

Service
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Service Manual



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Feature Different	/12	/51	/55	/78	/93	/98
RDS	✓					
Voltage Selector			✓	✓		✓
ECO Standby	✓					
DTS	✓	✓	✓	✓	✓	✓



Repair Scenario Matrix

Type versions Boards in used	HTS5120					
	/12	/51	/55	/78	/93	/98
Main Unit:						
Touch Button Board	C	C	C	C	C	C
VFD Display Board	C	C	C	C	C	C
IPOD, USB & MP3 Boards	C	C	C	C	C	C
Up/Down Control Board	C	C	C	C	C	C
Left/Right Control Board	C	C	C	C	C	C
Optical Socket Board	C	C	C	C	C	C
Decoder Board	BD	BD	BD	BD	BD	BD
AMP Board	BD	BD	BD	BD	BD	BD
Radio Transmit Board	BD	BD	BD	BD	BD	BD
Frequency Divider Board	BD	BD	BD	BD	BD	BD
Subwoofer Box:						
Radio Receiver Board	BD	BD	BD	BD	BD	BD
Power Board	BD	BD	BD	BD	BD	BD

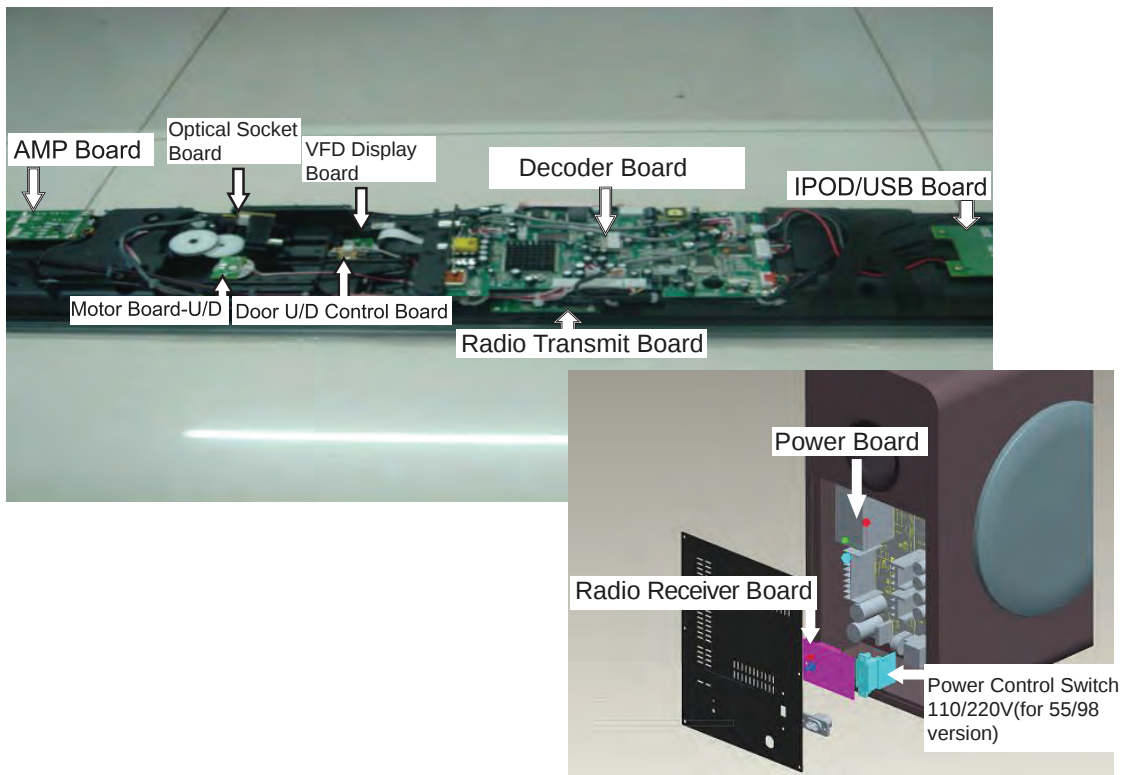
* BD = Board Level Replacem

* C = Component Level Repair

Technical Specification and Connection Facilities

1. Technical Specification and Connection Facilities

1.1 PCB Locations



1.2 General:

Power supply : 100-240V, 50Hz~60Hz
Power consumption(Main Unit) : 35W
Power consumption(Subwoofer) : 45W
Standby power consumption : < 1 W
Amplifier : 70W(8Ω) x 2 + 260W(8Ω)

Image Rejection Ratio : ≥25dB
Overall Frequency Response : 63Hz~12.5kHz ±3dB
50dB S/N Sensitivity (Mono),
freq. deviation 75kHz(L,M,H) : ≤23dBf

1.3 Radio

Tuning Frequency Range : 87.5MHz - 108MHz
S/N (video unweighted) at 75Ω : ≤71dB
Singal To Noise Ratio : ≥50dB
Search Tuning Sensitivity : 19~35 dBf
RF Signal : < 2.5min
(Typical 3 minutes)
Search Time Digital Tuning System
Stop level (vision carrier) : ≥ 31dBμV
Maximun tuning error during
operation(drift) : ≤ 50 kHz
Maximun tuning error of a recalled
program : ± 22.5 kHz
Modulation : 1kHz
Noise Limited sensitivity
(26dB Mono) : 22 dBf
Noise Limited sensitivity
(46dB Stereo) : 52dBf

1.4 Analog Inputs / Outputs

1.4.1 Audio Input Connectors

AUDION IN (AUDIO 1/2) -- AUX IN

Input voltage : 2Vrms max
Input impedance : > 10kΩ

AUDION IN (AUDIO 1/2) -- MP3 LINE IN

Input voltage : 1Vrms max
Input impedance : > 10kΩ

1.4.2 Video Output Connectors

VIDEO OUT -- CVBS OUT

Output voltage : 700mVpp+10/-15%
Output impedance : 75Ω
S/N on output : ≥ 55dB

Technical Specifications and Connection Facilities

VIDEO OUT -- (Y/Pb/Pr)

Output voltage	: 700mVpp+10/-15%
Output impedance	: 75Ω
S/N on outputs	: ≥55dB

1.5 Digital Inputs/Outputs

1.5.1 COAXIAL DIGITAL IN

LPCM	: according IEC 60958-3
MPEG 1, MPEG 2, AC3	: according IEC 61937
DTS	: according IEC 61937 + addendum

1.5.2 USB

Compatibility	: USB 2.0
Type of connector	: Series A Connector
Class support	: UMS(USB Mass Storage Class)
File System	: FAT12, FAT24, FAT36

1.5.3 HDMI Output

Compatibility	: HDMI version 1.3
Type of connector	: Type A connector (19 pins)

1.5.4 Sampling Frequency:

MP3	: 22kHz, 44.1kHz, 48kHz
WMA	: 44.1kHz, 48kHz

1.5.4 Constant bit rate:

MP3	: 112 kbps - 320 kbps
WMA	: 44 kbps - 192 kbps

1.6 Ipad Docking Component

PHILIPS specified using iPod/iPhone	
iPod/ iPhone Voltage	: 4.9V ~ 5.02V/1A

1.7 Video Performance

1.7.1 SNR

PAL

RGB	CVBS	
≥ 55 dB	Luminance: ≥ 55 dB Chroma: ≥ 55 dB (AM) ≥ 52 dB (PM)	

NTSC

Y Pb Pr	CVBS	
≥ 55 dB	Luminance: ≥ 55 dB Chroma: ≥ 54 dB (AM) ≥ 54 dB (PM)	

1.7.2 Bandwidth

PAL

RGB	CVBS	
0.5 to 4 MHz: +1dB/-2dB	0.5 to 4 MHz: +1dB/-2dB	
4.8 MHz: -3dB	4.8 MHz: -3dB	
5.8 MHz: -6dB	5.8 MHz: -6dB	

NTSC

YPbPr	CVBS	
4.2 MHz: -3dB	4.2 MHz: -3dB	
5.8 MHz: -6dB	5.8 MHz: -6dB	
With Pscan: 8.4MHz -3dB		

1.7.3 Video Supporting Format

Signal System : PAL / NTSC

Component Video Output:

480i/576i, 480p/576p, 720p, 1080i

HDMI Output:

480p, 576p, 720p, 1080i, 1080p

Technical Specifications and Connection Facilities

1.8 Dimension and Weight

Set Dimension W x H x D	: 790.6 x 145 x 57.4 mm
Net Weight	: 2.23 kg
Subwoofer Dimension W x H x D	: 182 x 365 x 306 mm
Net Weight	: 6 kg

1.9 Laser Output Power & Wavelength

1.9.1 DVD

Output power during reading	: 7mW
Output power during writing	: 6mW
Wavelength	: 80nm (at 25 °C)

1.9.2 CD

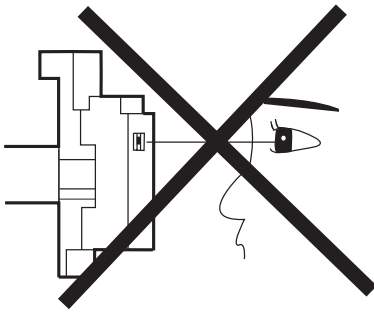
Output power	: 6mW
Wavelength	: 60nm (at 25 °C)

2.0 Playability

Video Playback		
1.	Playback Media: CD-R/CD-RW, DVD+R/+RW, DVD-R/-RW, DVD-Video, Video CD/SVCD, DVD+R DL, DVD-R DL, USB flash drive	x
2.	Compression Formats: MPEG2, MPEG1, DivX 3.11, DivX 4.x, DivX 5.x, DivX 6.0, MPEG4	x
Audio Playback		
1.	Playback Media: Audio CD, CD-R/RW, DVD+R DL, DVD+R/+RW, DVD-R/-RW, MP3- CD, MP3-DVD, USB flash drive, WMA-CD	x
2.	Compression Format: Dolby Digital, MP3, MPEG2 Multichannel, PCM, WMA	x
3.	MPEG1 bit rates: 64-384 kbps and VBR	x
Still Picture Playback		
1.	Playback Media: CD-R/RW, DVD+R DL, DVD+R/+RW, DVD- R/-RW, Picture CD, USB Digital Camera (PTP), USB flash drive	x
2.	Picture Compression Format: JPEG, JPEG digital camera photos	x
3.	Picture enhancement: Slideshow with MP3 playback, Create albums, Rotate, Slideshow with music playback, Zoom	x

Laser Beam Safety Precautions

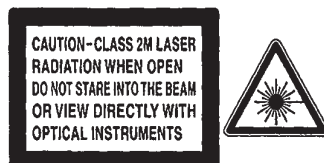
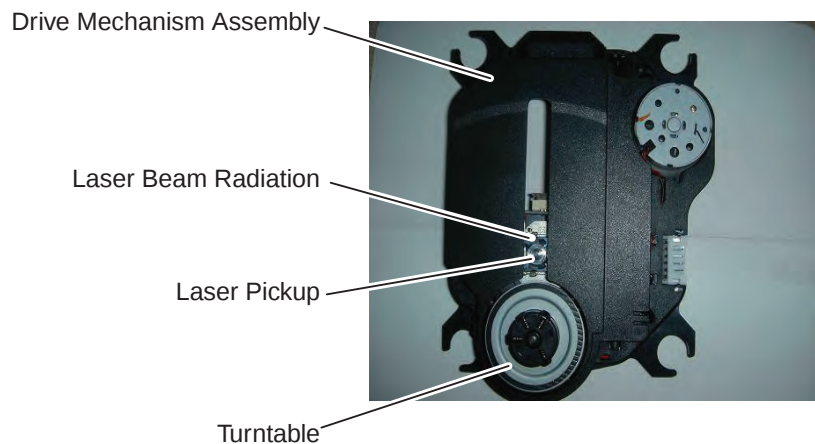
This DVD player uses a pickup that emits a laser beam.



Do not look directly at the laser beam coming from the pickup or allow it to strike against your skin.

The laser beam is emitted from the location shown in the figure. When checking the laser diode, be sure to keep your eyes at least 30 cm away from the pickup lens when the diode is turned on. Do not look directly at the laser beam.

CAUTION: Use of controls and adjustments, or doing procedures other than those specified herein, may result in hazardous radiation exposure.



Location: Inside Top of DVD mechanism.

Important Safety Precautions

Important

Read and understand all instructions before you use your home theater. If damage is caused by failure to follow instructions, the warranty does not apply.

Safety

Risk of electric shock or fire!

- Never expose the product and accessories to rain or water. Never place liquid containers, such as vases, near the product. If liquids are spilt on or into the product, disconnect it from the power outlet immediately. Contact Philips Consumer Care to have the product checked before use.
- Never place the product and accessories near naked flames or other heat sources, including direct sunlight.
- Never insert objects into the ventilation slots or other openings on the product.
- Where the mains plug or an appliance coupler is used as the disconnect device, the disconnect device shall remain readily operable.
- Disconnect the product from the power outlet before lightning storms.
- When you disconnect the power cord, always pull the plug, never the cable.

Risk of short circuit or fire!

- Before you connect the product to the power outlet, ensure that the power voltage matches the value printed on the back or bottom of the product. Never connect the product to the power outlet if the voltage is different.

Risk of injury or damage to the home theater!

- For wall-mountable products, use only the supplied wall mount bracket. Secure the wall mount to a wall that can support the combined weight of the product and the wall mount. Koninklijke Philips Electronics N.V. bears no responsibility for improper wall mounting that results in accident, injury or damage.

- For speakers with stands, use only the supplied stands. Secure the stands to the speakers tightly. Place the assembled stands on flat, level surfaces that can support the combined weight of the speaker and stand.
- Never place the product or any objects on power cords or on other electrical equipment.
- If the product is transported in temperatures below 5°C, unpack the product and wait until its temperature matches room temperature before connecting it to the power outlet.
- Visible and invisible laser radiation when open. Avoid exposure to beam.
- Do not touch the disc optical lens inside the disc compartment.

Risk of overheating!

- Never install this product in a confined space. Always leave a space of at least four inches around the product for ventilation. Ensure curtains or other objects never cover the ventilation slots on the product.

Risk of contamination!

- Do not mix batteries (old and new or carbon and alkaline, etc.).
- Remove batteries if they are exhausted or if the remote control is not to be used for a long time.
- Batteries contain chemical substances, they should be disposed of properly.

Product care

- Do not insert any objects other than discs into the disc compartment.
- Do not insert warped or cracked discs into the disc compartment.
- Remove discs from the disc compartment if you are not using the product for an extended period of time.
- Only use microfiber cloth to clean the product.

Important Safety Precautions

Disposal of your old product and batteries



Your product is designed and manufactured with high quality materials and components, which can be recycled and reused.



When this crossed-out wheeled bin symbol is attached to a product it means that the product is covered by the European Directive 2002/96/EC. Please inform yourself about the local separate collection system for electrical and electronic products.

Please act according to your local rules and do not dispose of your old products with your normal household waste.

Correct disposal of your old product helps to prevent potential negative consequences for the environment and human health.



Your product contains batteries covered by the European Directive 2006/66/EC, which cannot be disposed with normal household waste.

Please inform yourself about the local rules on separate collection of batteries because correct disposal helps to prevent negative consequences for the environmental and human health.

User manual CD

To read the complete user manual, which includes information on advanced features, use the CD supplied with your home theater. For a printed copy of the complete user manual, contact Philips Consumer Care in your country.

To access the user manual



Caution

- The user manual CD is for PC or Mac only. Do not insert the user manual CD into the disc compartment of the home theater.

Requirements:

- A PC (Microsoft Windows compatible) or Mac (OS X) with CD-ROM
- Adobe Reader

- 1** Insert the user manual CD into the CD-ROM tray of the PC or Mac.
- 2** Close the CD-ROM tray.
 - » The user manual screen appears. If the user manual screen does not appear, skip Step 2 and navigate to the 'pdf' folder in the CD-ROM, double-clicking the PDF of your choice.
- 3** Click a user manual language.
 - » Acrobat Reader launches, displaying the complete user manual in the language of your choice.

Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts, and wires have been returned to their original positions. Afterwards, do the following tests and confirm the specified values to verify compliance with safety standards.

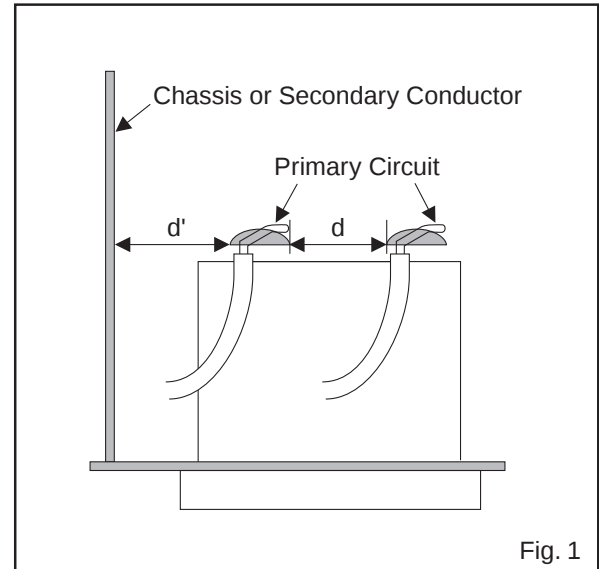
1. Clearance Distance

When replacing primary circuit components, confirm specified clearance distance (d) and (d') between soldered terminals, and between terminals and surrounding metallic parts. (See Fig. 1)

Table 1: Ratings for selected area

AC Line Voltage	Clearance Distance (d), (d')
110V~220V	≥ 3.2 mm (0.126 inches)

Note: This table is unofficial and for reference only. Be sure to confirm the precise values.



2. Leakage Current Test

Confirm the specified (or lower) leakage current between B (earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.) is lower than or equal to the specified value in the table below.

Measuring Method (Power ON):

Insert load Z between B (earth ground, power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across the terminals of load Z. See Fig. 2 and the following table.

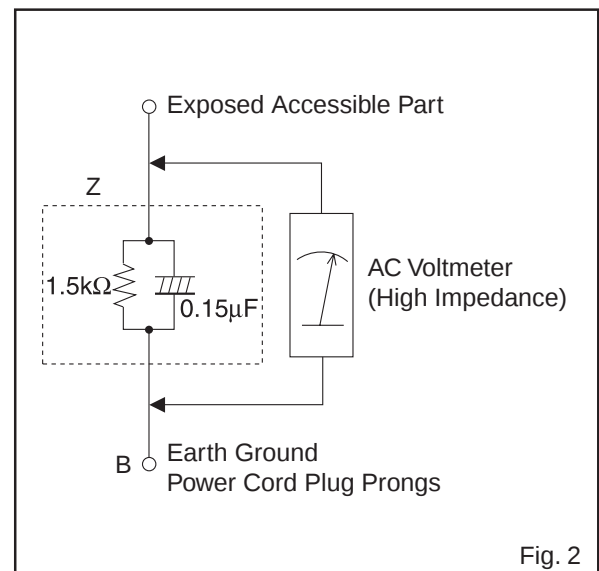


Table 2: Leakage current ratings for selected areas

AC Line Voltage	Load Z	Leakage Current (i)	Earth Ground (B) to:
110V~220V	0.15 μ F CAP. & 1.5 kΩ RES. Connected in parallel	$i \leq 0.5$ mA Peak	Exposed accessible parts

Note: This table is unofficial and for reference only. Be sure to confirm the precise values.

Safety Information, General Notes & Lead Free Requirements

1 Safety Instructions

1.1 General Safety

Safety regulations require that during a repair:

- Connect the unit to the mains via an isolation transformer.
- Replace safety components, indicated by the symbol  , only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.

Safety regulations require that after a repair, you must return the unit in its original condition. Pay, in particular, attention to the following points:

- Route the wires/cables correctly, and fix them with the mounted cable clamps.
- Check the insulation of the mains lead for external damage.
- Check the electrical DC resistance between the mains plug and the secondary side:
 1. Unplug the mains cord, and connect a wire between the two pins of the mains plug.
 2. Set the mains switch to the 'on' position (keep the mains cord unplugged!).
 3. Measure the resistance value between the mains plug and the front panel, controls, and chassis bottom.
 4. Repair or correct unit when the resistance measurement is less than 1 MΩ.
 5. Verify this, before you return the unit to the customer/ user (ref. UL-standard no. 1492).
 6. Switch the unit 'off', and remove the wire between the two pins of the mains plug.

1.2 Laser Safety

This unit employs a laser. Only qualified service personnel may remove the cover, or attempt to service this device (due to possible eye injury).

Laser Device Unit	
Type	: Semiconductor laser GaAlAs
Wavelength	: 650 nm (DVD) : 780 nm (VCD/CD)
Output Power	: 20 mW (DVD+RW writing) : 0.8 mW (DVD reading) : 0.3 mW (VCD/CD reading)
Beam divergence	: 60 degree

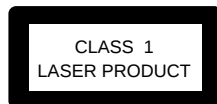


Figure 2-1

Note: Use of controls or adjustments or performance of procedure other than those specified herein, may result in hazardous radiation exposure. Avoid direct exposure to beam.

