



DVD RECEIVER AMP

BASIC MODEL: HT-X20

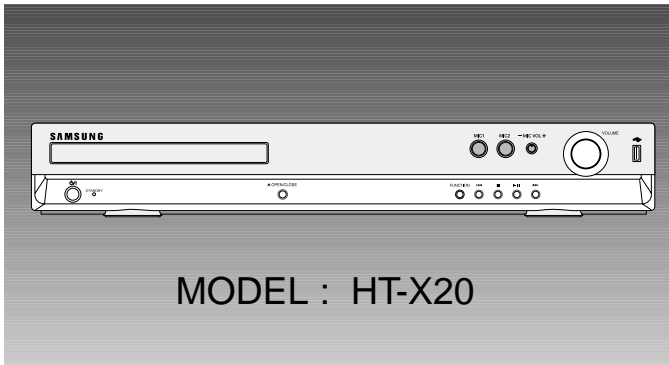
* Application : HT-X20/ KX20/ TX22/ TX25

HT-THX22/ THX25

HT-TKX22/ TKX25

SERVICE *Manual*

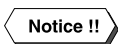
DVD RECEIVER AMP SYSTEM



Features

- * Multi-Disc Playback & FM Tuner
- * Dolby Pro Logic II
- * DTS (Digital Theater Systems)
- * TV Screen Saver Function
- * Customized TV Screen Display

- Confidential -



You can search for the updated part code through ITSELF web site.
URL; <http://itself.sec.samsung.co.kr>



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1. Precautions

Follow these safety, servicing and ESD precautions to prevent damage and protect against potential hazards such as electrical shock and X-rays.

1-1 Safety Precautions

1. Be sure that all of the built-in protective devices are replaced.
2. When reinstalling the chassis and its assemblies, be sure to restore all protective devices, including control knobs and compartment covers.
3. Make sure that there are no cabinet openings through which people--particularly children--might insert fingers and contact dangerous voltages. Such openings include the spacing between the picture tube and the cabinet mask, excessively wide cabinet ventilation slots, and improperly fitted back covers.
4. Design Alteration Warning:
Never alter or add to the mechanical or electrical design of the unit. Example: Do not add auxiliary audio or video connectors. Such alterations might create a safety hazard. Also, any design changes or additions will void the manufacturer's warranty.
5. Leakage Current Hot Check (Figure 1-1):
Warning: Do not use an isolation transformer during this test. Use a leakage-current tester or a metering system that complies with American National Standards Institute (ANSI C101.1, *Leakage Current for Appliances*), and Underwriters Laboratories (*UL Publication UL1410, 59.7*).

With the unit completely reassembled, plug the AC line cord directly into a 120V AC outlet. With the unit's AC switch first in the ON position and then OFF, measure the current between a known earth ground (metal water pipe, etc.) and all exposed metal parts. Examples: Handle brackets, metal cabinets, screwheads and control shafts. The current measured should not exceed 0.5 milliamp. Reverse the power-plug prongs in the AC outlet and repeat.

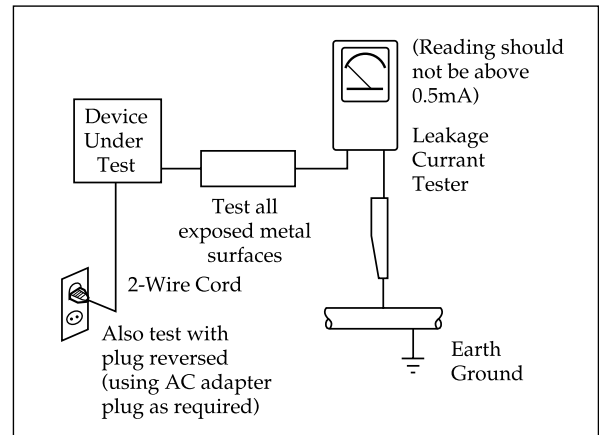


Fig. 1-1 AC Leakage Test

6. Insulation Resistance Cold Check:
(1) With the unit's AC plug disconnected from the AC source, connect an electrical jumper across the two AC prongs. (2) Set the power switch to ON. (3) Measure the resistance between the shorted AC plug and any exposed metallic parts. Example: Screwheads, antenna, control shafts or handle brackets.

If any of the exposed metallic parts has a return path to the chassis, the measured resistance should be between 1 and 5.2 megohms. If there is no return path, the measured resistance should be "infinite." If the resistance is outside these limits, a shock hazard might exist. See Figure 1-2

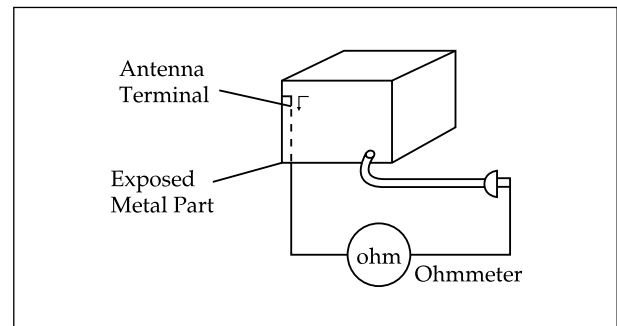




Fig. 1-2 Insulation Resistance Test

1-1 Safety Precautions (Continued)

7. Components, parts and wiring that appear to have overheated or that are otherwise damaged should be replaced with parts that meet the original specifications. Always determine the cause of damage or overheating, and correct any potential hazards
8. Observe the original lead dress, especially near the following areas: Antenna wiring, sharp edges, and especially the AC and high voltage power supplies. Always inspect for pinched, out-of-place, or frayed wiring. Do not change the spacing between components and the printed circuit board. Check the AC power cord for damage. Make sure that no wires or components touch thermally hot parts.
9. Product Safety Notice:
Some electrical and mechanical parts have special safety-related characteristics which might not be obvious from visual inspection. These safety features and the protection they give might be lost if the replacement component differs from the original--even if the replacement is rated for higher voltage, wattage, etc.
- 10 Components that are critical for safety are indicated in the circuit diagram by shading,  or . Use replacement components that have the same ratings, especially for flame resistance and dielectric strength specifications. A replacement part that does not have the same safety characteristics as the original might create shock, fire or other hazards.

1-2 Servicing Precautions

Warning1: First read the "Safety Precautions" section of this manual. If some unforeseen circumstance creates a conflict between the servicing and safety precautions, always follow the safety precautions.

1. Servicing precautions are printed on the cabinet. Follow them.
2. Always unplug the unit's AC power cord from the AC power source before attempting to: (a) Remove or reinstall any component or assembly, (b) Disconnect an electrical plug or connector, (c) Connect a test component in parallel with an electrolytic capacitor.
3. Some components are raised above the printed circuit board for safety. An insulation tube or tape is sometimes used. The internal wiring may be clamped to prevent contact with thermally hot components. Reinstall all such elements to their original position.
4. After servicing, always check that the screws, components and wiring have been correctly reinstalled. Make sure that the portion around the serviced part has not been damaged.
5. Check the insulation between the blades of the AC plug and accessible conductive parts (examples: metal panels, input terminals and earphone jacks).
6. Insulation Checking Procedure: Disconnect the power cord from the AC source and turn the power switch ON. Connect an insulation resistance meter (500V) to the blades of the AC plug.

