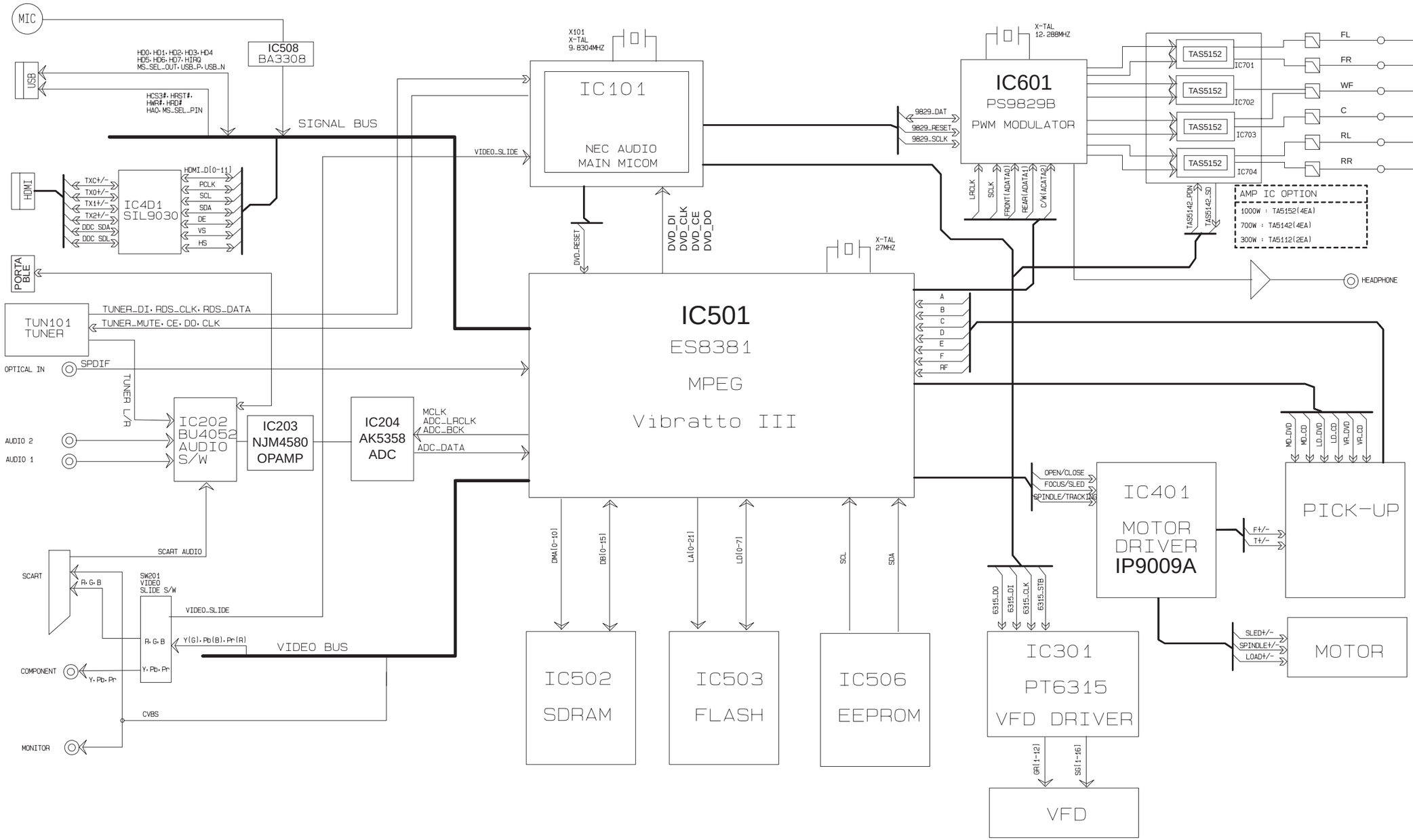


MEMO

WIRING DIAGRAM



BLOCK DIAGRAM



CIRCUIT DIAGRAMS

1. SMPS(POWER) CIRCUIT DIAGRAM

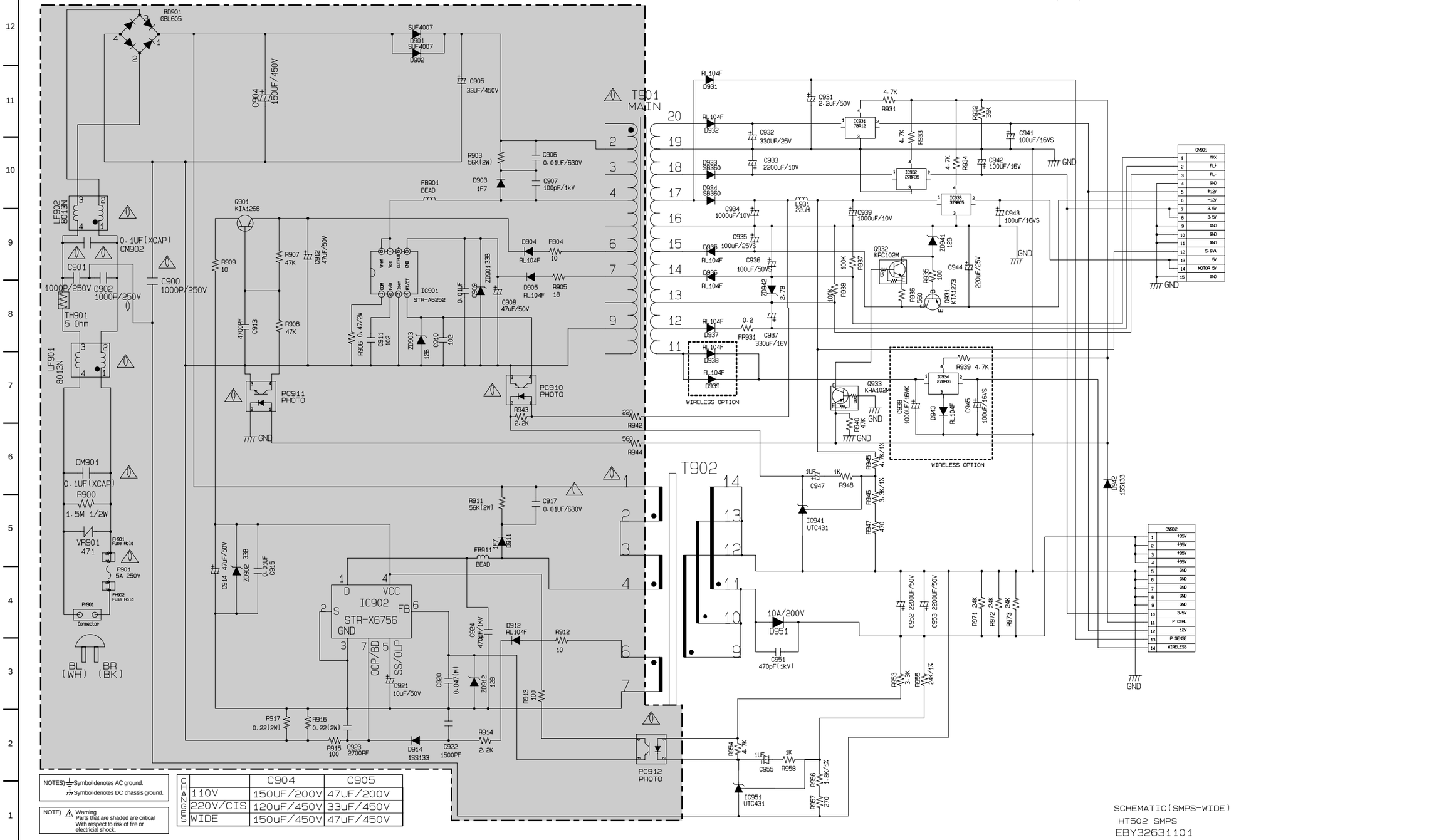
IMPORTANT SAFETY NOTICE

WHEN SERVICING THIS CHASSIS, UNDER NO CIRCUMSTANCES SHOULD THE ORIGINAL DESIGN BE MODIFIED OR ALTERED WITHOUT PERMISSION FROM THE LG 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.

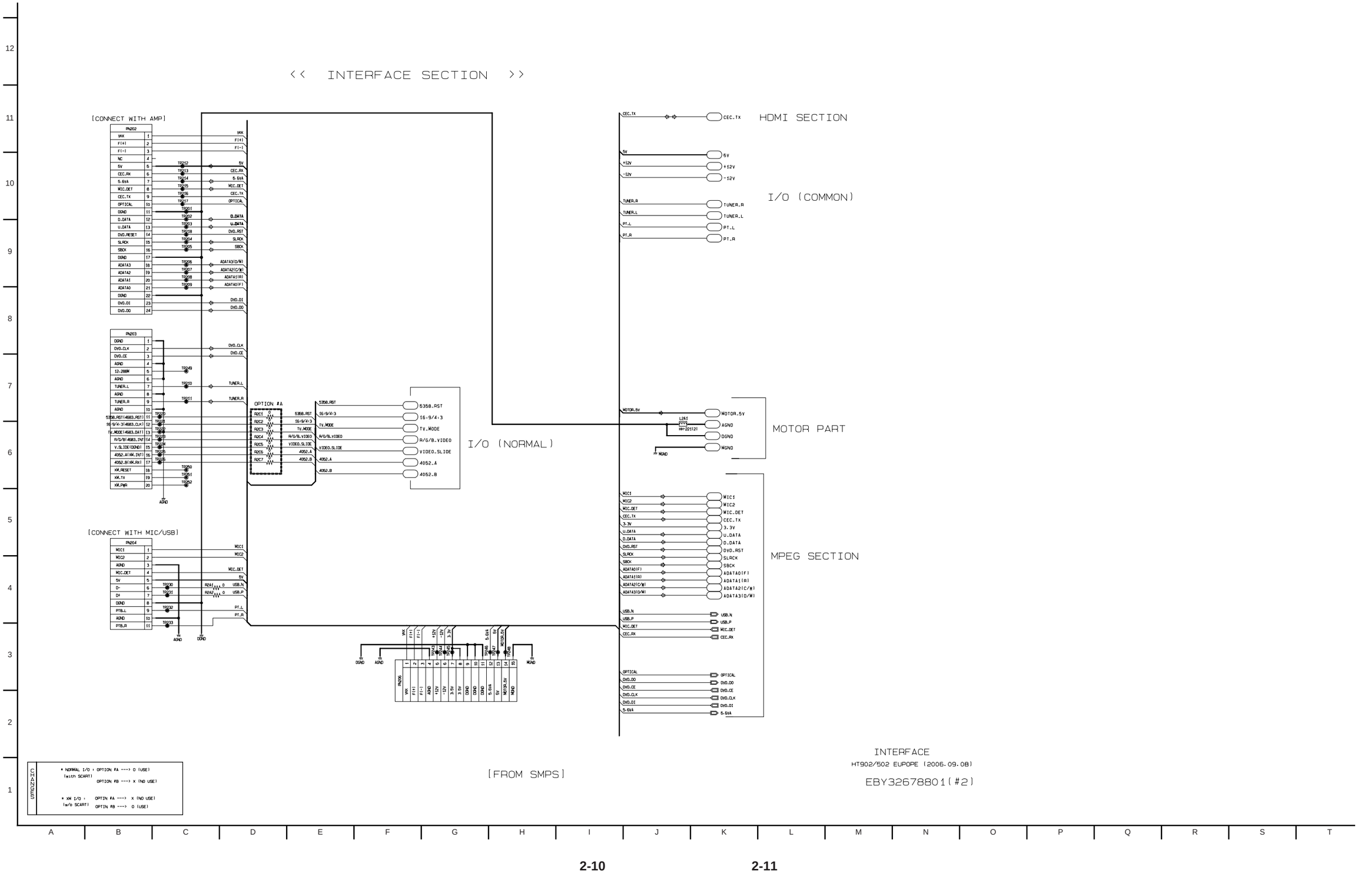


NOTES) ⏚ Symbol denotes AC ground.
⏚ Symbol denotes DC chassis ground.

NOTE) ⚠ Warning
Parts that are shaded are critical
With respect to risk of fire or
electricial shock.

CIS/WIDE	C904	C905
110V	150UF/200V	47UF/200V
220V/CIS	120uF/450V	33uF/450V
WIDE	150uF/450V	47uF/450V

2. POWER INTERFACE CIRCUIT DIAGRAM

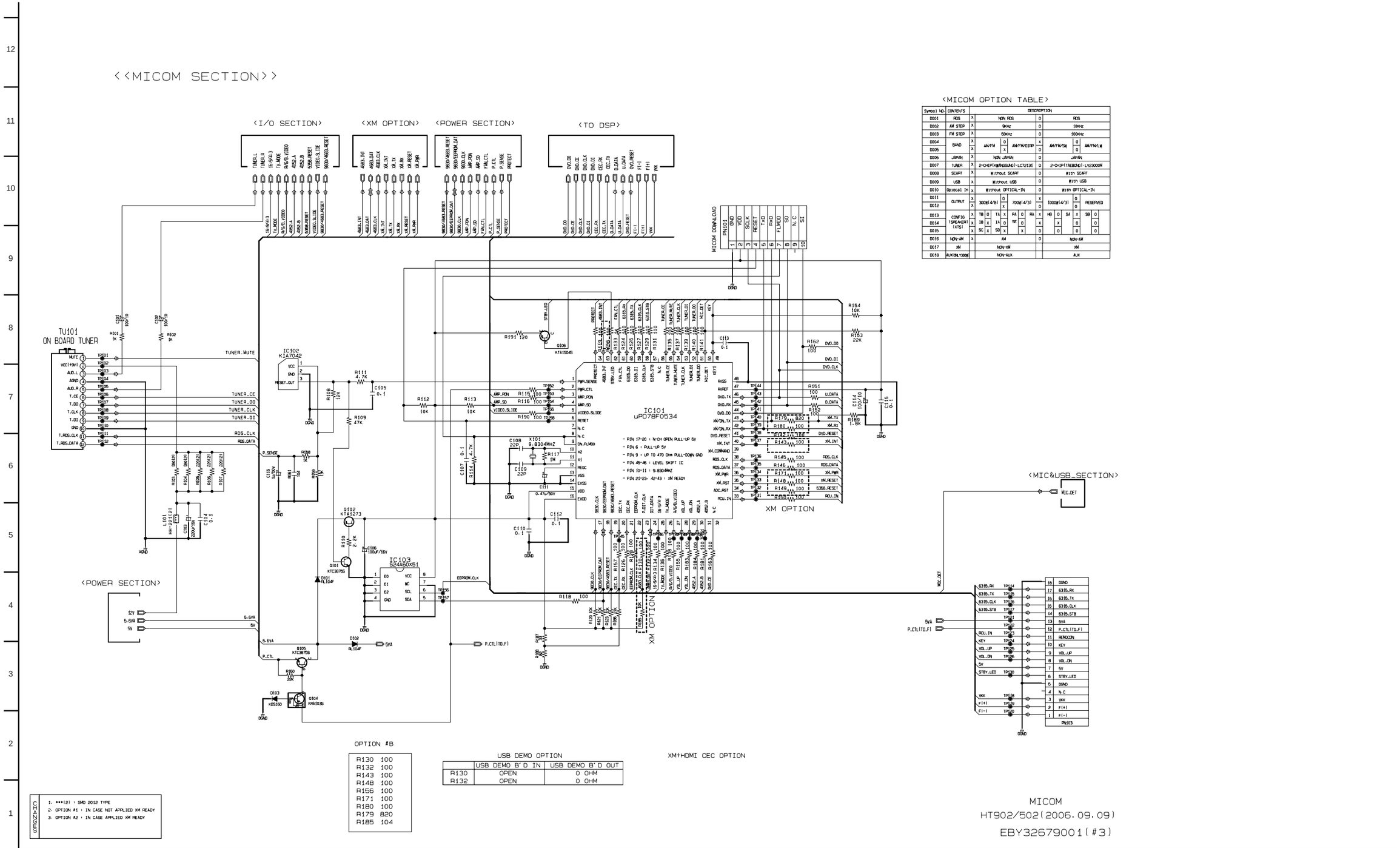


INTERFACE

HT902/502 EUROPE (2006.09.08)

EBY32678801(#2)

3. µ-COM(MAIN) CIRCUIT DIAGRAM



<MICOM OPTION TABLE>

Symbol No.	CONTENTS	DESCRIPTION					
D001	RDS	X	NON RDS	O	RDS		
D002	AM STEP	X	9KHz	O	10KHz		
D003	FM STEP	X	50KHz	O	100KHz		
D004	BAND	X	AM/FM O	O	AM/FM/SW O	AM/FM/LW	
D005		X	AM/FM X	X	AM/FM/DIRP O		
D006	JAPAN	X	NON JAPAN	O	JAPAN		
D007	TUNER	X	2-CH(PIONEER)-LC72131	O	2-CH(PITABERG)-LV23000M		
D008	SCART	X	Without SCART	O	With SCART		
D009	USB	X	Without USB	O	With USB		
D010	Optical In	X	Without OPTICAL-IN	O	With OPTICAL-IN		
D011	OUTPUT	X	300M(4/8) O	X	700M(4/3) O	1000M(4/3)	O RESERVED
D012		X		X		O	O
D013	CONFIG (SPEAKER) (ATS)	X	TB O TA X	PA O	RA X	HB O	SA X SB O
D014		X	TB X TA O	SE O		X	X O O
D015		X	SC X SD X	X		O	O O O
D016	NON-AM	X	AM	O	NON-AM		
D017	XM		NON-XM		XM		
D018	AUX(DLY300M)		NON-AUX		AUX		

OPTION #B

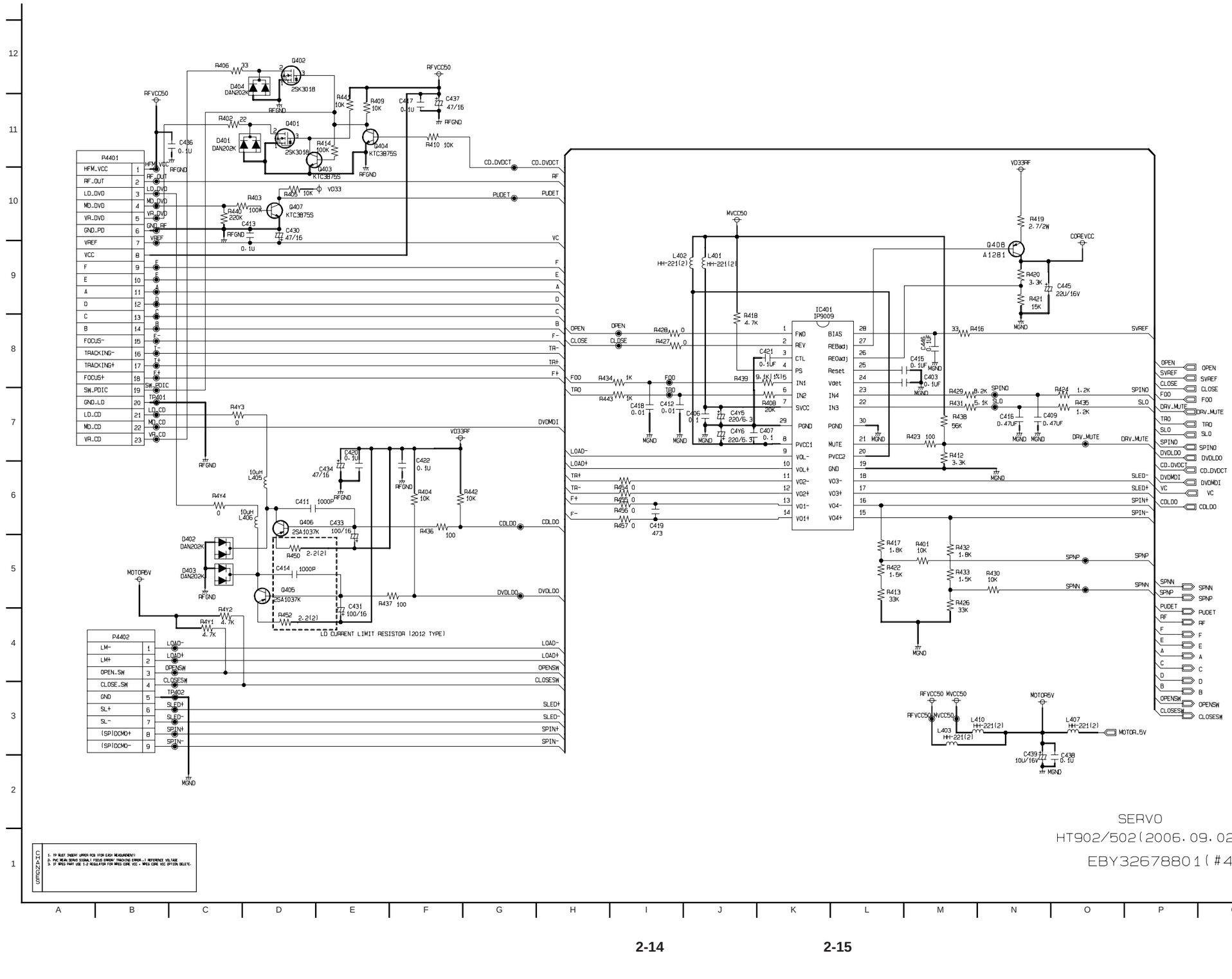
R130	100
R132	100
R143	100
R148	100
R156	100
R171	100
R180	100
R179	820
R185	104