2 Warnings

2.1 General

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD, ). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are at the same potential as the mass of the set by a wristband with resistance. Keep components and tools at this same potential. Available ESD protection equipment:
 - Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
 - Wristband tester 4822 344 13999.
- Be careful during measurements in the live voltage section. The primary side of the power supply, including the heatsink, carries live mains voltage when you connect the player to the mains (even when the player is 'off!'). It is possible to touch copper tracks and/ or components in this unshielded primary area, when you service the player. Service personnel must take precautions to prevent touching this area or components in this area. A 'lightning stroke' and a stripe-marked printing on the printed wiring board, indicate the primary side of the power supply.
- Never replace modules, or components, while the unit is 'on'.

2.2 Laser

- The use of optical instruments with this product, will increase eye hazard.
- Only qualified service personnel may remove the cover or attempt to service this device, due to possible eye injury.
- Repair handling should take place as much as possible with a disc loaded inside the player.
- Text below is placed inside the unit, on the laser cover shield:

CAUTION: VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN. AVOID EXPOSURE TO BEAM.
ADVARSEL: SYNLIG OG USYNLIG LASERSTRÅLING VED ÅBNING. UNDGÅ UDSÆTTELSE FOR STRÅLING.
ADVARSEL: SYNLIG OG USYNLIG LASERSTRÅLING NÅR DEKSEL ÅPNES. UNNGÅ EKSPONERING FOR STRÅLEN.
VARNING: SYNLIG OCH OSYNLIG LASERSTRÅLNING NÅR DENNA DEL ÄR ÖPPNAD. BETRÄKTA EJ STRÅLEN.
VARO! AVARTTAESSA OLET ALTTIIN NÄKYVÄLLE JA NÄKYMÄTTÖMÄLLE LASER SÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN.
VORSICHT: SICHTBARE UND UNSICHTBARE LASERSTRAHLUNG WENN ABDECKUNG GEÖFFNET. NICHT DEM STRAHL AUSSETZEN.
DANGER: VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO BEAM.
ATTENTION: RAYONNEMENT LASER VISIBLE ET INVISIBLE EN CAS D'OUVERTURE. EXPOSITION DANGEREUSE AU FAISCEAU.

Figure 2-2

3 Lead Free Requirement

Information about Lead-free produced sets

Philips CE is starting production of lead-free sets from 1.1.2005 onwards.

IDENTIFICATION:

Regardless of special logo (not always indicated)

One must treat all sets from 1 Jan 2005 onwards, according next rules.

Example S/N:

Bottom line of typeplate gives a 14-digit S/N. Digit 5&6 is the year, digit 7&8 is the week number, so in this case 1991 wk 18

So from 0501 onwards = from 1 Jan 2005 onwards

Important note: In fact also products of year 2004 must be treated in this way as long as you avoid mixing solder-alloys (lead-ed/ lead-free). So best to always use SAC305 and the higher temperatures belong to this.

Due to lead-free technology some rules have to be respected by the workshop during a repair:

- Use only lead-free solder alloy Philips SAC305 with order code 0622 149 00106. If lead-free solder-pate is required, please contact the manufacturer of your solder-equipment. In general use of solder-paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free solder alloy. The solder tool must be able
 - o To reach at least a solder-temperature of 400°C,
 - o To stabilize the adjusted temperature at the solder-tip
 - o To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature around 360°C – 380°C is reached and stabilized at the solder joint. Heating-time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C otherwise wear-out of tips will rise drastically and flux-fluid will be destroyed. To avoid wear-out of tips switch off un-used equipment, or reduce heat.
- Mix of lead-free solder alloy / parts with lead-ed solder alloy / parts is possible but PHILIPS recommends strongly to avoid mixed solder alloy types (lead-ed and lead-free). If one cannot avoid or does not know whether product is lead-free, clean carefully the solder-joint from old solder alloy and re-solder with new solder alloy (SAC305).
- Use only original spare-parts listed in the Service-Manuals. Not listed standard-material (commodities) has

to be purchased at external companies.

- Special information for BGA-ICs:

- always use the 12nc-recognizable soldering temperature profile of the specific BGA (for de-soldering always use the lead-free temperature profile, in case of doubt)
- lead free BGA-ICs will be delivered in so-called 'dry-packaging' (sealed pack including a silica gel pack) to protect the IC against moisture. After opening, dependent of MSL-level seen on indicator-label in the bag, the BGA-IC possibly still has to be baked dry. (MSL=Moisture Sensitivity Level). This will be communicated via AYS-website.

Do not re-use BGAs at all.

- For sets produced before 1.1.2005 (except products of 2004), containing lead-ed solder-alloy and components, all needed spare-parts will be available till the end of the service-period. For repair of such sets nothing changes.

- On our website www.atyourservice.ce.Philips.com you find more information to:

- BGA-de-/soldering (+ baking instructions)
- Heating-profiles of BGAs and other ICs used in Philips-sets

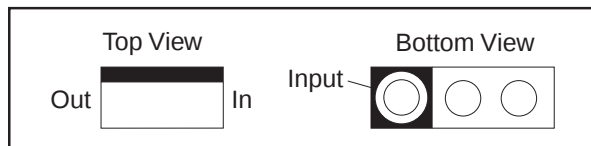
You will find this and more technical information within the "magazine", chapter "workshop news".

For additional questions please contact your local repair-helpdesk.

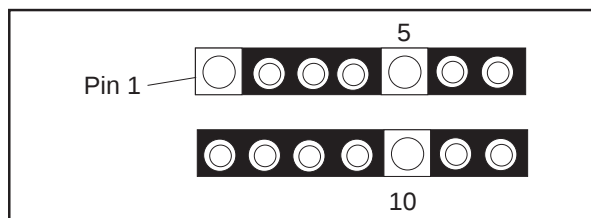
Standard Notes for Servicing

Circuit Board Indications

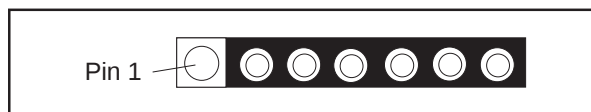
1. The output pin of the 3 pin Regulator ICs is indicated as shown.



2. For other ICs, pin 1 and every fifth pin are indicated as shown.

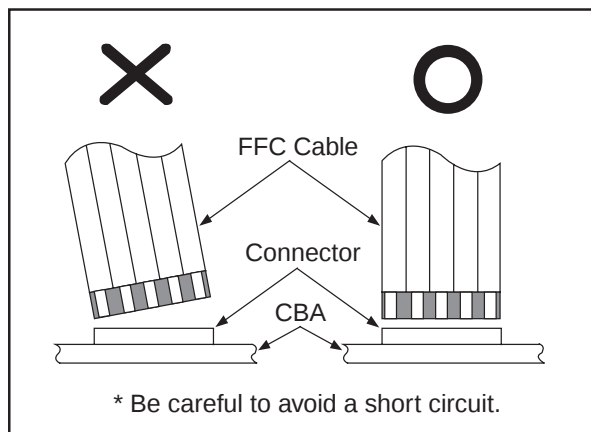


3. The 1st pin of every male connector is indicated as shown.



Instructions for Connectors

1. When you connect or disconnect the FFC (Flexible Foil Connector) cable, be sure to first disconnect the AC cord.
2. FFC (Flexible Foil Connector) cable should be inserted parallel into the connector, not at an angle.



Pb (Lead) Free Solder

When soldering, be sure to use the Pb free solder.

Information about lead-free soldering

Philips CE is producing lead-free sets from 1.1.2005 onwards.

IDENTIFICATION

Regardless of special logo (not always indicated)



One must treat all sets from 1 Jan 2005 onwards, according to the next rule:

Serial Number gives a 14-digit. Digit 5&6 shows the YEAR, and digit 7&8 shows the WEEK.

So from 0501 onwards=from 1 Jan 2005 onwards

Important note : In fact also products of year 2004 must be treated in this way as long as you avoid mixing solder-alloys (leaded/ lead-free). So best to always use SAC305 and the higher temperatures belong to this.

Due to lead-free technology some rules have to be respected by the workshop during a repair:

- Use only lead-free solder alloy Philips SAC305 with order code 0622 149 00106. If lead-free solder-paste is required, please contact the manufacturer of your solder-equipment. In general use of solder-paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free solder alloy. The solder tool must be able
 - To reach at least a solder-temperature of 400°C,
 - To stabilize the adjusted temperature at the solder-tip
 - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature around 360°C - 380°C is reached and stabilized at the solder joint. Heating-time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C otherwise wear-out of tips will rise drastically and flux-fluid will be destroyed. To avoid wear-out of tips switch off un-used equipment, or reduce heat.
- Mix of lead-free solder alloy / parts with leaded solder alloy / parts is possible but PHILIPS recommends strongly to avoid mixed solder alloy types (leaded and lead-free).
If one cannot avoid or does not know whether product is lead-free, clean carefully the solder-joint from old solder alloy and re-solder with new solder alloy (SAC305).
- Use only original spare-parts listed in the Service-Manuals. Not listed standard-material (commodities) has to be purchased at external companies.

Special Information of BGA IC & Flat Pack-IC

- Special information for BGA-ICs:

- always use the 12nc-recognizable soldering temperature profile of the specific BGA (for de-soldering always use the lead-free temperature profile, in case of doubt)
- lead free BGA-ICs will be delivered in so-called 'dry-packaging' (sealed pack including a silica gel pack) to protect the IC against moisture. After opening, dependent of MSL-level seen on indicator-label in the bag, the BGA-IC possibly still has to be baked dry. (MSL=Moisture Sensitivity Level). This will be communicated via AYS-website. Do not re-use BGAs at all.

- For sets produced before 1.1.2005 (except products of 2004), containing leaded solder-alloy and components, all needed spare-parts will be available till the end of the service-period. For repair of such sets nothing changes.

- On our website www.atyourservice.ce.Philips.com you find more information to:

- BGA-de-/soldering (+ baking instructions)
- Heating-profiles of BGAs and other ICs used in Philips-sets

You will find this and more technical information within the "magazine", chapter "workshop news".

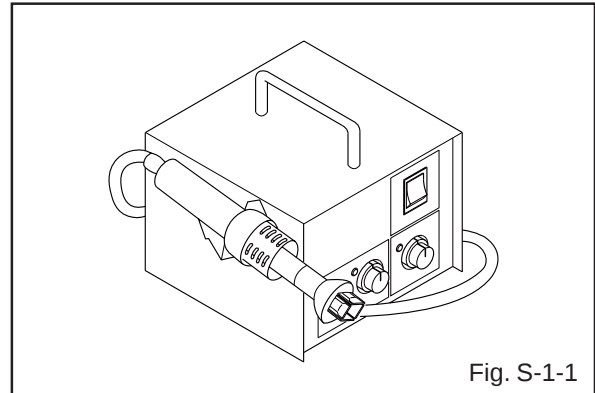
For additional questions please contact your local repair-helpdesk.

How to Remove / Install Flat Pack-IC

1. Removal

With Hot-Air Flat Pack-IC Desoldering Machine:

1. Prepare the hot-air flat pack-IC desoldering machine, then apply hot air to the Flat Pack-IC (about 5 to 6 seconds). (Fig. S-1-1)

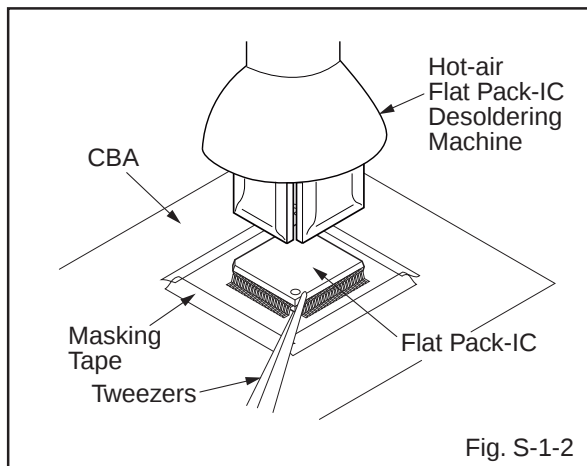


2. Remove the flat pack-IC with tweezers while applying the hot air.
3. Bottom of the flat pack-IC is fixed with glue to the CBA; when removing entire flat pack-IC, first apply soldering iron to center of the flat pack-IC and heat up. Then remove (glue will be melted). (Fig. S-1-6)
4. Release the flat pack-IC from the CBA using tweezers. (Fig. S-1-6)

CAUTION:

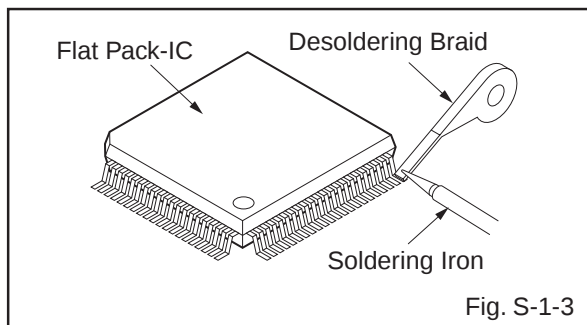
1. The Flat Pack-IC shape may differ by models. Use an appropriate hot-air flat pack-IC desoldering machine, whose shape matches that of the Flat Pack-IC.
2. Do not supply hot air to the chip parts around the flat pack-IC for over 6 seconds because damage to the chip parts may occur. Put masking tape around the flat pack-IC to protect other parts from damage. (Fig. S-1-2)

3. The flat pack-IC on the CBA is affixed with glue, so be careful not to break or damage the foil of each pin or the solder lands under the IC when removing it.

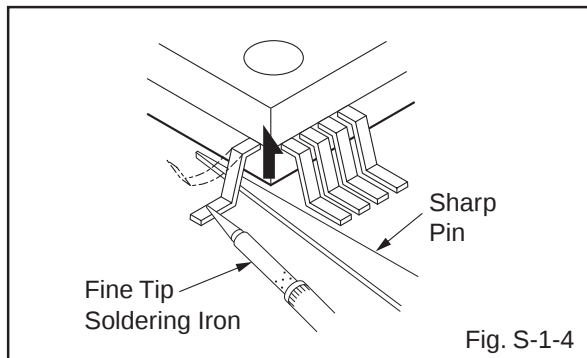


With Soldering Iron:

1. Using desoldering braid, remove the solder from all pins of the flat pack-IC. When you use solder flux which is applied to all pins of the flat pack-IC, you can remove it easily. (Fig. S-1-3)



2. Lift each lead of the flat pack-IC upward one by one, using a sharp pin or wire to which solder will not adhere (iron wire). When heating the pins, use a fine tip soldering iron or a hot air desoldering machine. (Fig. S-1-4)

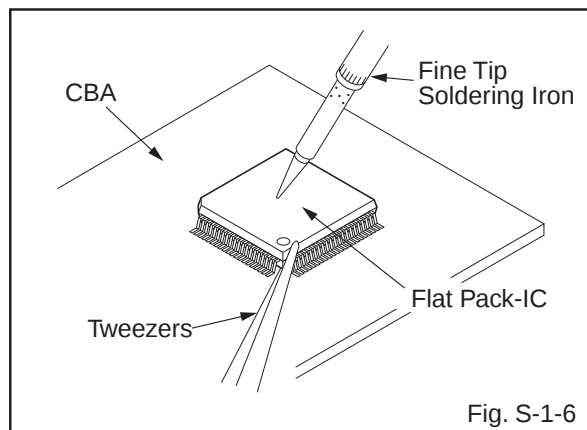
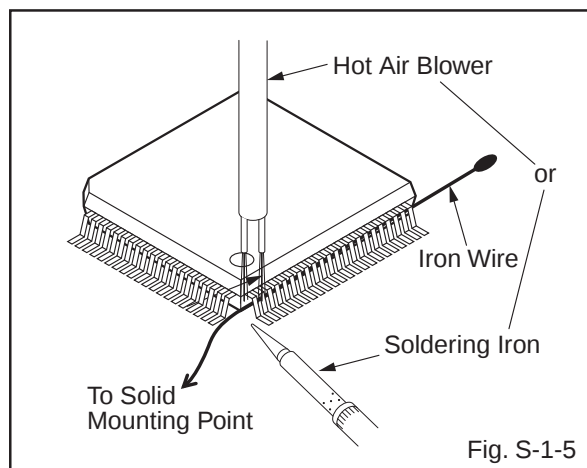


3. Bottom of the flat pack-IC is fixed with glue to the CBA; when removing entire flat pack-IC, first apply soldering iron to center of the flat pack-IC and heat up. Then remove (glue will be melted). (Fig. S-1-6)
4. Release the flat pack-IC from the CBA using tweezers. (Fig. S-1-6)

With Iron Wire:

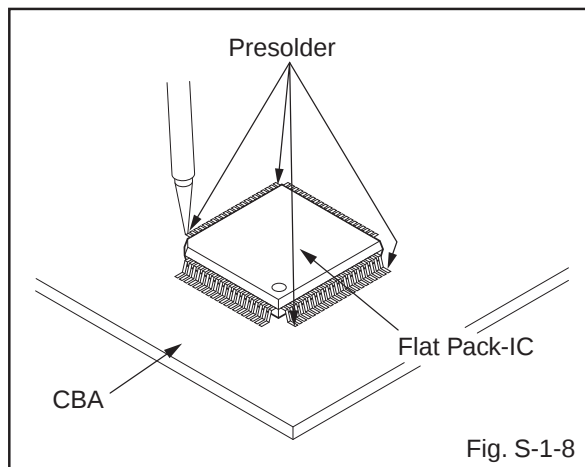
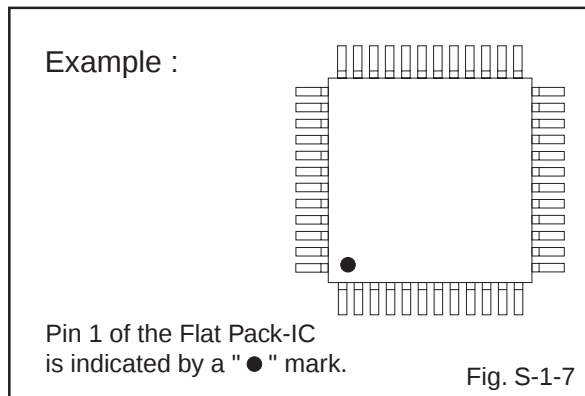
1. Using desoldering braid, remove the solder from all pins of the flat pack-IC. When you use solder flux which is applied to all pins of the flat pack-IC, you can remove it easily. (Fig. S-1-3)
2. Affix the wire to a workbench or solid mounting point, as shown in Fig. S-1-5.
3. While heating the pins using a fine tip soldering iron or hot air blower, pull up the wire as the solder melts so as to lift the IC leads from the CBA contact pads as shown in Fig. S-1-5.
4. Bottom of the flat pack-IC is fixed with glue to the CBA; when removing entire flat pack-IC, first apply soldering iron to center of the flat pack-IC and heat up. Then remove (glue will be melted). (Fig. S-1-6)
5. Release the flat pack-IC from the CBA using tweezers. (Fig. S-1-6)

Note: When using a soldering iron, care must be taken to ensure that the flat pack-IC is not being held by glue. When the flat pack-IC is removed from the CBA, handle it gently because it may be damaged if force is applied.



2. Installation

1. Using desoldering braid, remove the solder from the foil of each pin of the flat pack-IC on the CBA so you can install a replacement flat pack-IC more easily.
2. The "●" mark on the flat pack-IC indicates pin 1. (See Fig. S-1-7.) Be sure this mark matches the 1 on the PCB when positioning for installation. Then presolder the four corners of the flat pack-IC. (See Fig. S-1-8.)
3. Solder all pins of the flat pack-IC. Be sure that none of the pins have solder bridges.



Instructions for Handling Semi-conductors

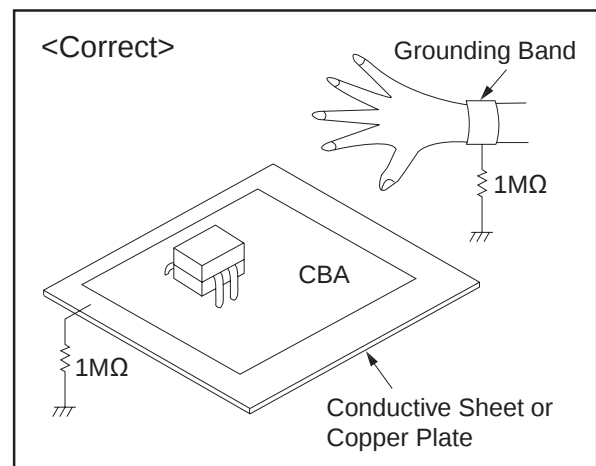
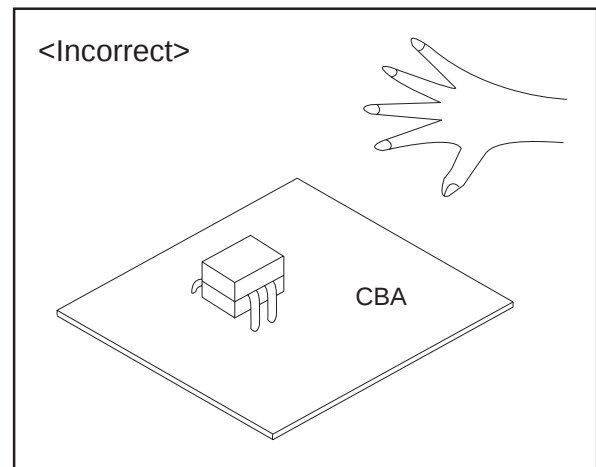
Electrostatic breakdown of the semi-conductors may occur due to a potential difference caused by electrostatic charge during unpacking or repair work.