The insulation resistance between each blade of the AC plug and accessible conductive parts (see above) should be greater than 1 megohm.
7. Never defeat any of the B+ voltage interlocks. Do not apply AC power to the unit (or any of its assemblies) unless all solid-state heat sinks are correctly installed.
8. Always connect a test instrument's ground lead to the instrument chassis ground *before* connecting the positive lead; always remove the instrument's ground lead last.

1-3 Precautions for Electrostatically Sensitive Devices (ESDs)

1. Some semiconductor ("solid state") devices are easily damaged by static electricity. Such components are called Electrostatically Sensitive Devices (ESDs). Examples include integrated circuits and some field-effect transistors. The following techniques will reduce the occurrence of component damage caused by static electricity.
2. Immediately before handling any semiconductor components or assemblies, drain the electrostatic charge from your body by touching a known earth ground. Alternatively, wear a discharging wrist-strap device. (Be sure to remove it prior to applying power--this is an electric shock precaution.)
3. After removing an ESD-equipped assembly, place it on a conductive surface such as aluminum foil to prevent accumulation of electrostatic charge.
4. Do not use freon-propelled chemicals. These can generate electrical charges that damage ESDs.
5. Use only a grounded-tip soldering iron when soldering or unsoldering ESDs.
6. Use only an anti-static solder removal device. Many solder removal devices are not rated as "anti-static" (these can accumulate sufficient electrical charge to damage ESDs).
7. Do not remove a replacement ESD from its protective package until you are ready to install it. Most replacement ESDs are packaged with leads that are electrically shorted together by conductive foam, aluminum foil or other conductive materials.
8. Immediately before removing the protective material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.
9. Minimize body motions when handling unpackaged replacement ESDs. Motions such as brushing clothes together, or lifting a foot from a carpeted floor can generate enough static electricity to damage an ESD.

1-4 Special Precautions and Warning Labels for Laser Products

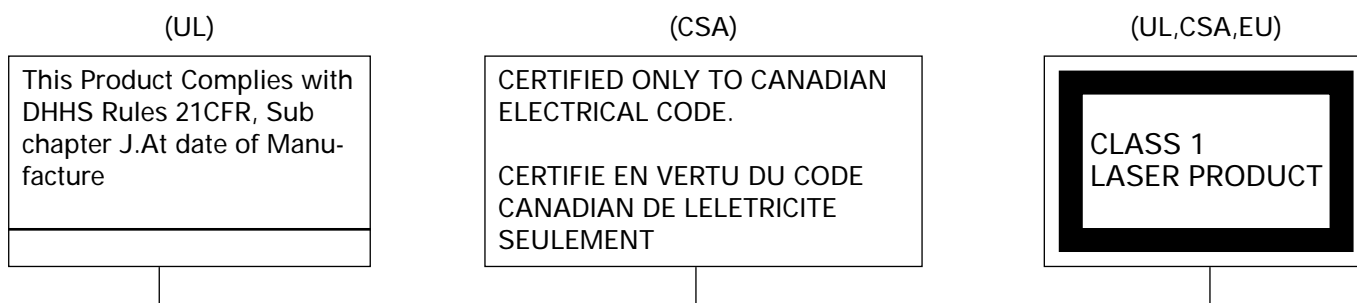


Fig. 1-3 Warning Labels (Location: Enclosure Block)

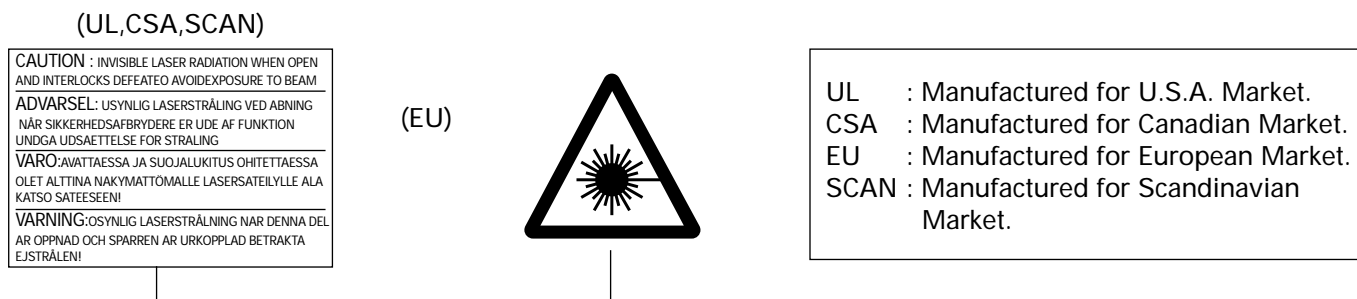


Fig. 1-4 Warning Labels (Location: Disc Clamper, Inner Side of Unit Door or Nearby Unit Chassis)

1-4 Special Precautions and Warning Labels for Laser Products (Continued)

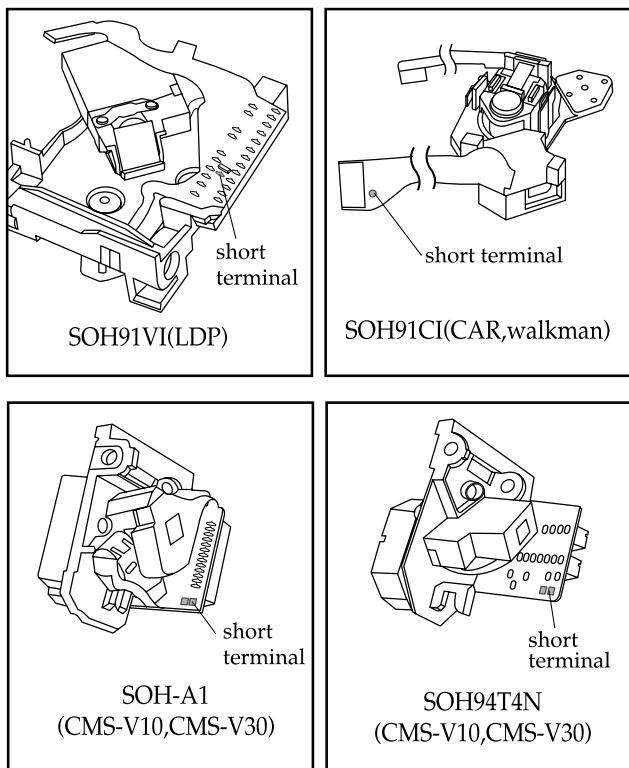
1-4-1 Warnings

1. When servicing, do not approach the LASER exit with the eye too closely. In case it is necessary to confirm LASER beam emission, be sure to observe from a distance of more than 30 cm from the surface of the objective lens on the optical pick-up block.
2. Do not attempt to handle the objective lens when the DISC is not on the tray.

1-4-2 Laser Diode Specifications

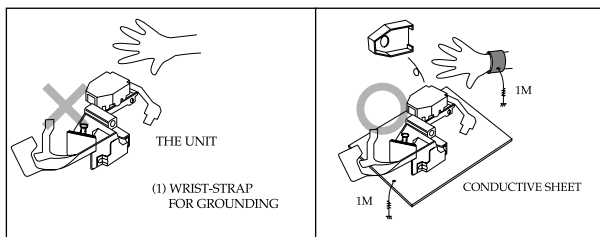
Material: GaAs+ GaAlAs
 Wavelength: 760-800 nm
 Emission Duration: Continuous

Laser Output: 0.2 mw (measured at a 1.6 mm distance from the objective lens surface on the optical pick-up block.)