USB DEMO OPTION

	USB DEMO B'D IN	USB DEMO B'D OUT
R130	OPEN	0 OHM
R132	OPEN	0 OHM

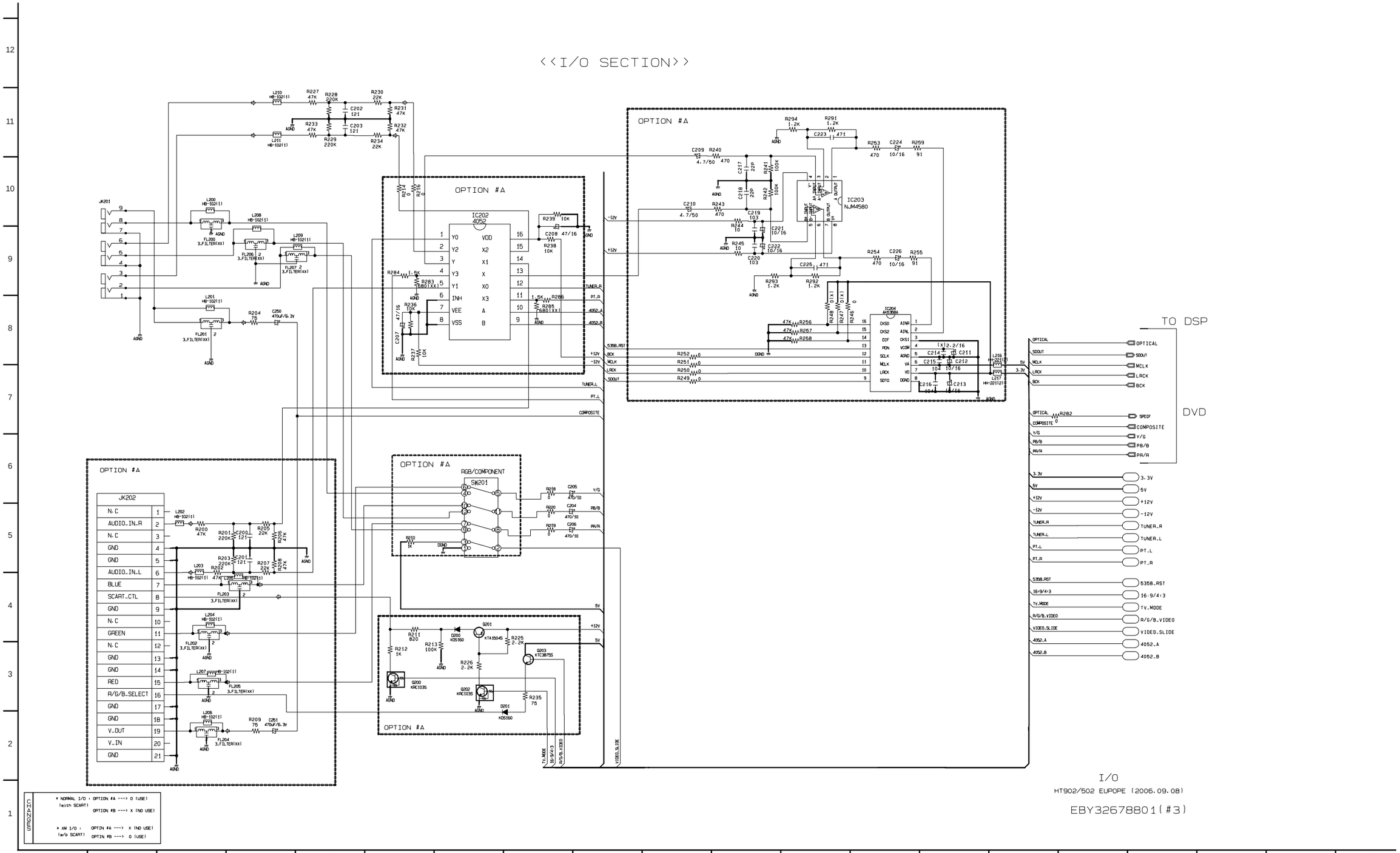
1. ***[2] : SMD 2012 TYPE
2. OPTION #1 : IN CASE NOT APPLIED XM READY
3. OPTION #2 : IN CASE APPLIED XM READY

4. SERVO CIRCUIT DIAGRAM



SERVO
HT902/502(2006.09.02)
EBY32678801(#4)

5. I/O CIRCUIT DIAGRAM

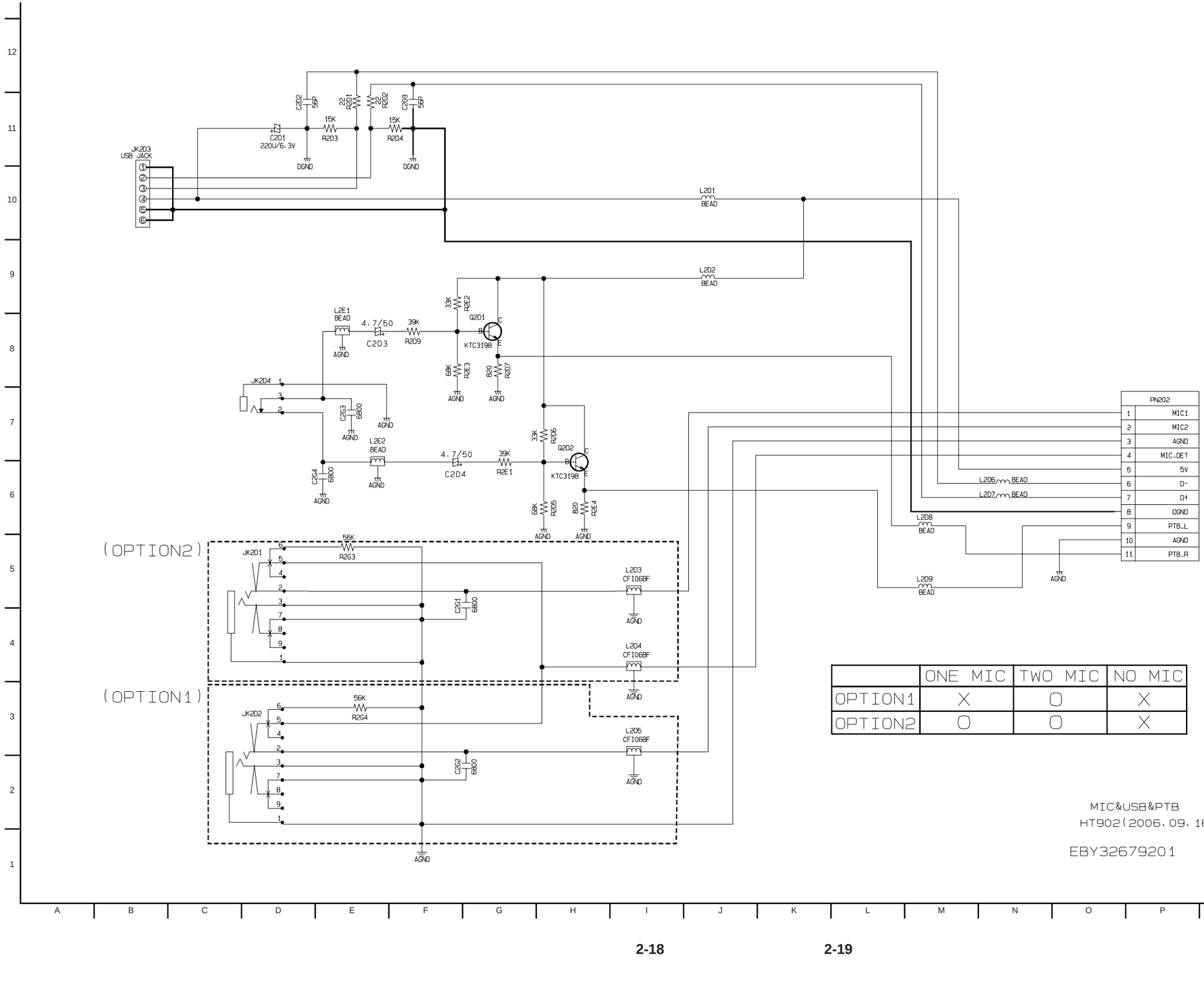


I/O

HT902/502 EUROPE (2006.09.08)

EBY32678801(#3)

6. MIC & USB & PTB CIRCUIT DIAGRAM

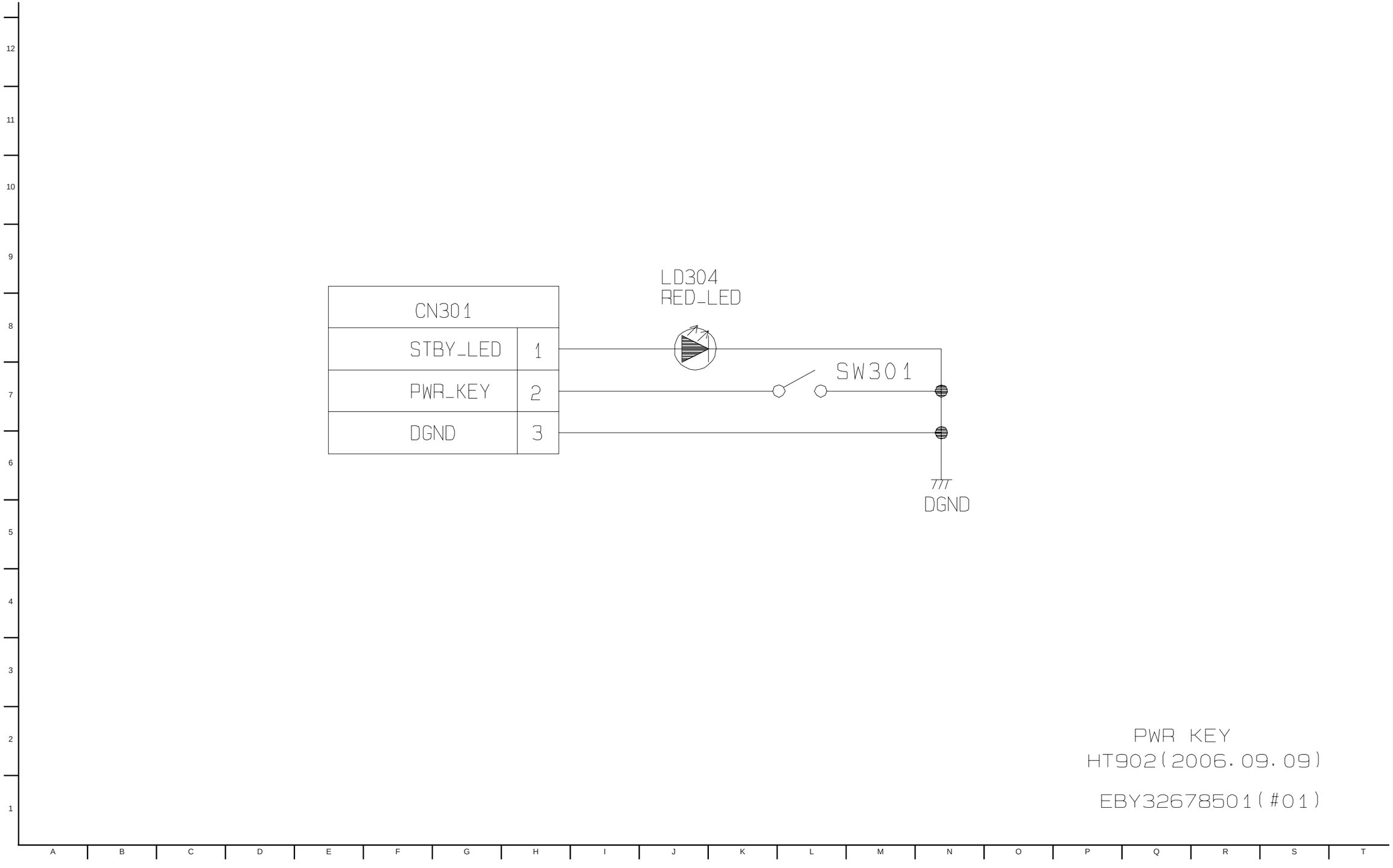


	ONE MIC	TWO MIC	NO MIC
OPTION1	X	O	X
OPTION2	O	O	X

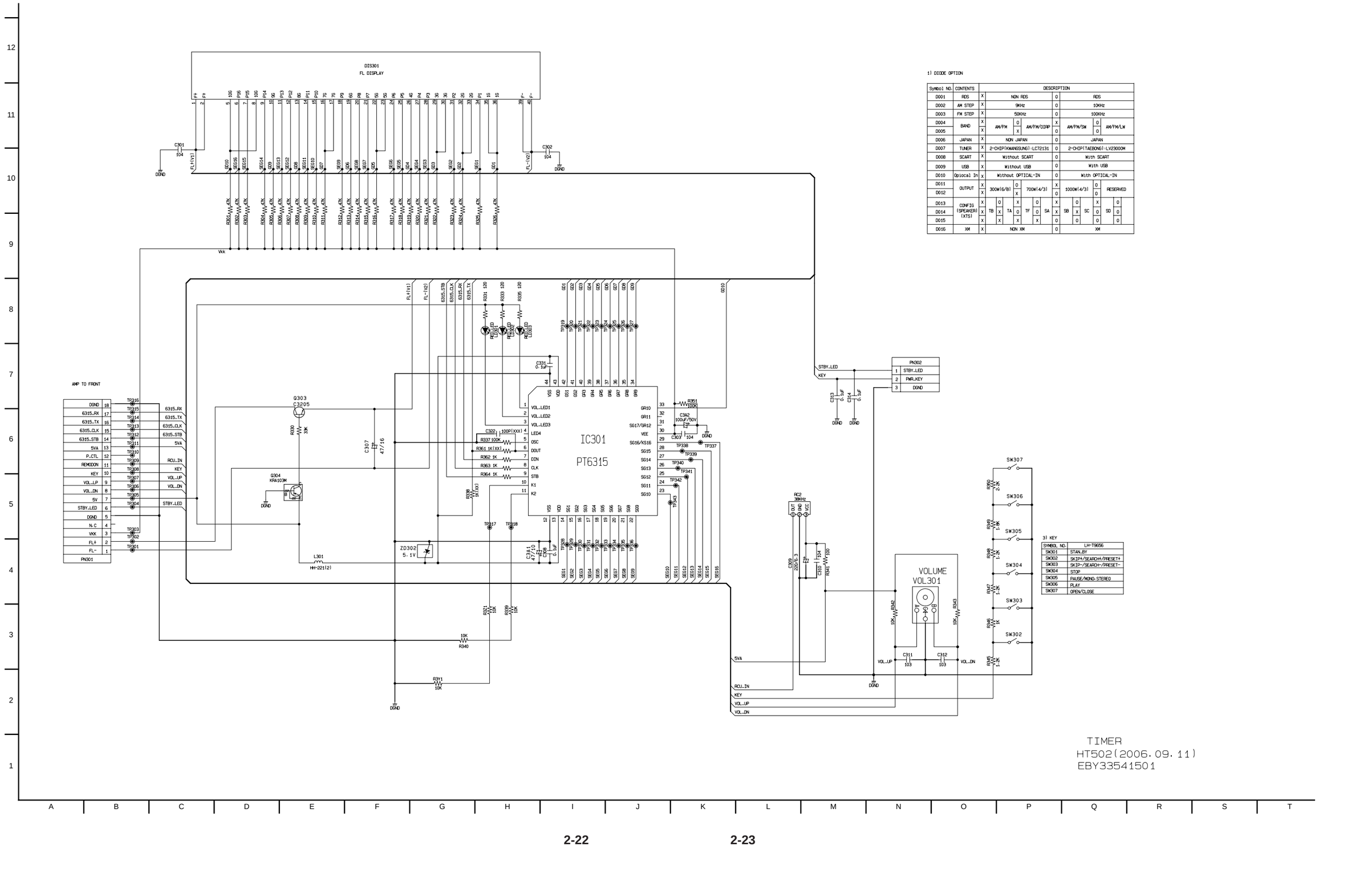
MIC&USB&PTB
HT902(2006.09.16)

EBY32679201

7. POWER KEY CIRCUIT DIAGRAM



8. TIMER CIRCUIT DIAGRAM

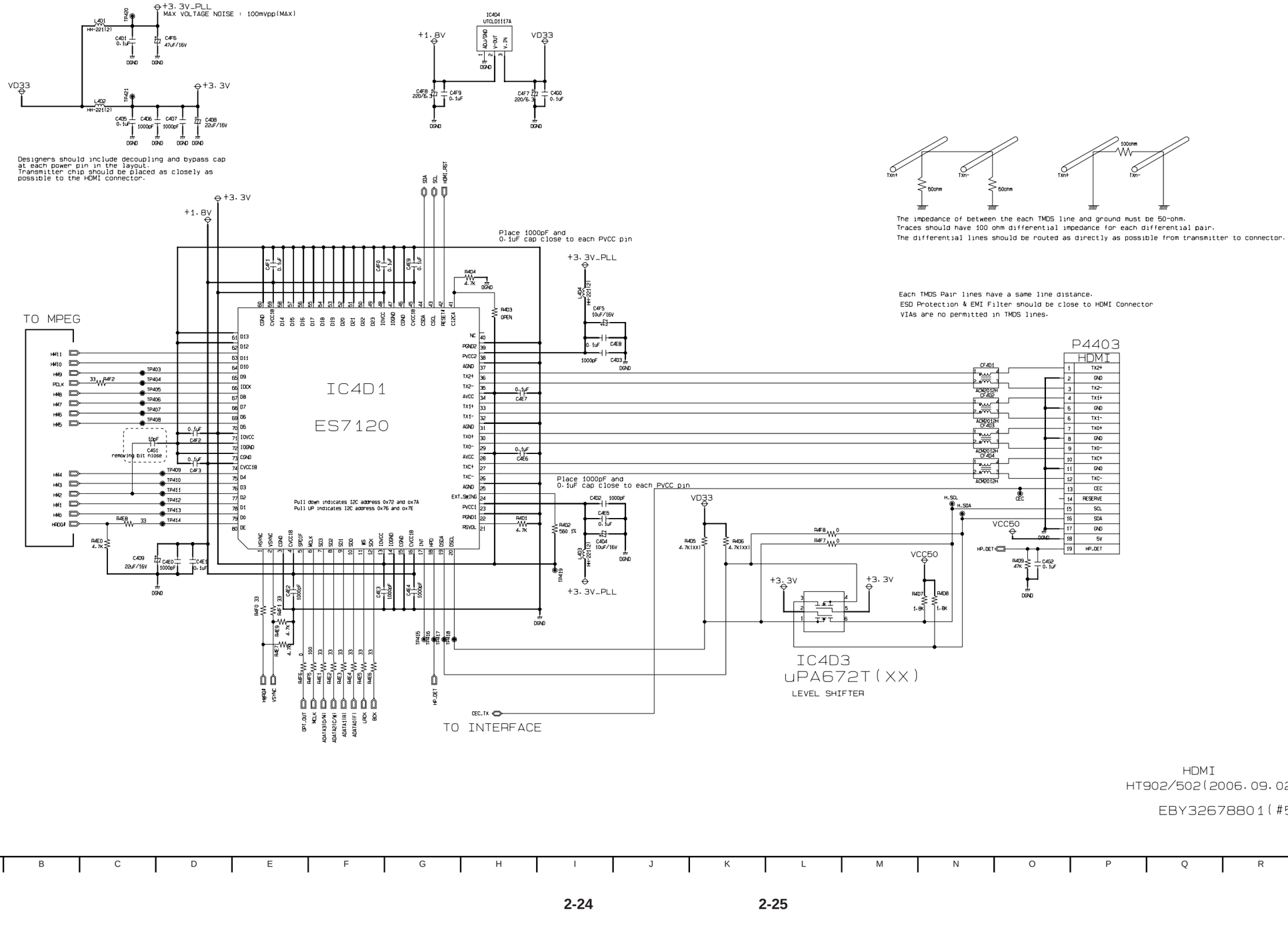


1) DIODE OPTION

Symbol NO.	CONTENTS	DESCRIPTION								
D001	RDS	X	NON RDS			0	RDS			
D002	AM STEP	X	9KHz			0	10KHz			
D003	FM STEP	X	50KHz			0	100KHz			
D004	BAND	X	AM/FM	0	AM/FM/DIRP	X	AM/FM/SW	0	AM/FM/LW	
D005		X		X		0		0		
D006	JAPAN	X	NON JAPAN			0	JAPAN			
D007	TUNER	X	2-CHIP(KWANGSUNG):LC72131			0	2-CHIP(TAEBONG):LV23000M			
D008	SCART	X	Without SCART			0	With SCART			
D009	USB	X	Without USB			0	With USB			
D010	Opiocal In	X	Without OPTICAL-IN			0	With OPTICAL-IN			
D011	OUTPUT	X	300W(6/8)	0	700W(4/3)	X	1000W(4/3)	0	RESERVED	
D012		X		X		0		0		
D013	CONFIG (SPEAKER) (XTS)	X	0		X	0		X	0	
D014		X	TB	X	TA	0	TF	0	SA	X
D015		X		X		X		0		
D016	XM	X	NON XM			0	XM			

SB	0 / X	SC	0 / X	SD	0 / X
	0		0		0

9. HDMI CIRCUIT DIAGRAM

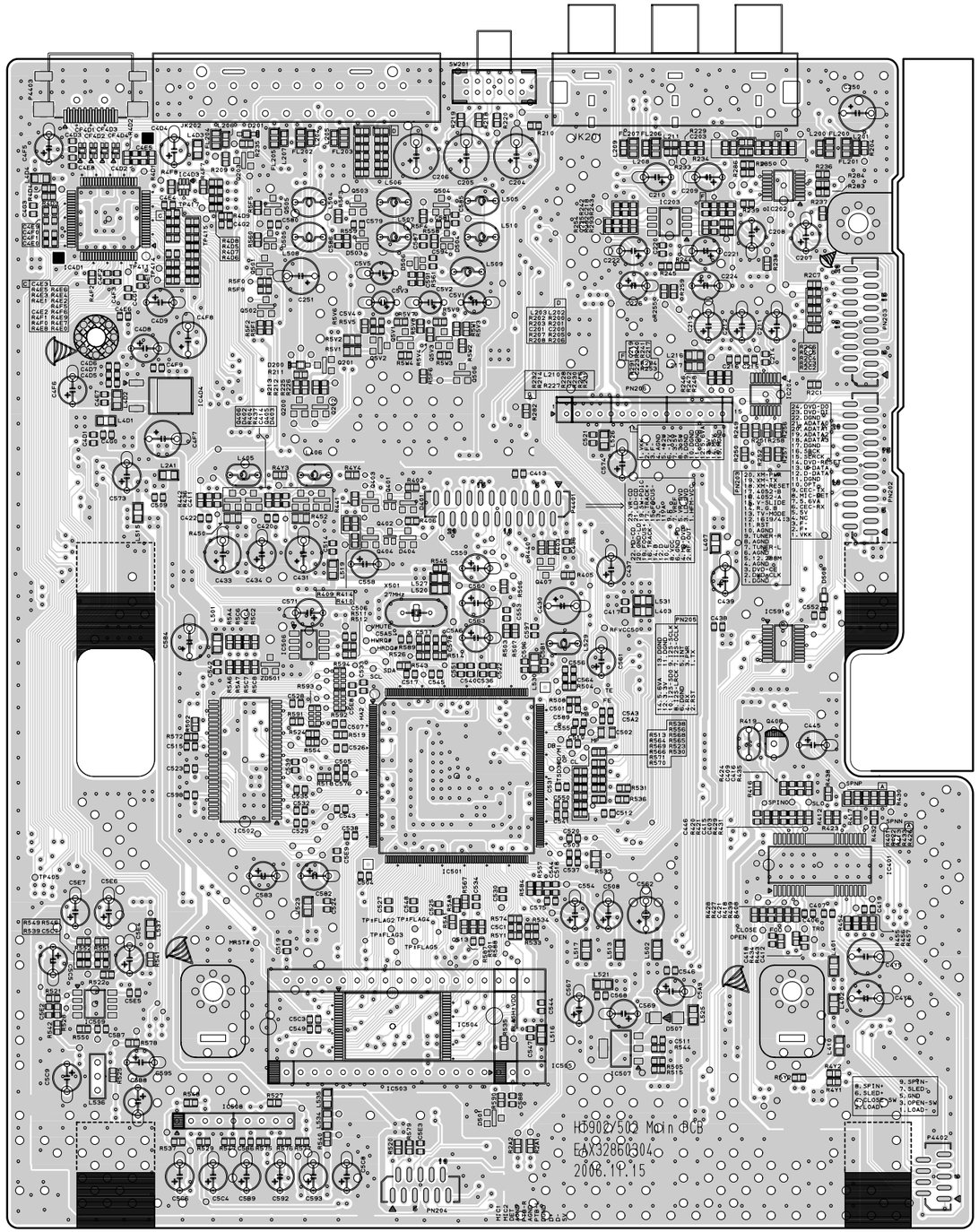


HDMI
HT902/502(2006.09.02)