1. Ground for Human Body

Be sure to wear a grounding band (1 MΩ) that is properly grounded to remove any static electricity that may be charged on the body.

2. Ground for Workbench

Be sure to place a conductive sheet or copper plate with proper grounding (1 MΩ) on the workbench or other surface, where the semi-conductors are to be placed. Because the static electricity charge on clothing will not escape through the body grounding band, be careful to avoid contacting semi-conductors with your clothing.



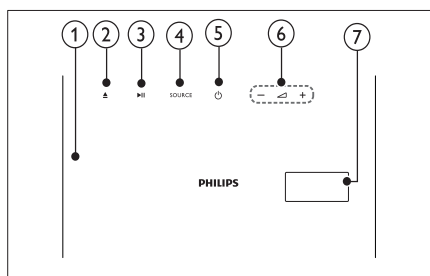
Direction of Use

*The following excerpt of the DFU/QSG serves as an introduction to the set. The Complete Direction for Use can be download in different languages from the internet site of Philips Customer care Center : www.p4c.philips.com

Your home theater

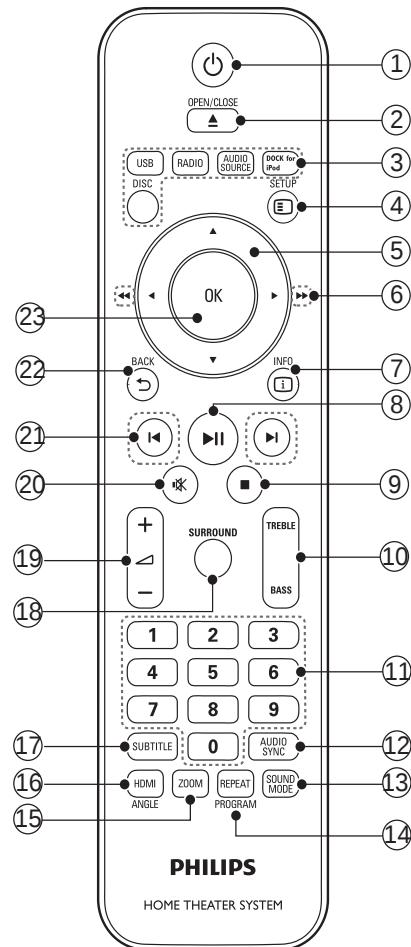
Congratulations on your purchase, and welcome to Philips! To fully benefit from the support that Philips offers, register your home theater at www.philips.com/welcome.

Main unit



- a Disc compartment
- b ▲ (Open/Close)
Opens or closes the disc compartment.
- c ►|| (Play/Pause)
Starts, pauses or resumes disc play.
- d SOURCE
Selects an audio/video source for the home theater.
- e ⏻ (Standby-On)
Switches the home theater on or to standby.
- f ▲ +/- (Volume)
Increases or decreases volume.
- g Display panel

Remote control



- a ⏻ (Standby-On)
 - Switches the home theater on or to standby.
 - When EasyLink is enabled, press and hold for at least three seconds to switch all connected HDMI CEC compliant devices to standby.
- b ▲ OPEN/CLOSE
Opens or closes the disc compartment.

Direction of Use

Remote Control

- c Audio Source
 - DISC: Switches to disc source.
 - USB: Switches to USB storage device.
 - RADIO: Switches to FM radio.
 - AUDIO SOURCE: Selects an audio input source.
 - DOCK for iPod: Switches to Philips Dock for iPod/iPhone.
- d  SETUP
Accesses or exits the setup menu.
- e  (Navigation buttons)
 - Navigate menus.
 - In video mode, press left or right to fast backward or fast forward.
 - In radio mode, press left or right to search a radio station; press up or down to  tune a radio frequency.
- f  (Fast Backward)  (Fast Forward)
Fast backwards or fast forwards. Press repeatedly to change the search speed.
- g  INFO
Displays information about what is playing.
- h  (Play/Pause)
Starts, pauses or resumes disc play.
- i  (Stop)
 - Stops disc play.
 - In radio mode, erases the current preset radio station.
- j TREBLE/BASS
Changes treble or bass. Use with +/- .
- k Numeric buttons
Selects an item to play.
- l AUDIO SYNC
 - Selects an audio language or channel.
 - Press and hold to synchronize audio with video. Use with +/- .
- m SOUND MODE
Selects a predefined sound effect.
- n REPEAT/PROGRAM
 - Selects a repeat or shuffle mode.
 - In radio mode, programs radio stations.
- o ZOOM
Zooms into a video scene or picture.
- p HDMI / ANGLE
 - Selects video resolution of HDMI output from the home theater.
 - Displays options for different camera angles.
- q SUBTITLE
Selects subtitle language for video.
- r SURROUND
Selects Dolby Virtual Speaker surround sound.
- s  +/-
Increases or decreases volume.
- t  (Mute)
Mutes or restores volume.
- u  (Previous/Next)
Skips to the previous or next track, chapter or  e.
- v  BACK
Returns to a previous menu screen.
- w OK
Confirms an entry or selection.

Direction of Use

Connect your home theater

This section helps you connect your home theater to a TV and other devices. The basic connections of the home theater with its accessories are provided in the Quick Start. For a comprehensive interactive guide, see www.connectivityguide.philips.com.

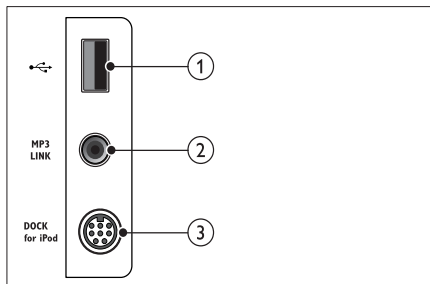


Note

- Refer to the type plate at the back or bottom of the product for identification and supply ratings.
- Before you make or change any connections, ensure that all devices are disconnected from the power outlet.

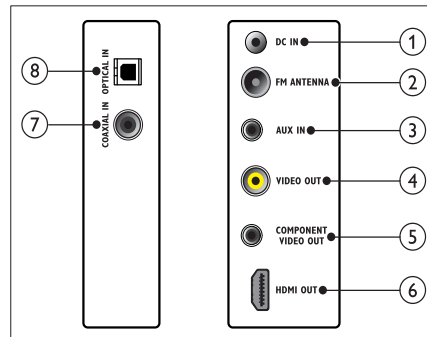
Connectors

Side connectors



- (USB)
Audio, video or picture input from a USB storage device.
- MP3 LINK
Audio input from an MP3 player.
- DOCK for iPod
Connects to a Philips Dock for iPod/iPhone. (sold separately)

Back connectors



- DC IN
Connects to the AC-DC adapter.
- FM ANTENNA
Connects the FM antenna for radio reception.
- AUX IN
Connects to the analog audio output on the TV or an analog device.
- VIDEO OUT
Connects to the composite video input on the TV.
- COMPONENT VIDEO OUT
Connects to the component video input on the TV.
- HDMI OUT
Connects to the HDMI input on the TV.
- COAXIAL IN
Connects to the coaxial audio output on the TV or a digital device.
- OPTICAL IN
Connects to the optical audio output on the TV or a digital device.

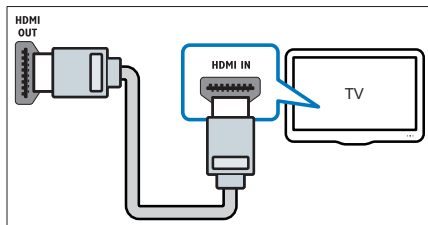
Connect to the TV

Connect your home theater directly to a TV through one of the following connectors (from highest to basic quality video):

- HDMI
- Component video
- Composite video
- SCART

Direction of Use

Option 1: Connect to the TV through HDMI



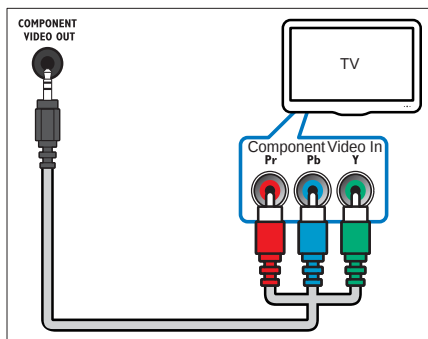
Note

- If the HDTV has a DVI connector, connect using an HDMI/DVI adapter.
- If the TV supports EasyLink HDMI CEC, control the home theater and TV with one remote control (see 'Use Philips EasyLink' on page 13).

Option 2: Connect to the TV through YPbPr (component video)

Note

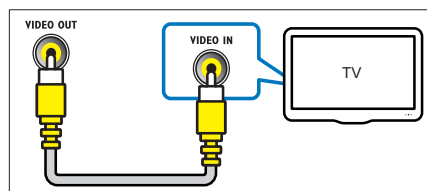
- The component video cable or connector might be labeled Y Cb Cr or YUV



Option 3: Connect to the TV through composite video (CVBS)

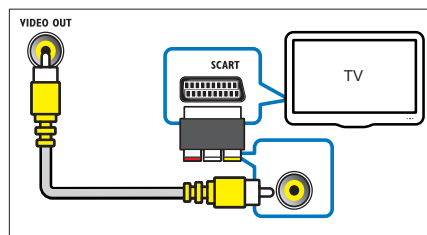
Note

- The composite video cable or connector might be labeled AV IN, VIDEO IN, COMPOSITE or BASEBAND



Option 4: Connect to the TV through SCART

Use the supplied scart adapter.



Connect audio from TV or other devices

Use your home theater to play audio from the TV or other devices such as a cable box. Choose from the following connectors.

Tip

- Press AUDIO SOURCE repeatedly to select the audio output of your connection.

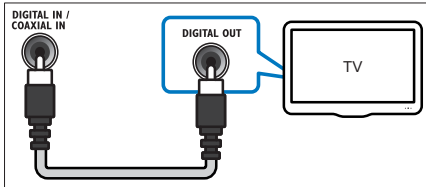
Direction of Use

Option 1: Connect audio through a digital coaxial cable

Note

- The digital coaxial cable or connector might be labeled COAXIAL DIGITAL OUT or SPDIF OUT.

(Cable not supplied)

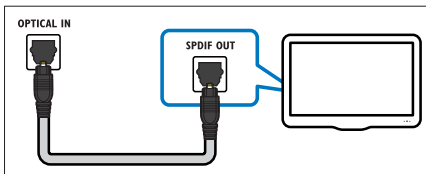


Option 2: Connect audio through a digital optical cable

Note

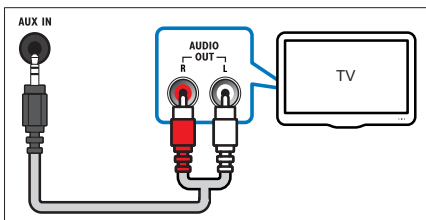
- The digital optical cable or connector might be labeled SPDIF OUT or OPTICAL OUT.

(Cable not supplied)



Option 3: Connect audio through analog audio cables

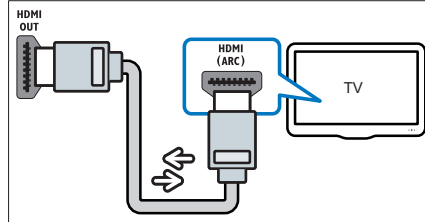
(Cable not supplied)



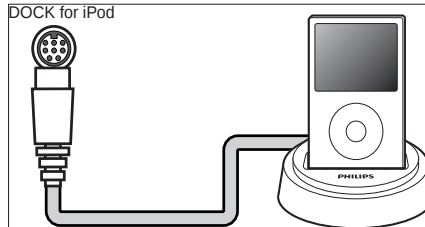
Option 4: Connect audio through an HDMI cable

Note

- The HDMI connector on the TV might be labeled HDMI 1 or HDMI ARC. This feature works with Audio Return Channel (ARC) compatible devices only.



Connect a Philips Dock for iPod/iPhone



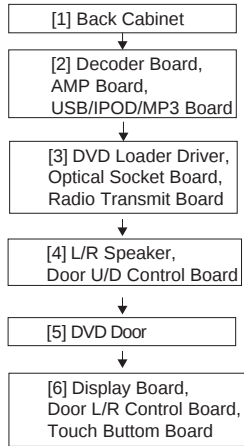
Note

- Philips iPod Dock is sold separately.
- You can use the iPod Dock to charge the iPod while the home theater is in iPod mode.

Cabinet Disassembly Instructions

1. Disassembly Flowchart

This flowchart indicates the disassembly steps to gain access to item(s) to be serviced. When reassembling, follow the steps in reverse order. Bend, route, and dress the cables as they were originally.



2. Disassembly Method

ID/ Loc. No.	Part	Removal		
		Fig. No.	Remove/*Unhook/ Unlock/Release/ Unplug/Desolder	Note
[1]	Back Cabinet	D1	8(A03) D3x10BA, 2(A04) D3x10FA	
[2]	Decoder Board, AMP Board, USB/IPOD/MP3 Board	D2	9(A05) D3x8PA, 2(A07) D3x6PA	
[3]	DVD Loader Driver, Optical Socket Board, Radio Transmit Board	D3	2(A04) D3x10FA, 2(A06) D2.6x6BB, 4(A10) D2.6x10PWT	
[4]	L/R Speaker, Door U/D Control Board	D4	12(A03) D3x10BA, 1(A06) D2.6x6BB	
[5]	DVD Door	D5 D6	1(A08) D2x3FB	
[6]	Display Board, Door L/R Control Board, Touch Button Board	D7	5(A02) D2x3FB, 2(A05) D3x8PA, 2(A05) D2.6x6BB	

Note:

- (1) Identification (location) No. of parts in the figures
- (2) Name of the part
- (3) Figure Number for reference
- (4) Identification of parts to be removed, unhooked, unlocked, released, unplugged, unclamped, or desoldered.

Axx = Screw, CNxx/Jxx/CONxx = Connector
D3.5X12BA is specification of screw.

* = Unhook, Unlock, Release, Unplug, or Desolder
e.g. 7(A01) = seven Screws

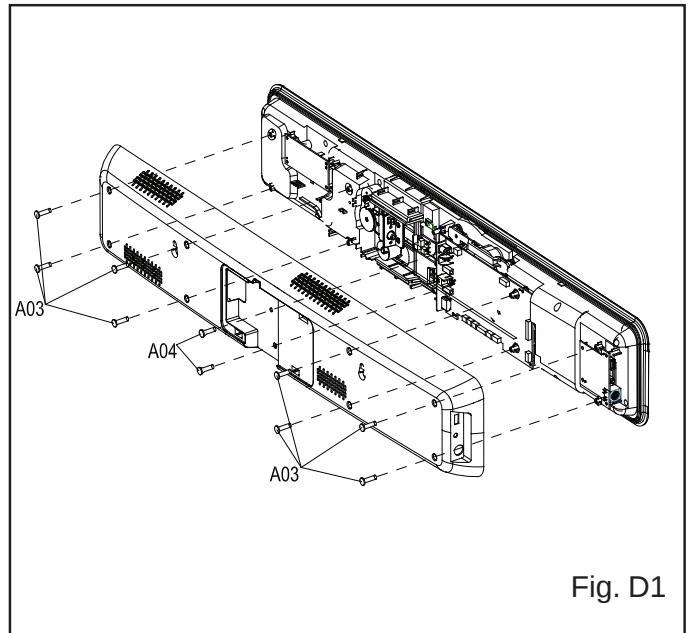


Fig. D1

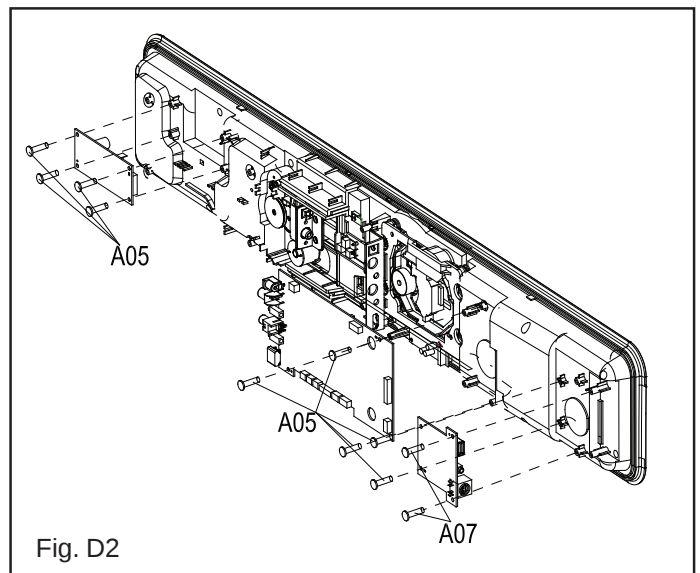
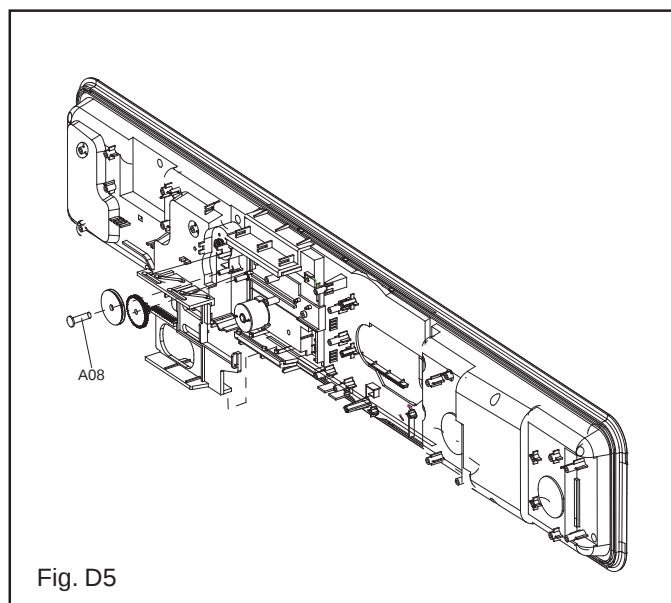
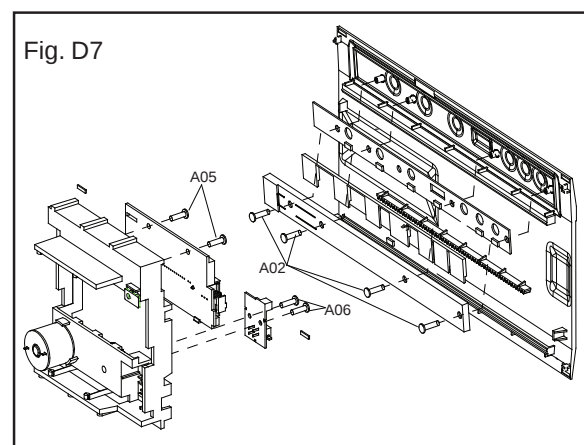
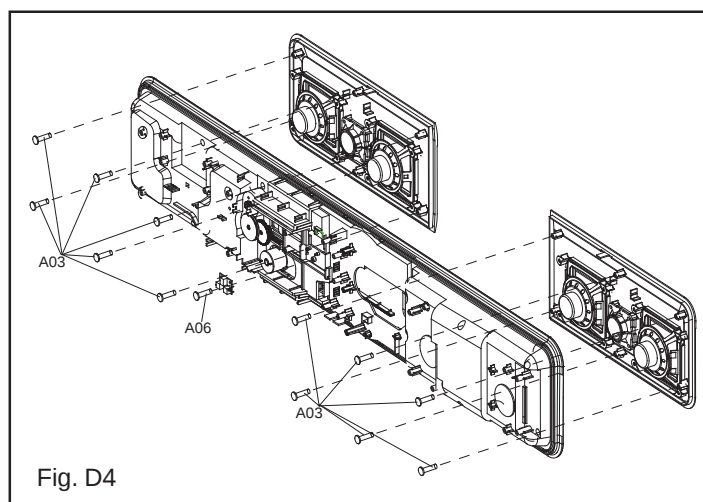
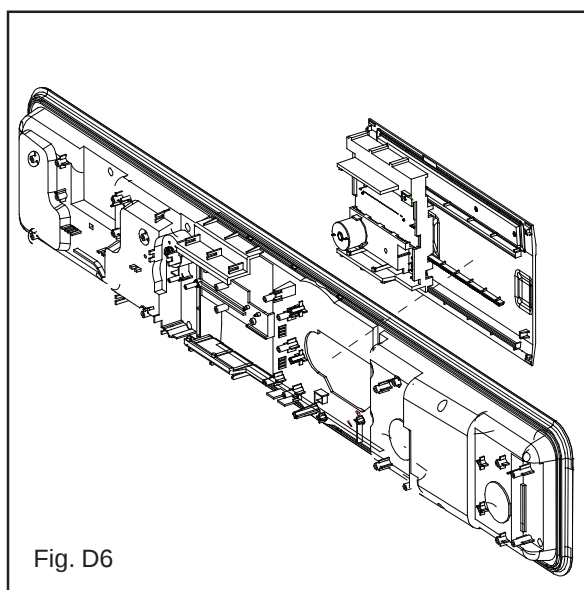
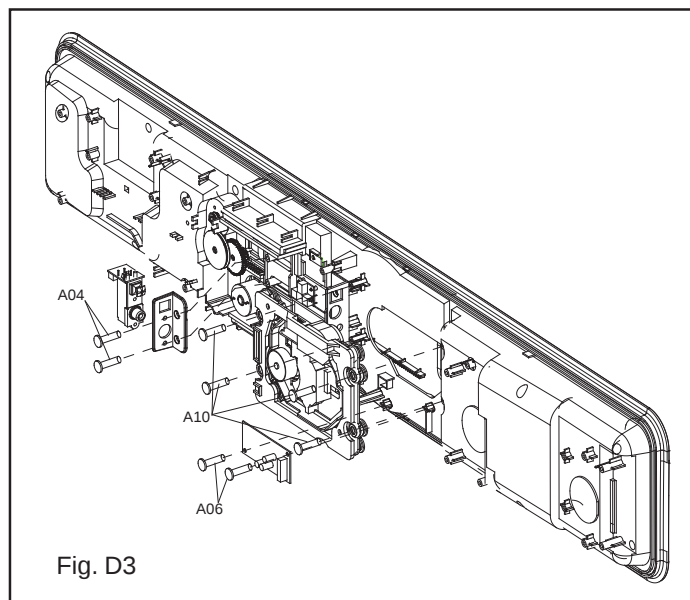