1-4-3 Handling the Optical Pick-up

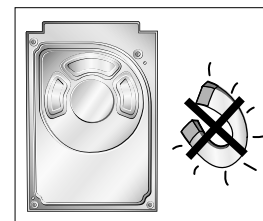
1. Static electricity from clothing or the body may cause electrostatic breakdown of the laser diode in the Optical Pickup. Follow this procedure:
2. Place a conductive sheet on the work bench (i.e., the black sheet used for wrapping repair parts.) Note: The surface of the work bench should be covered by a copper ground plane, which is grounded.
3. The repair technician must wear a wrist strap which is grounded to the copper sheet.
4. To remove the Optical Pickup block: Place the set on the conductive sheet, and momentarily touch the conductive sheet with both hands. (While working, do not allow any electrostatic sources--such as clothes--to touch the unit.)
5. Ground the "Short Terminal" (located on the PCB, inside the Pickup Assembly) before replacing the Pickup. This terminal should be shorted whenever the Pickup Assembly is lifted or moved.
6. After replacing the Pickup, reopen the Short Terminal. See diagrams below:



1-5 Special Precautions for HDD

* HDD Data Maintenance Step

1. Since the data on the HDD is weak to mechanical shock, place the HDD in a safe location that is free from mechanical shock once it is removed from the main unit.
2. In order to safe keep the data on the HDD, back up the data before the repair or make sure not to place the HDD near any electrical appliance that generates a strong magnetic field.



2. Product Description

1. Specifications

HT-X20

S P E A K E R	Speaker system	5.1ch speaker system		
		Front/Center/Rear speaker	Subwoofer speaker	
	Impedance	3Ω x 5	3Ω	
	Frequency range	140Hz~20KHz	35Hz~160Hz	
	Output sound pressure level	82dB/W/M	85dB/W/M	
	Rated input	80W	100W	
	Maximum input	160W	200W	
	Dimensions (W x H x D)	Front/Rear	90 x 152x 90 mm	175 x 320 x 381 mm
		Center	200 x 90 x 92 mm	
	Weights	Front/Rear	0.5 Kg/0.4 Kg	5.1 kg
		Center	0.6 Kg	

2. Notes on discs



DVD (Digital Versatile Disc) offers fantastic audio and video, thanks to Dolby Digital surround sound and MPEG-2 video compression technology. Now you can enjoy these realistic effects in the home, as if you were in a movie theater or concert hall.



DVD players and the discs are coded by region. These regional codes must match in order for the disc to play. If the codes do not match, the disc will not play.

The Region Number for this player is given on the rear panel of the player.
(Your DVD player will only play DVDs that are labeled with identical region codes.)



Playable Discs

Disc Type	Mark (Logo)	Recorded Signals	Disc Size	Max. Playing Time
DVD		Audio + Video	12cm	Approx. 240 min. (single-sided) Approx. 480 min. (double-sided)
			8cm	Approx. 80 min. (single-sided) Approx. 160 min. (double-sided)
VIDEO-CD		Audio + Video	12cm	74 min.
			8cm	20 min.
AUDIO-CD		Audio	12cm	74 min.
			8cm	20 min.



Do not use the following types of disc!

- LD, CD-G, CD-I, CD-ROM and DVD-ROM cannot be played on this player.
If such discs are played, a "WRONG DISC FORMAT" message appears on the TV screen.
- DVD discs purchased abroad may not play on this player.
If such discs are played, a "WRONG REGION CODE" message appears on the TV screen.

Copy Protection

- Many DVD discs are encoded with copy protection. Because of this, you should only connect your DVD player directly to your TV, not to a VCR. Connecting to a VCR results in a distorted picture from copy-protected DVD discs.
- This product incorporates copyright protection technology that is protected by methods claims of certain U.S. patents and other intellectual property rights owned by Macrovision Corporation and other rights owners. Use of this copyright protection technology must be authorized by Macrovision Corporation, and is intended for home and other limited viewing uses only unless otherwise authorized by Macrovision Corporation. Reverse engineering or disassembly is prohibited.

Disc Recording Format

CD-R Discs

- Some CD-R discs may not be playable depending on the disc recording device (CD-Recorder or PC) and the condition of the disc.
- Use a 650MB/74 minute CD-R disc.
Do not use CD-R disk over 700MB/80 minute as much as possible since it may not be played back.
- Some CD-RW (Rewritable) media, may not be playable.
- Only CD-Rs that are properly "closed" can be fully played. If the session is closed but the disc is left open, you may not be able to fully play the disc.

CD-R MP3 Discs

- Only CD-R discs with MP3 files in ISO 9660 or Joliet format can be played.
- MP3 file names should be 8 characters or less in length and contain no blank spaces or special characters (. / = +).
- Use discs recorded with a compression/decompression data rate greater than 128Kbps.
- Only files with the ".mp3" and ".MP3" extensions can be played.
- Only a consecutively written Multisession disc can be played. If there is a blank segment in the Multisession disc, the disc can be played only up to the blank segment.
- If the disc is not closed, it will take longer to begin playback and not all of the recorded files may be played.
- For files encoded in Variable Bit Rate (VBR) format, i.e. files encoded in both low bit rate and high bit rate (e.g., 32Kbps ~ 320Kbps), the sound may skip during playback.
- A maximum of 500 tracks can be played per CD.
- A maximum of 300 folders can be played per CD.

CD-R JPEG Discs

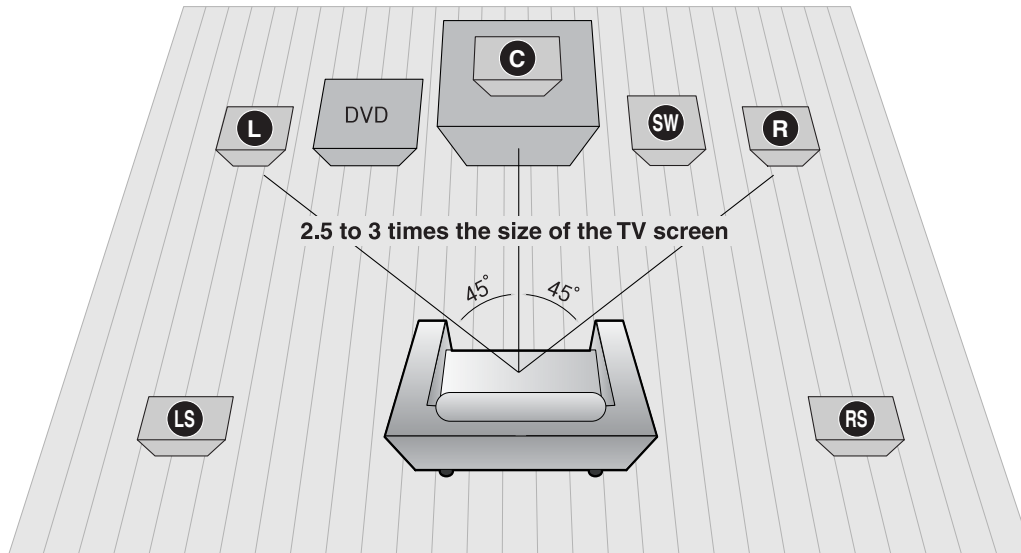
- Only files with the ".jpeg" and ".JPEG" extensions can be played.
- If the disc is not closed, it will take longer to start playing and not all of the recorded files may be played.
- Only CD-R discs with JPEG files in ISO 9660 or Joliet format can be played.
- JPEG file names should be 8 characters or less in length and contain no blank spaces or special characters (. / = +).
- Only a consecutively written multisession disc can be played. If there is a blank segment in the multisession disc, the disc can be played only up to the blank segment.
- A maximum of 9,999 images can be stored on a single CD.
- When playing a Kodak/Fuji Picture CD, only the JPEG files in the picture folder can be played.
- Picture discs other than Kodak/Fuji Picture CDs may take longer to start playing or may not play at all.