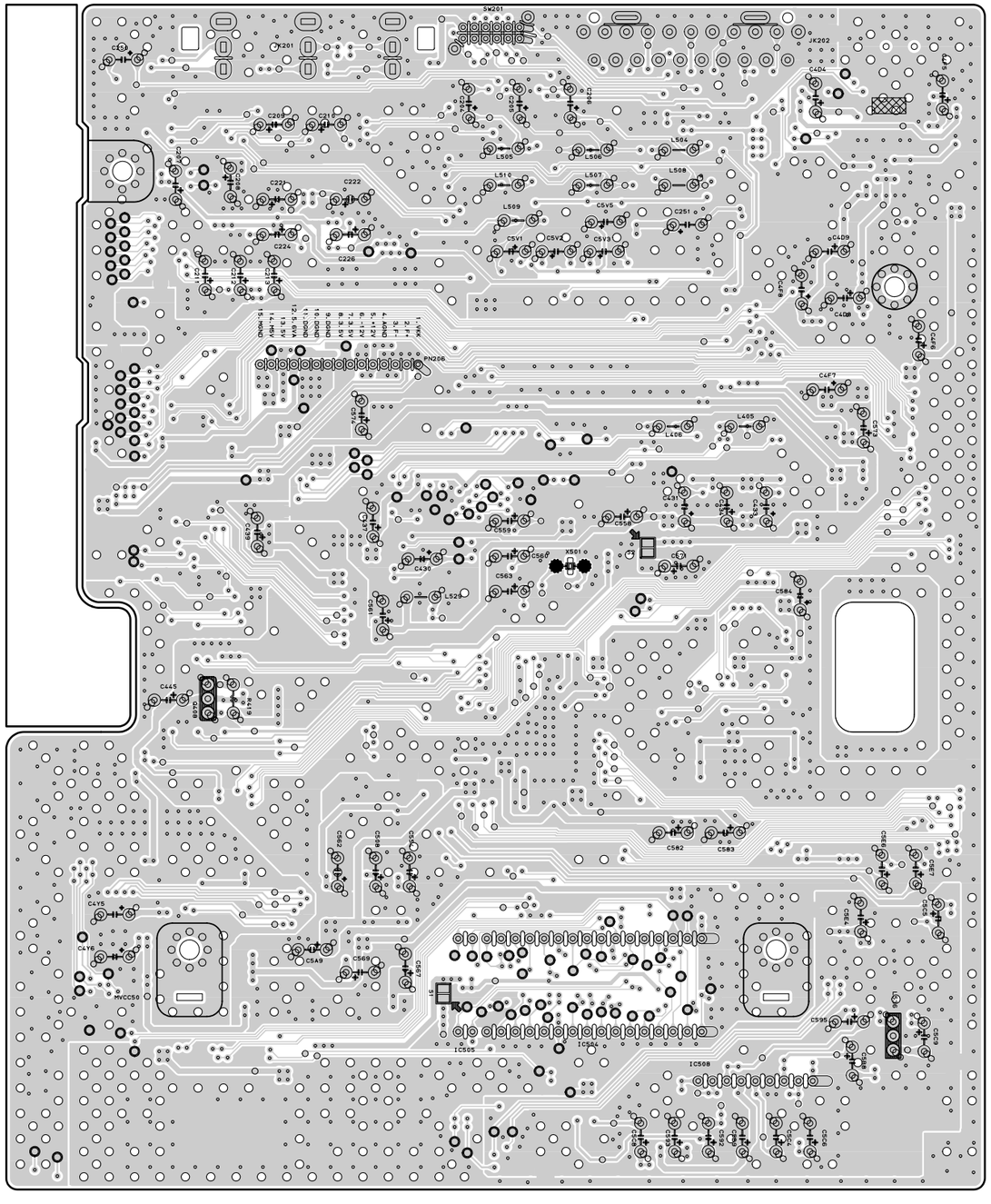
EBY32678801(#5)

PRINTED CIRCUIT BOARD DIAGRAMS

1. MAIN P.C. BOARD DIAGRAM (TOP VIEW)

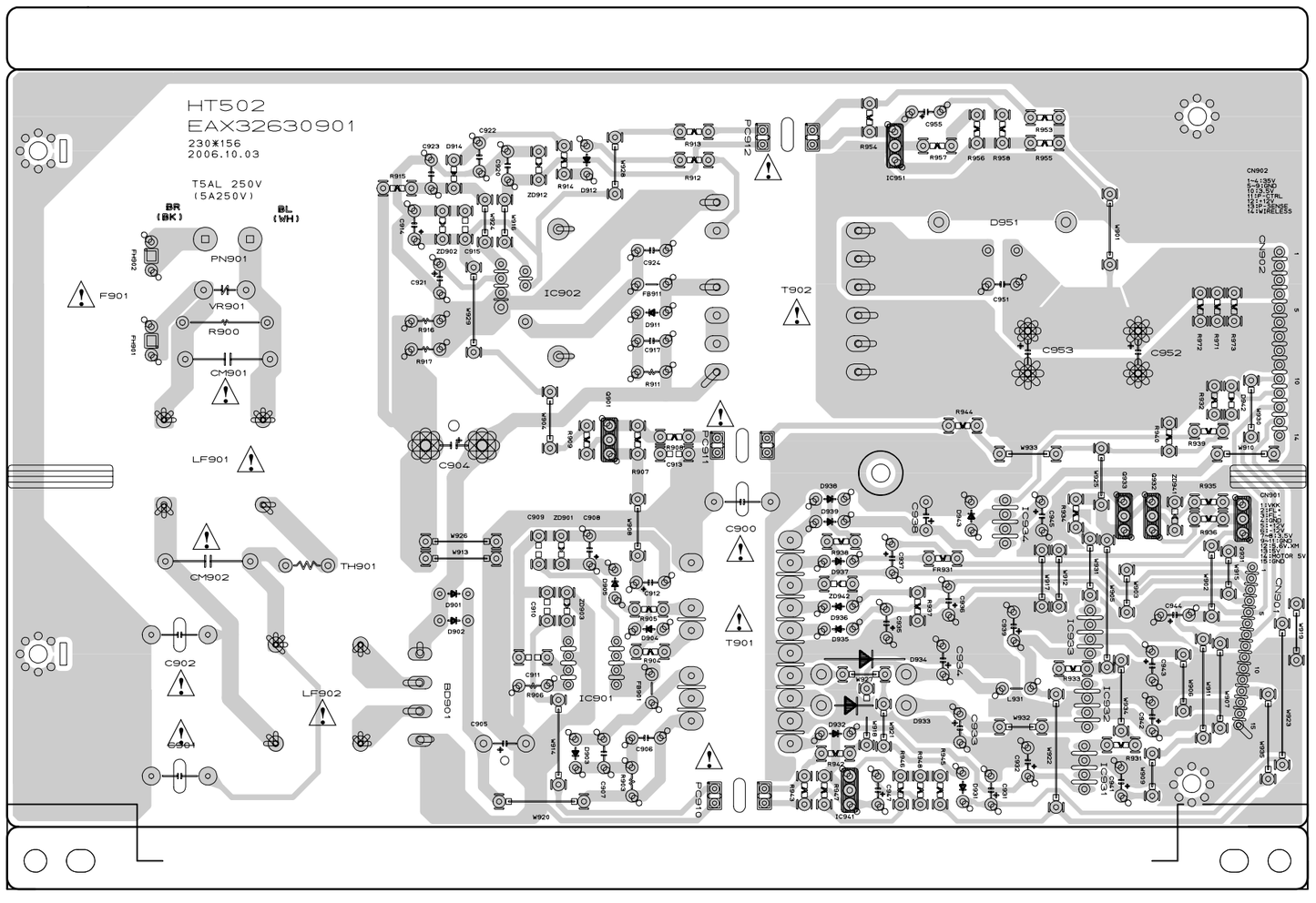


2. MAIN P.C. BOARD DIAGRAM (BOTTOM VIEW)

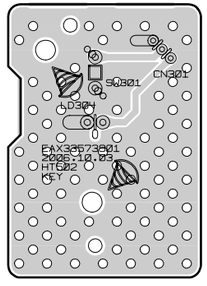


3. SMPS P.C. BOARD

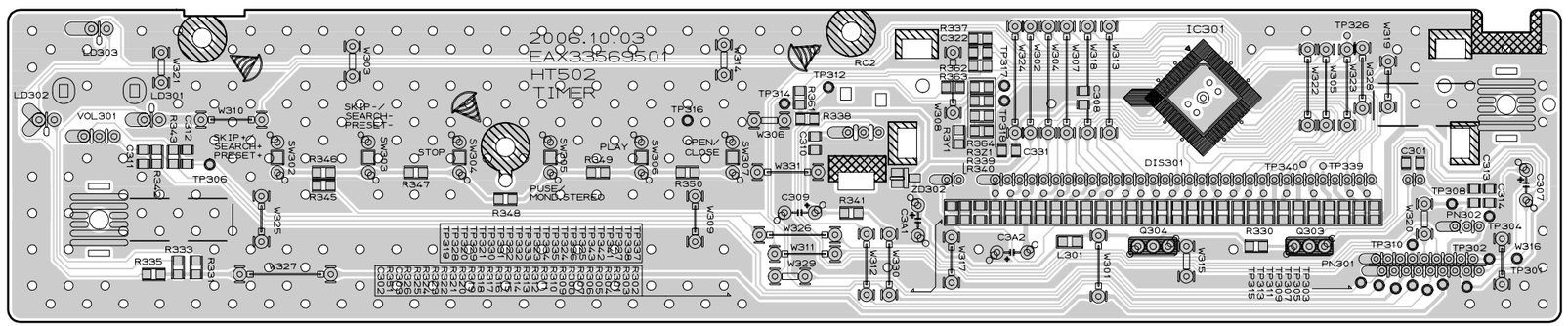
NOTES) ⚠ Warning
Parts that are shaded are critical with respect to risk of fire or electricial shock.