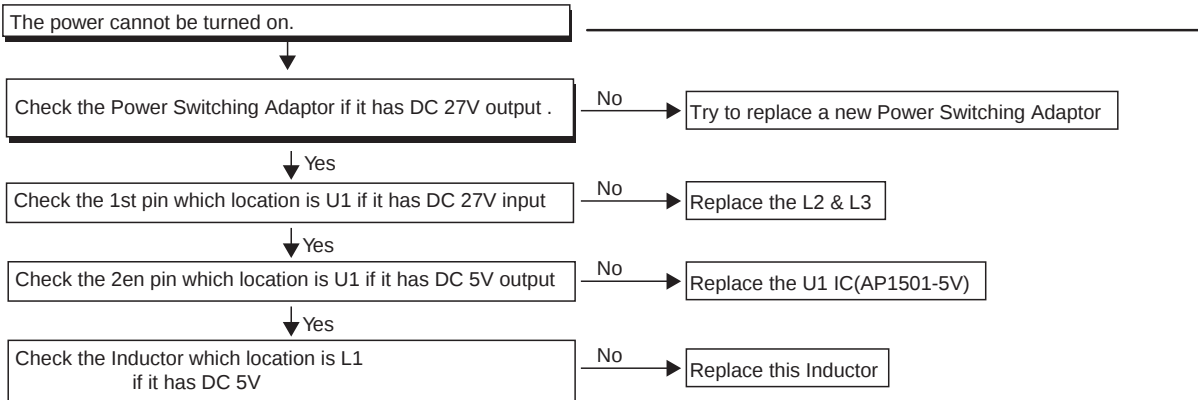
Fig. D2

Cabinet Disassembly Instructions

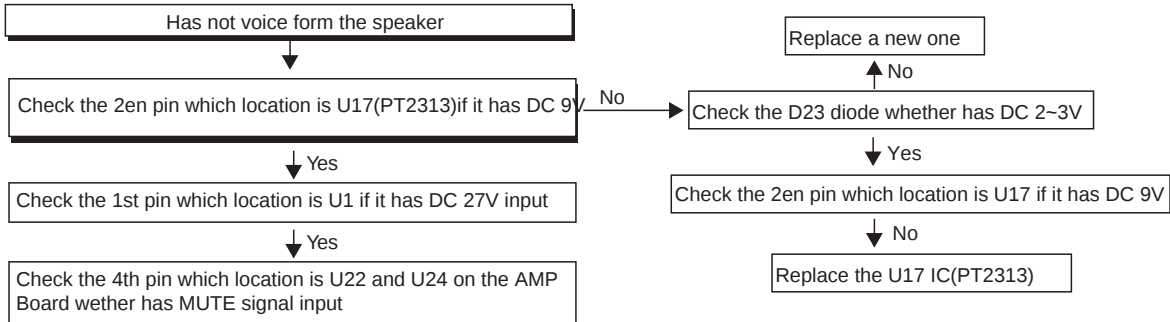


Troubleshooting

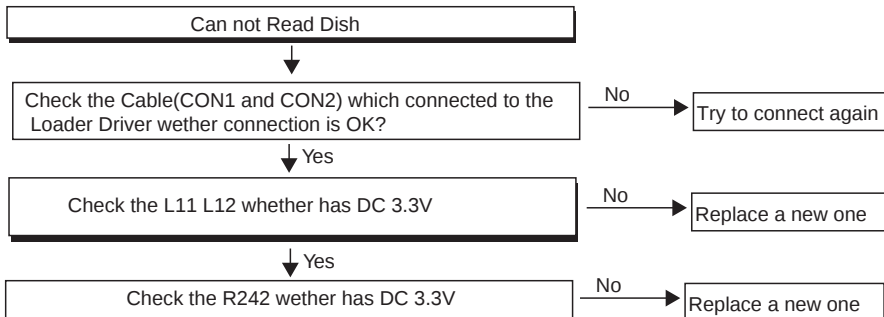
FLOW CHART NO.1



FLOW CHART NO.2



FLOW CHART NO.3



Software Upgrading Procedure

- 1, Download the Software from Philips support Website:

<http://www.philips.com/support>.

- 2, Copy the Software upgrade file into USB device.

A, Connect to TV and Turn on Main Unit

Main unit Screen Display:



TV Screen Display:

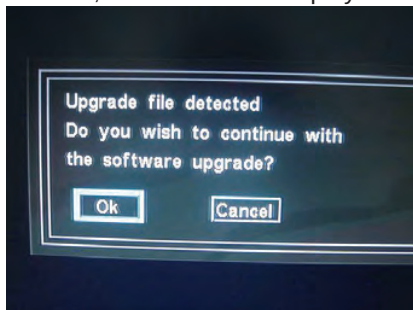


B, When insert the USB Device with software

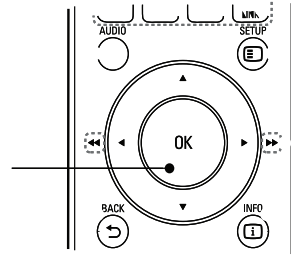
Main unit Screen Display:



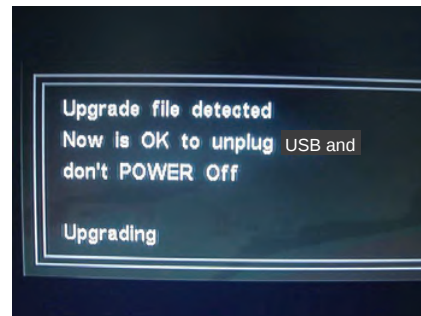
Meanwhile, the TV Screen Display:



C, Press the "OK" on the Remote Control.



D, Software Upgrading, TV Screen Display:



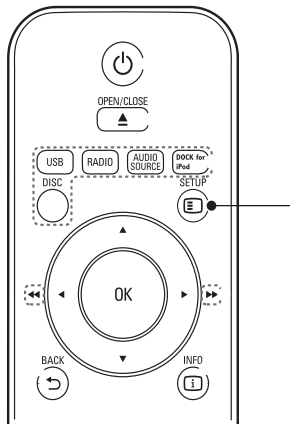
E, After 1 or 2 minute, TV Screen will reset and Display:



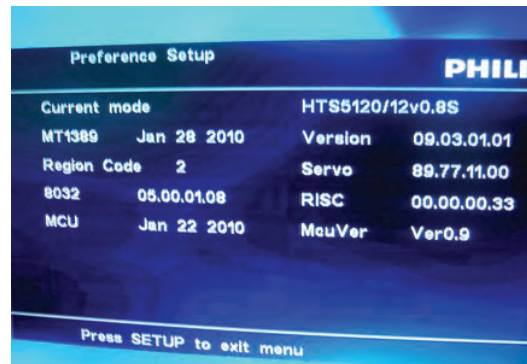
Software Upgrade finish.

Software Version Check

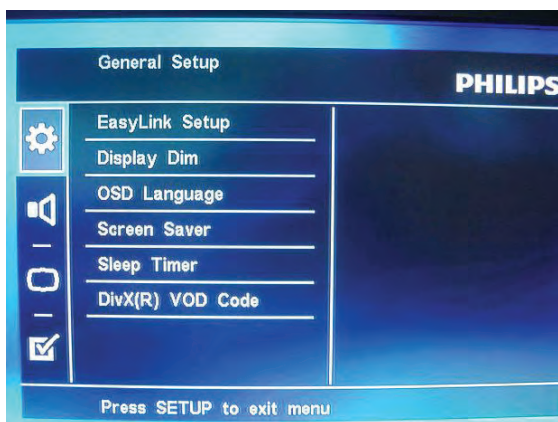
1, Select the "Menu", like below show:



Press OK on Remote Control:



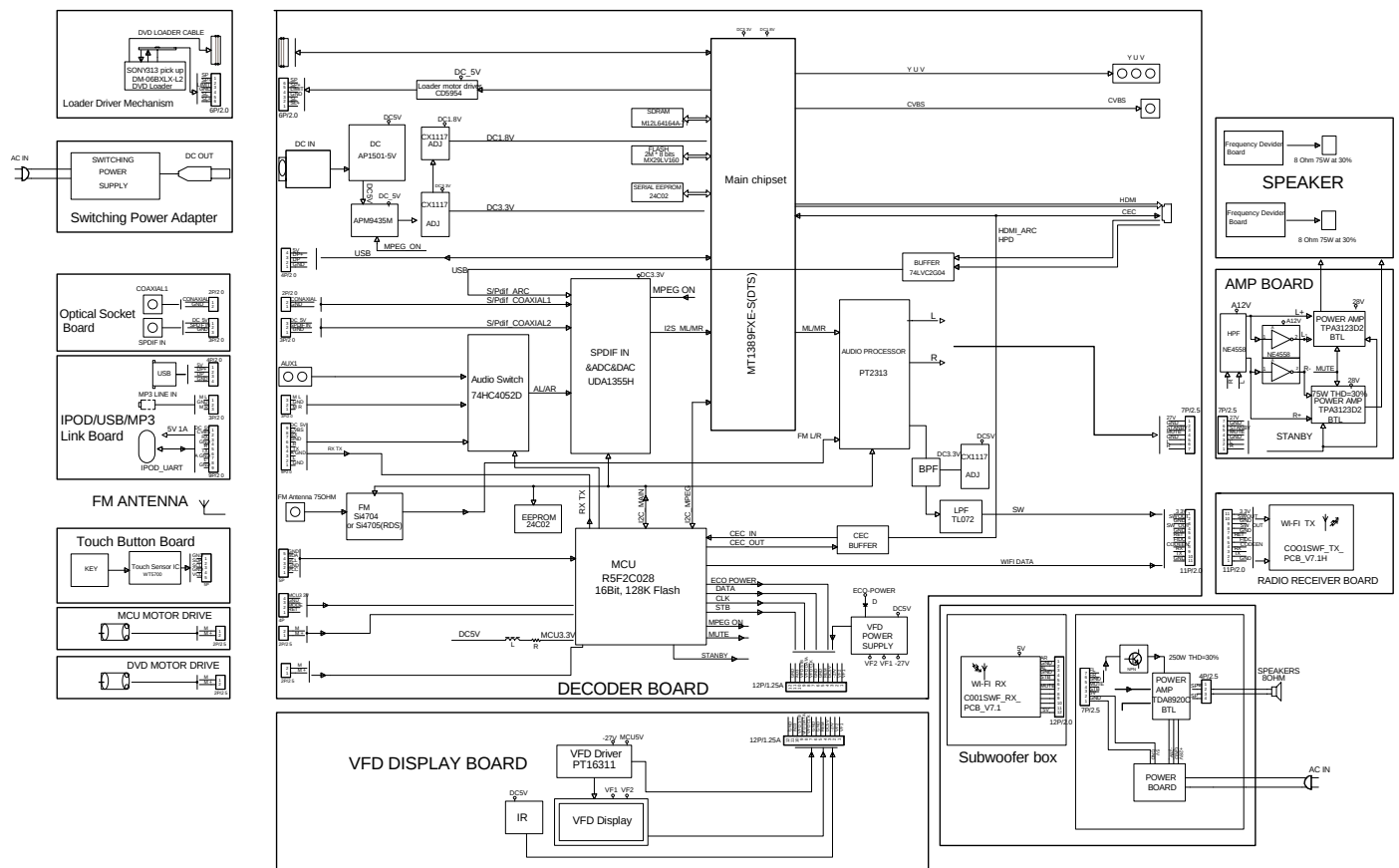
2, TV Screen Display:



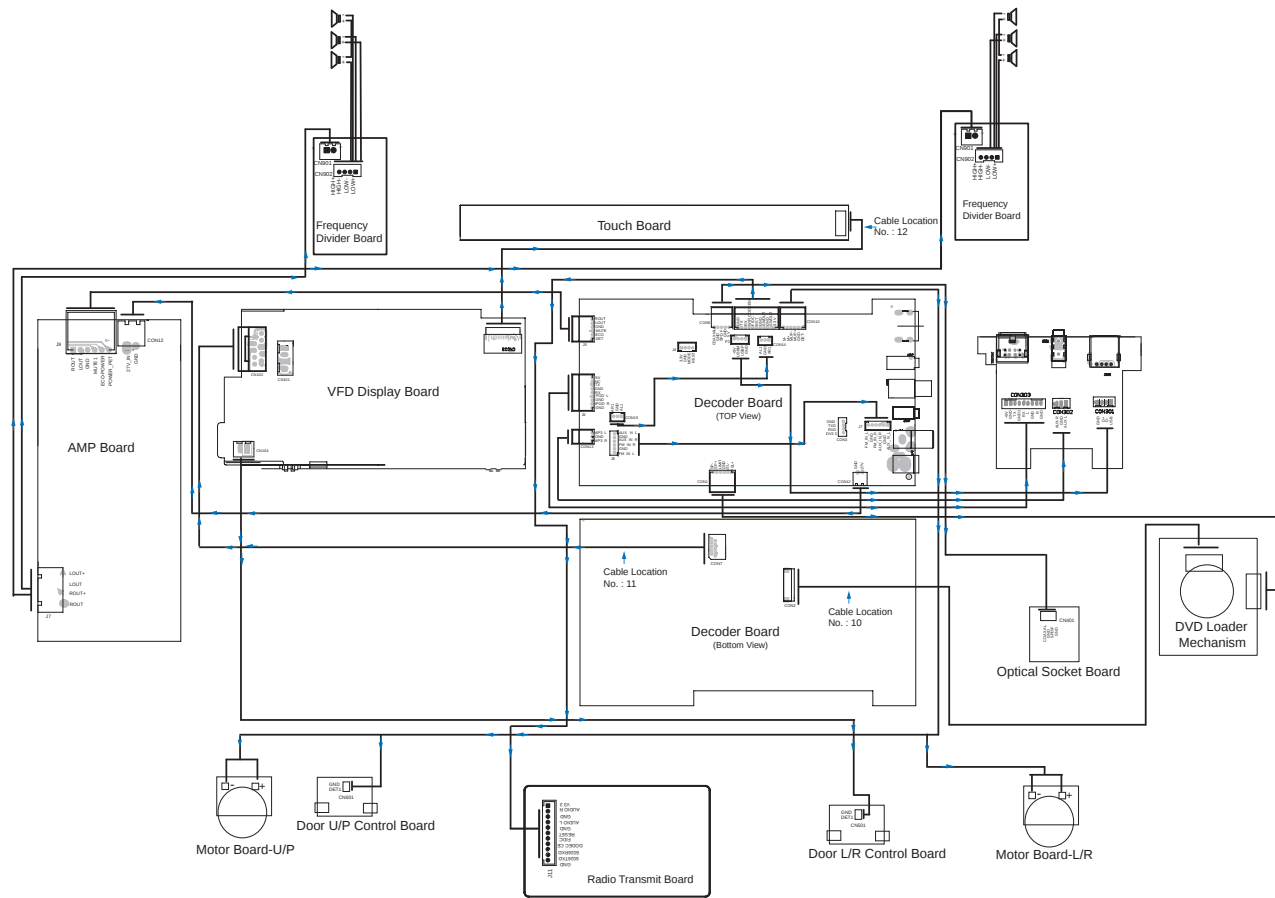
2, Select ☒ to get the Version information :



Block Diagram



Wiring Diagram

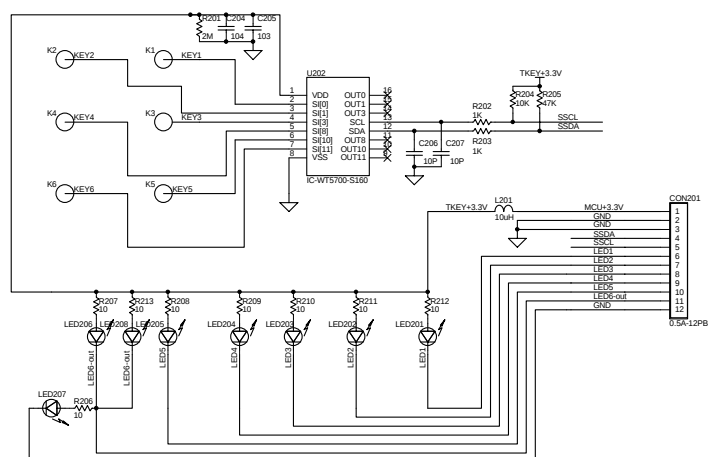


14-1

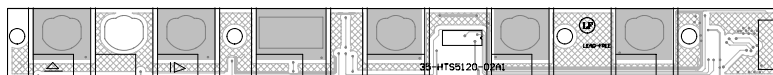
14-1

Main Unit -- Touch Button Board Circuit & Layout Diagram

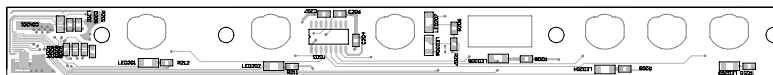
Circuit Diagram



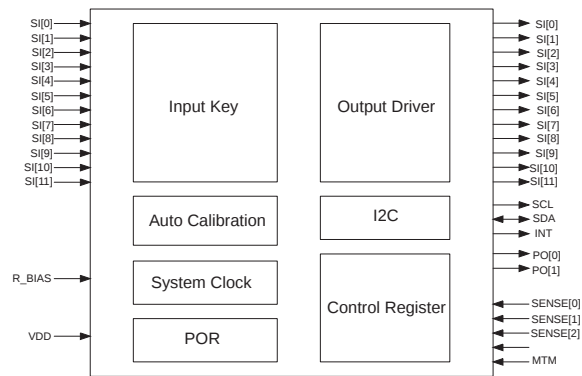
TOP Layout Diagram



Bottom Layout Diagram



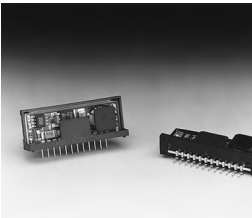
Block Diagram



Pin description

R480	U320	S160	Pin Name	I/O	Function Description
2		3	SI[1]	A	Capacitive sensor input[1]
3	1		SI[2]	A	Capacitive sensor input[2]
4	2	4	SI[3]	A	Capacitive sensor input[3]
5	3		SI[4]	A	Capacitive sensor input[4]
6	4		SI[5]	A	Capacitive sensor input[5]
7	5		SI[6]	A	Capacitive sensor input[6]
8	6		SI[7]	A	Capacitive sensor input[7]
9	7	5	SI[8]	A	Capacitive sensor input[8]
10	8		SI[9]	A	Capacitive sensor input[9]
11		6	SI[10]	A	Capacitive sensor input[10]
14		7	SI[11]	A	Capacitive sensor input[11]
15	9		TEST1	I	Test mode pin
16	10		INT	O	Interrupt output
17	11		MTM	I	Multi touch mode select input (pull high)
18	12	8	TEST2	I	Test mode pin
19	13	8	VSS	P	ground
20	14		WIN_CTL	I	Window of sensitivity select input (pull high)
21		9	OUT[11]	O	Channel of output[11] (Open drain)
22		10	OUT[10]	O	Channel of output[10] (Open drain)
23	15		OUT[9]	O	Channel of output[9] (Open drain)
26	16	11	OUT[8]	O	Channel of output[8] (Open drain)
27	17		OUT[7]	O	Channel of output[7] (Open drain)
28	18		OUT[6]	O	Channel of output[6] (Open drain)
29	19		PO[1]	O	PO[1] output
30	20	12	SDA	I/O	I2C SDA pin
31	21	13	SCL	I/O	I2C SCL pin
32	22		PO[0]	O	PO[0] output
33	23		OUT[5]	O	Channel of output[5] (Open drain)
34	24		OUT[4]	O	Channel of output[4] (Open drain)
35	25	14	OUT[3]	O	Channel of output[3] (Open drain)
38	26		OUT[2]	O	Channel of output[2] (Open drain)
39		15	OUT[1]	O	Channel of output[1] (Open drain)
40		16	OUT[0]	O	Channel of output[0] (Open drain)
41	27		SENSE[0]	I	Sensitivity control [0] (pull high)
42	28	1	VDD	P	VDD
43	29		SENSE[1]	I	Sensitivity control [1] (pull high)
44	30		SENSE[2]	I	Sensitivity control [2] (pull high)
45	31		PO_EN	I	PO output enable (for power saving) (pull high)
46	32		PO_SLT	I	PO output selection (pull high)
47		2	SI[0]	A	Capacitive sensor input[0]





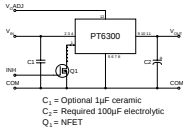
- 87% Efficiency
- Adjustable Output Voltage
- Internal Short Circuit Protection
- Over-Temperature Protection
- On/Off Control (Ground Off)
- Small SIP Footprint
- Wide Input Range

The PT6310 series is a High-Performance 2 Amp, 12-Pin SIP (Single In-line Package) Integrated

Switching Regulator (ISR) designed to meet the on-board power conversion needs of battery powered or other equipment requiring high efficiency and small size. This high performance ISR offers a unique combination of features combining 87% typical efficiency with open-collector on/off control and adjustable output voltage.