3. Accessories

Code no.	Description & Specification	Remarks
AH39-40001V	CABLE-AUDIO CABLE;1P-1P,3000MM,-	COMMON
AH42-00021A	ANT FM T;T18011F-1,75 ohm,1800mm	COMMON
AH59-01787S	REMOCON-ASSY;HT-X20,XAA,AR-7060,	US

3. Product Functions

1. SPK connection



Position of the DVD Player

- Place it on a stand or cabinet shelf, or under the TV stand.

Front Speakers **L R**

- Place these speakers in front of your listening position, facing inwards (about 45°) toward you.
- Place the speakers so that their tweeters will be at the same height as your ear.
- Align the front face of the front speakers with the front face of the center speaker or place them slightly in front of the center speakers.

Center Speaker **C**

- It is best to install it at the same height as the front speakers.
- You can also install it directly over or under the TV.

Selecting the Listening Position

The listening position should be located about 2.5 to 3 times the distance of the TV's screen size away from the TV. Example: For 32" TVs 2~2.4m (6~8feet)
For 55" TVs 3.5~4m (11~13feet)

Rear Speakers **LS RS**

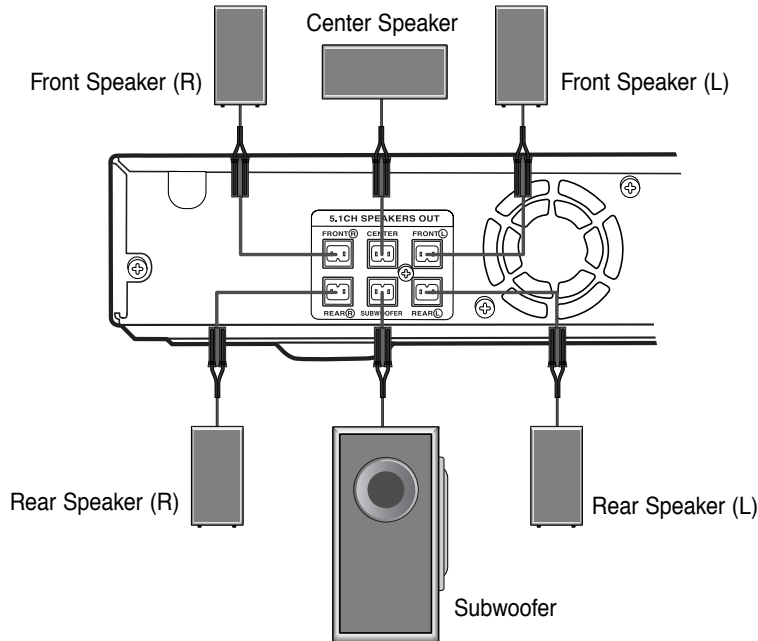
- Place these speakers behind your listening position.
- If there isn't enough room, place these speakers to face each other.
- Place them about 60 to 90cm (2 to 3feet) above your ear, facing slightly downward.

* Unlike the front and center speakers, the rear speakers are used to handle mainly sound effects and sound will not come from them all the time.

Subwoofer **SW**

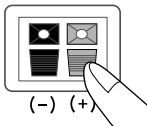
- The position of the subwoofer is not so critical. Place it anywhere you like.
- Usually, it is placed by a corner near the front speakers.

HT-Q20

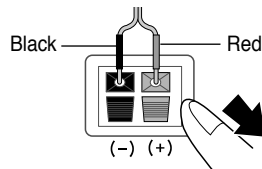


Connecting the Speakers

- 1 Press down the terminal tab on the back of the speaker.



- 2 Insert the black wire into the black terminal (-) and the red wire into the red (+) terminal, and then release the tab.



- 3 Connect the correct color speaker cable to the same color speaker output terminal on the rear of the subwoofer, according to the polarity markings (+/-).

Example: Connect the green center speaker cable to the green center speaker output terminal on the rear of the subwoofer according to the polarity markings (+/-).

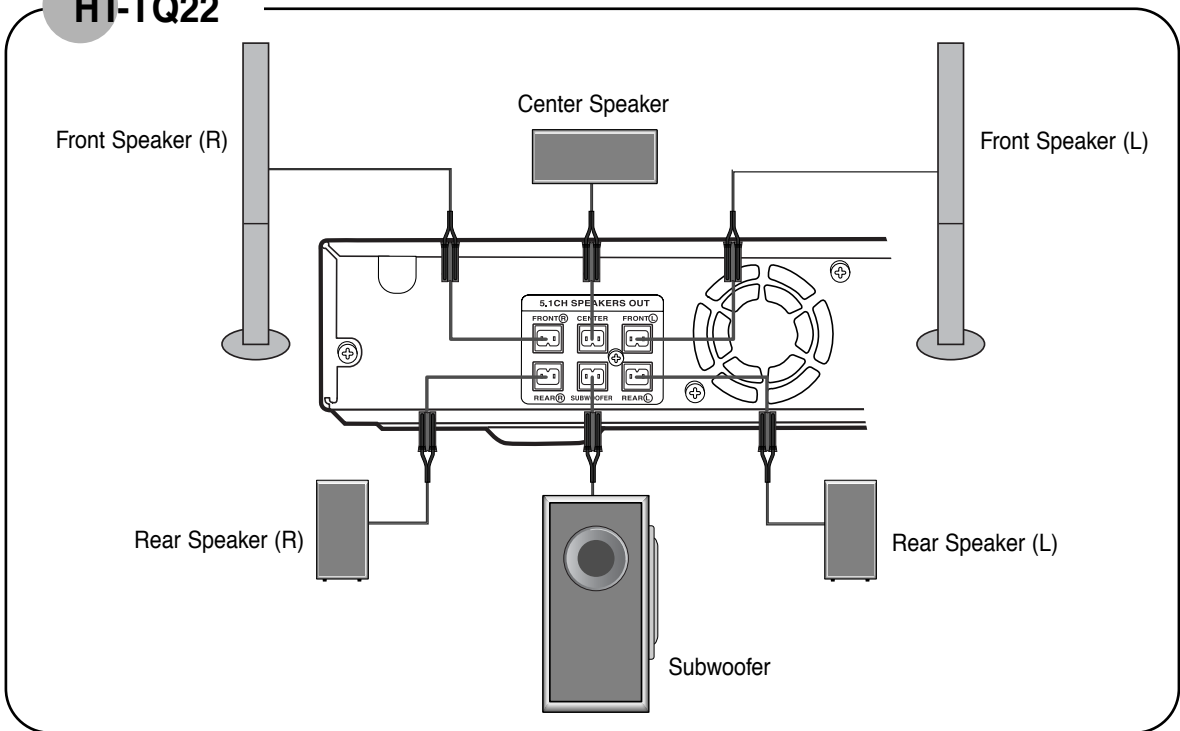
Caution

- Do not let children play with or near the speakers. They could get hurt if a speaker falls.
- When connecting the speaker wires to the speakers, make sure that the polarity (+/-) is correct.