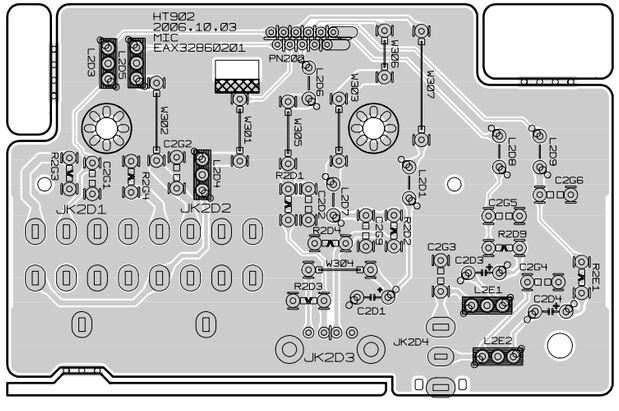
4. KEY P.C. BOARD



5. TIMER P.C. BOARD



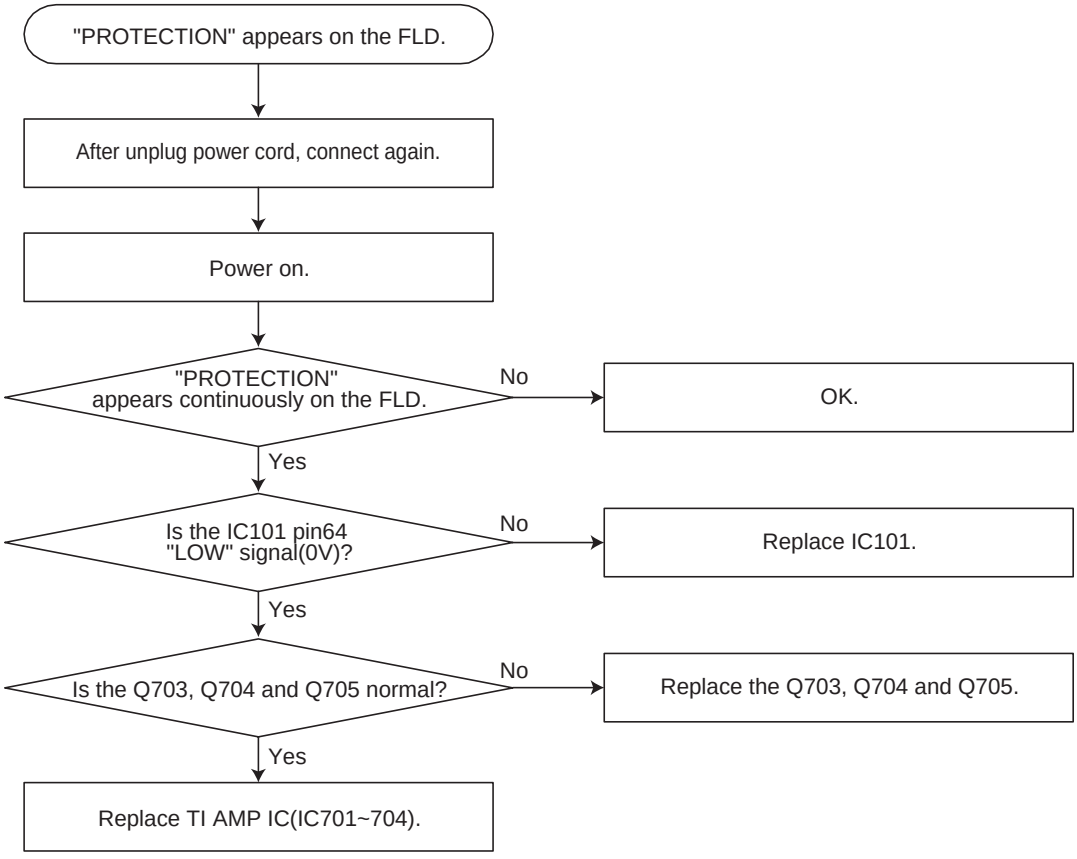
6. USB P.C. BOARD



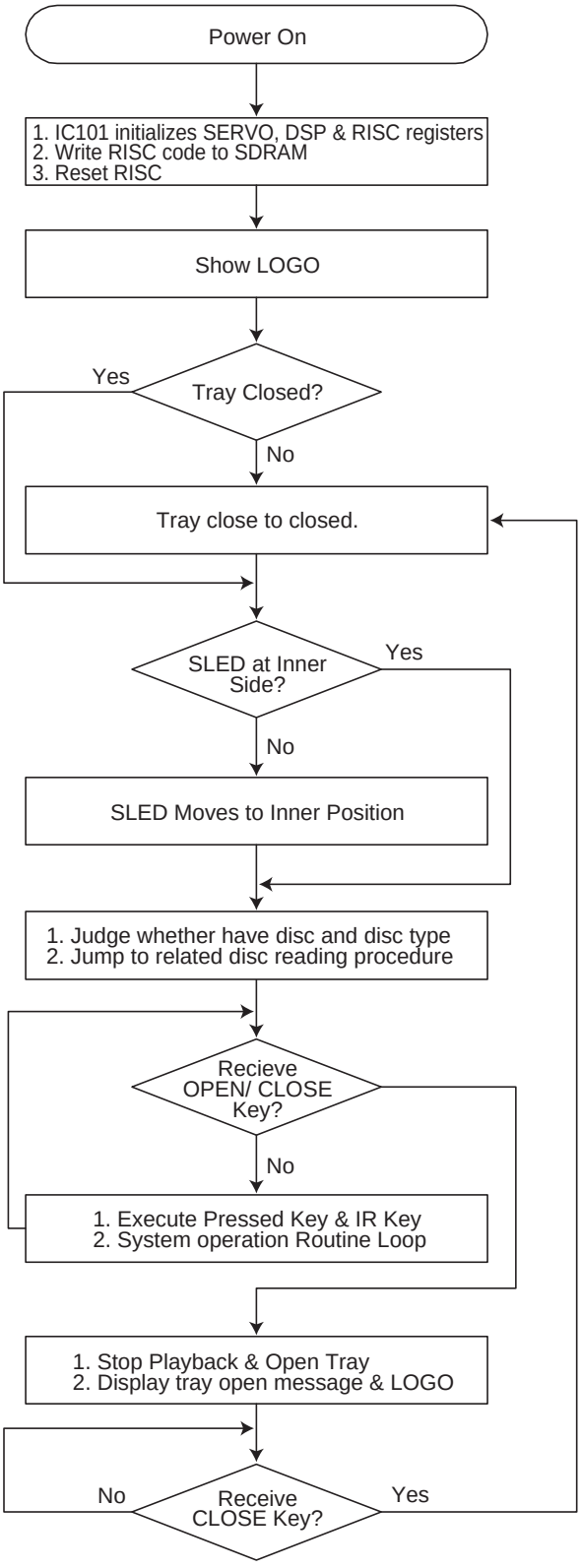
SECTION 3. DVD & AMP PART

ELECTRICAL TROUBLESHOOTING GUIDE

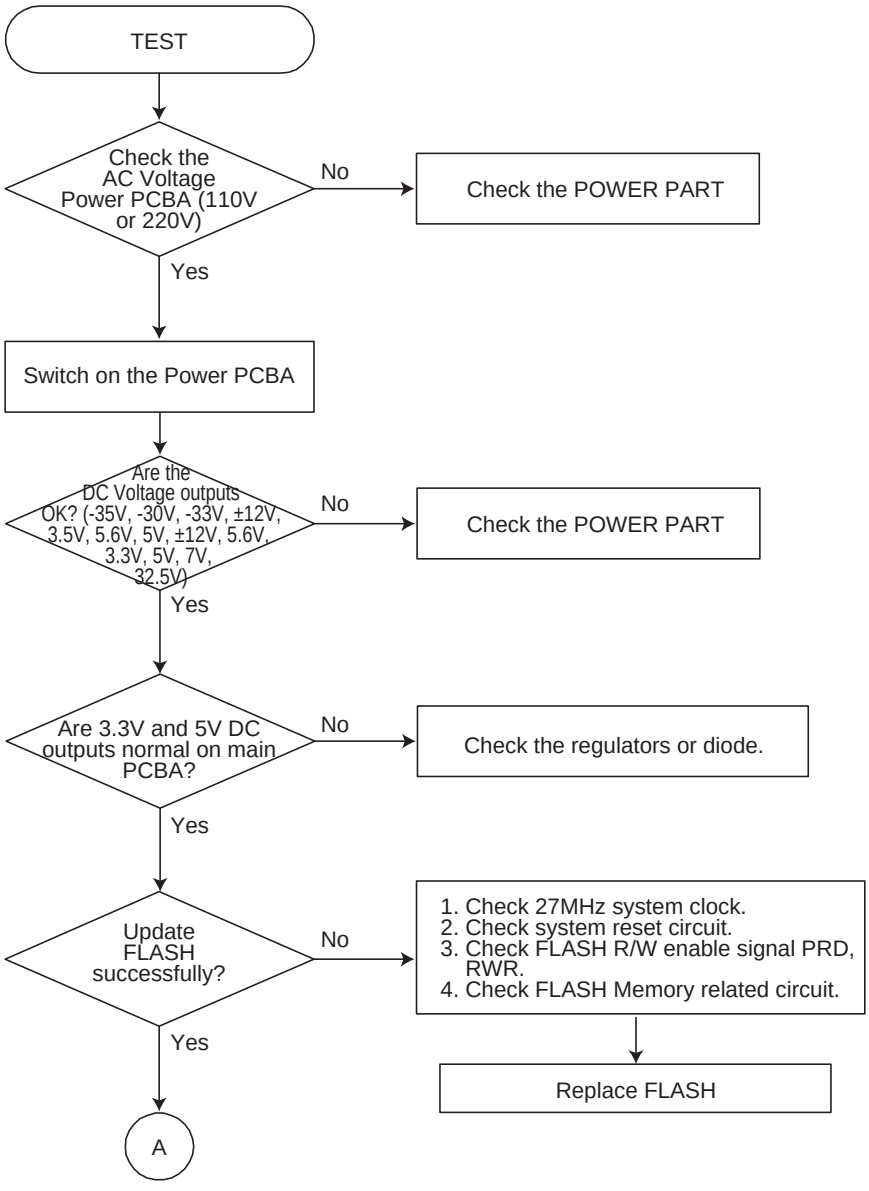
1. AMP PROTECTION

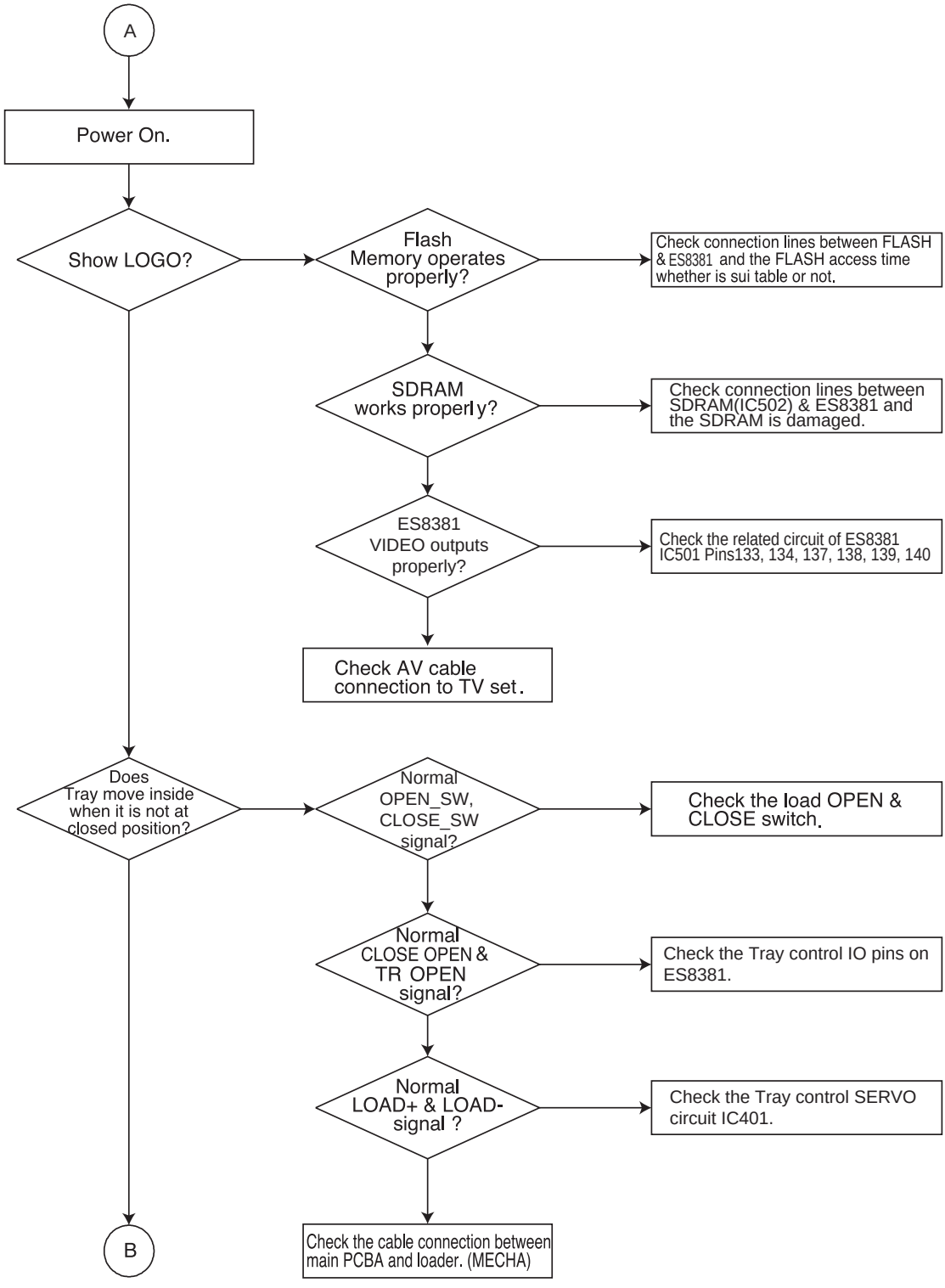


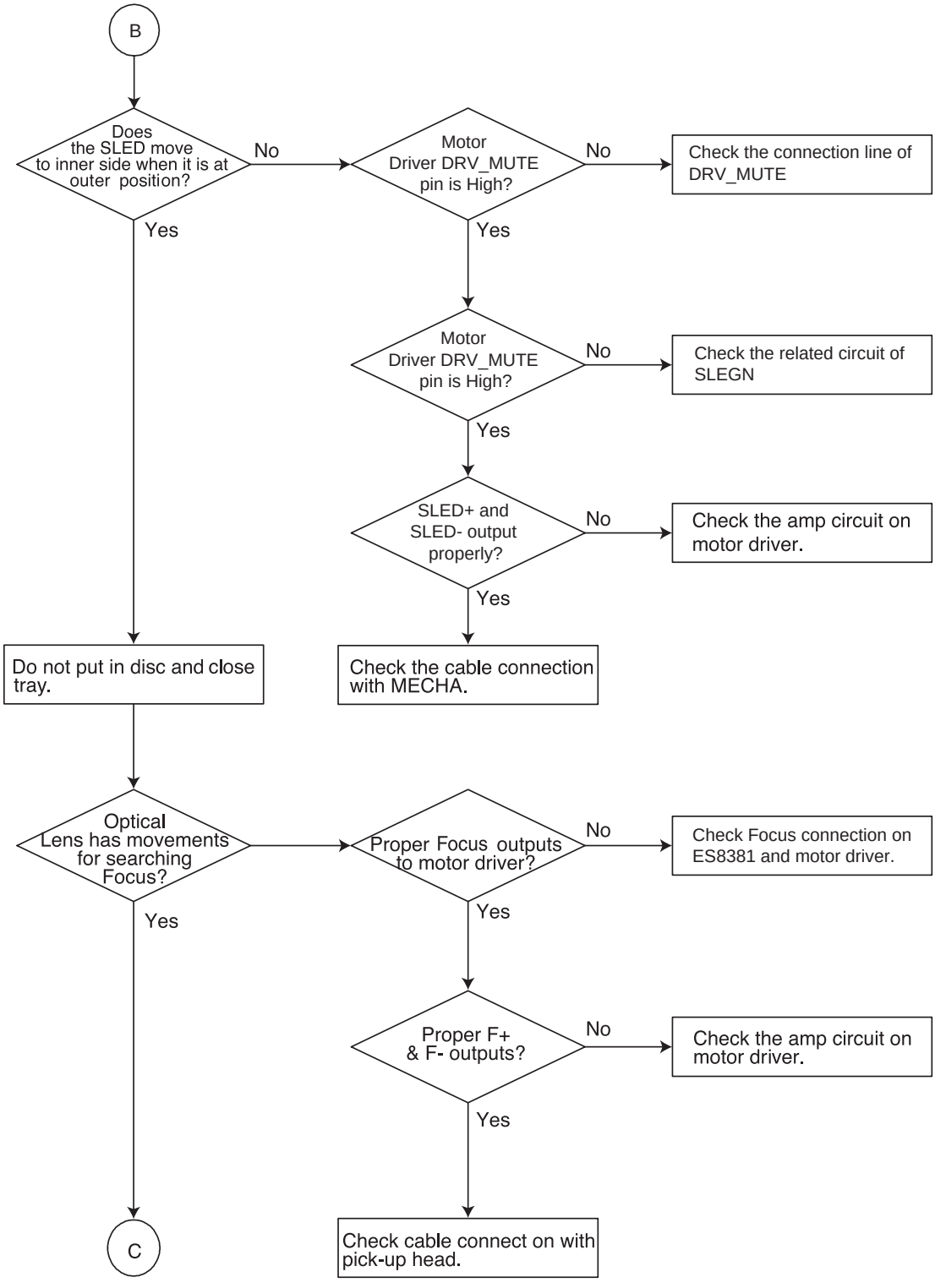
2. SYSTEM OPERATION FLOW

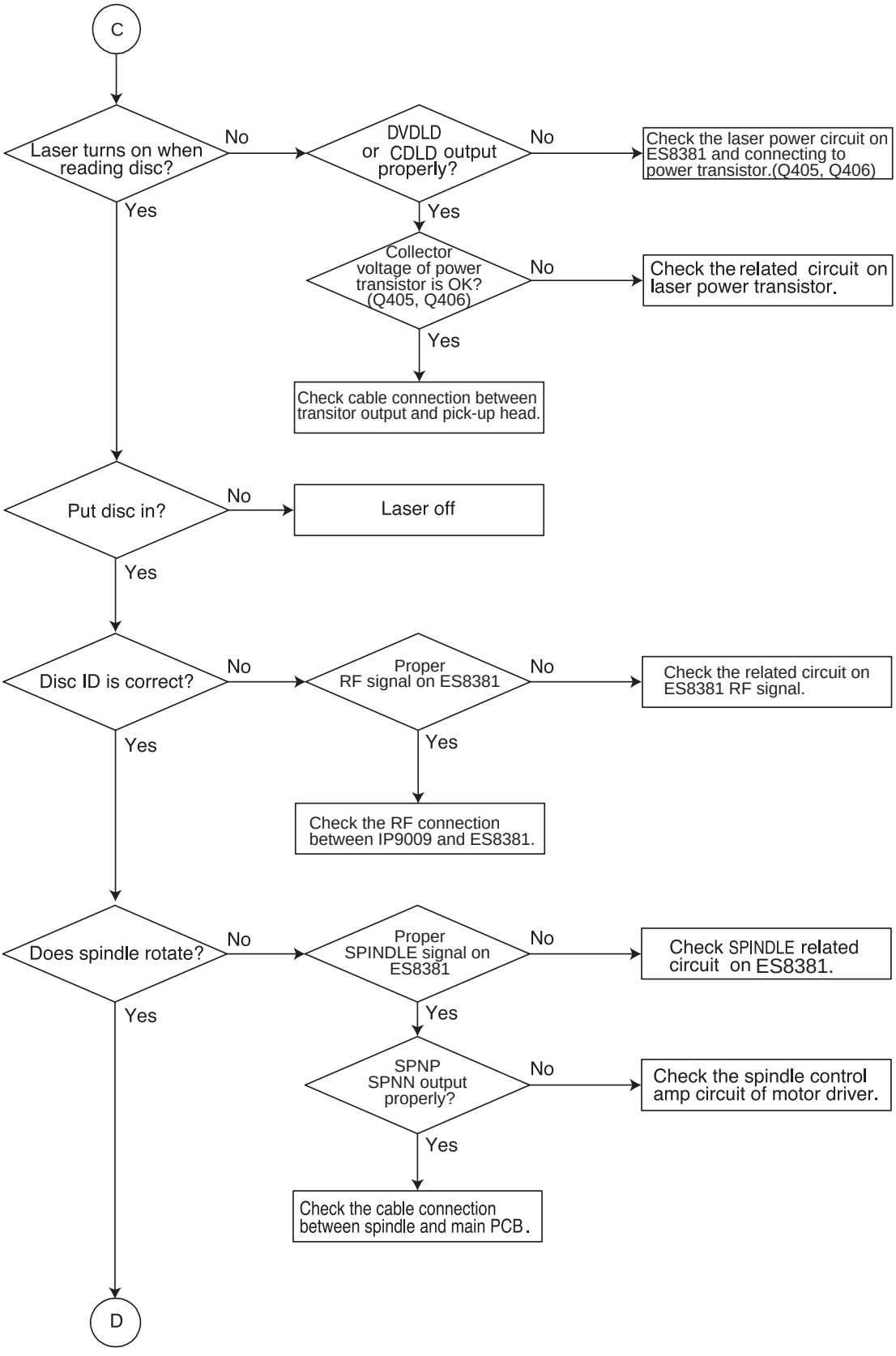


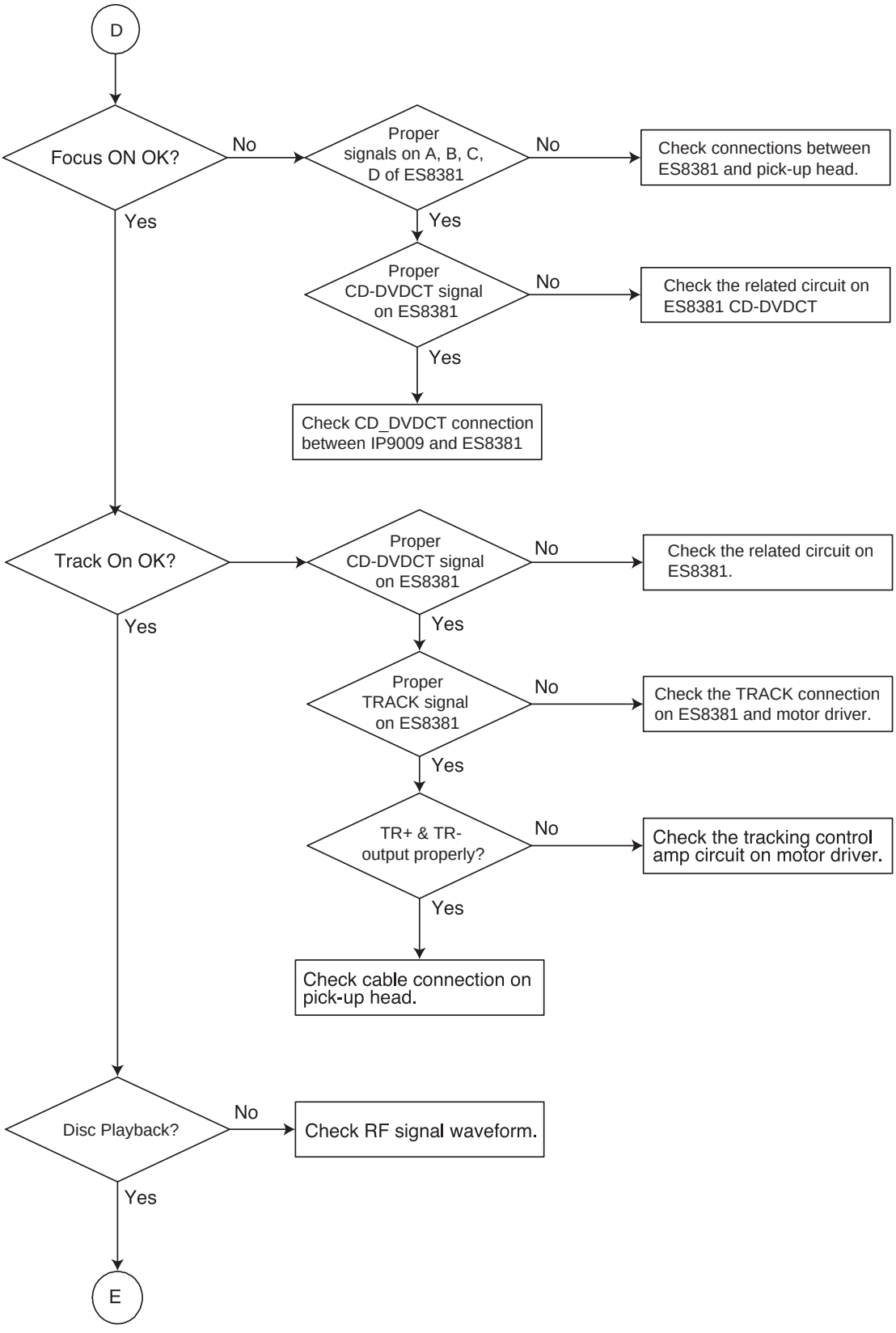
3. TEST & DEBUG FLOW

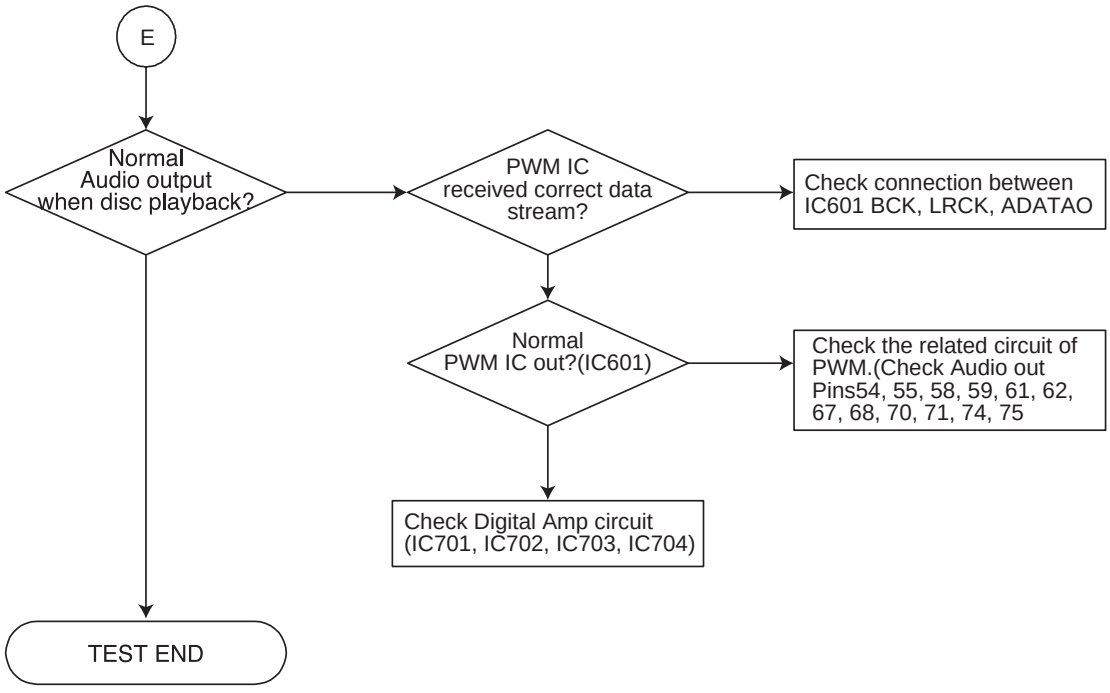



A
Power On.
Show LOGO?
Flash Memory operates properly?
Check connection lines between FLASH & ES8381 and the FLASH access time whether is sui table or not.
SDRAM works properly?
Check connection lines between SDRAM(IC502) & ES8381 and the SDRAM is damaged.
ES8381 VIDEO outputs properly?
Check the related circuit of ES8381 IC501 Pins133, 134, 137, 138, 139, 140
Check AV cable connection to TV set.
Does Tray move inside when it is not at closed position?
Normal OPEN_SW, CLOSE_SW signal?
Check the load OPEN & CLOSE switch.
Normal CLOSE OPEN & TR OPEN signal?
Check the Tray control IO pins on ES8381.
Normal LOAD+ & LOAD- signal ?
Check the Tray control SERVO circuit IC401.
B
Check the cable connection between main PCBA and loader. (MECHA)

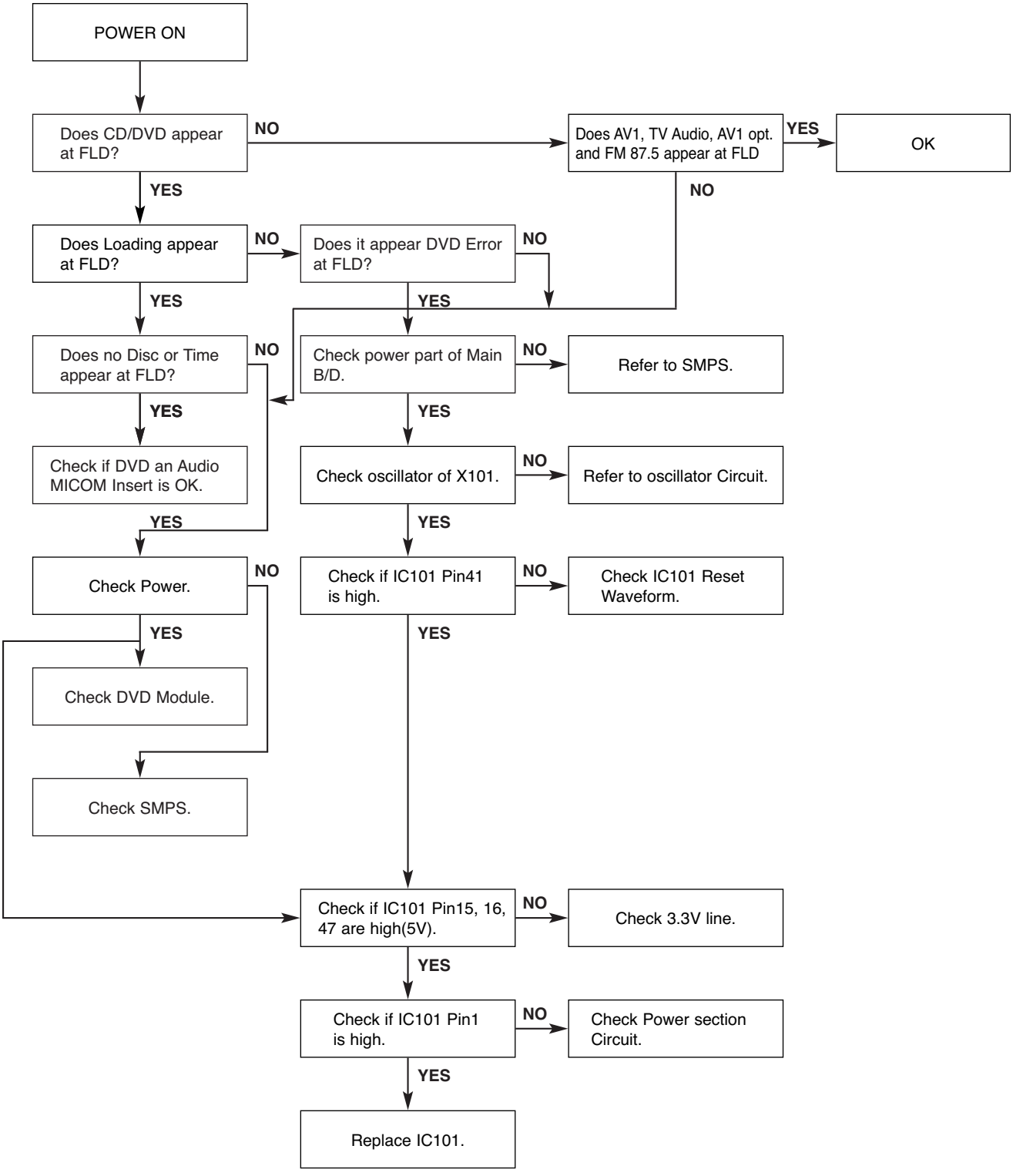

B
Does the SLED move to inner side when it is at outer position?
No
Yes
Motor Driver DRV_MUTE pin is High?
No
Check the connection line of DRV_MUTE
Yes
Motor Driver DRV_MUTE pin is High?
No
Check the related circuit of SLEGN
Yes
SLED+ and SLED- output properly?
No
Check the amp circuit on motor driver.
Yes
Do not put in disc and close tray.
Check the cable connection with MECHA.
Optical Lens has movements for searching Focus?
Proper Focus outputs to motor driver?
No
Check Focus connection on ES8381 and motor driver.
Yes
Proper F+ & F- outputs?
No
Check the amp circuit on motor driver.
Yes
C
Check cable connect on with pick-up head.