Quiescent current in the shutdown mode is typically less than 100µA.

Standard Application



Specifications

Characteristics (T _a = 25°C unless noted)	Symbols	Conditions	PT6310 Series			Units
			Min	Typ	Max	
Output Current	I _O	Over V _O range	0.1*	—	2.0	A
Short Circuit Current	I _{SC}	V _O = V _O + 5V	—	5.0	—	Apk
Input Voltage Range	V _I	0.1 ≤ I _O ≤ 2.0 A	V _O + 4	—	38**	V
Output Voltage Tolerance	ΔV _O	Over V _O range, I _O = 2.0 A T _a = 0°C to +60°C	—	±1.0	±2.0	%V _O
Line Regulation	Reg _{Line}	Over V _O range	—	±0.25	±0.5	%V _O
Load Regulation	Reg _{Load}	0.1 ≤ I _O ≤ 2.0 A	—	±0.25	±0.5	%V _O
V _O Ripple/Noise	V _r	V _O = V _O min, I _O = 2.0 A	—	±2	—	%V _O
Transient Response with C _L = 100µF	t _r V _O	50% load change V _O over/undershoot	—	100 5.0	200 —	µSec %V _O
Efficiency	η	V _O = 24V, I _O = 2.0 A	—	87	—	%
Switching Frequency	f _s	Over V _O and I _O ranges	PT6312 only			
			600 500	700 550	800 600	kHz kHz
Shutdown Current	I _{SD}	V _I = 15V	—	100	—	µA
Quiescent Current	I _Q	I _O = 0A, V _O = 10V	—	10	—	mA
Output Voltage Adjustment Range	V _O	Below V _O Above V _O	See Application Notes.			
Absolute Maximum Operating Temperature Range	T _a		-40	—	+85	°C
Recommended Operating Temperature Range	T _a	Free Air Convection, (40-60LFM) At V _I = 18V, I _O = 2.0 A	-40	—	+70	°C
Thermal Resistance	θ _{JA}	Free Air Convection (40-60LFM)	—	30	—	°C/W
Storage Temperature	T _s		-40	—	+125	°C
Mechanical Shock		Per MIL-STD-883D, Method 2002.3, 1 msec, Half Sine, mounted to a fixture	—	500	—	G's
Mechanical Vibration		Per MIL-STD-883D, Method 2007.2, 20-2000 Hz, Soldered in a PC board	—	10	—	G's
Weight	—		—	6.5	—	grams

* ISR will operate to no load with reduced specifications.
** Input voltage cannot exceed 30V when the inhibit function is used.
Note: The PT6310 requires a 100µF electrolytic or tantalum output capacitor for proper operation in all applications.

Pin-Out Information

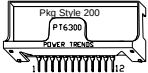
Pin	Function
1	Inhibit (30V max)
2	V _I
3	V _I
4	V _I
5	GND
6	GND
7	GND
8	GND
9	V _O
10	V _O
11	V _O
12	V _O Adj

Ordering Information

PT6310	= +14.6 Volts
PT6311	= +15.5 Volts
PT6312	= +15.0 Volts
PT6313	= +8.0 Volts

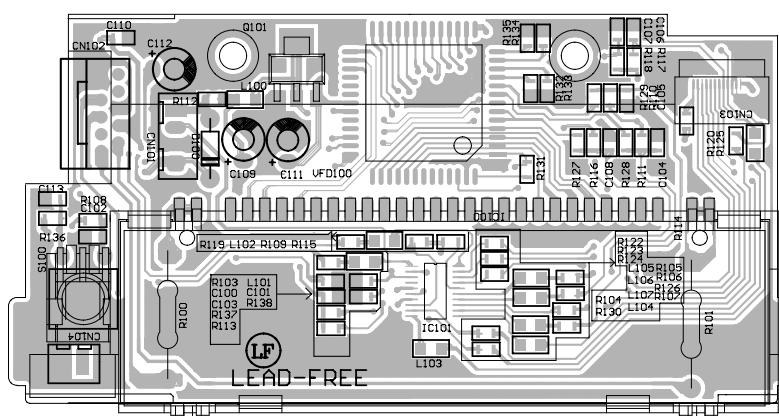
PT Series Suffix (PT1234)X

Case/Pin Configuration	
Vertical Through-Hole	N
Horizontal Through-Hole	A
Horizontal Surface Mount	C

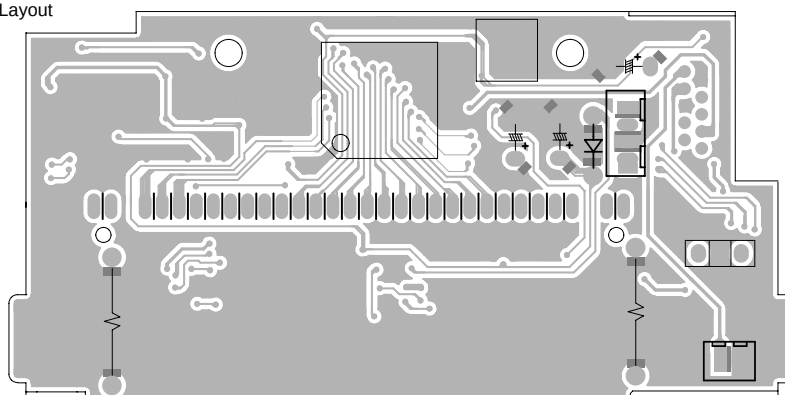


Main Unit--VFD Display Board Layout Diagram

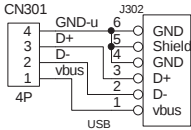
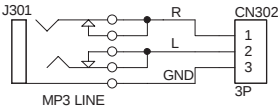
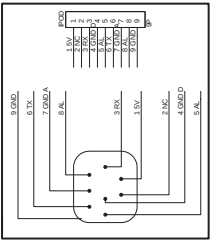
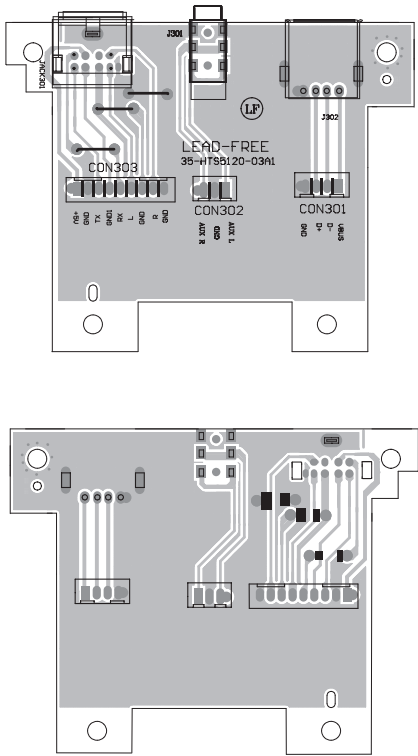
TOP Layout



Bottom Layout

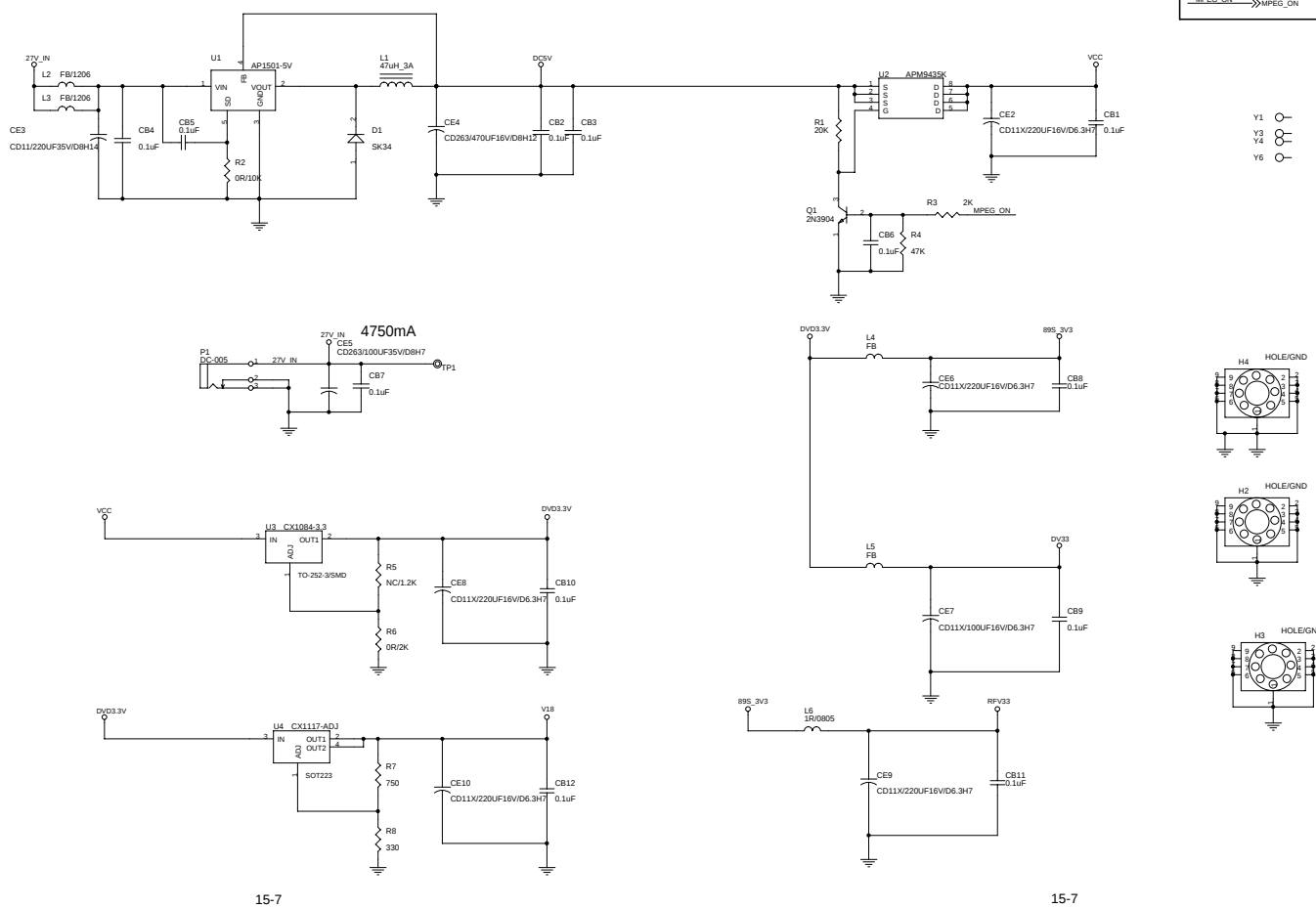


Main Unit -- IPOD, USB & MP3 Board Circuit & Layout Diagram



Main Unit--Decoder Board Circuit Diagram

Power Support

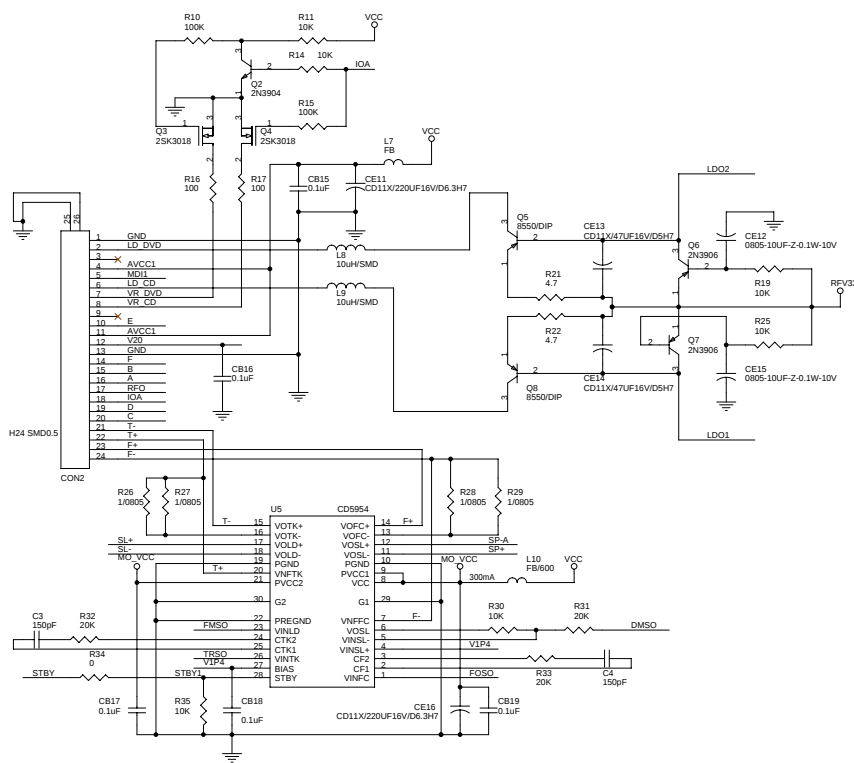


15-7

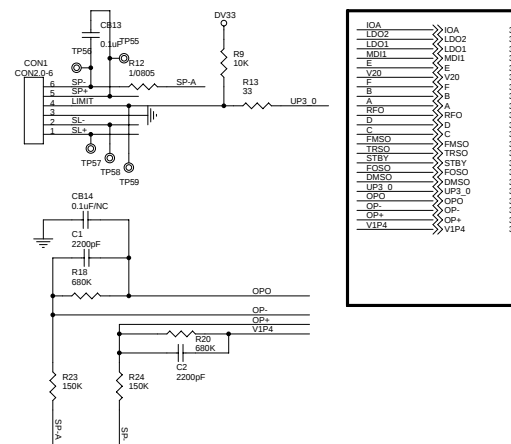
15-7

Main Unit--Decoder Board Circuit Diagram

Driver



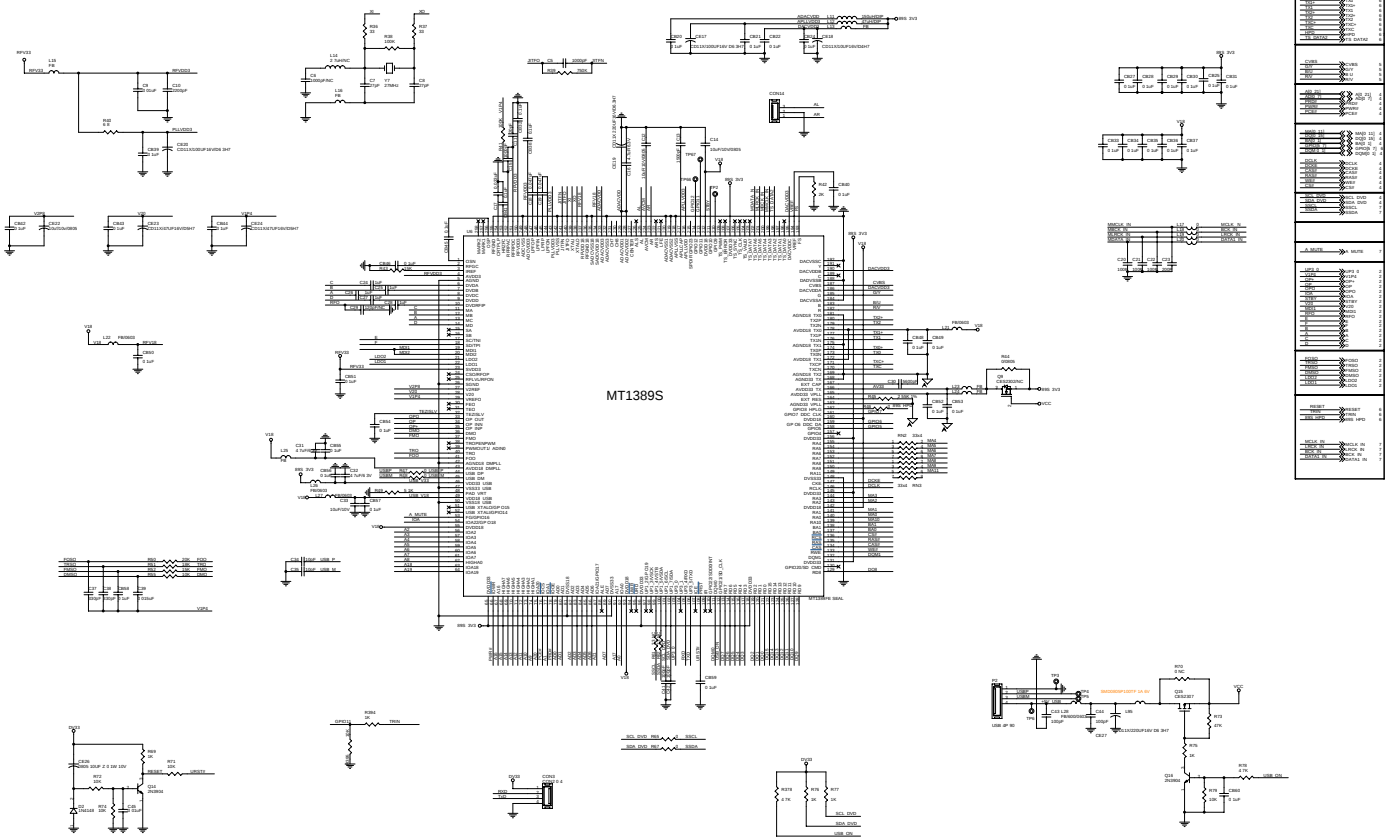
15-8



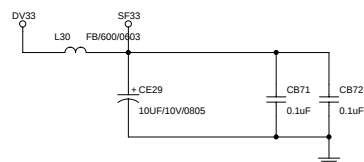
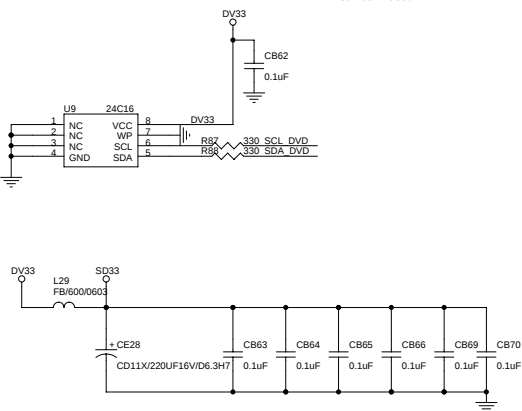
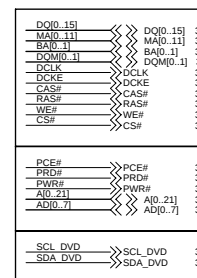
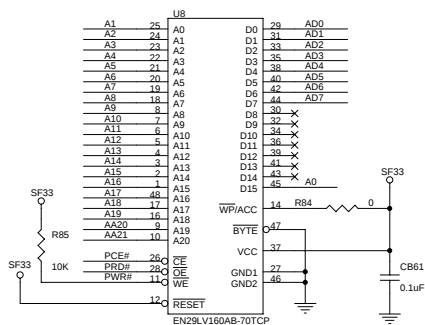
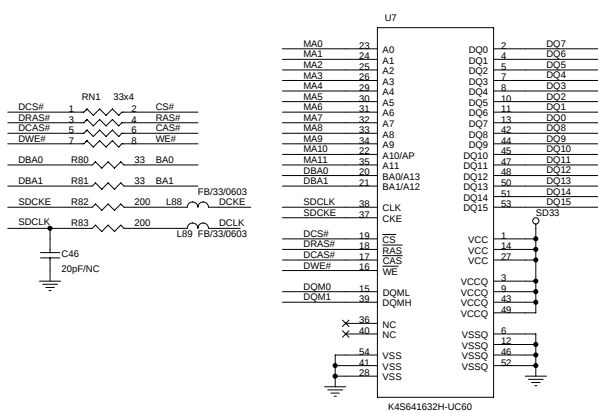
15-8