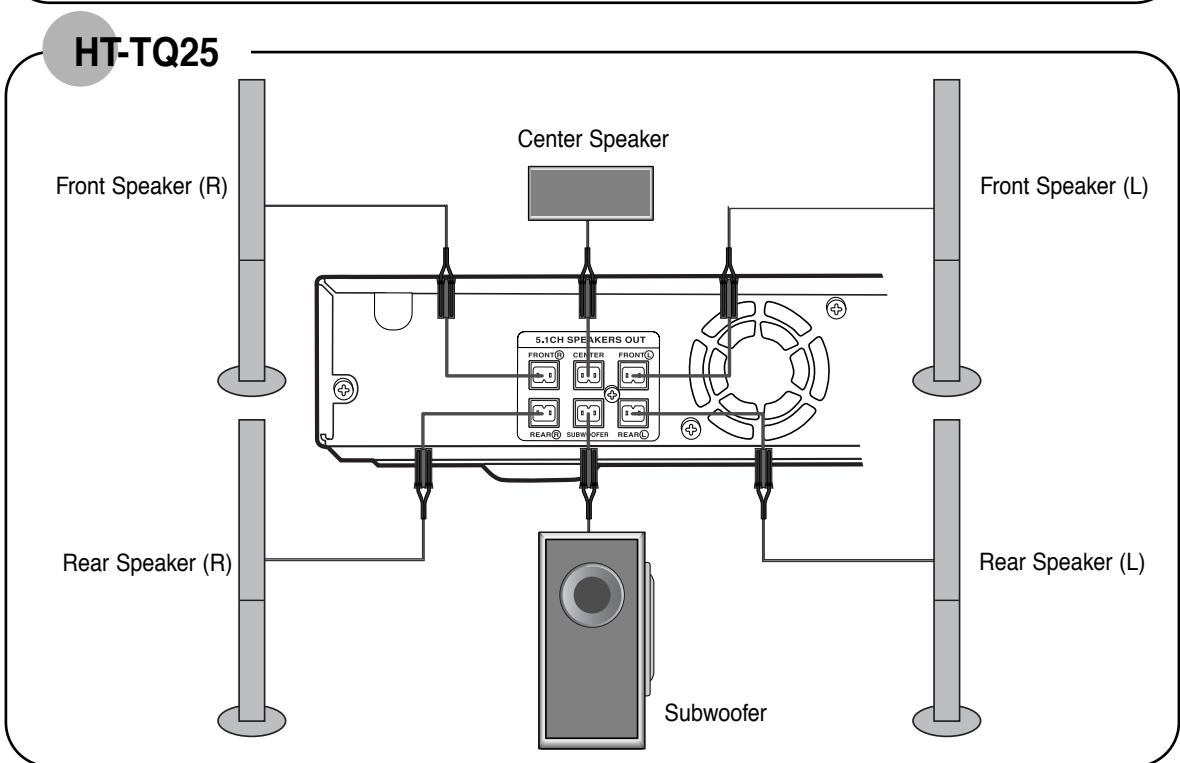
Note

- If you place a speaker near your TV set, screen color may be distorted because of the magnetic field generated by the speaker. If this occurs, place the speaker away from your TV set.

HT-TQ22



HT-TQ25



Disc Playback



Note

- Depending on the content of the disc, the initial screen may appear different.

1 Press **OPEN/CLOSE** button to open the disc tray.

2 Load a disc.
• Place a disc gently into the tray with the disc's label facing up.

3 Close the compartment by pressing the **OPEN/CLOSE** button again.

DVD VCD CD

- Playback starts automatically.

To stop playback, press **STOP during playback.**

- If pressed once, "PRESS PLAY" is displayed and the stop position will be stored in memory. If **PLAY/PAUSE** (▶/II) button or **ENTER** button is pressed, playback resumes from the stop position. (This function works only with DVDs.)
- If pressed twice, "STOP" is displayed, and if **PLAY/PAUSE** (▶/II) button is pressed, playback starts from the beginning.

To temporarily pause playback, press **PLAY/PAUSE during playback.**

- To resume playback, press **PLAY/PAUSE** (▶/II) button again.

Selecting the Video Format

Press and hold **NT/PAL** button on the remote controller for over 5 seconds while the power is turned off.

- By default, the video format is set to "PAL".
- "NTSC" or "PAL" will appear in the display. At this time, press the **NT/PAL** button shortly to select between "NTSC" and "PAL".
- Each country has a different video format standard.
- For normal playback, the video format of the disc must be the same as the video format of your TV.

Selecting Audio Language

Audio Language Selection Function **DVD**

1 Press **INFO** button twice.

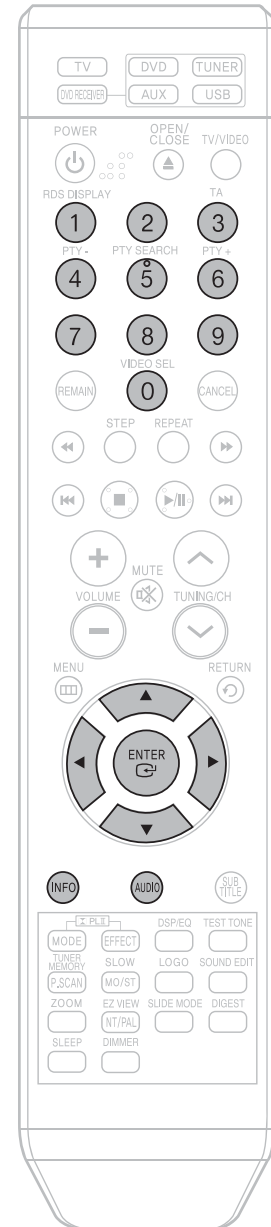
DVD ◀ EN 1/3

2 Press Cursor **▲**, **▼** buttons or numeric buttons to select the desired audio language.

- Depending on the number of languages on a DVD disc, a different audio language (ENGLISH, SPANISH, FRENCH, etc.) is selected each time the button is pressed.

DVD ◀ EN 1/3

SP 2/3
FR 3/3



Selecting Subtitle Language

Subtitle Language Selection Function DVD

1 Press **INFO** button twice.

DVD ◀ EN 1/3 OFF/ 02 OFF

2 Press Cursor button to move to **SUBTITLE** () display.

DVD ◀ EN 1/3 OFF/ 02 OFF

3 Press Cursor button or numeric buttons to select the desired subtitle.

DVD ◀ EN 1/3 EN 01/ 03 OFF

- ▶ SP 02/ 03
- ▶ FR 03/ 03
- ▶ OFF / 03

Note

- To operate this function, you can also press the Select AUDIO or Select SUBTITLE buttons on the remote control.
- Depending on the disc, the Subtitle and Audio Language functions may not be available.



Using Disc Menu DVD

You can use the menus for the audio language, subtitle language, profile, etc.
DVD menu contents differ from disc to disc.

1 In Stop mode, press **MENU** button.

- When playing a VCD (version 2.), this toggles between PBC ON and OFF.



2 Press Cursor \blacktriangle , \blacktriangledown buttons to move to 'DISC MENU' and then press **ENTER** button.

- When you select Disc Menu and it is not supported by the disc, the "This menu is not supported" message appears on the screen.



3 Press Cursor \blacktriangle , \blacktriangledown , \blacktriangleleft , \blacktriangleright buttons to select the desired item.

- Press **ENTER** button.



Note

- Disc menu display may be different depending on the disc.

PBC (Playback Control) Function

When playing a VCD (version 2.0), you can select and view various scenes according to the menu screen.