C
Laser turns on when reading disc?
No
DVDLD or CDLD output properly?
No
Check the laser power circuit on ES8381 and connecting to power transistor.(Q405, Q406)
Yes
Yes
Collector voltage of power transistor is OK? (Q405, Q406)
No
Check the related circuit on laser power transistor.
Yes
Check cable connection between transitor output and pick-up head.
Put disc in?
No
Laser off
Yes
Disc ID is correct?
No
Proper RF signal on ES8381
No
Check the related circuit on ES8381 RF signal.
Yes
Yes
Check the RF connection between IP9009 and ES8381.
Does spindle rotate?
No
Proper SPINDLE signal on ES8381
No
Check SPINDLE related circuit on ES8381.
Yes
Yes
SPNP SPNN output properly?
No
Check the spindle control amp circuit of motor driver.
Yes
Check the cable connection between spindle and main PCB.
D


D
Focus ON OK?
No
Proper signals on A, B, C, D of ES8381
No
Check connections between ES8381 and pick-up head.
Yes
Yes
Proper CD-DVDCT signal on ES8381
No
Check the related circuit on ES8381 CD-DVDCT
Yes
Check CD_DVDCT connection between IP9009 and ES8381
Track On OK?
Yes
Proper CD-DVDCT signal on ES8381
No
Check the related circuit on ES8381.
Yes
Proper TRACK signal on ES8381
No
Check the TRACK connection on ES8381 and motor driver.
Yes
TR+ & TR- output properly?
No
Check the tracking control amp circuit on motor driver.
Yes
Check cable connection on pick-up head.
Disc Playback?
No
Check RF signal waveform.
Yes
E


E
Normal
Audio output
when disc playback?
PWM IC
received correct data
stream?
Check connection between
IC601 BCK, LRCK, ADATAO
Normal
PWM IC out?(IC601)
Check the related circuit of
PWM.(Check Audio out
Pins54, 55, 58, 59, 61, 62,
67, 68, 70, 71, 74, 75
Check Digital Amp circuit
(IC701, IC702, IC703, IC704)
TEST END

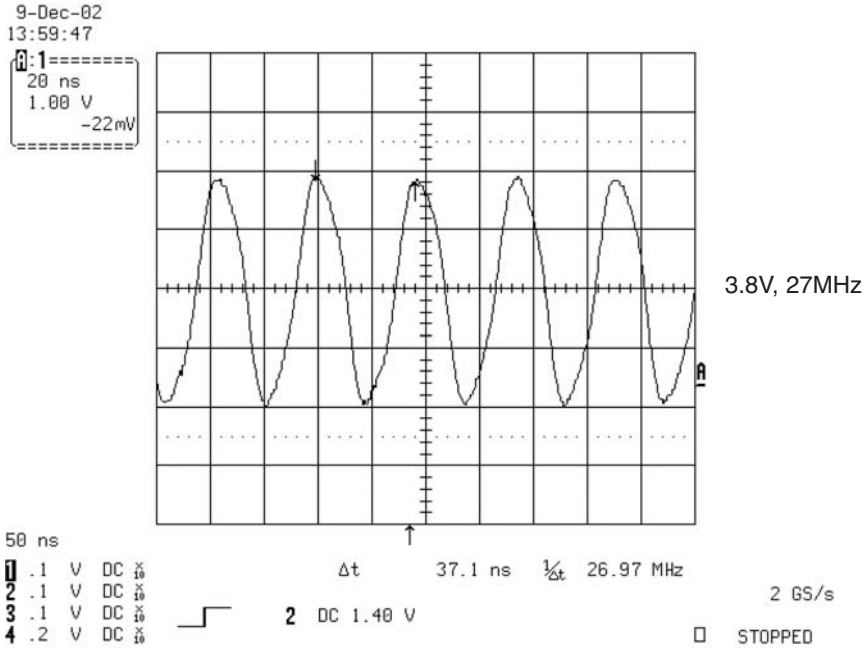
4. AUDIO μ-COM CIRCUIT(DVD & AMP)



DETAILS AND WAVEFORMS ON SYSTEM TEST AND DEBUGGING

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

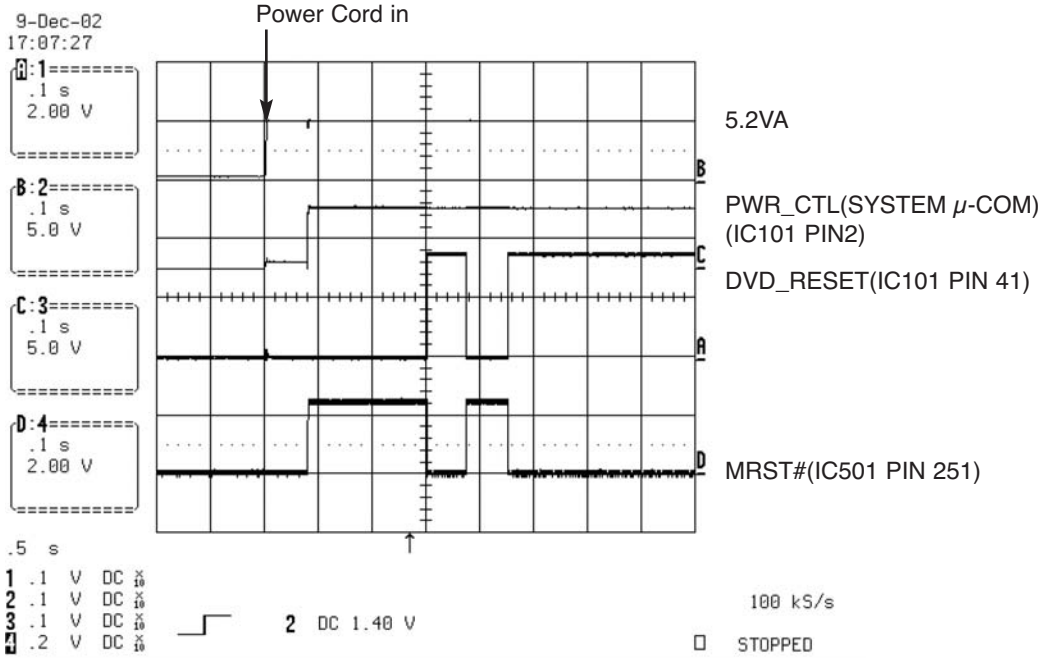
1) ES8381 main clock is at 27MHz(X501)



3.8V, 27MHz

FIG 1-1

2) ES8381 reset is high active.



5.2VA

PWR_CTL(SYSTEM μ-COM)
(IC101 PIN2)

DVD_RESET(IC101 PIN 41)

MRST#(IC501 PIN 251)

FIG 1-2

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

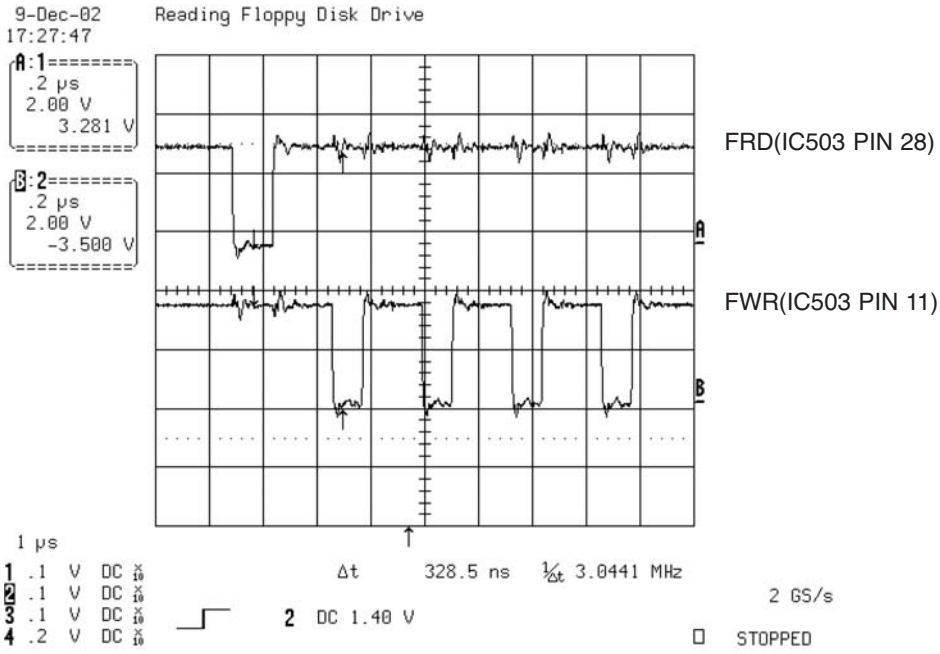


FIG 1-4

2. SDRAM CLOCK

1) ES8381 main clock is at 27MHz(X501)

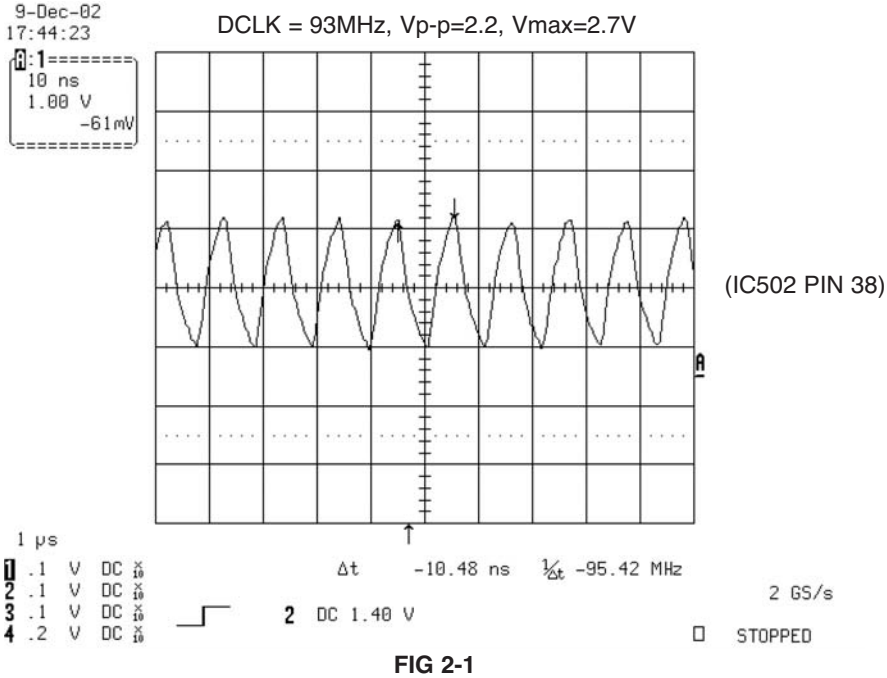


FIG 2-1

3. TRAY OPEN/CLOSE SIGNAL

1) Tray open/close waveform

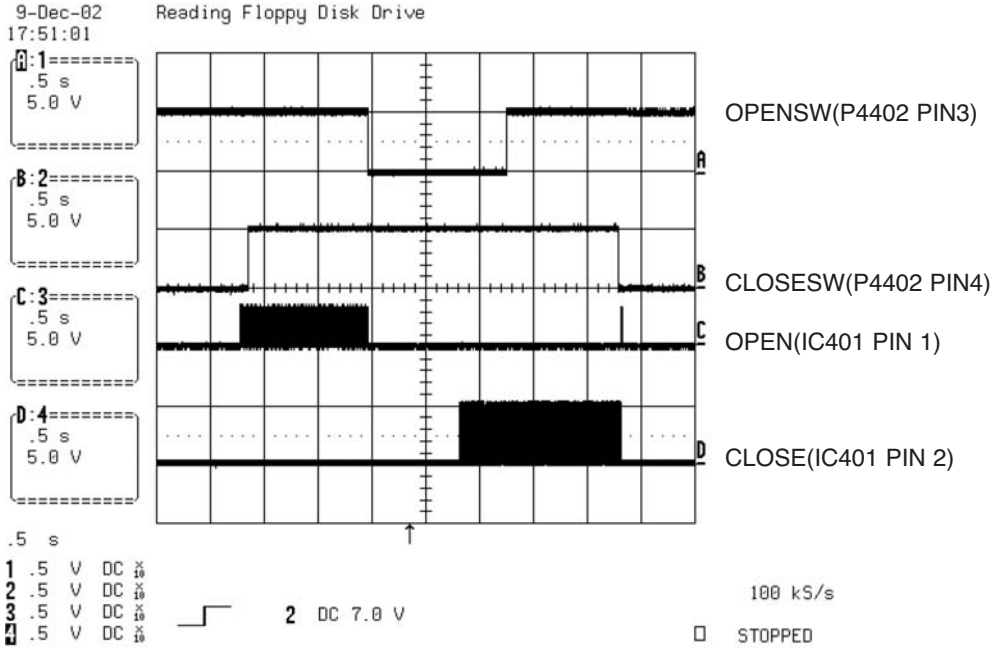


FIG 3-1

2) Tray close waveform

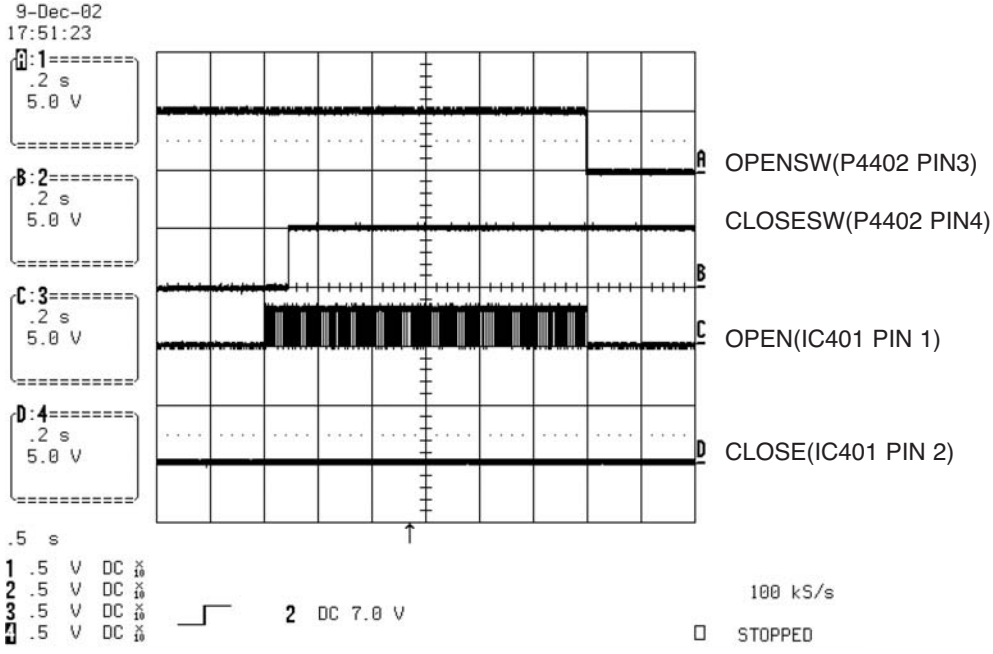


FIG 3-2

3) Tray open waveform

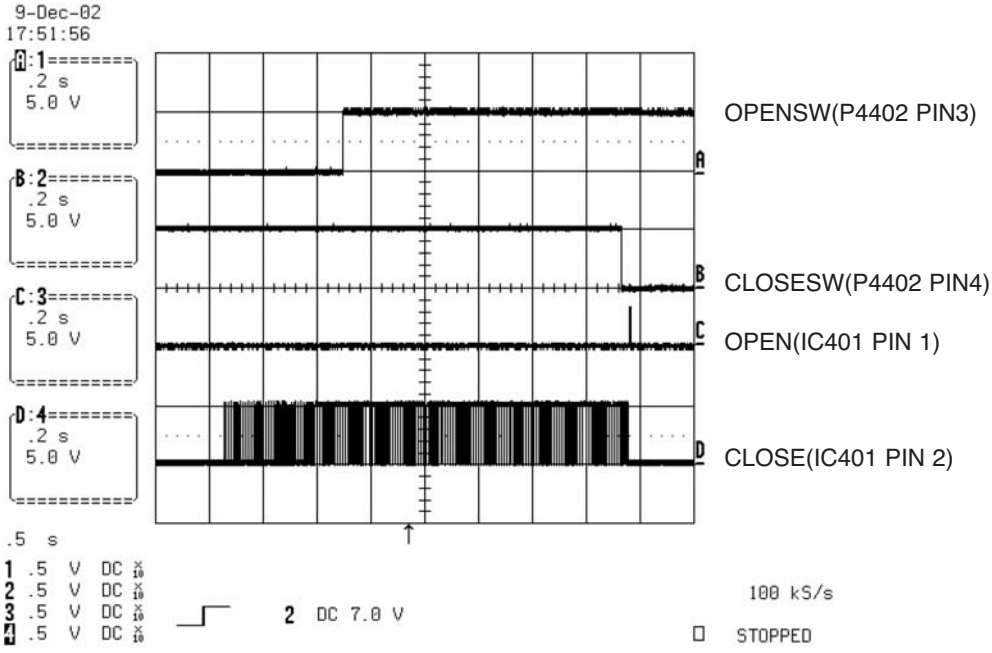


FIG 3-3

4. SLED CONTROL RELATED SIGNAL (NO DISC CONDITION)

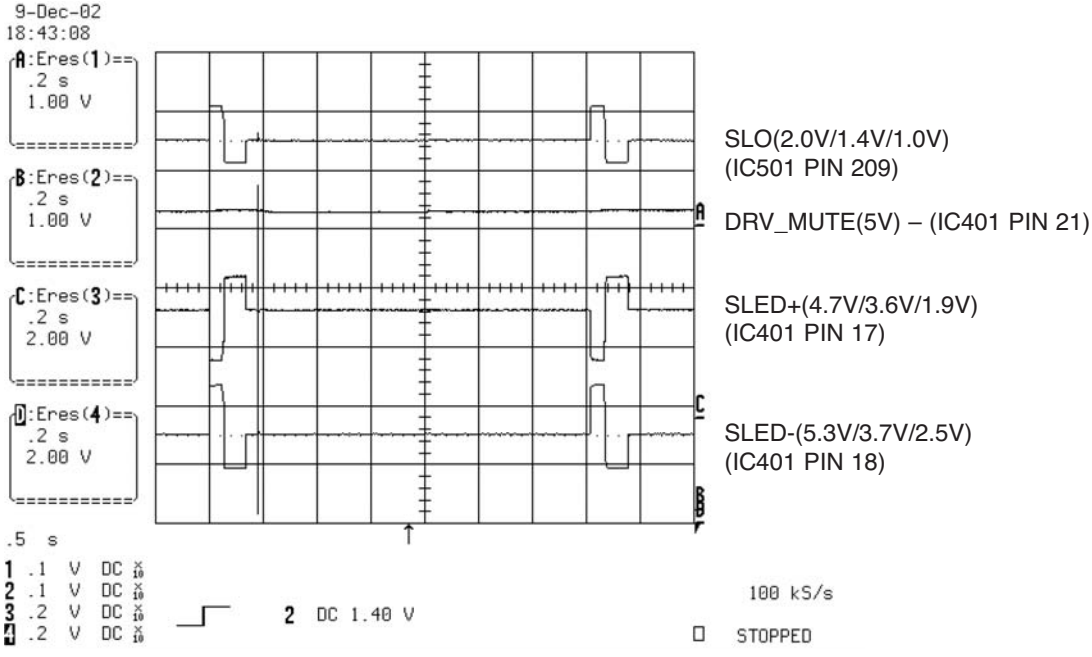
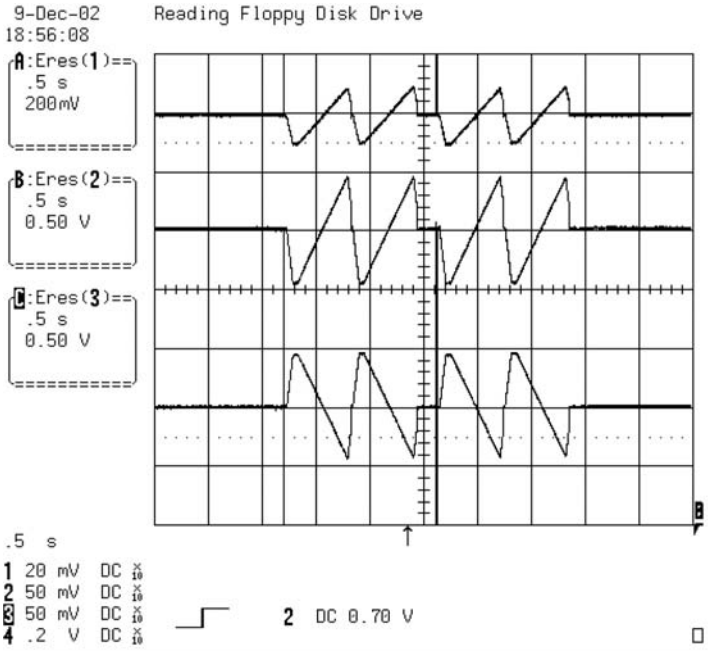


FIG 4-1

5. LENS CONTROL RELATED SIGNAL(NO DISC CONDITION)



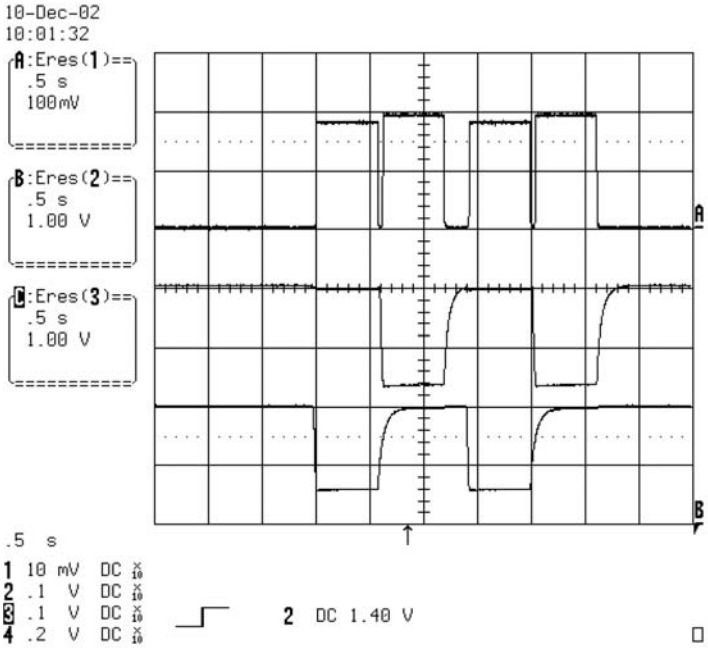
FOO(1.5V/1.4V/1.3V)
(IC501 PIN 208)

F+(4.0V/3.6V/3.2V)
(IC401 PIN 13)

F-(4.0V/3.6V/3.2V)
(IC401 PIN 14)