Main Unit--Decoder Board Circuit Diagram

Main Chip



SDRAM & FLASH

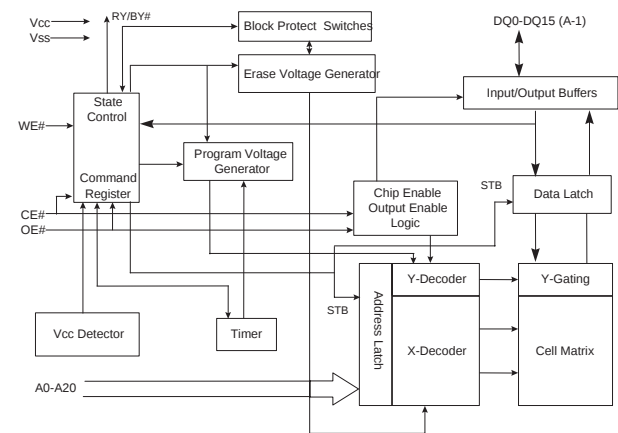


PRODUCT SELECTOR GUIDE

Product Number	EN29LV320A	
Speed Option	-70	-90
Max Access Time, ns (t_{ACC})	70	90
Max CE# Access, ns (t_{CE})	70	90
Max OE# Access, ns (t_{OE})	30	35

Notes:
1. V_{CC} =3.0 – 3.6 V for 70ns read operation

BLOCK DIAGRAM



32M FLASH USER MODE TABLE

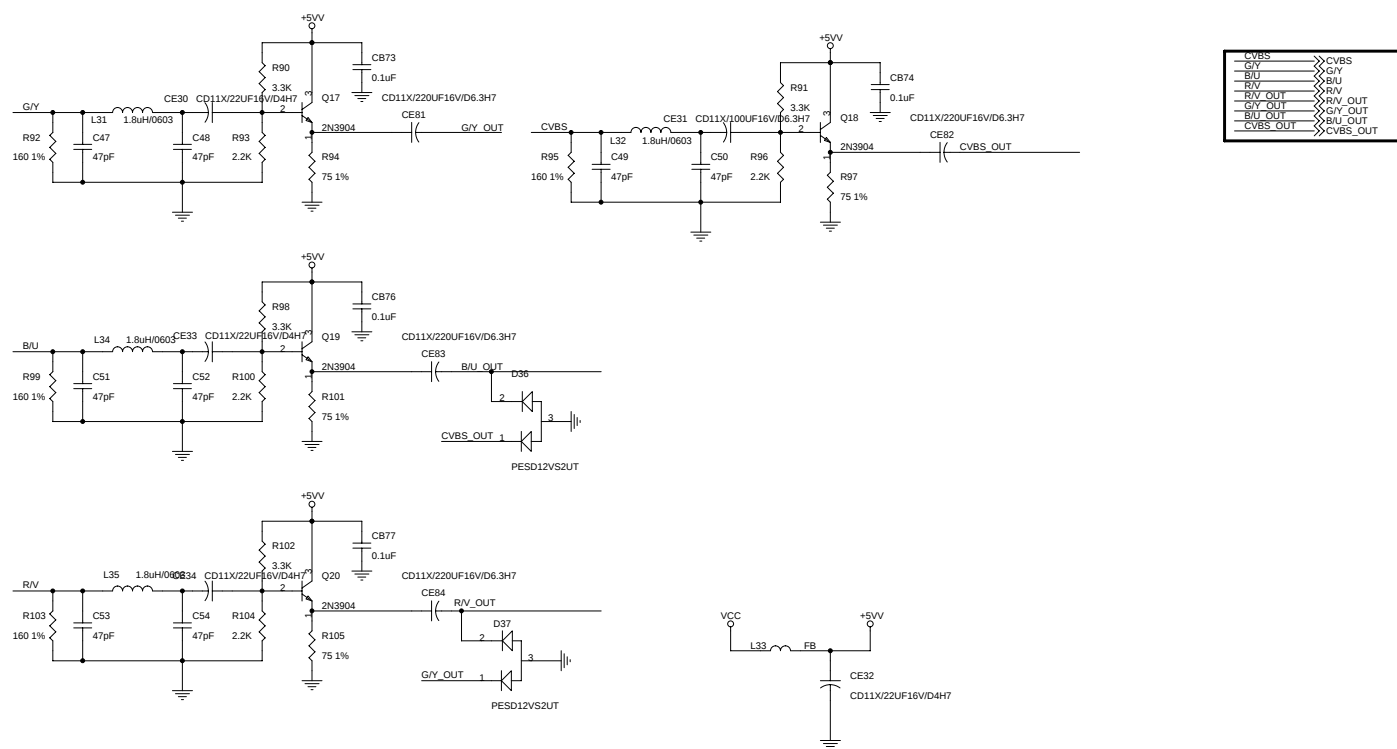
Operation	CE#	OE#	WE#	RESET #	WP#/AC C	A0- A20	DQ0- DQ7	DQ8-DQ15	
								BYTE# = V_{IL}	BYTE# = V_{IH}
Read	L	L	H	H	L/H	A_{IN}	D_{OUT}	D_{OUT}	$DQ8-DQ14 = DQ15 = A-1$
Write	L	H	L	H	(Note 1)	A_{IN}	D_{IN}	D_{IN}	
Accelerated Program	L	H	L	H	V_{HH}	A_{IN}	D_{IN}	D_{IN}	
CMOS Standby	$V_{CC} \pm 0.3V$	X	X	$V_{CC} \pm 0.3V$	H	X	High-Z	High-Z	High-Z
TTL Standby	H	X	X	H	H	X	High-Z	High-Z	High-Z
Output Disable	L	H	H	H	L/H	X	High-Z	High-Z	High-Z
Hardware Reset	X	X	X	L	L/H	X	High-Z	High-Z	High-Z
Sector (Group) Protect	L	H	L	V_{ID}	L/H	SA, A6=L, A1=H, A0=L	(Note 2)	X	X
Sector Unprotect	L	H	L	V_{ID}	(Note 1)	SA, A6=H, A1=H, A0=L	(Note 2)	X	X
Temporary Sector Unprotect	X	X	X	V_{ID}	(Note 1)	A_{IN}	(Note 2)	(Note 2)	High-Z

L=logic low= V_{IL} , H=Logic High= V_{IH} , $V_{ID} = V_{HH} = 11 \pm 0.5V = 10.5-11.5V$, X=Don't Care (either L or H, but not floating), SA=Sector Addresses, D_{IN} =Data In, D_{OUT} =Data Out, A_{IN} =Address In

- Notes:
1. If $WP\#/ACC = V_{IL}$, the two outermost boot sectors remain protected. If $WP\# / ACC = V_{IH}$, the outermost boot sector protection depends on whether they were last protected or unprotected. If $WP\#/ACC = V_{HH}$, all sectors will be unprotected.
 2. Please refer to "Sector/Sector Group Protection & Chip Unprotection", Flowchart 7a and Flowchart 7b.

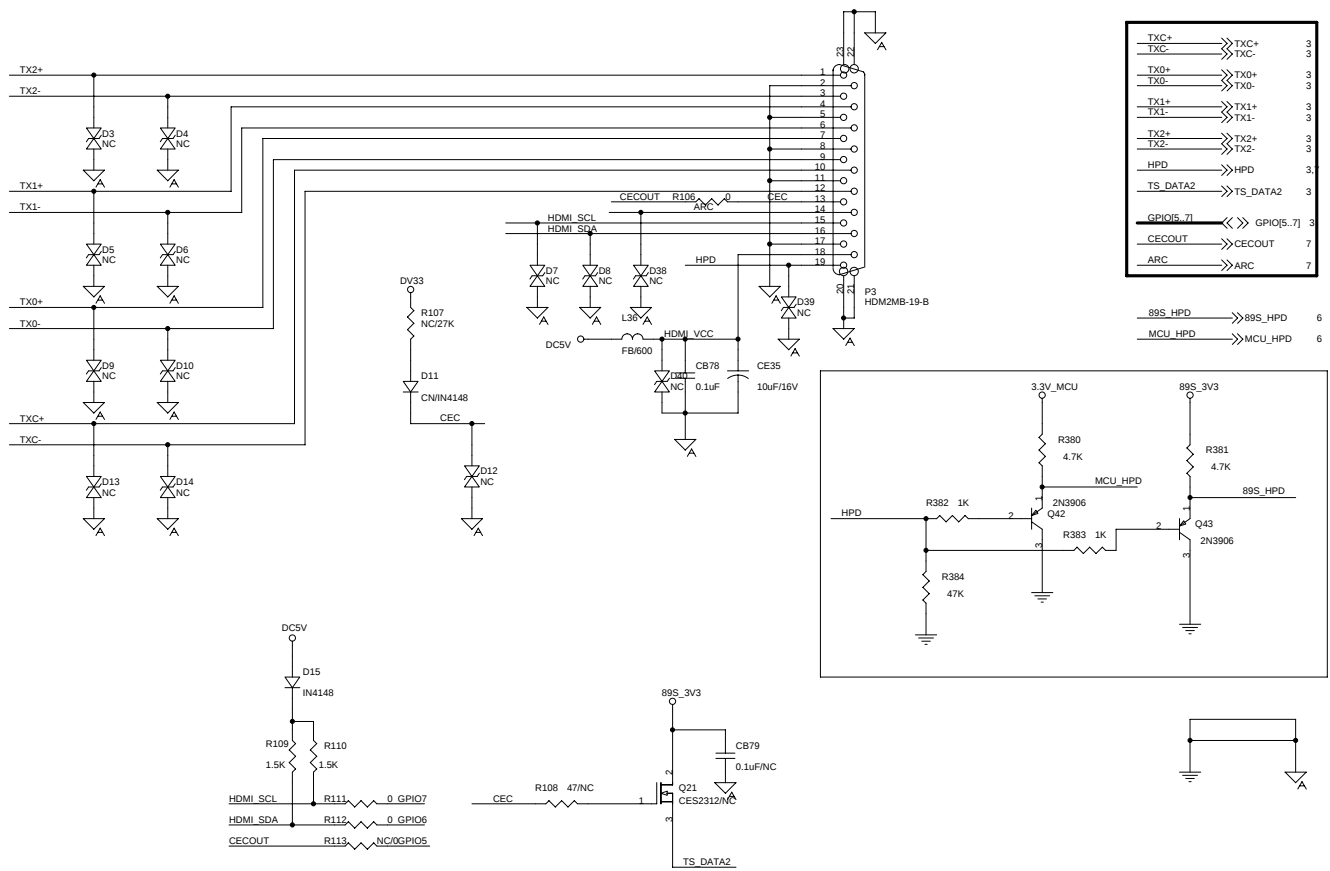
Main Unit--Decoder Board Circuit Diagram

VIDEO OUT



Main Unit--Decoder Board Circuit Diagram

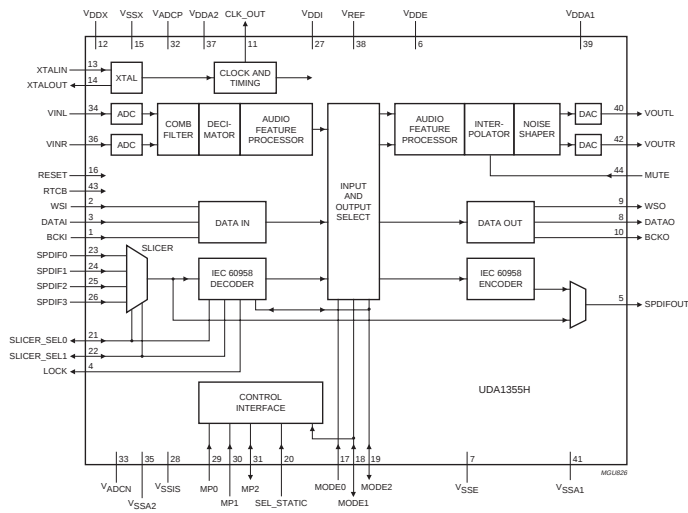
HDMI





U15: UDA1355H IC Specification

BLOCK DIAGRAM

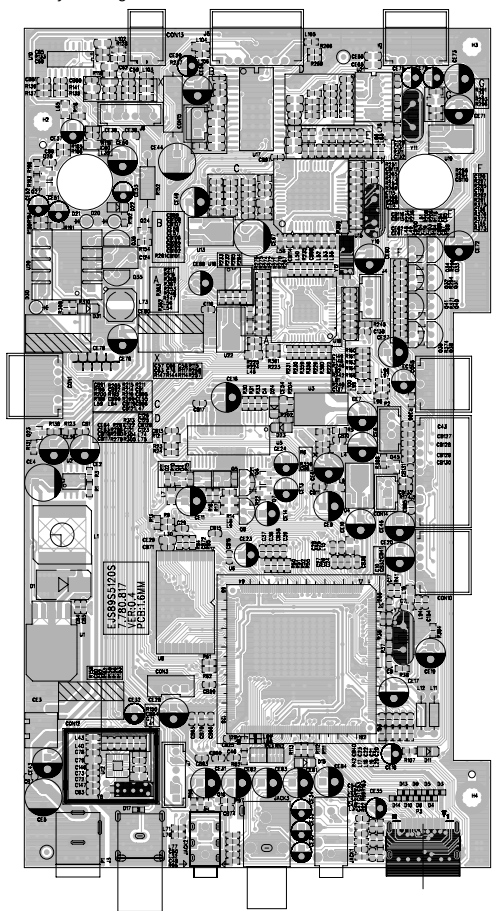


PINNING

SYMBOL	PIN	PAD ⁽¹⁾	DESCRIPTION
BCKI	1	bpt4mtht5v	bit clock input (master or slave)
WSI	2	bpt4mtht5v	word select input (master or slave)
DATAI	3	iptht5v	digital data input
LOCK	4	op4mc	PLL lock indicator output
SPDIFOUT	5	op4mc	SPDIF output
V _{DDE}	6	vdde	digital pad supply voltage
V _{SSE}	7	vsse	digital pad ground
DATAO	8	ops5c	digital data output
WSO	9	bpt4mtht5v	word select output (master or slave)
BCKO	10	bpt4mtht5v	bit clock output (master or slave)
CLK_OUT	11	op4mc	clock output, 256f _s or 384f _s
V _{DDX}	12	vddco	crystal oscillator and PLL supply voltage
XTALIN	13	apio	crystal oscillator input
XTALOUT	14	apio	crystal oscillator output
V _{SSX}	15	vssco	crystal oscillator and PLL ground
RESET	16	ipthdt5v	reset input
MODE0	17	apio	mode selection input 0 for static mode or microcontroller mode (grounded for I ² C-bus)
MODE1	18	bpts5tht5v	mode selection input 1 for static mode or AO address input and output for microcontroller mode
MODE2	19	bpts5tht5v	mode selection input 2 for static mode or U_RDY output for microcontroller mode
SEL_STATIC	20	apio	selection input for static mode, I ² C-bus mode or L3-bus mode
SLICER_SEL0	21	bpts5tht5v	SPDIF slicer selection input 0 for static mode and USER bit output for microcontroller mode
SLICER_SEL1	22	bpts5tht5v	SPDIF slicer selection input 1 for static mode and AC3 preamble detect output for microcontroller mode
SPDI0	23	apio	SPDIF input 0
SPDI1	24	apio	SPDIF input 1
SPDI2	25	apio	SPDIF input 2
SPDI3	26	apio	SPDIF input 3
V _{DDI}	27	vddi	digital core supply voltage
V _{SSIS}	28	vssis	digital core ground
MP0	29	apio	multi-purpose pin 0: frequency select for static mode, not used for microcontroller mode
MP1	30	iptht5v	multi-purpose pin 1: SFOR1 for static mode, SCL for I ² C-bus mode and L3CLOCK for L3-bus mode
MP2	31	iic400kt5v	multi-purpose pin 2: SFOR0 for static mode, SDA for I ² C-bus mode and L3DATA for L3-bus mode
V _{ADCP}	32	vddco	positive ADC reference voltage
V _{ADCN}	33	vssco	negative ADC reference voltage
SYMBOL	PIN	PAD ⁽¹⁾	DESCRIPTION
VINL	34	apio	ADC left channel input
VSSA2	35	vssco	ADC ground
VINR	36	apio	ADC right channel input
V _{DDA2}	37	vddco	ADC supply voltage
V _{REF}	38	apio	reference voltage for ADC and DAC
V _{DDA1}	39	vddco	DAC supply voltage
VOUTL	40	apio	DAC left channel output
VSSA1	41	vssco	DAC ground
VOUTR	42	apio	DAC right channel output
RTCB	43	ipthdt5v	test control input
MUTE	44	ipthdt5v	DAC mute input