PBC ON: This VCD disc is version 2.0. The disc is played back according to the menu screen. Some functions may be disabled. When some functions are disabled, select "PBC OFF" to enable them.

PBC OFF: This VCD disc is version 1.1. The disc is played back in the same way as with a music CD.

Using the Title Menu DVD

For DVDs containing multiple titles, you can view the title of each movie.
Depending on the disc, the availability of this feature may vary.

1 In Stop mode, press **MENU** button.



2 Press Cursor \blacktriangle , \blacktriangledown button to move to 'Title Menu'.



3 Press **ENTER** button.

- The title menu appears.



Press **MENU** button to exit the setup screen.

Note

- Title menu display may be different depending on the disc.

3. New Functions

DivX Playback

The functions on this page apply to DIVX disc playback.

Skip Forward/Back

During playback, press the **⏮️⏭️** button.

- Goes to the next file whenever you press **⏭️** button, if there are over 2 files in the disk.
- Goes to the previous file whenever you press **⏮️** button, if there are over 2 files in the disk.

Fast playback

To play back the disc at a faster speed, press **⏮️** or **⏭️** during playback.

- Each time you press either button, the playback speed will change as follows:
2x → 4x → 8x → 32x → Normal.

5 Minute Skip function

During playback, press the **⏪**, **⏩** button.

- Playback skips 5 minutes forward whenever you press **⏩** button.
- Playback skips 5 minutes back whenever you press **⏪** button.

Zoom Function

1 Press **ZOOM** button.

- Each time you press the button, your selection will toggle between "ZOOM X2" and "ZOOM OFF".

2 Press Cursor **▲**, **▼**, **◀**, **▶** buttons to move to the area you want to enlarge.

Note

- DIVX file can be zoomed only in ZOOM X2 mode.
- DivX files have .Avi file extensions, however, not all .Avi files are DivX and may not be playable in this unit.




Subtitle Display


Press the **SUBTITLE** button.

- Each time you press the button, your selection will toggle between "SUBTITLE ON" (1/1, 1/2 ...) and "SUBTITLE OFF".
- If the disc has only one subtitle file, it will be played automatically.

Audio Display

Press the **AUDIO** button.

- Each time you press the button, your selection will toggle between "AUDIO ON" (1/1, 1/2 ...) and " ".

Note • "  " is displayed when there is one supported audio item in the disc.

DivX(Digital internet video eXpress)

DivX is a video file format developed by Microsoft based on the MPEG4 so as to provide audio, and video data over the Internet in real-time.

MPEG4 is used for video encoding and MP3 for audio encoding so that the users can watch a movie in DVD-quality video and audio.

1. Supported Formats

- This product only provides the following media formats. If both of the video and audio formats are not supported simultaneously, the user may experience problems such as broken image or no sound.

• Supported Video Formats

Format	AVI	WMA
Supported Versions	DivX3.11 ~ 5.1	V1/V2/V3/V7

• Supported Audio Format

Format	MP3	WMA	AC3	DTS
Bit Rate	80~384kbps	56~128kbps	128~384kbps	N/A
Sampling Frequency	44.1khz		44.1/48khz	N/A

- Aspect Ratio: Although default DivX resolution is 640*480 pixels (4:3), this product supports up to 720*480 pixels (16:9). It will not be supported when the screen resolution is higher than 800.

2. Caption Related

- To use the caption function, save the caption file (*.smi) in the same file name as that of the DivX media file (*.avi) within the same folder.
Example. Root Samsung_Bluetek_007CD1.avi
 Samsung_Bluetek_007CD1.smi
- Up to 60 alphanumeric characters or 30 East Asian characters (2 byte characters such as Korean and Chinese) for the file name.

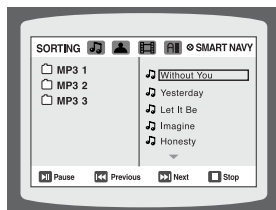
MP3/WMA-CD Playback

Data CDs (CD-ROM, CD-R, CD-RW) encoded in MP3/WMA format can be played.



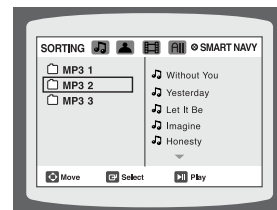
1 Press the **OPEN/CLOSE** button to open the disc tray, and then load the MP3/WMA disc.

- The MP3/WMA menu screen will appear and playback will start.
- The appearance of the menu depends on the MP3/WMA disc.
- WMA-DRM files cannot be played.



2 In Stop mode, use ◀ ▶ ▲ ▼ to select the album, and then press the **ENTER** button.

- Use ▲ ▼ to select the track.



3 To change the album, use ◀ ▶ ▲ ▼ to select another album in Stop mode, and then press the **ENTER** button.

- To select another album and track, repeat Steps 2 and 3 above.

4 Press the **STOP** button to stop playback.

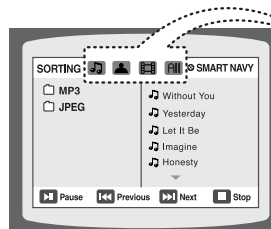
Note

- Depending on the recording mode, some MP3/WMA-CDs may not play.
- Table of contents of a MP3-CD varies depending on the MP3/WMA track format recorded on the disc.

To play a file icon in the screen,

Press the ◀ ▶ ▲ ▼ button when it is in stop status and select a desired icon from the top part of the menu.

- To play music files only, select the icon.
- To view image files only, select the icon.
- To view movie files only, select the icon.
- To select all files select the icon.



- Music File Icon
- Image File Icon
- Movie File Icon
- All File Icon

JPEG File Playback JPEG

Images captured with a digital camera or camcorder, or JPEG files on a PC can be stored on a CD and then played back with this Home Theater.

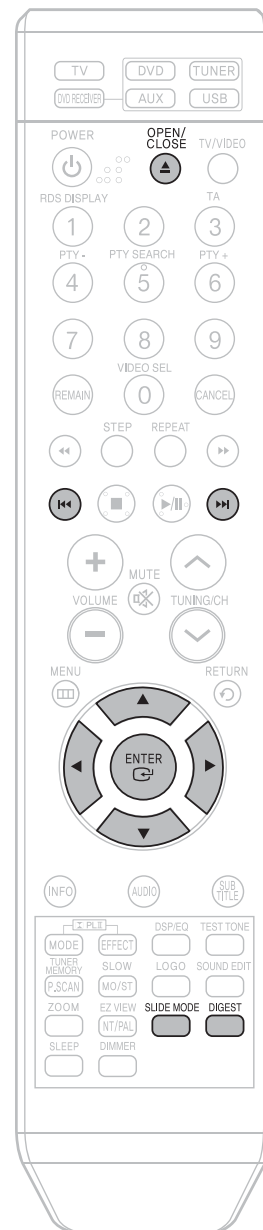
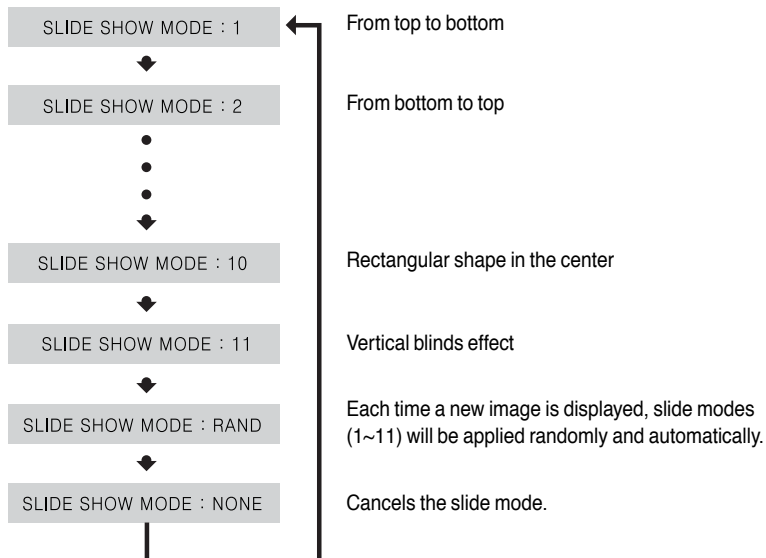
Slide Mode