FIG 5-1

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



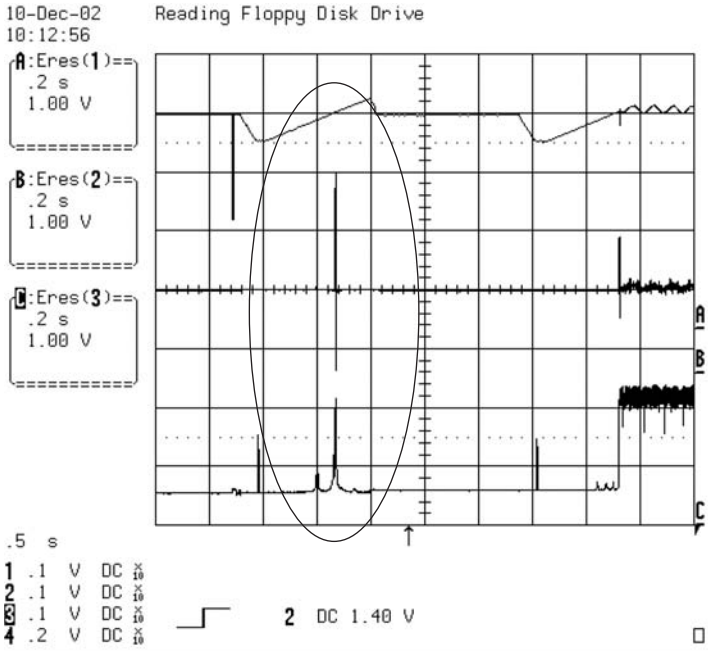
DVD MDI(0V/180mV)
(IC501 PIN 188)

DVDLDO501(5.0V//3.5V)
(IC501 PIN 185)

CDLDO(5.0V/3.6V)
(IC501 PIN 186)

FIG 6-1

7. DISC TYPE JUDGEMENT WAVEFORMS

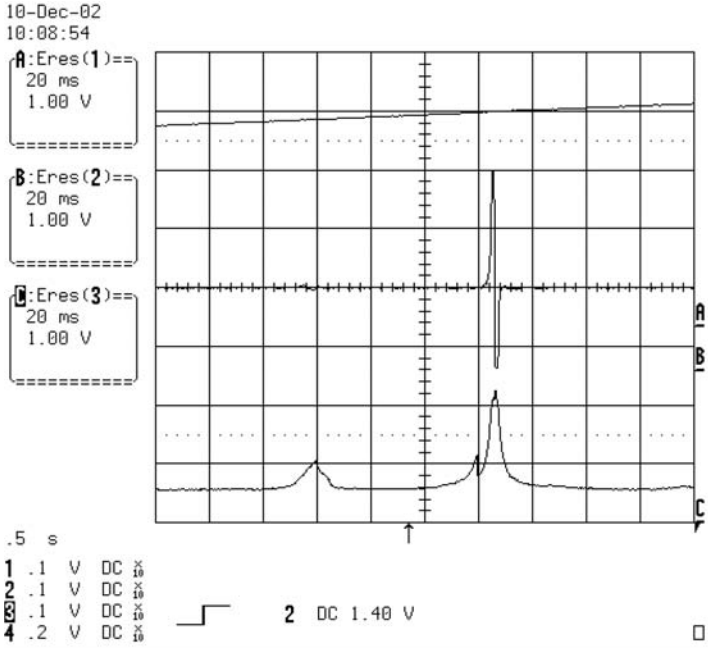


F+(IC401 PIN 13)

CD_DVDCT(IC501 PIN 169)

RF(IC501 PIN 196)

FIG 7-1 (DVD)



F+(IC401 PIN 13)

CD_DVDCT(IC501 PIN 169)

RF(IC501 PIN 196)

FIG 7-2 (DVD)

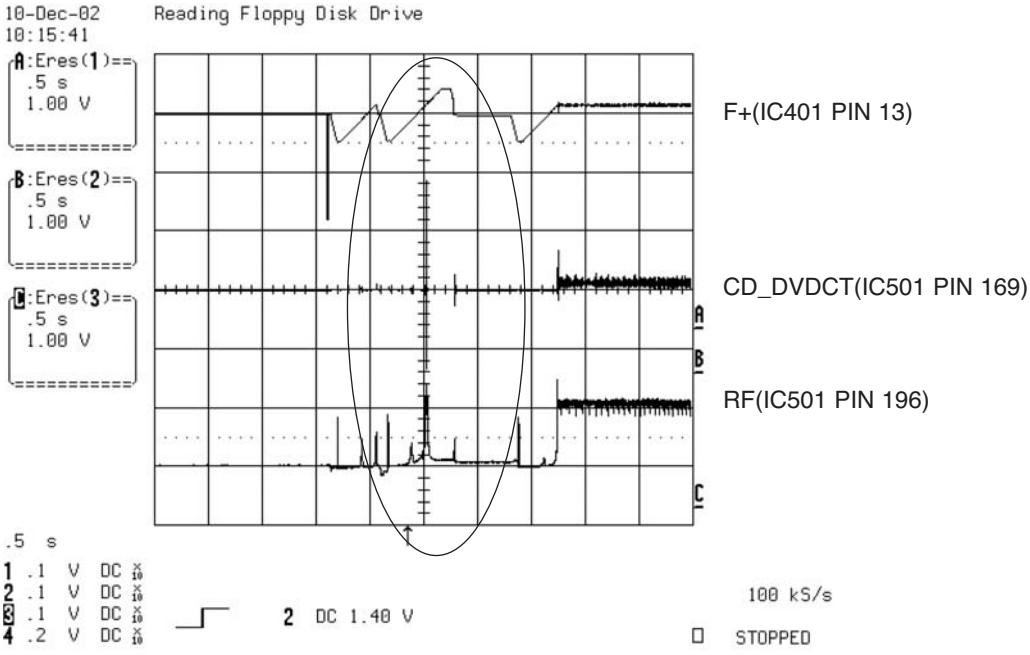


FIG 7-3 (CD)

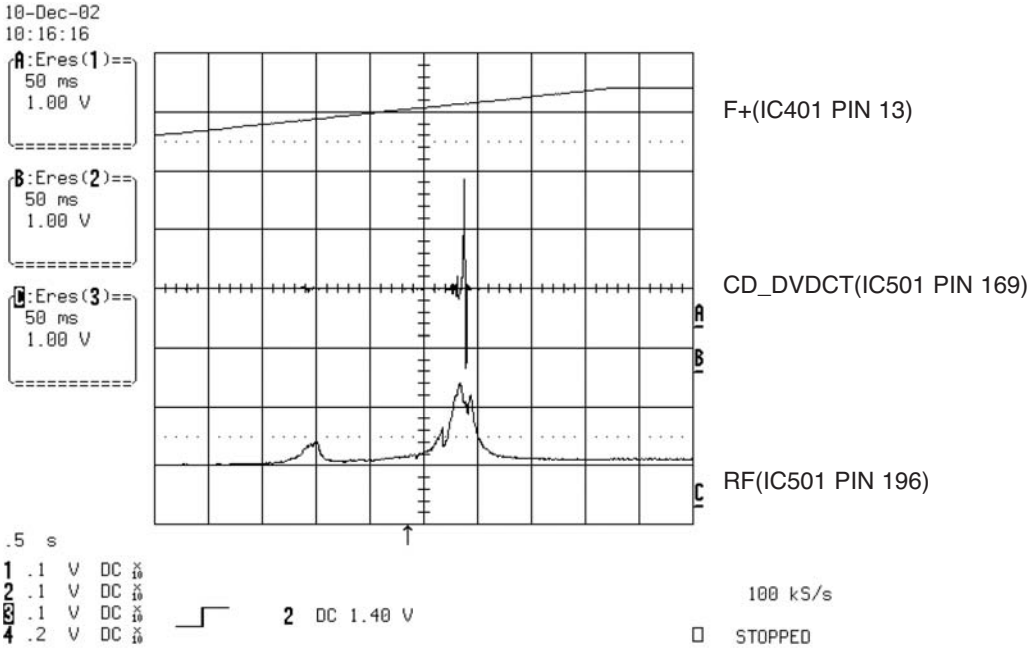


FIG 7-4 (CD)

8. FOCUS ON WAVEFORMS

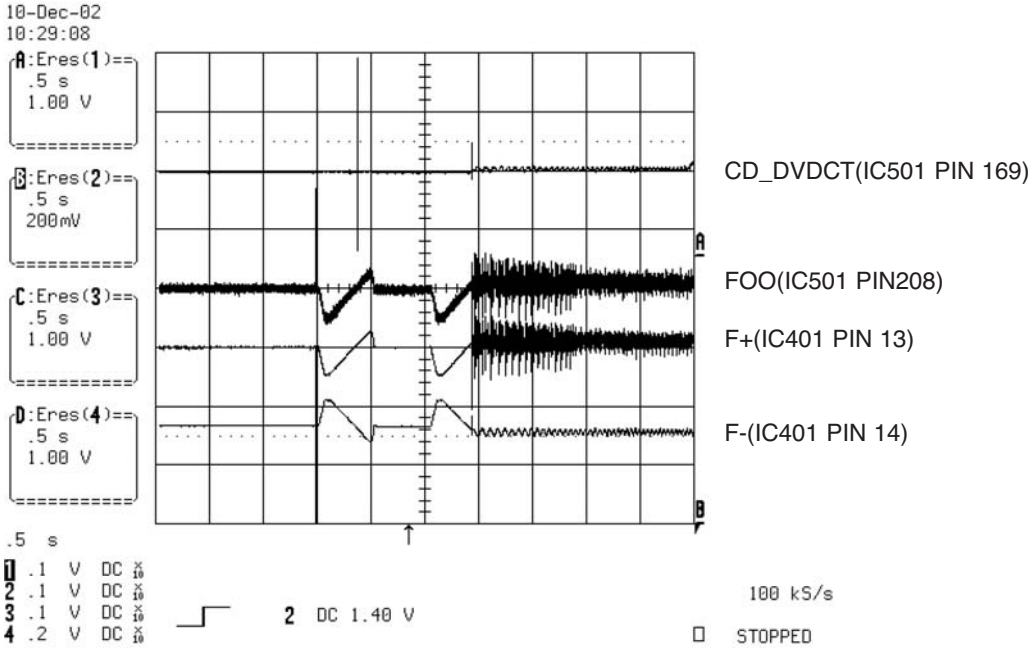


FIG 8-1 (DVD)

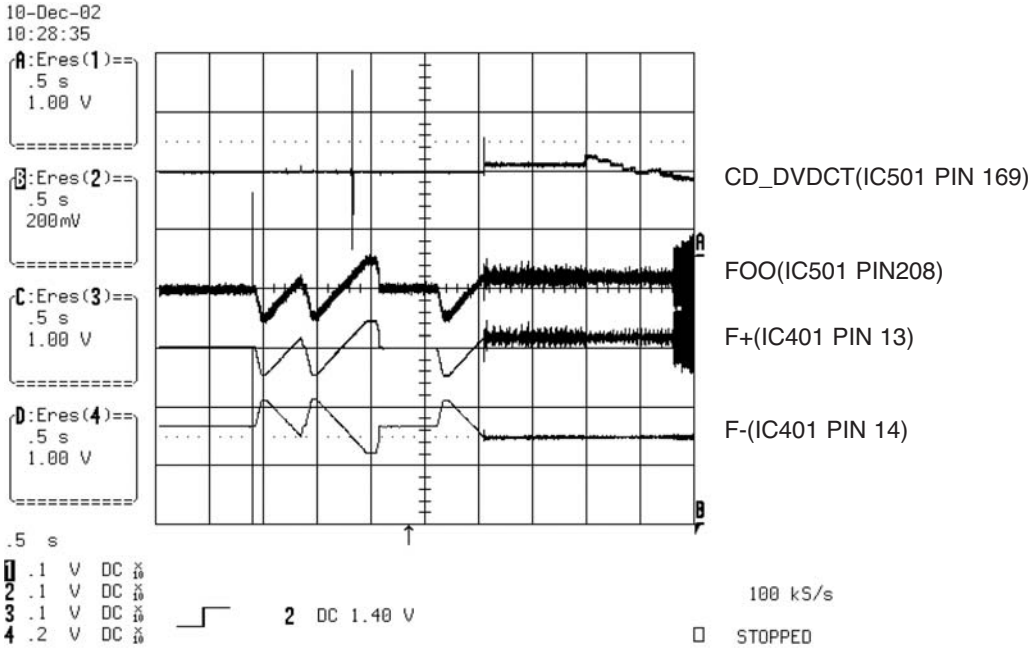


FIG 8-2 (CD)

9. SPINDLE CONTROL WAVEFORMS (NO DISC CONDITION)

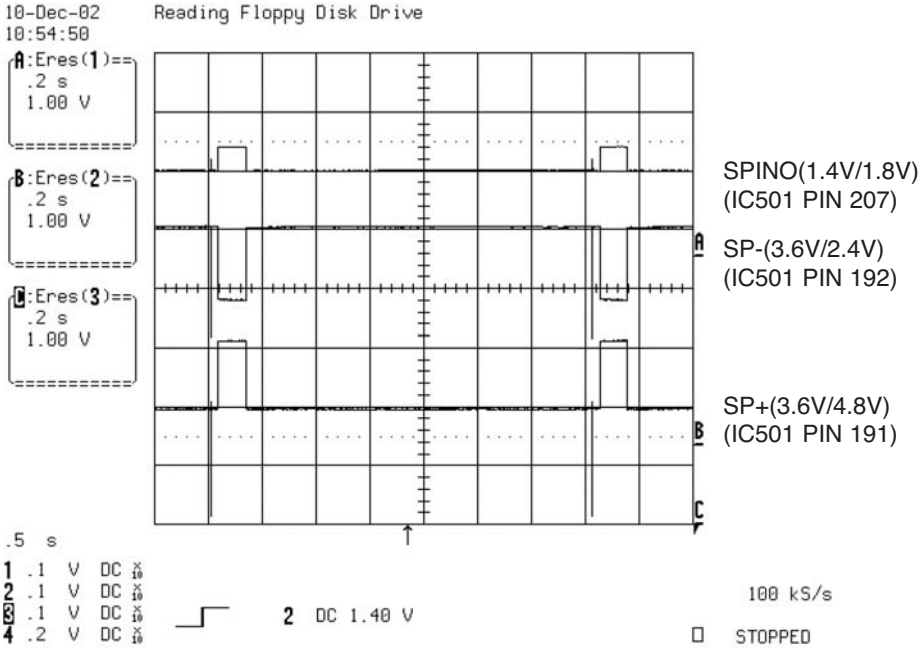


FIG 9-1

10. TRACKING CONTROL RELATED SIGNAL(System checking)

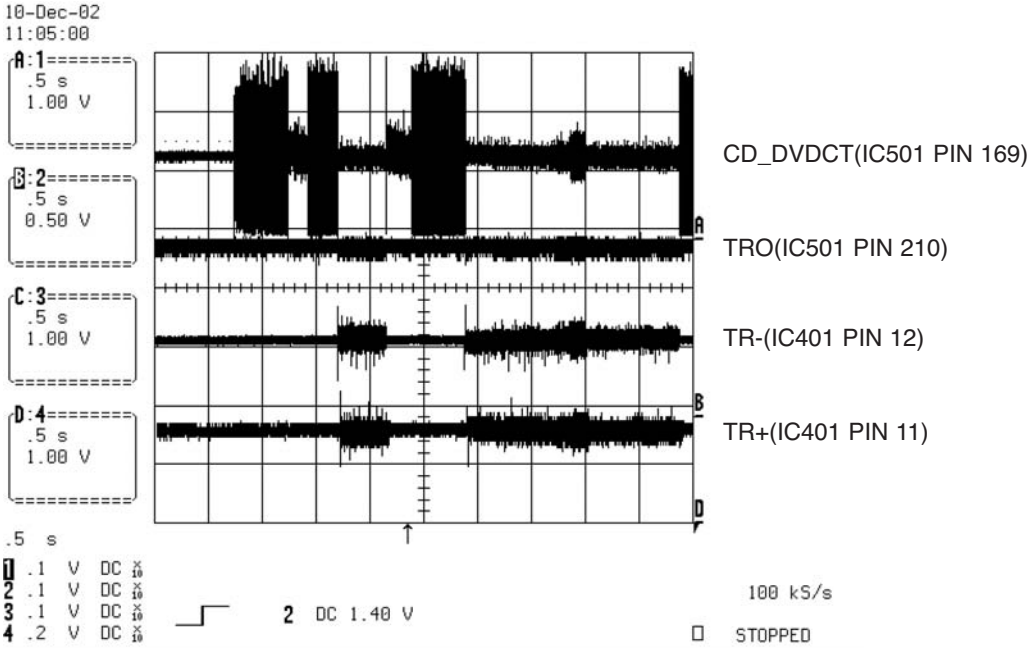


FIG 10-1(DVD)

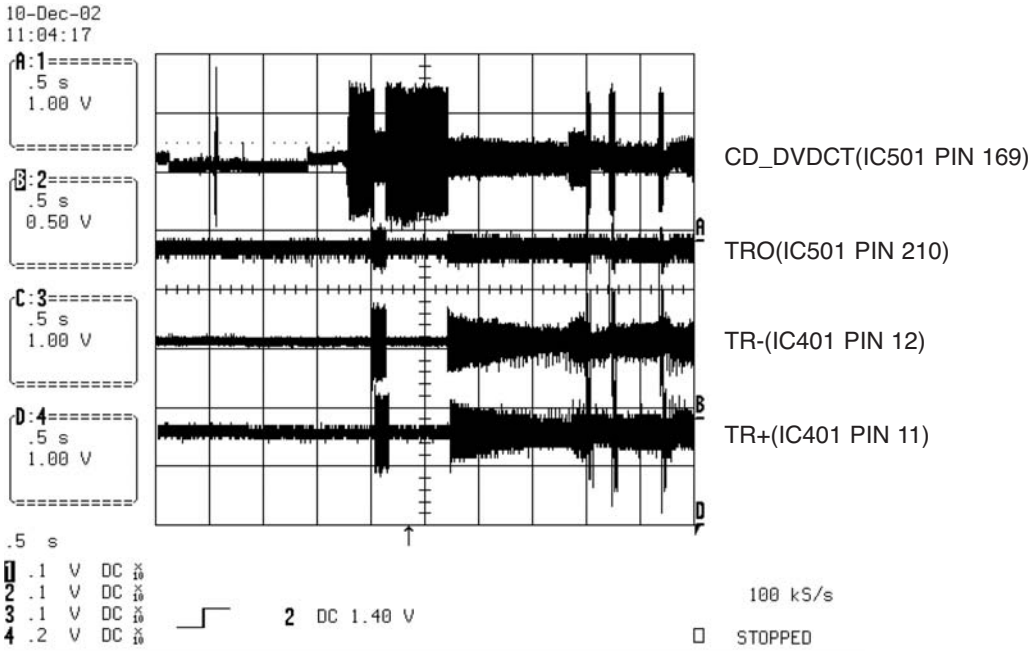


FIG 10-2(CD)

11. ES8381 VIDEO OUTPUT WAVEFORMS

1) Full colorbar signal(COMPOSIT)

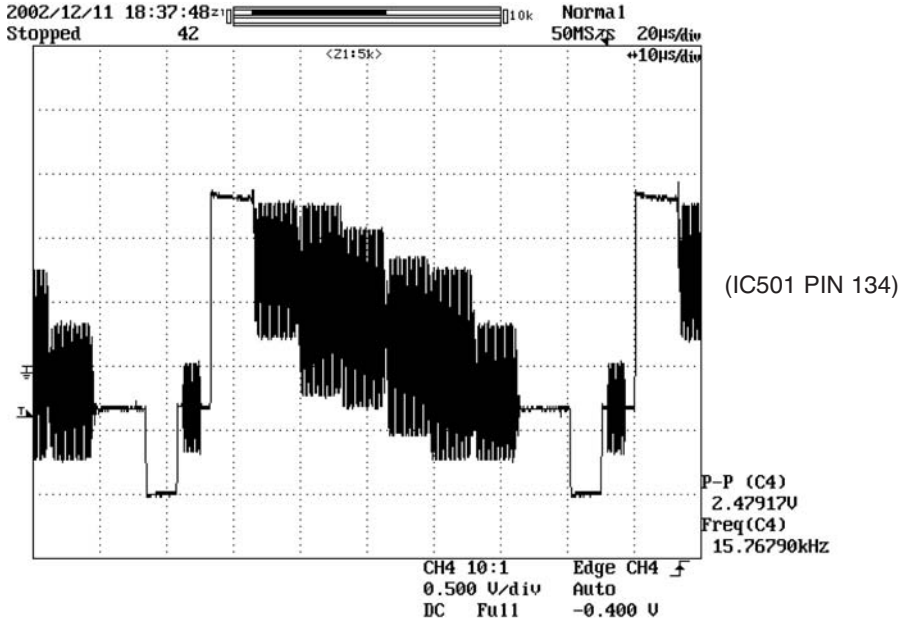
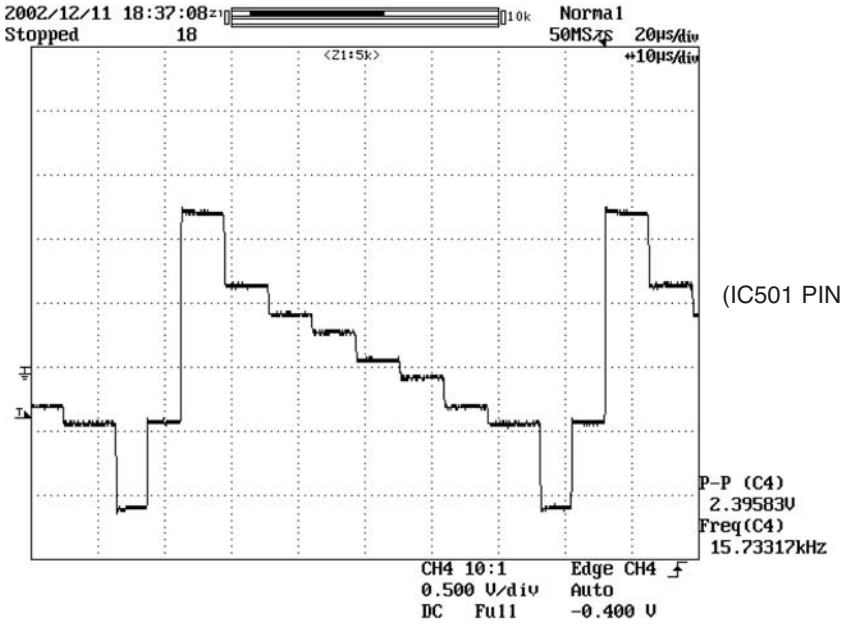