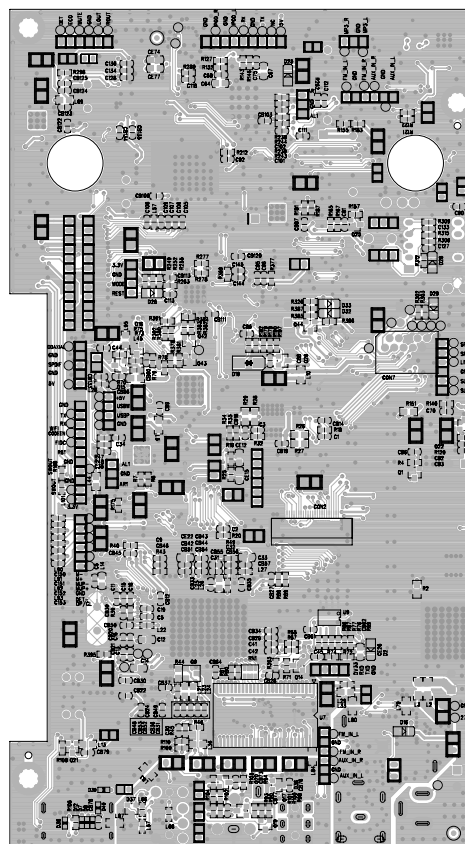
Main Unit--Decoder Board Layout Diagram

TOP Layout Diagram



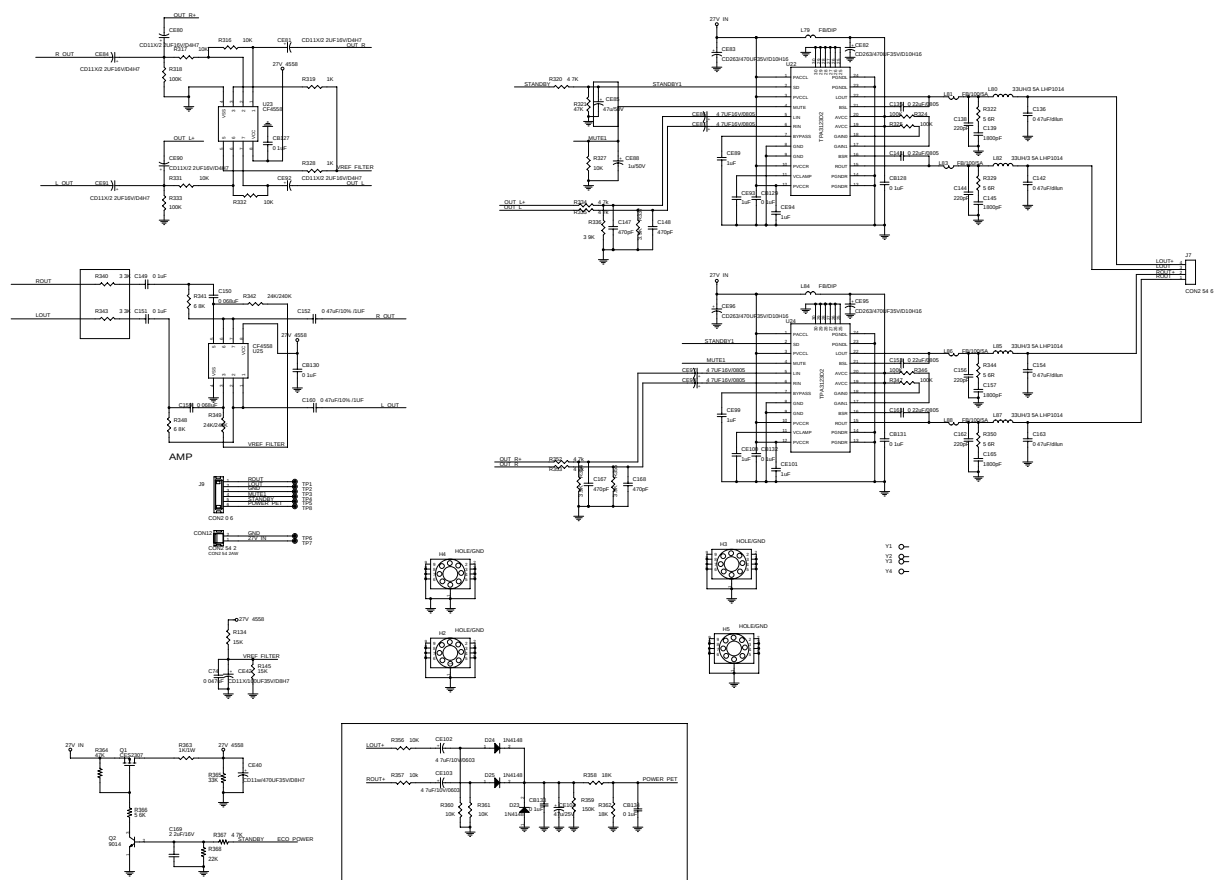
15-17

BOTTOM Layout Diagram



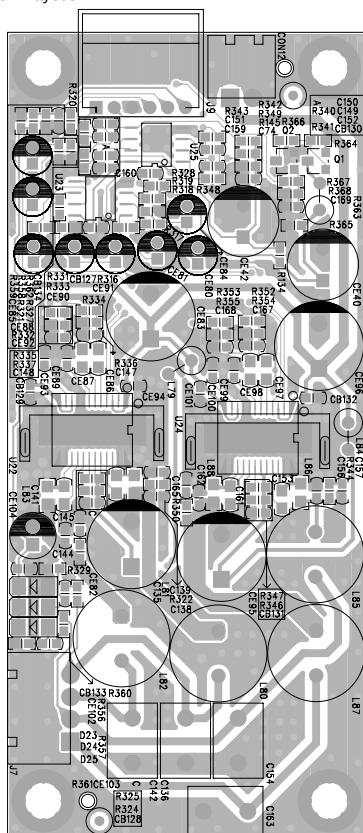
15-17

Main Unit--AMP Board Circuit Diagram



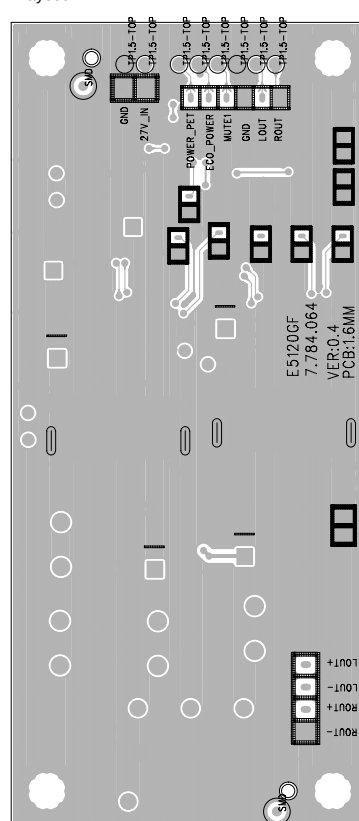
Main Unit--AMP Board Layout Diagram

TOP Layout



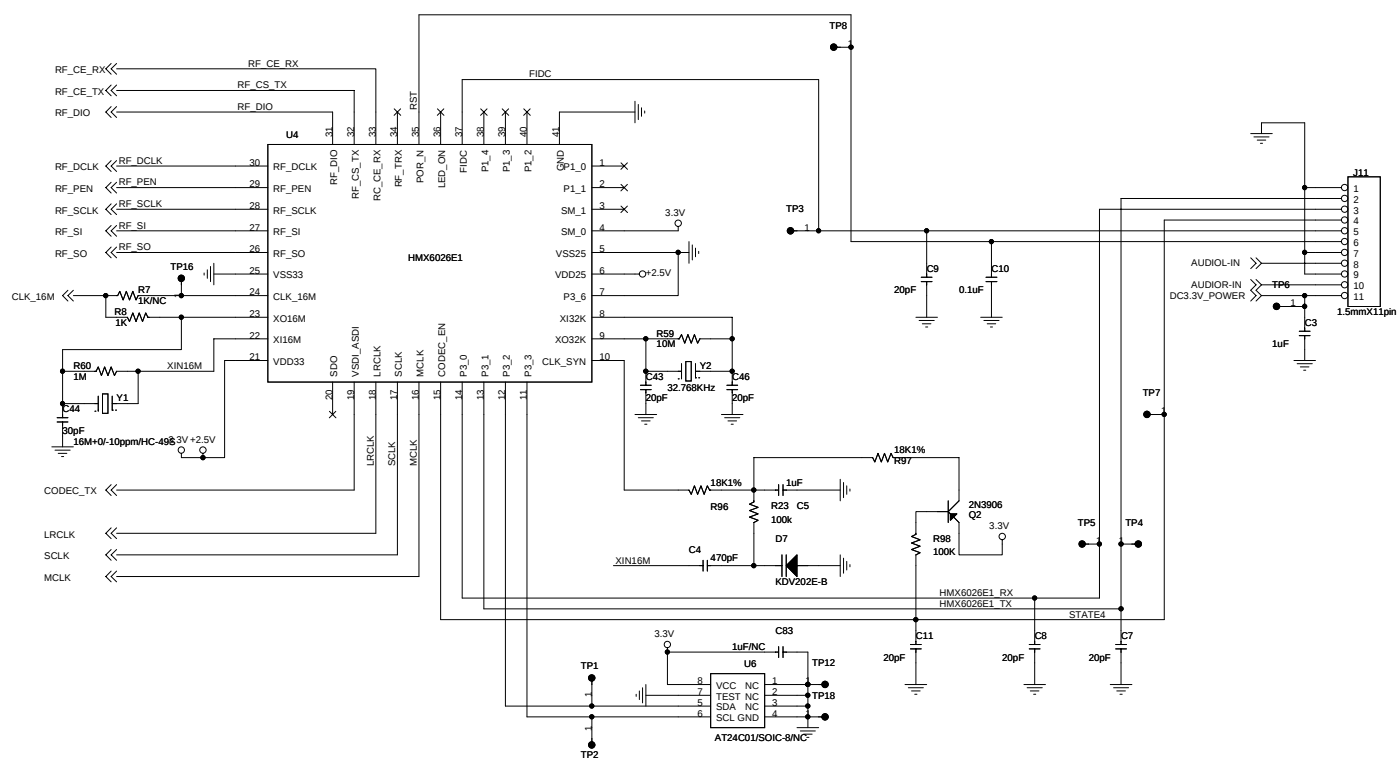
15-19

Bottom Layout

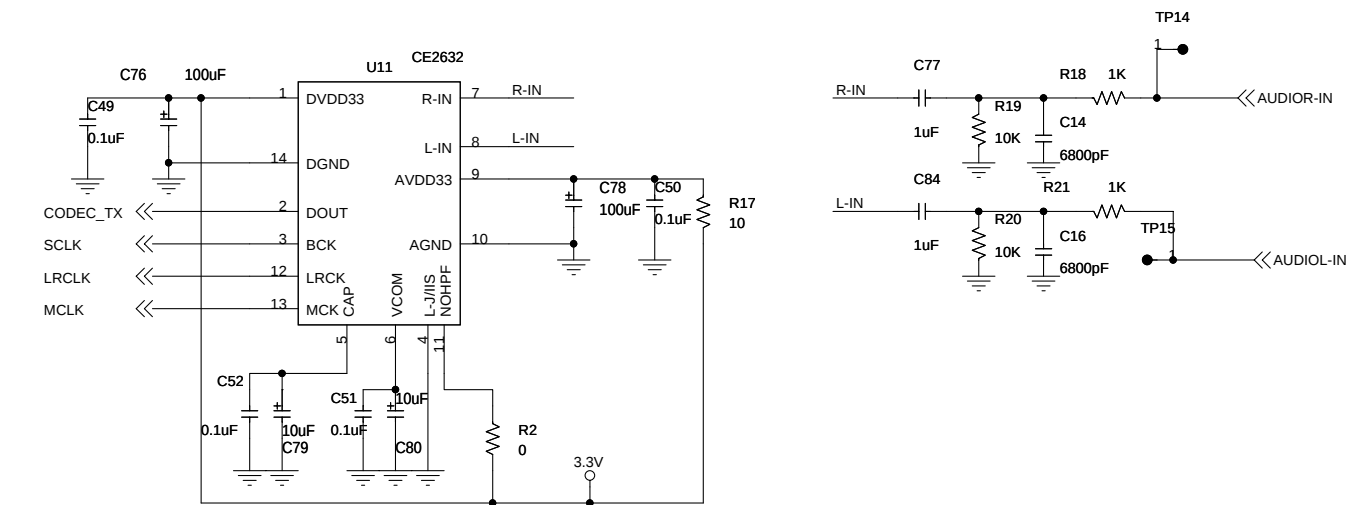


15-19

Main Unit--Radio Transmit Baord Circuit Diagram



Main Unit--Radio Transmit Board Circuit Diagram

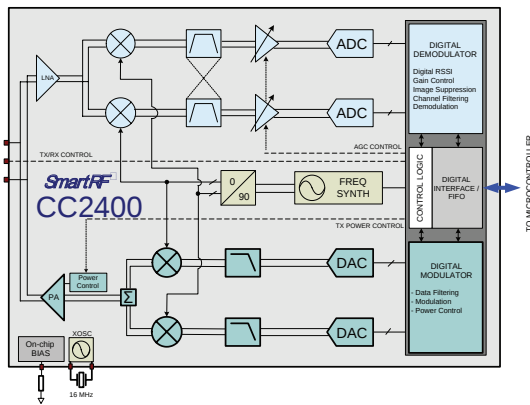


The schematic diagram illustrates the CC2400 module and its associated components. Key elements include:

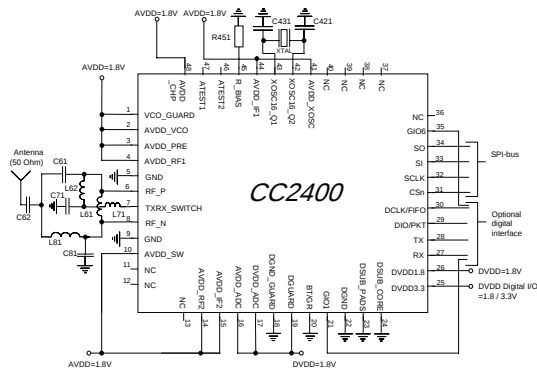
- U2 (TP-ANT):** A TP-ANT component connected to the ANT pin of the CC2400 module.
- U3 (CC2400):** The main CC2400 module, showing various pins and their connections to external components.
- U7 (LDO):** An LDO (X62221A182MR) used for voltage regulation, connected to the DC3.3V_POWER pin.
- Passive Components:** Various resistors (R14, R16, R22, R24, R27, R3), capacitors (C26, C27, C28, C32, C33, C36, C38, C40, C41, C45, C46, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100), and inductors (L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30, L31, L32, L33, L34, L35, L36, L37, L38, L39, L40, L41, L42, L43, L44, L45, L46, L47, L48, L49, L50, L51, L52, L53, L54, L55, L56, L57, L58, L59, L60, L61, L62, L63, L64, L65, L66, L67, L68, L69, L70, L71, L72, L73, L74, L75, L76, L77, L78, L79, L80, L81, L82, L83, L84, L85, L86, L87, L88, L89, L90, L91, L92, L93, L94, L95, L96, L97, L98, L99, L100) are used for filtering and impedance matching.
- Power and Ground Connections:** The module is connected to a +1.8V supply and ground. The LDO is connected to a DC3.3V_POWER supply.
- RF and Data Connections:** The module has various RF and data pins (RX, TX, DIO/PKT, DCLK/FIFO, CSn, SCLK, SI, SO, GIO6, NC) connected to external components.

U3: CC2400 IC Specification

Block Diagram



*Typical application circuit with discrete balun for interfacing single-ended antenna



*Pins Description

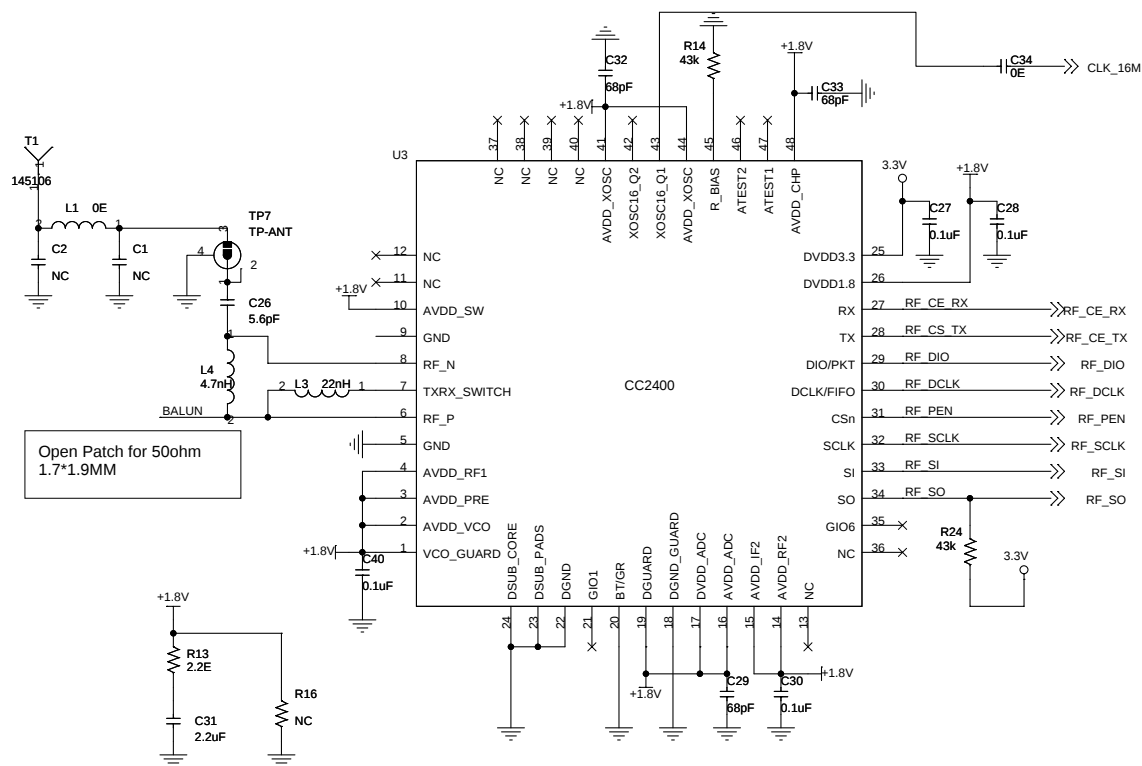
Pin no.	Pin name	Pin type	Description
-	AGND	Ground (analog)	Exposed die attach pad. Must be connected to solid ground plane.
1	VCO_GUARD	Power (Analog)	Connection of guard ring for VCO shielding.
2	AVDD_VCO	Power (Analog)	Power supply for VCO.
3	AVDD_PRE	Power (Analog)	Power supply for Prescaler.
4	AVDD_RF1	Power (Analog)	Power supply for RF front-end.
5	GND	Ground (Analog)	Grounded pin for RF shielding.
6	RF_P	RF I/O	Positive RF input/output signal to LNA/PA in receive/transmit mode.
7	TXRX_SWITCH	Power (Analog)	Common supply connection for RF front-end. Must be connected to RF_P and RF_N externally through a DC path.
8	RF_N	RF I/O	Negative RF input/output signal to LNA/PA in receive/transmit mode.
9	GND	Ground (Analog)	Grounded pin for RF shielding.
10	AVDD_SW	Power (Analog)	Power supply connection.
11	NC	---	No Connect
12	NC	---	No Connect
13	NC	---	No Connect
14	AVDD_RF2	Power (Analog)	Power supply for receive and transmit mixers.
15	AVDD_IF2	Power (Analog)	Power supply for transmit IF chain.
16	AVDD_ADC	Power (Analog)	Power supply connection of ADCs and DACs.
17	DVDD_ADC	Power (Digital)	Power supply for digital part of receive ADCs.
18	DGND_GUARD	Ground (Digital)	Ground connection for digital noise isolation.
19	DGUARD	Power (Digital)	Power supply connection for digital noise isolation.
20	BT/GR	Digital Input	Selection of Built-in-Test or Generic Radio (normal operation). Connect to ground for normal operation (NOTE: For Chipcon internal use only).
21	GIO1	Digital I/O	General digital I/O pin. Configure as output when not used. See Table 18.
22	DGND	Ground (Digital)	Ground connection for digital modules.
23	DSUB_PADS	Ground (Digital)	Substrate connection for digital I/O's.
24	DSUB_CORE	Ground (Digital)	Substrate connection for digital modules.
25	DVDD3.3	Power (Digital)	Power supply for digital I/O's.
26	DVDD1.8	Power (Digital)	Power supply for digital modules.
27	RX	Digital Input	Strobe signal for RX mode. Connect to ground when not used.
28	TX	Digital I/O	Strobe signal for TX mode. Connect to ground when not used.
29	DIO/PKT	Digital I/O	Data input/output in un-buffered mode or packet handling control signal. Configure as output when not used.
30	DCLK/FIFO	Digital Output	Data clock output signal in un-buffered mode or FIFO control signal. Leave open when not used.
31	CSn	Digital Input	SPI: Chip Select
32	SCLK	Digital Input	SPI: Serial data clock
33	SI	Digital Input	SPI: Slave Input
34	SO	Digital Output	SPI: Slave Output
35	GIO2	Digital Output	General digital output pin. See Table 18.
36	NC	---	No Connect
37	NC	---	No Connect
38	NC	---	No Connect
39	NC	---	No Connect
40	NC	---	No Connect
41	AVDD_XOSC	Power (Analog)	Power supply for 16 MHz crystal oscillator.
42	XOSC16_Q2	Analog output	16 MHz crystal oscillator.
43	XOSC16_Q1	Analog input	16 MHz crystal oscillator or external clock input.
44	AVDD_IF1	Power (Analog)	Power supply connection of receive IF chain.
45	R_BIAS	Analog Output	Connection for external precision bias resistor.
46	ATEST2	Analog I/O	Analog test I/O for prototype and production testing. Leave not connected when not used.
47	ATEST1	Analog I/O	Analog test I/O for prototype and production testing. Leave not connected when not used.
48	AVDD_CHP	Power (Analog)	Power supply for phase detector and charge pump.

NOTES:

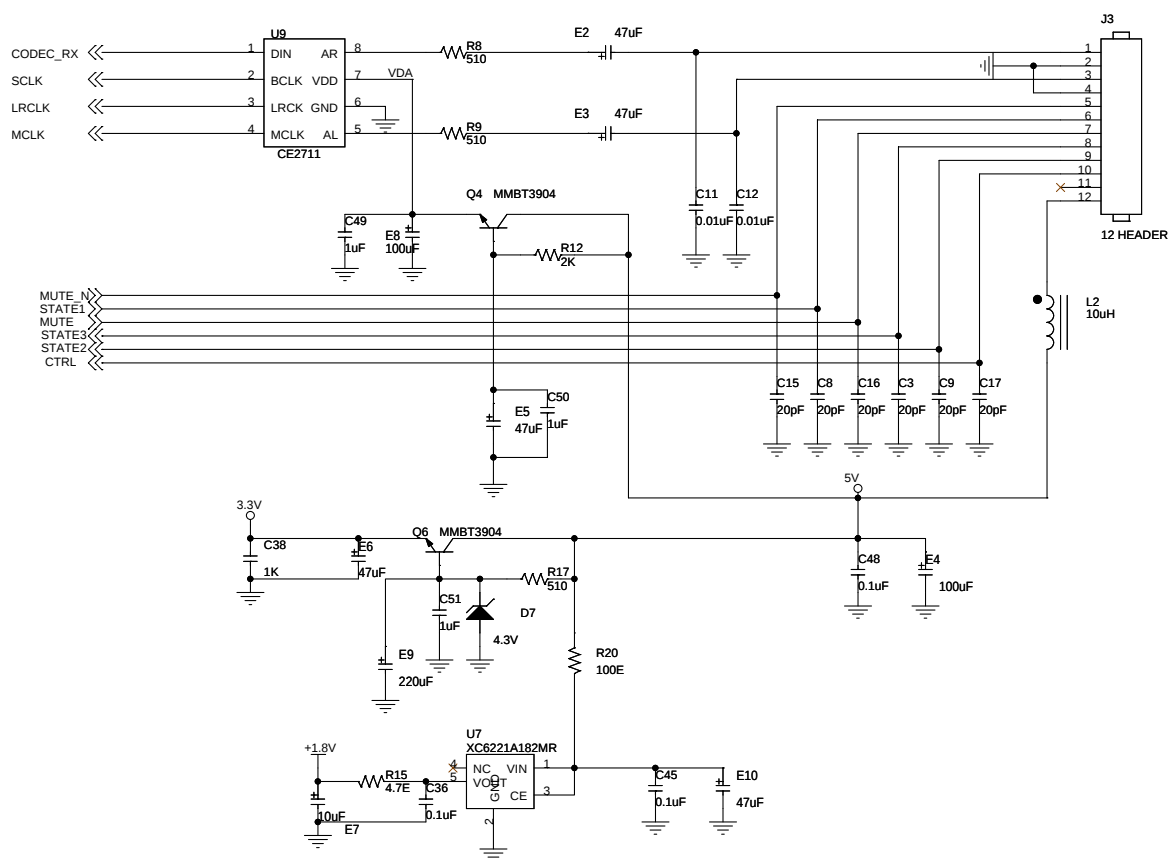
The exposed die attach pad must be connected to a solid ground plane as this is the main ground connection for the chip.

The digital inputs SCLK, SI and CSn are high-impedance inputs (no internal pull-up) and should have external pull-ups if not driven. RX and TX should have external pull-down if not driven (to prevent the state machine from being triggered). SO is high-impedance when CSn is high. External pull-up should be used at SO to prevent floating input at the microcontroller.