1 Place the JPEG disc on the disc tray.

2 Press the **OPEN/CLOSE** button.

3 Press **SLIDE MODE** button.

- Playback starts automatically.
- Each time the button is pressed, the image makes the transition as follows:



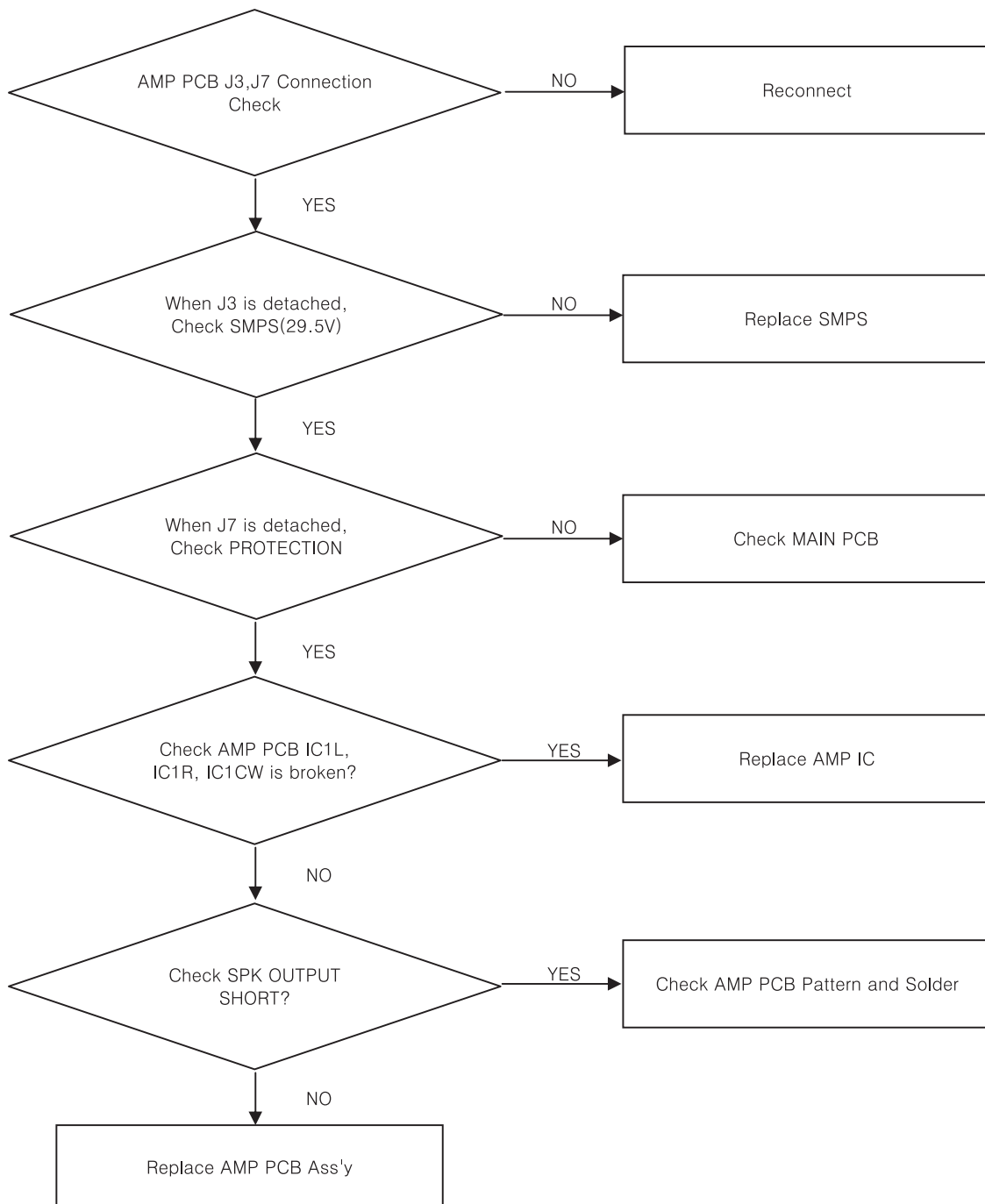
Press **◀▶▶▶** to skip to the next slide.

- Each time the button is pressed, the slide moves backward or forward.

4. Adjustments

* Protection Mode Explanation

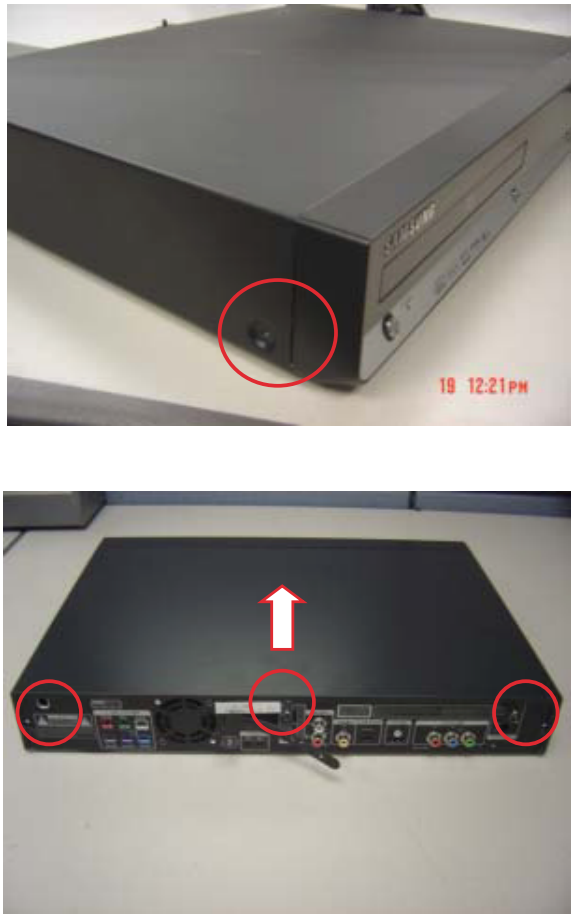
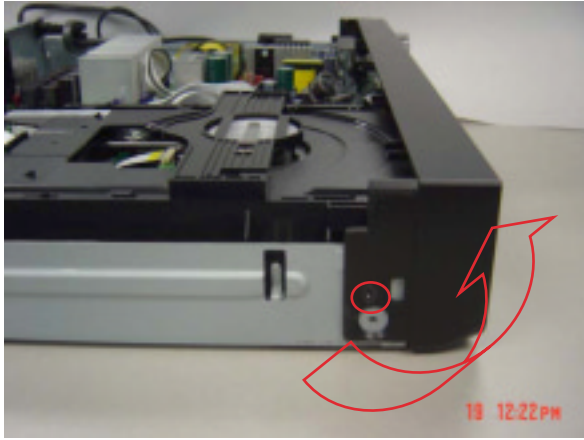
(When Power ON and 'PROTECTION' Mark is displayed)