FIG 11-1

2) Y

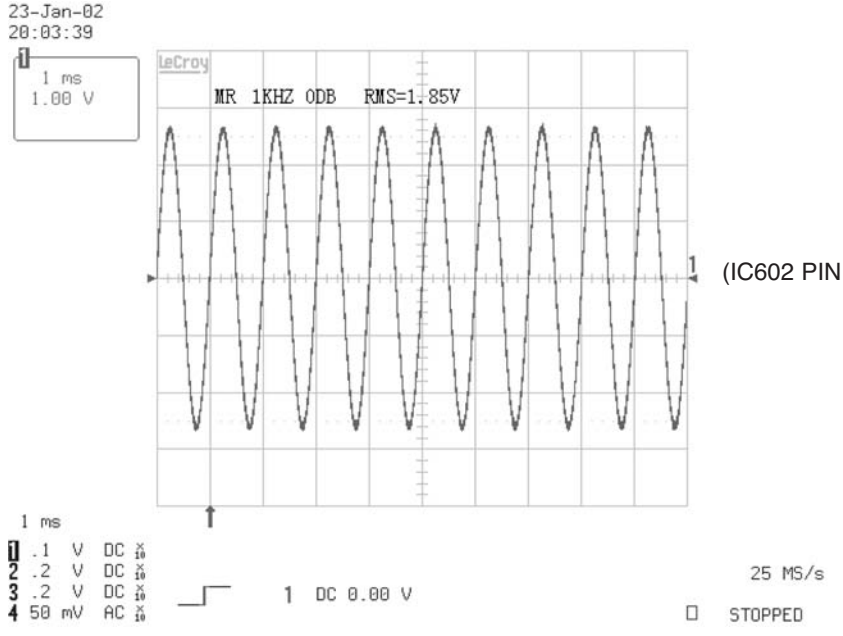


(IC501 PIN 140)

FIG 11-2

12. AUDIO OUTPUT FROM PWM IC

1) Audio L/R



(IC602 PIN 1, 7)

FIG 12-1

2) Audio related Signal

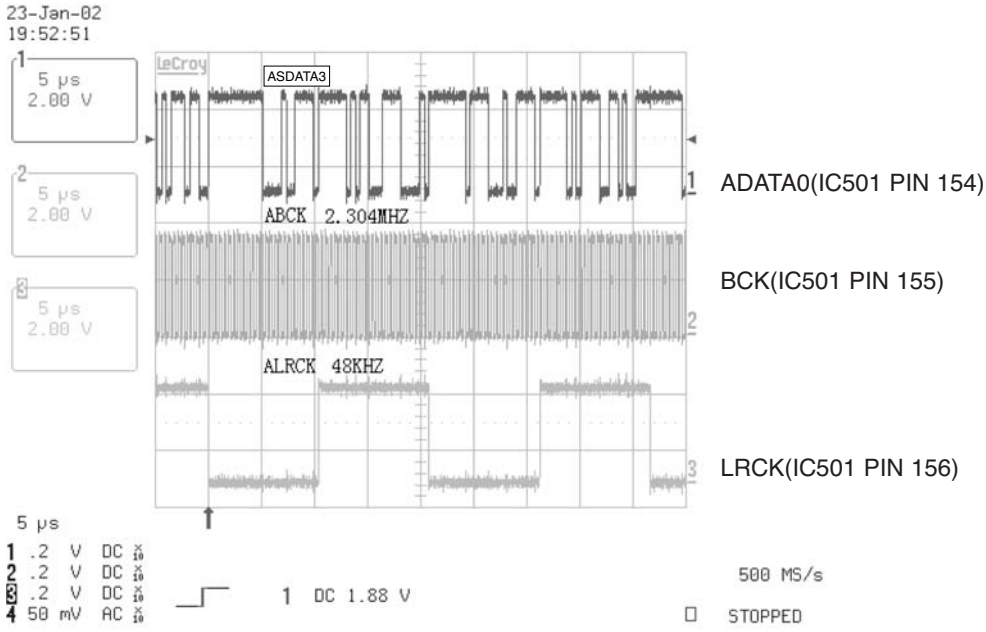
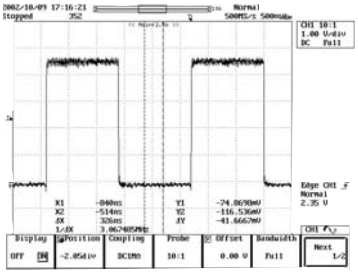


FIG 12-2

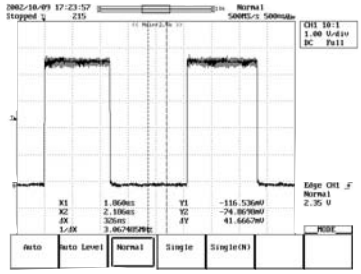
13. DVD & AMP WAVEFORMS

1)



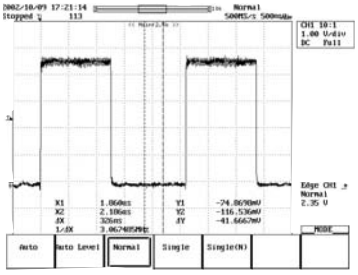
• R620 → TP611
or
R621 TP612

2)



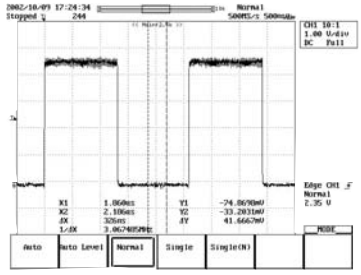
• R618 → TP609
or
R619 TP610

3)



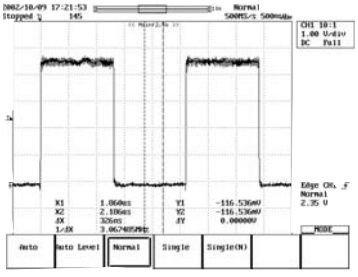
• R612 → TP603
or
R613 TP604

4)



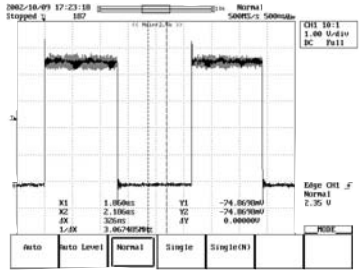
• R610 → TP601
or
R611 TP602

5)



• R614 → TP605
or
R615 TP606

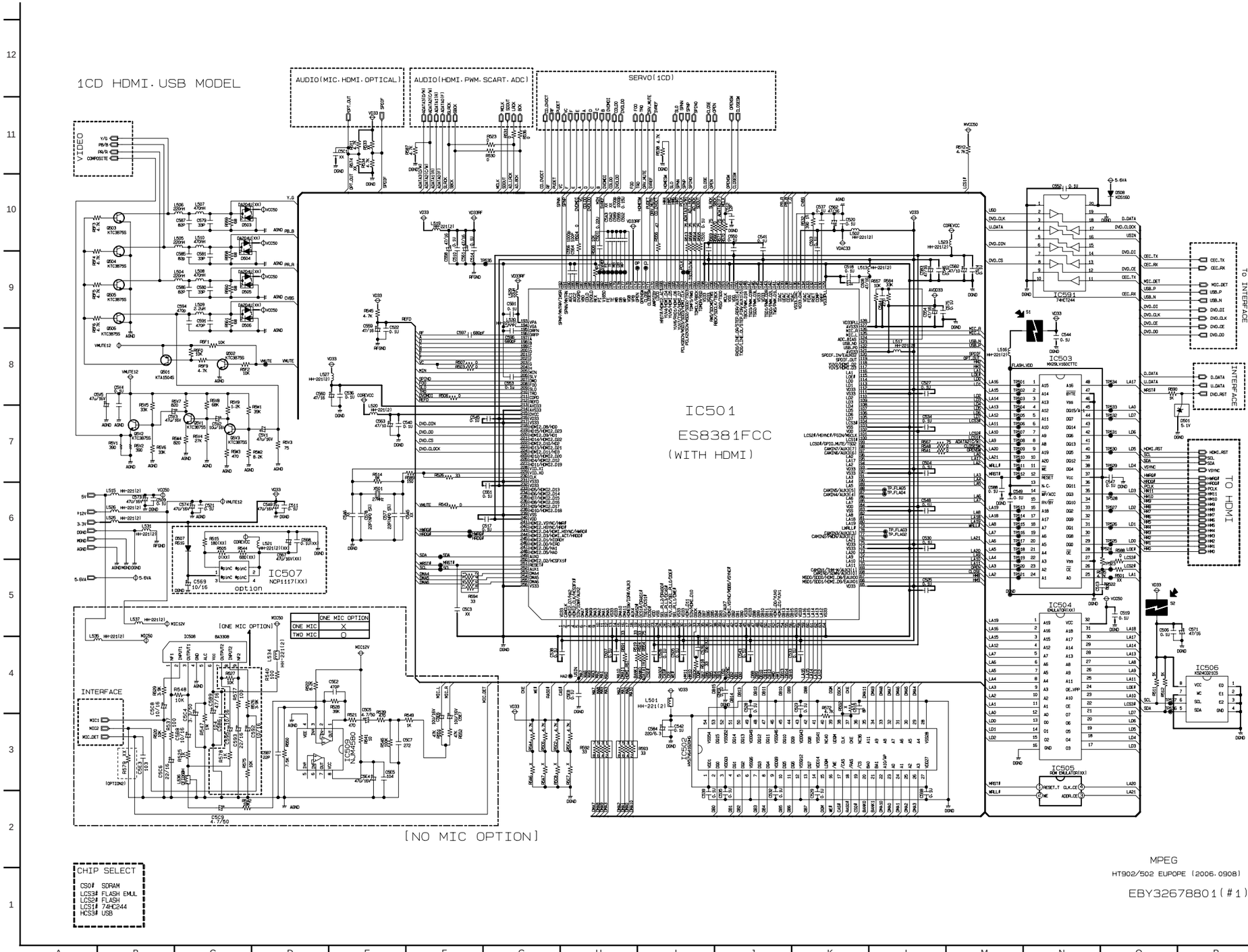
6)