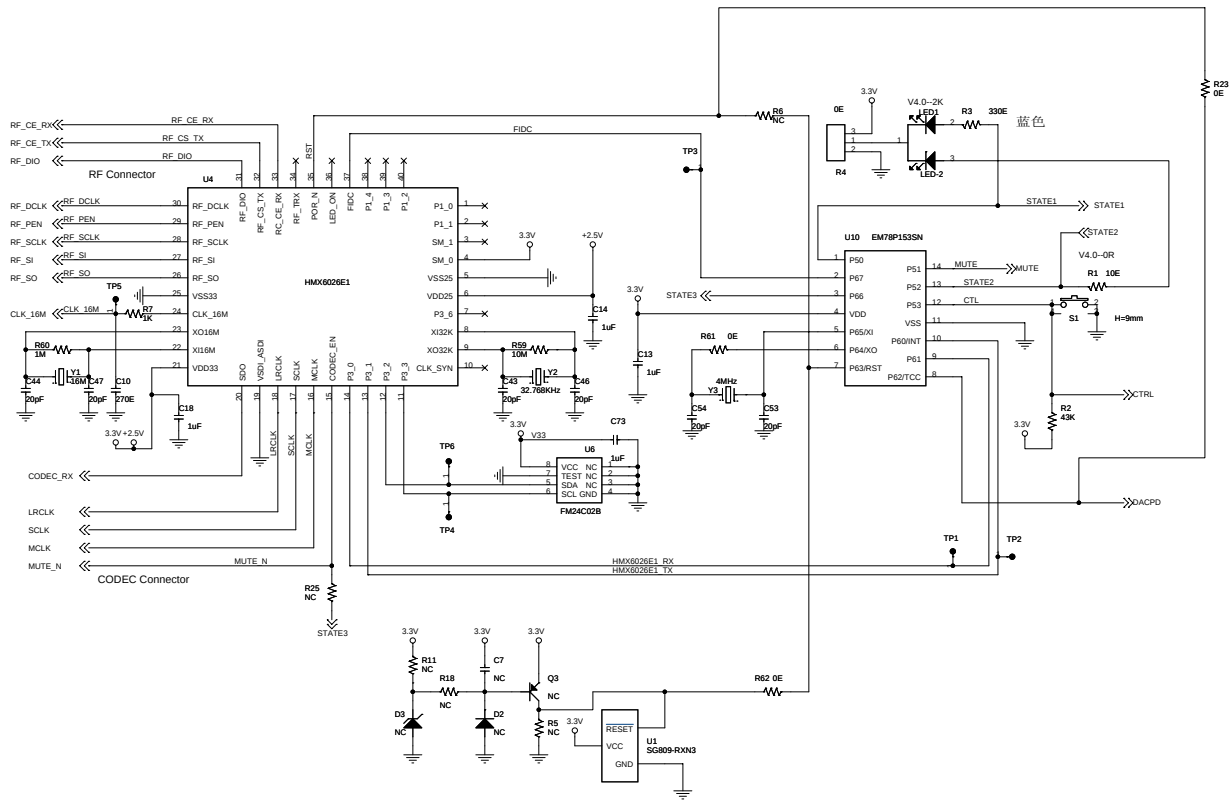
Subwoofer--Radio Receiver Board Circuit Diagram



Subwoofer--Radio Receiver Board Circuit Diagram

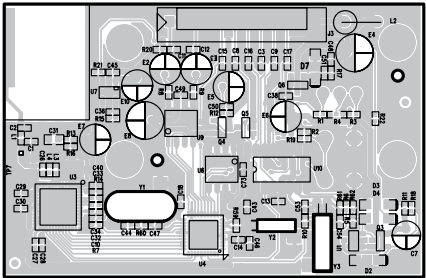


Subwoofer--Radio Receiver Board Circuit Diagram

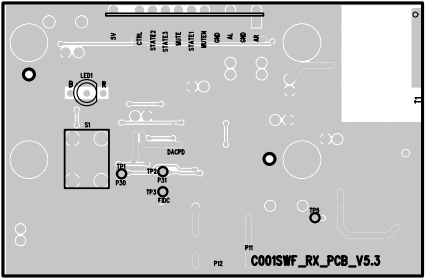


Subwoofer--Radio Receiver Board Layout Diagram

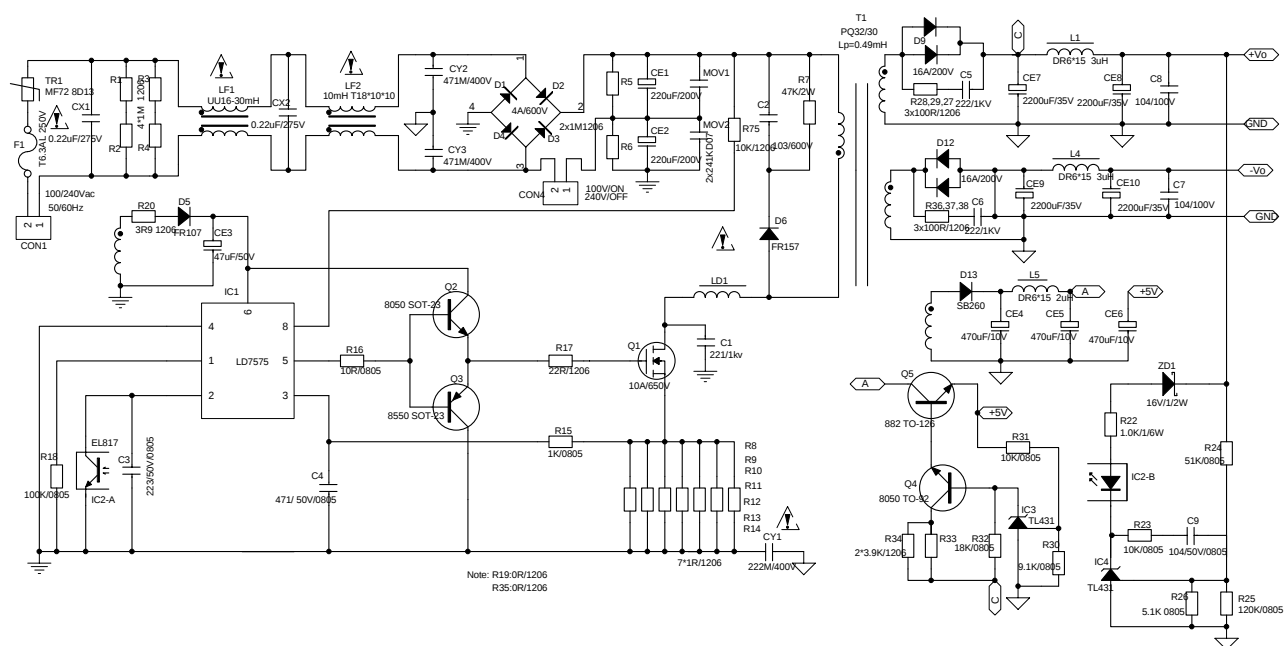
TOP Layout Diagram



Bottom Layout Diagram



Subwoofer--Power Board Circuit Diagram

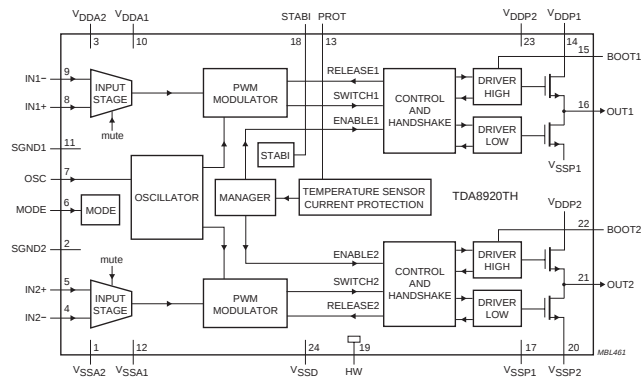


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15-29

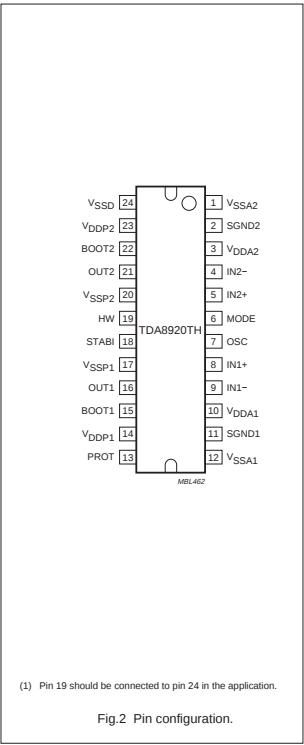
IC6: TDA8920 IC Specification

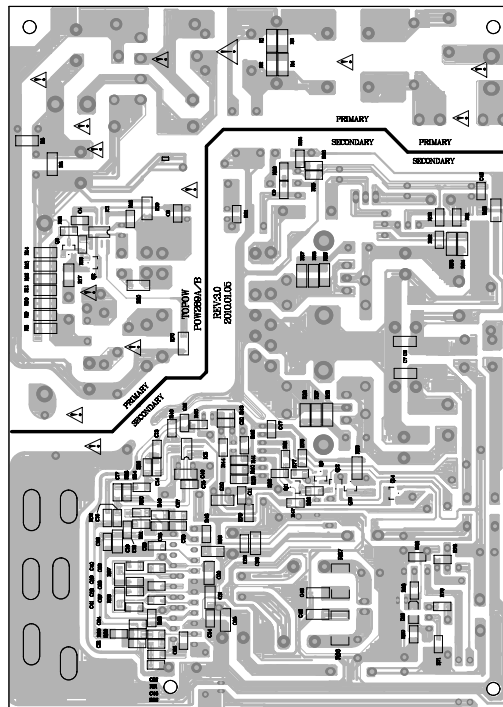
Block Diagram



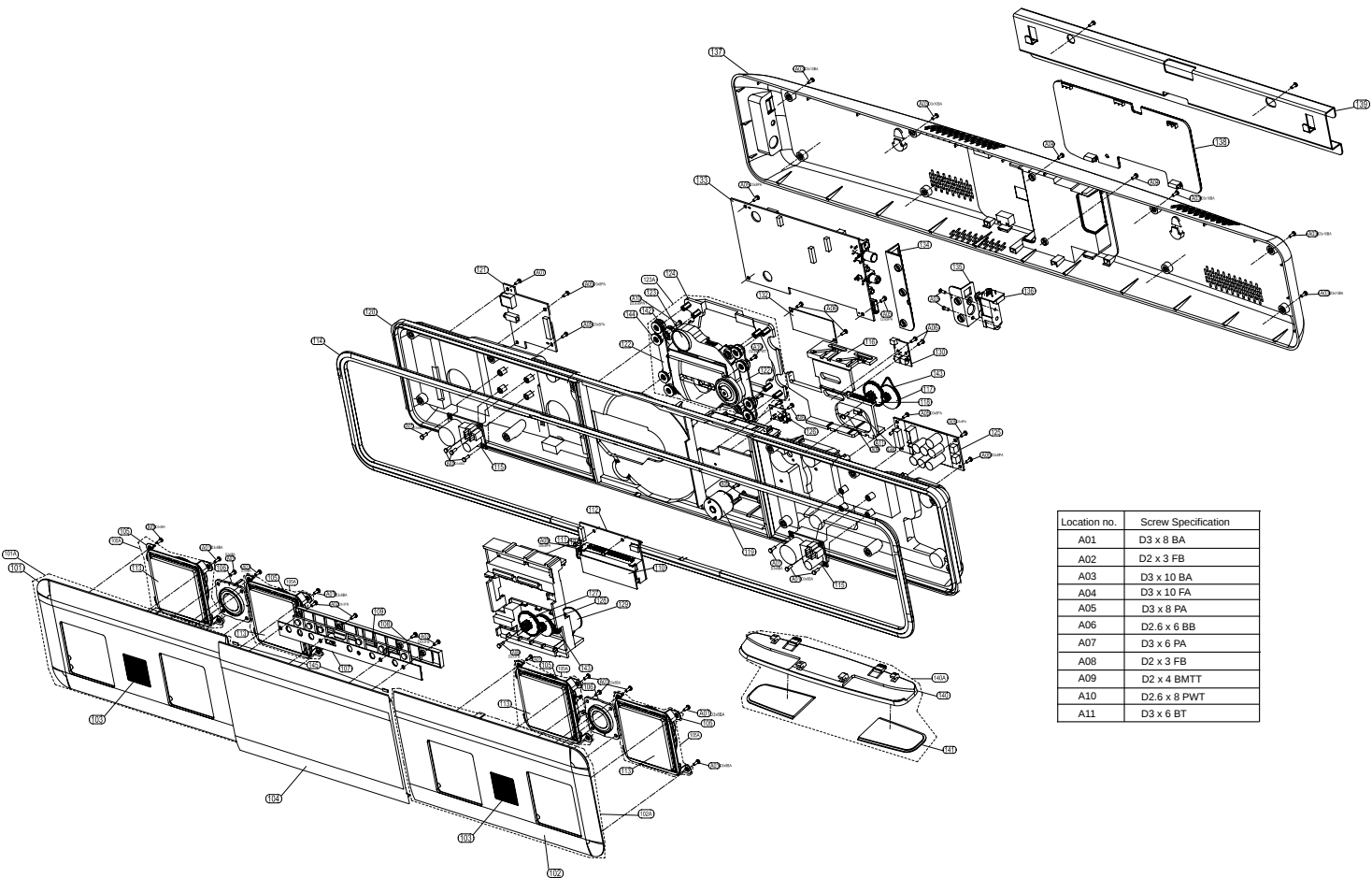
Pining

SYMBOL	PIN	DESCRIPTION
VSSA2	1	negative analog supply voltage for channel 2
SGND2	2	signal ground channel 2
VdDA2	3	positive analog supply voltage for channel 2
IN2-	4	negative audio input for channel 2
IN2+	5	positive audio input for channel 2
MODE	6	mode select input (standby/mute/operating)
OSC	7	oscillator frequency adjustment or tracking input
IN1+	8	positive audio input for channel 1
IN1-	9	negative audio input for channel 1
VdDA1	10	positive analog supply voltage for channel 1
SGND1	11	signal ground for channel 1
VSSA1	12	negative analog supply voltage for channel 1
PROT	13	time constant capacitor for protection delay
VDDP1	14	positive power supply for channel 1
BOOT1	15	bootstrap capacitor for channel 1
OUT1	16	PWM output from channel 1
VSSP1	17	negative power supply voltage for channel 1
STABI	18	decoupling internal stabilizer for logic supply
HW	19	handle wafer; must be connected to pin 24
VSSP2	20	negative power supply voltage for channel 2
OUT2	21	PWM output from channel 2
BOOT2	22	bootstrap capacitor for channel 2
VDDP2	23	positive power supply voltage for channel 2
VSSD	24	negative digital supply voltage





Main Unit Exploded View

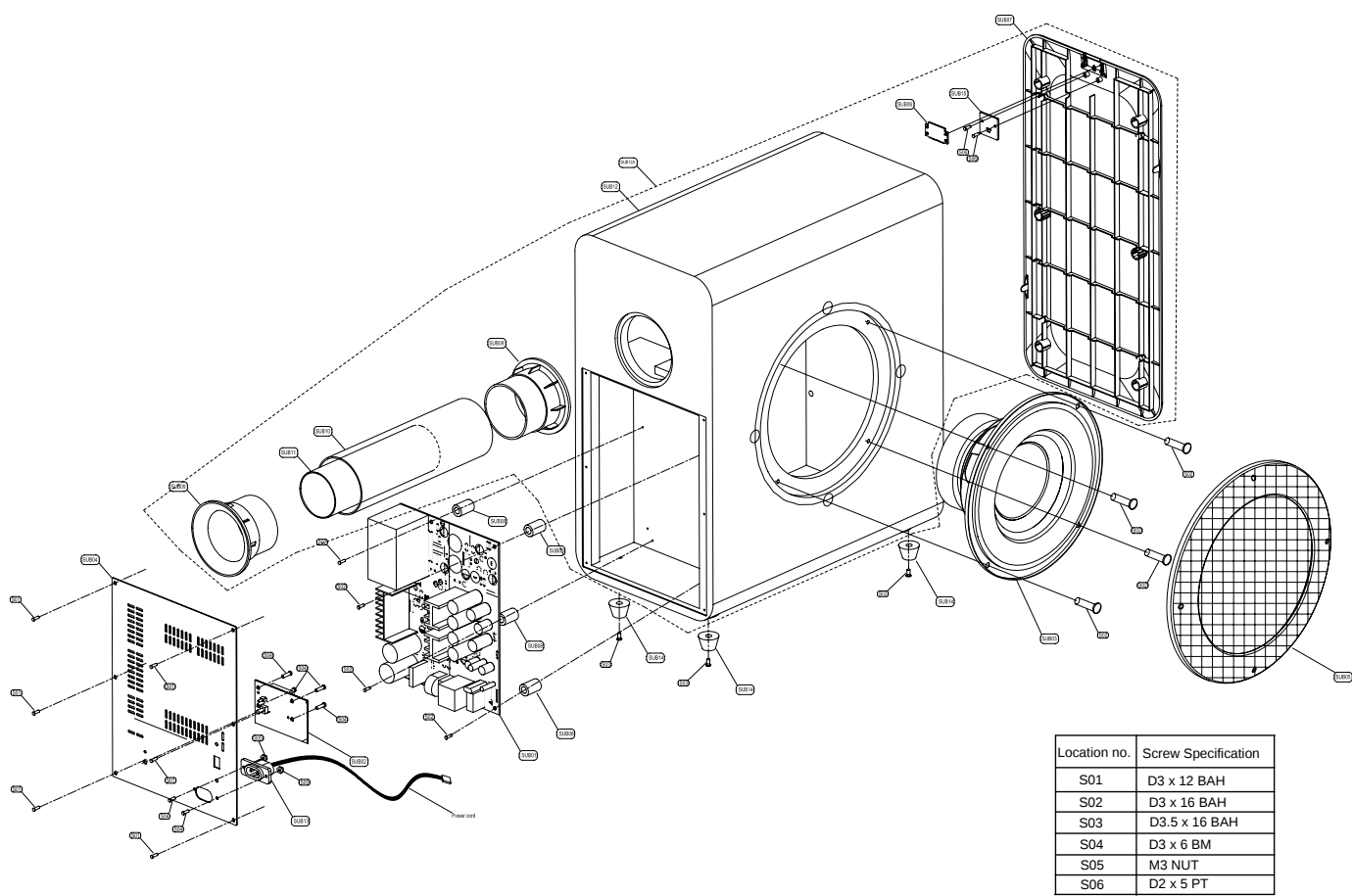


Location no.	Screw Specification
A01	D3 x 8 BA
A02	D2 x 3 FB
A03	D3 x 10 BA
A04	D3 x 10 FA
A05	D3 x 8 PA
A06	D2.6 x 6 BB
A07	D3 x 6 PA
A08	D2 x 3 FB
A09	D2 x 4 BMTT
A10	D2.6 x 8 PWT
A11	D3 x 6 BT

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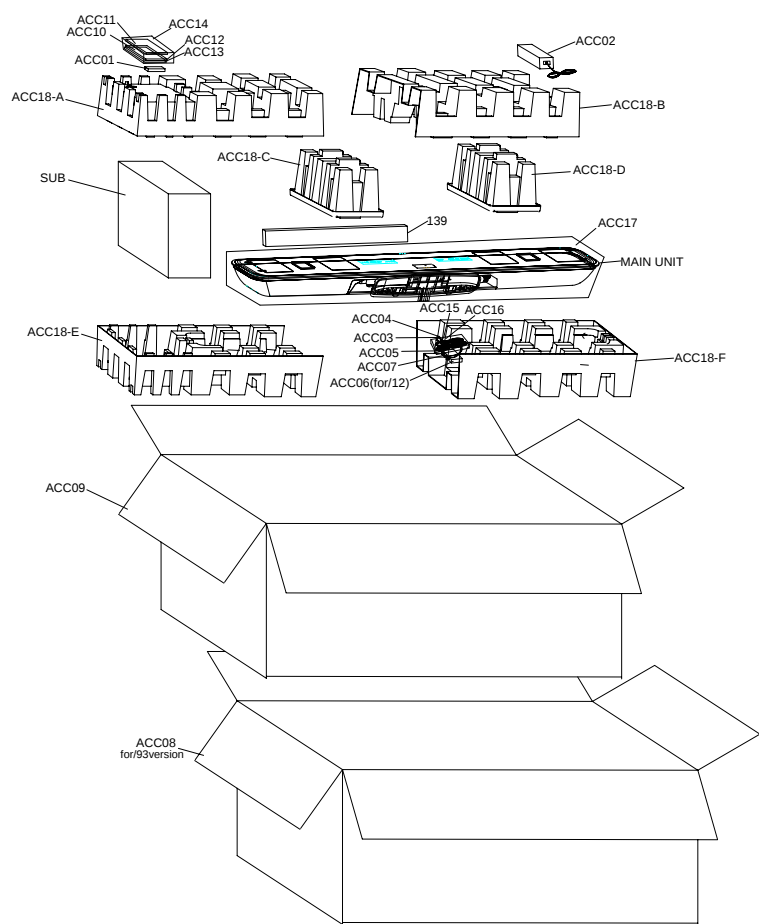
16-1

Subwoofer Exploded View



Location no.	Screw Specification
S01	D3 x 12 BAH
S02	D3 x 16 BAH
S03	D3.5 x 16 BAH
S04	D3 x 6 BM
S05	M3 NUT
S06	D2 x 5 PT

Packing Exploded View



Revision List

Revision List

Version 1.0

* Initial Release

Version 1.1

* Addition of HTS5120/78