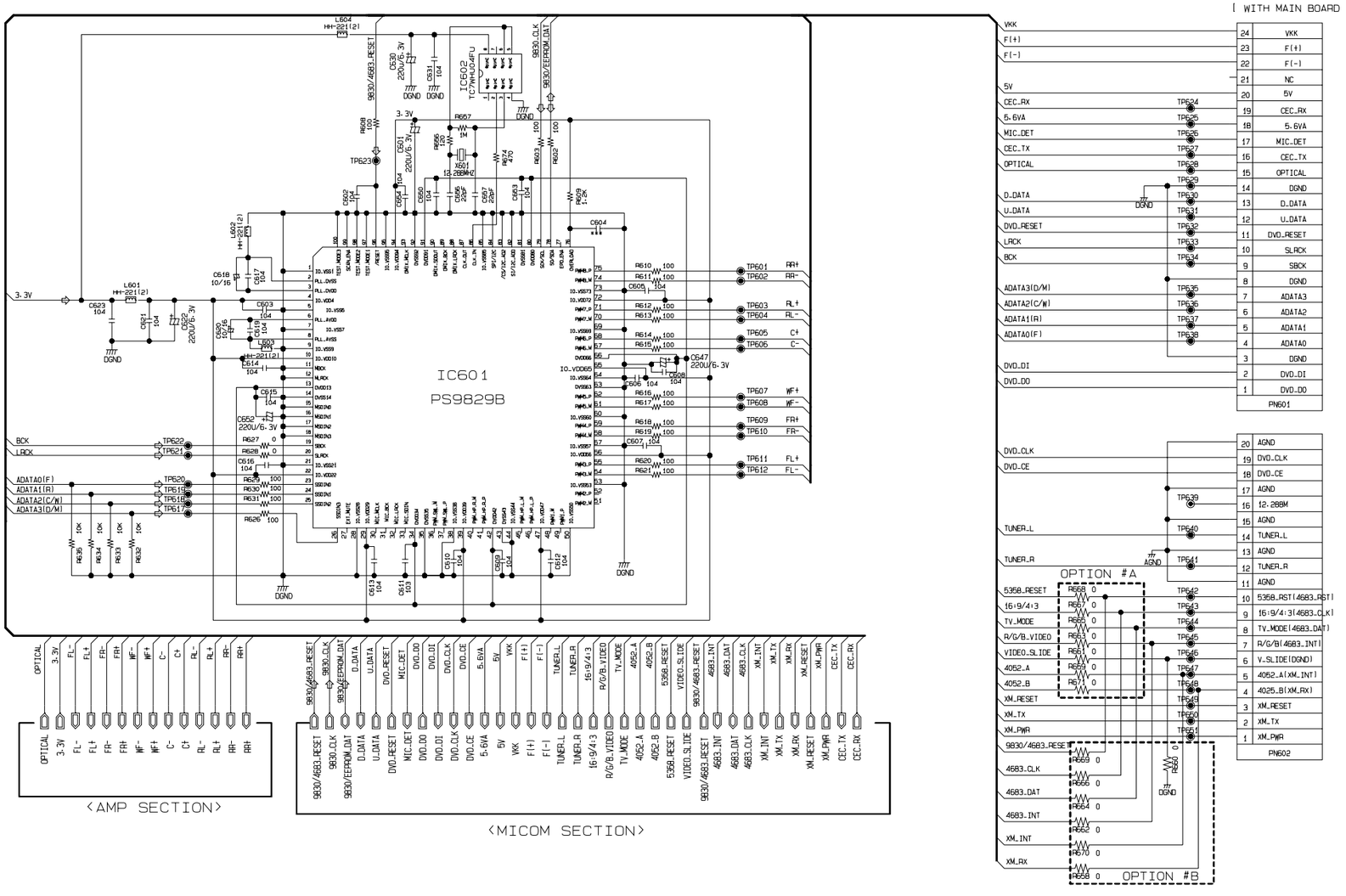
• R616 → TP607
or
R617 TP608

DVD & AMP CIRCUIT DIAGRAMS

1. MPEG CIRCUIT DIAGRAM



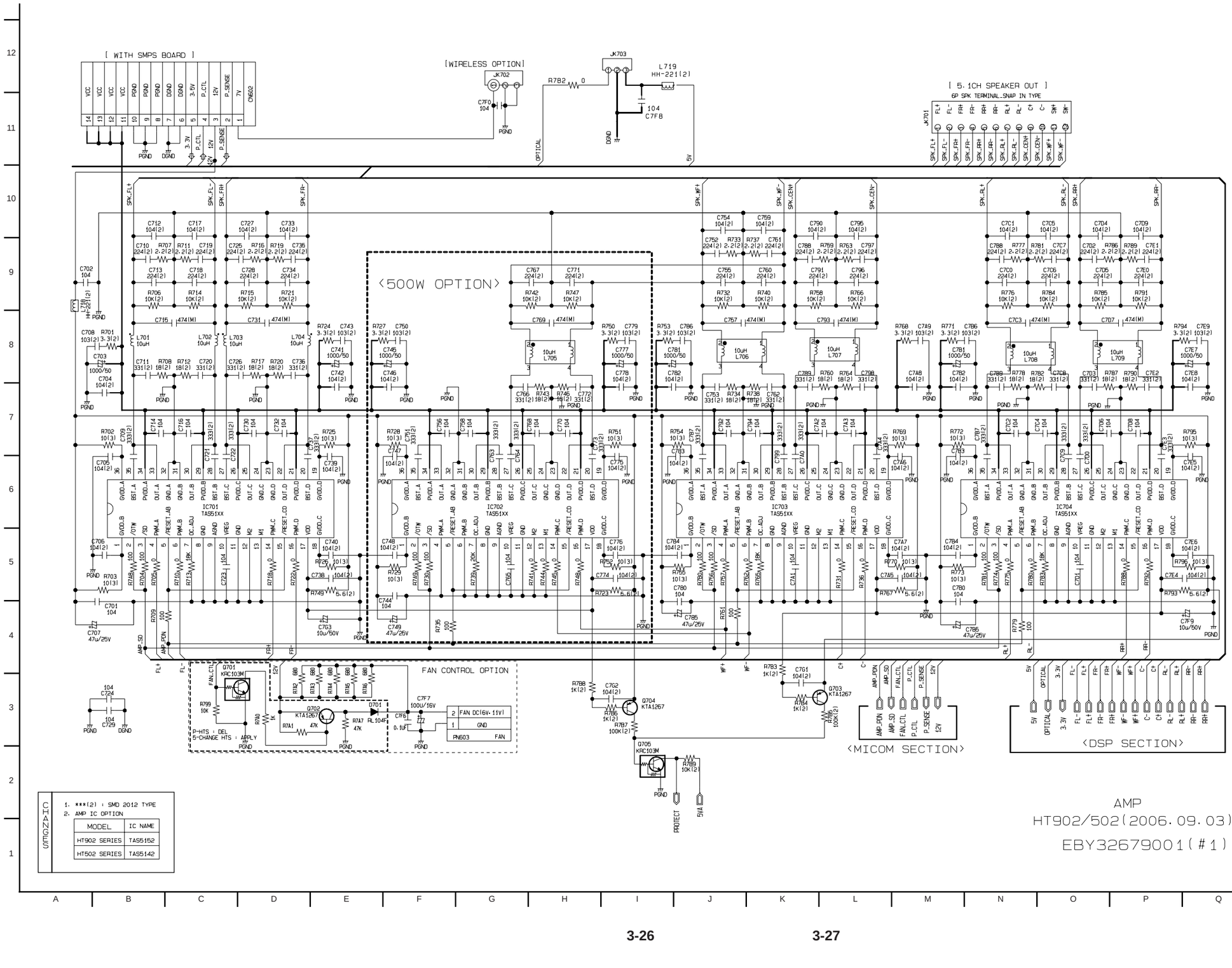
2. DSP CIRCUIT DIAGRAM



OPTION #A	
R668	R671
R667	
R665	
R663	
R661	
R659	

OPTION #B	
Q601	R672
R658	R666
R664	R660
R669	R662
R673	
R670	

3. AMP CIRCUIT DIAGRAM

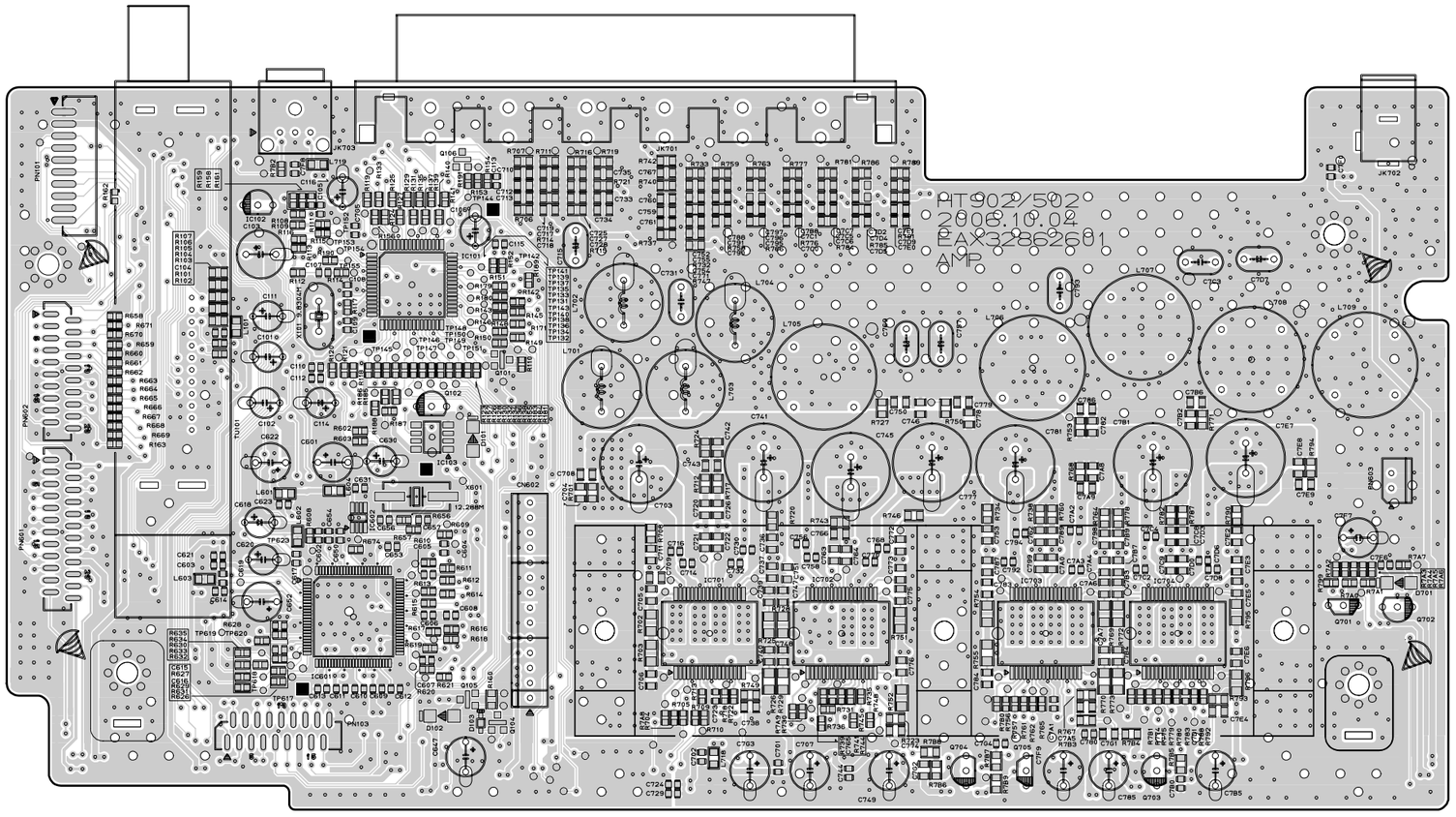


1. ***(2) : SMD 2012 TYPE
2. AMP IC OPTION

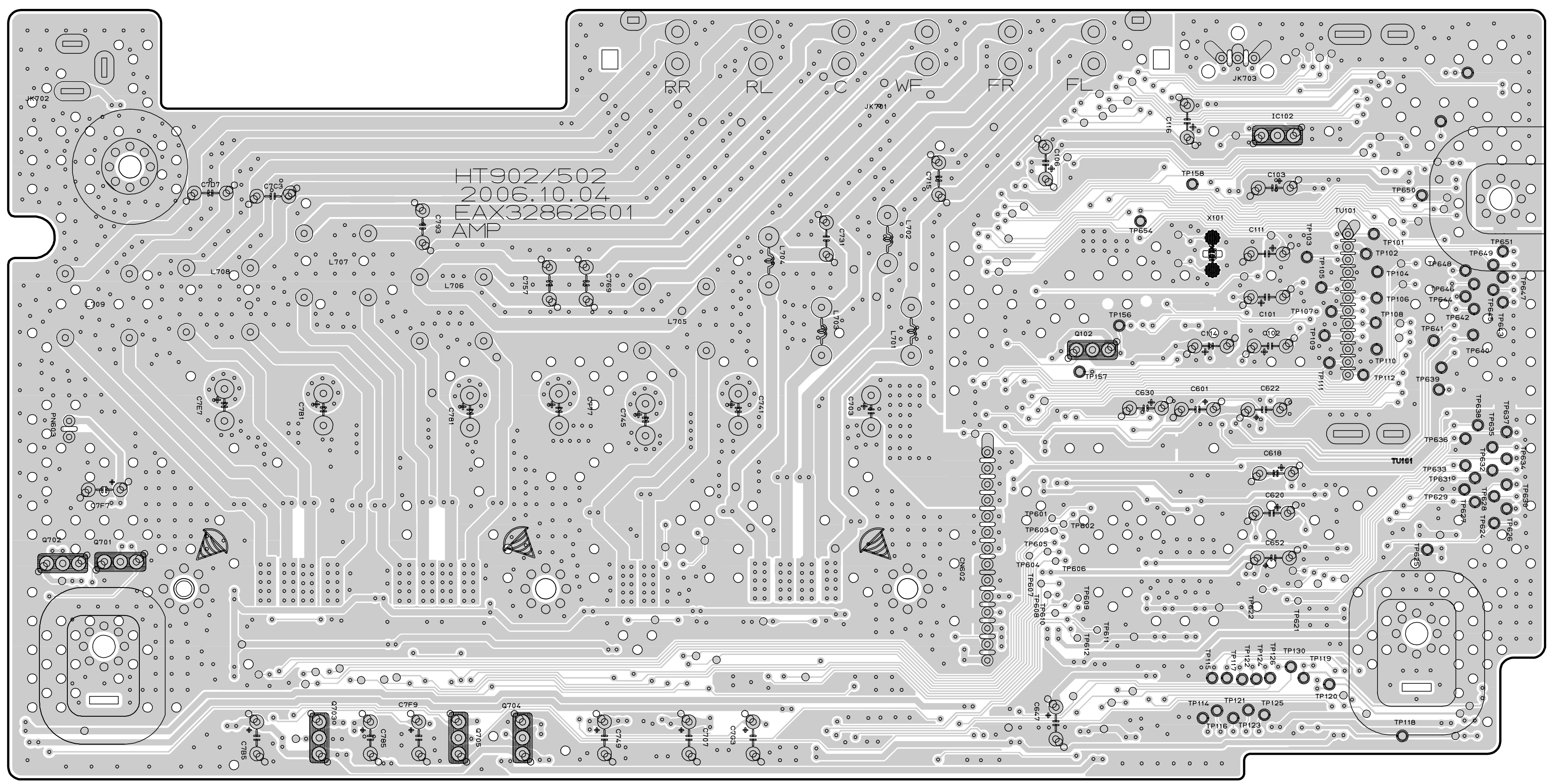
MODEL	IC NAME
HT902 SERIES	TAS5152
HT502 SERIES	TAS5142

PRINTED CIRCUIT BOARD DIAGRAMS

1. AMP P.C. BOARD DIAGRAM_TOP VIEW

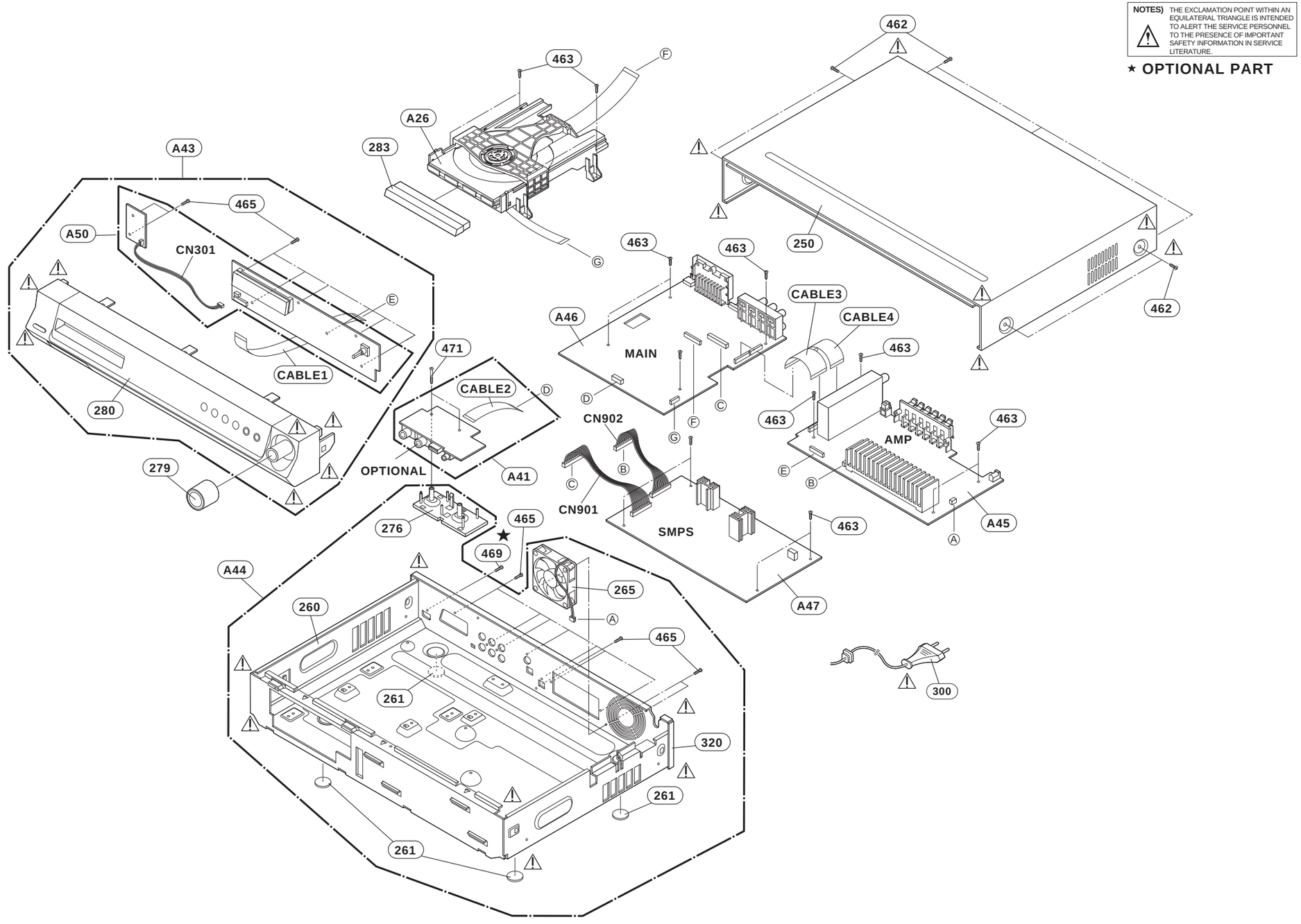


2. AMP P.C. BOARD DIAGRAM_BOTTOM VIEW

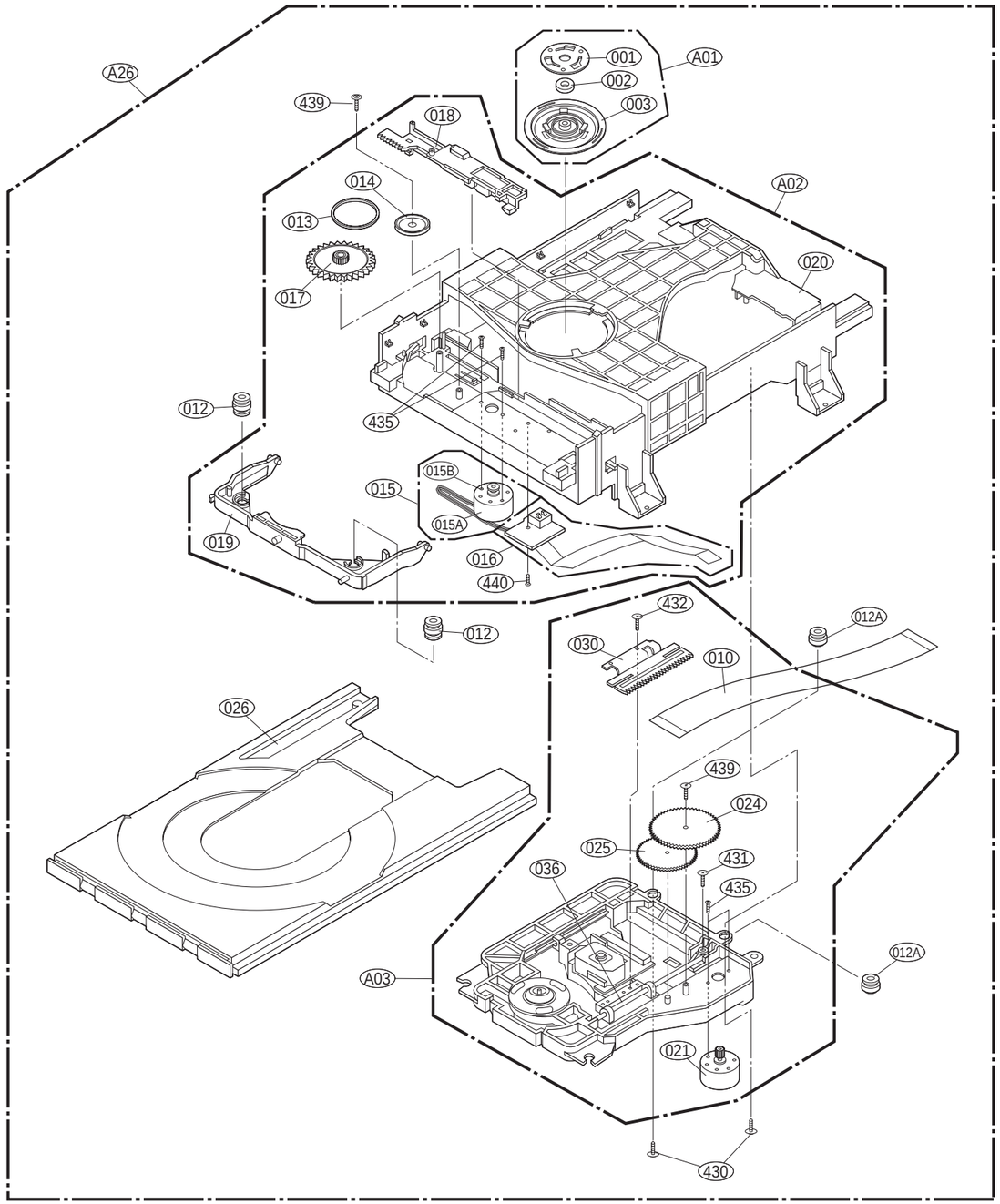


SECTION 4. EXPLODED VIEWS

• CABINET AND MAIN FRAME SECTION_HT502's



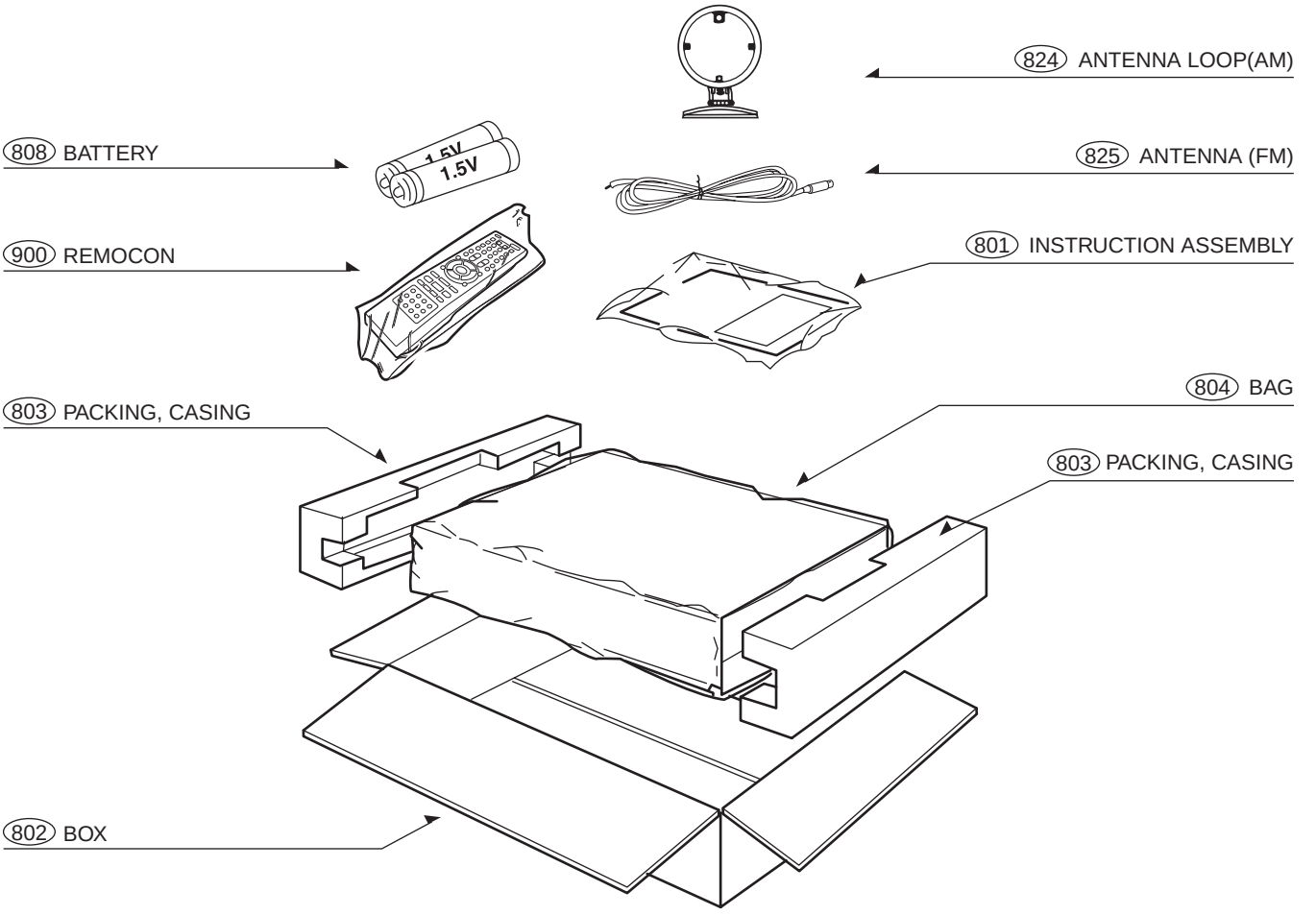
• DECK MECHANISM EXPLODED VIEW(DP-10A)



MEMO

MEMO

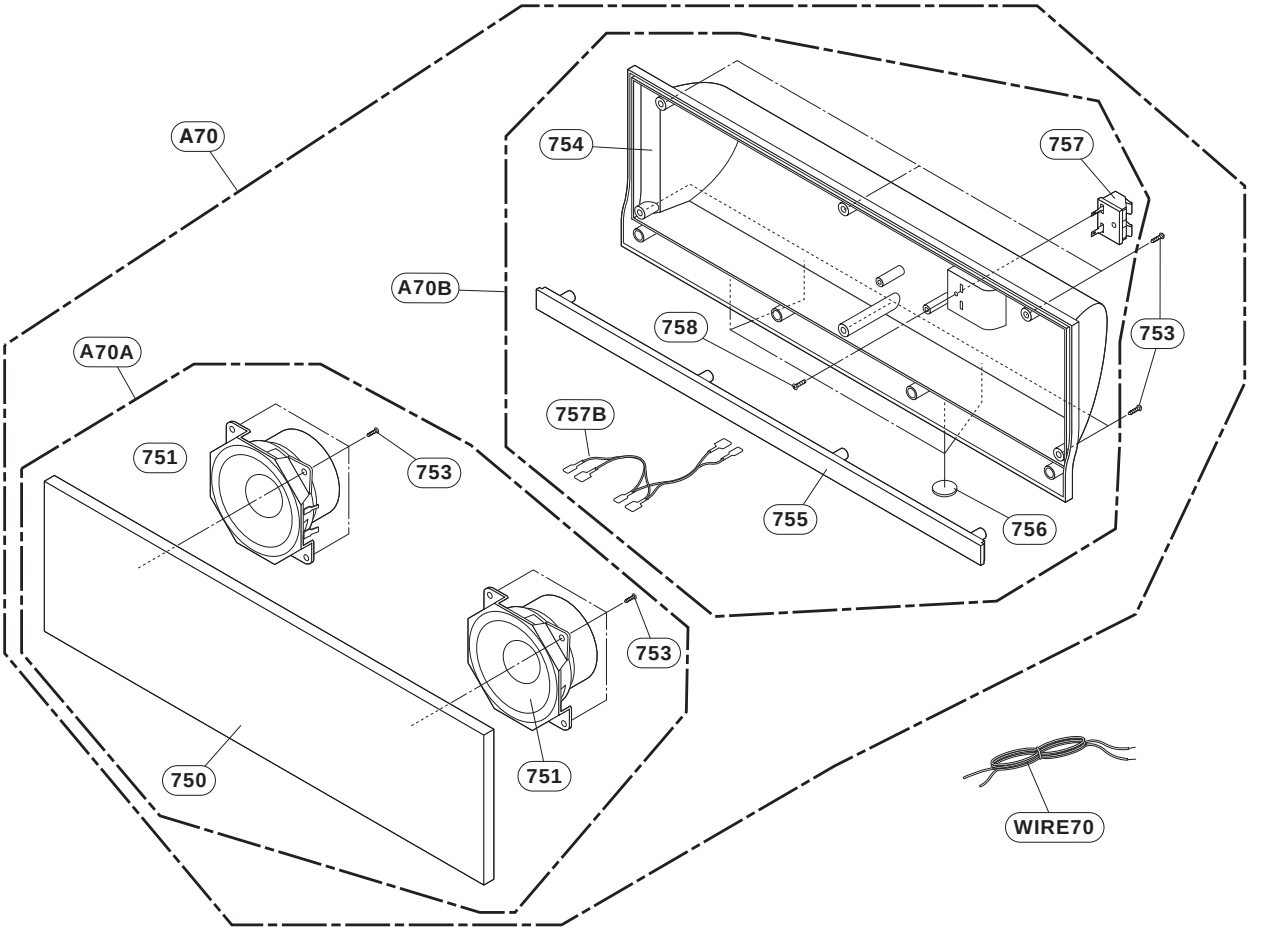
• PACKING ACCESSORY SECTION



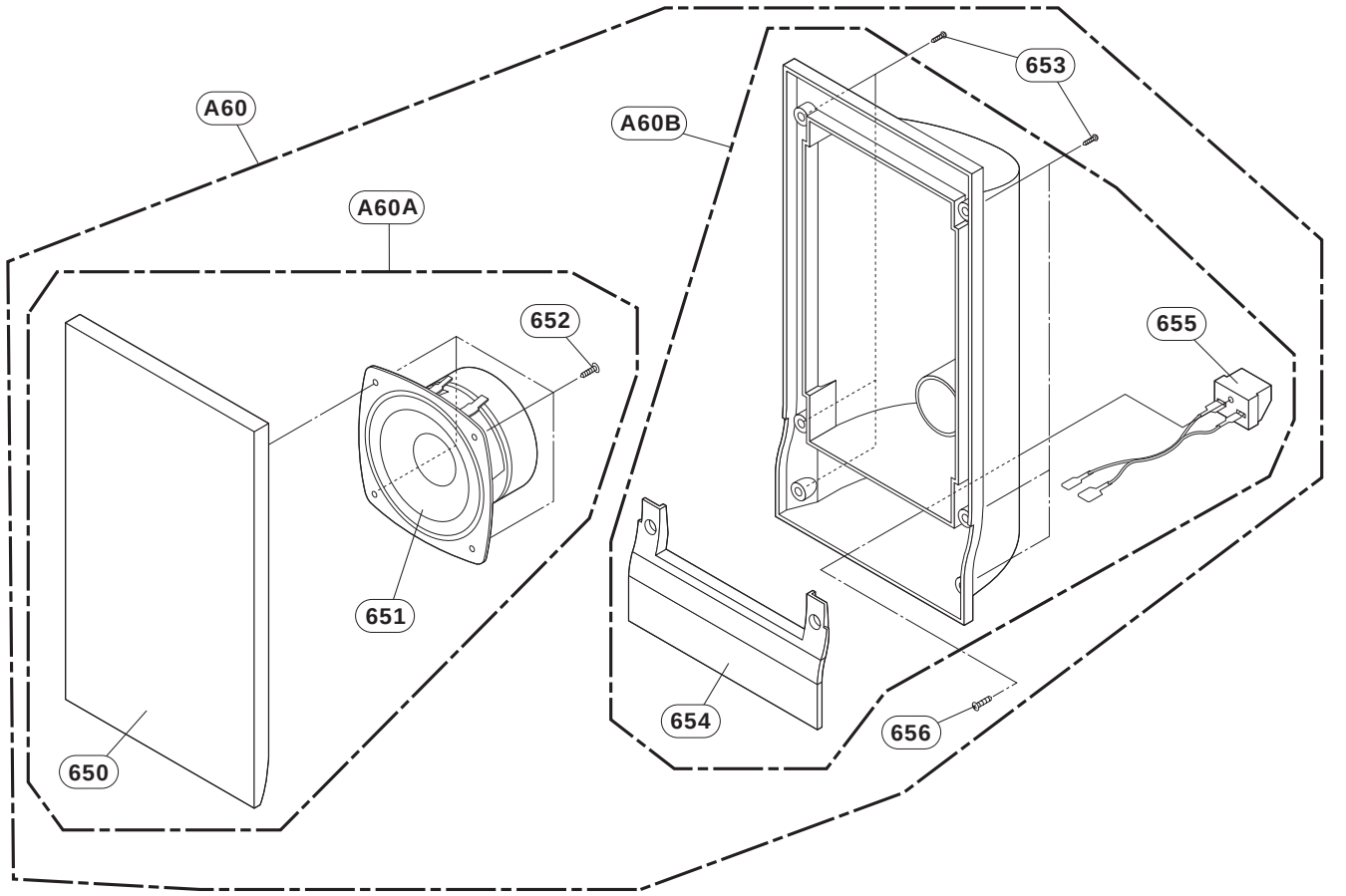
SECTION 5. SPEAKER SECTION

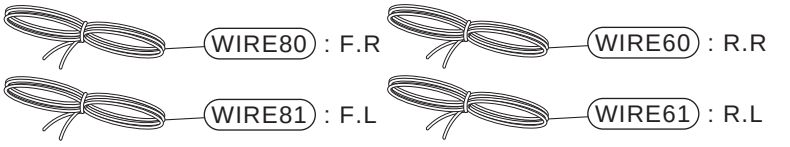
1. SH52SH

• CENTER SPEAKER(SH52SH-C)



• FRONT/REAR SPEAKER(SH52SH-S)





• PASSIVE SUBWOOFER SPEAKER(SH52SH-W)