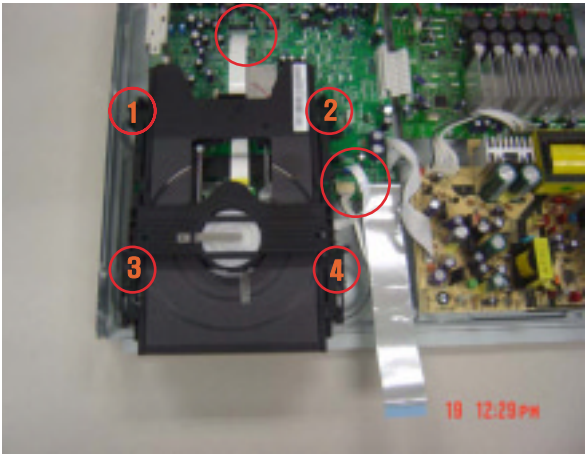




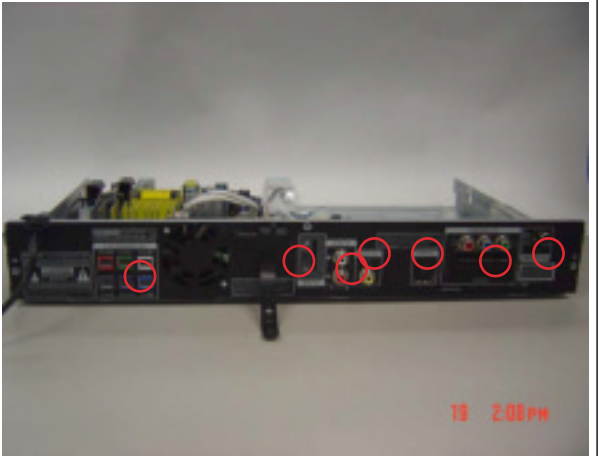
5. How to disassemble

* CAUTIONS

1. To avoid damage to the product, follow the disassembly method in the Service Manual.
2. As some Semiconductor devices are very sensitive to static, ensure that all procedures are adhered to when handling ESD's.

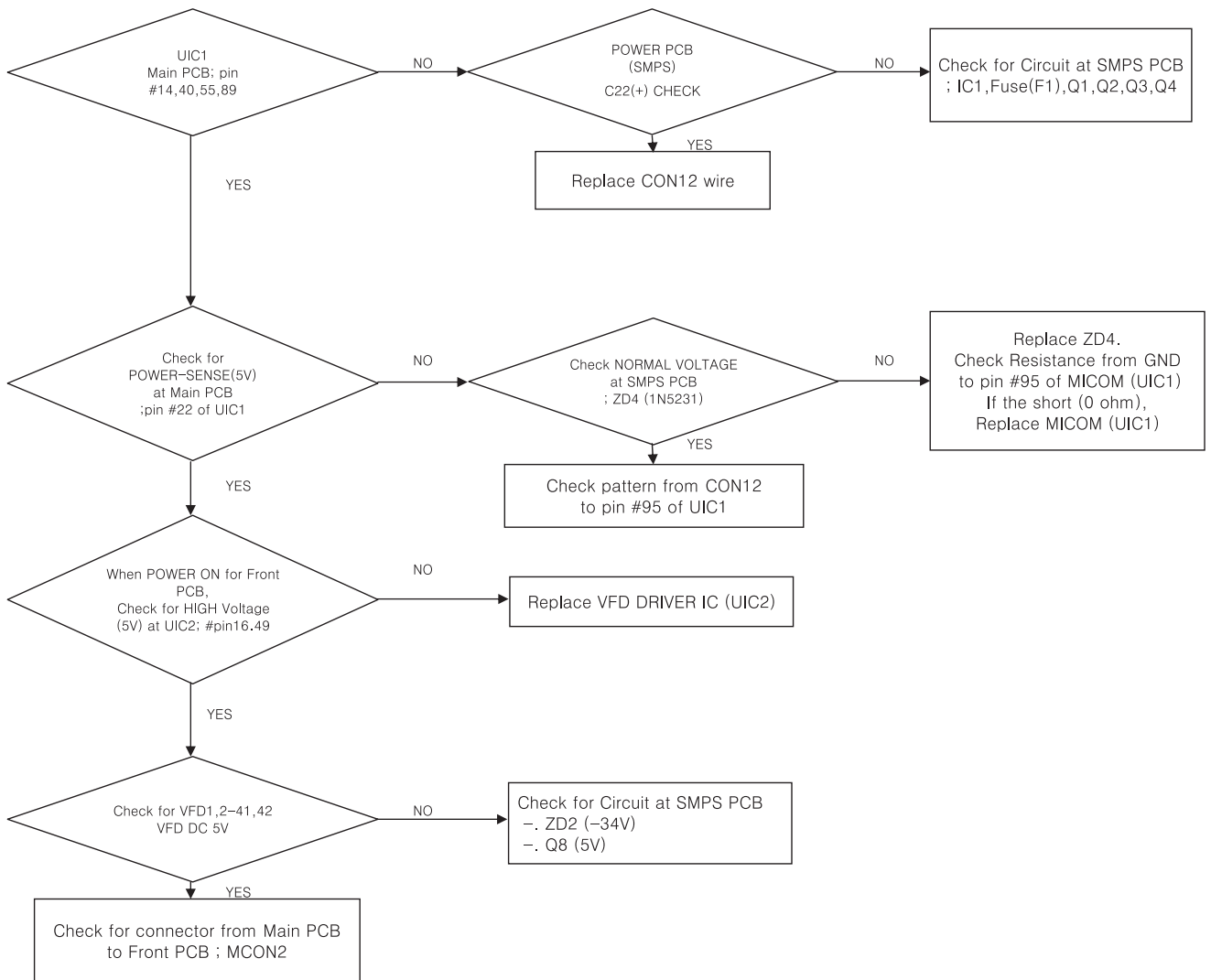
Order(Description)	Picture
<p>1. Unfasten 2 screw on FRONT SIDE and 3 screw on REAR SIDE.</p> <p>And then separate the CABINET-TOP in the direction of arrow.</p>	 <p>The first photograph shows the front-left corner of a black electronic device. Two screws on the front panel are circled in red. A red timestamp '19 12:21 PM' is visible in the bottom right corner.</p> <p>The second photograph shows the rear panel of the device. Three screws are circled in red. A white arrow points upwards from the top edge of the device, indicating the direction to lift the top panel. A red timestamp '19 12:21 PM' is visible in the bottom right corner.</p>
<p>2. Unfasten 2 screw on left, right SIDE. Lift and pull out the CABINET-FRONT.</p>	 <p>The photograph shows the internal components of the device, including a power supply unit, capacitors, and a disc tray. Two screws on the side of the chassis are circled in red. A red arrow points upwards and to the right, indicating the direction to lift and pull out the front panel. A red timestamp '19 12:22 PM' is visible in the bottom right corner.</p>

Order(Description)	Picture
<p>3. Remove the wire connected of CANINET-FRONT.</p>	 <p>A photograph showing the internal components of a device chassis. Two red circles highlight specific wires: one on the upper right side and another on the lower center. A timestamp '10 12:24 PM' is visible in the bottom right corner.</p>
<p>4. Unfasten 4 screw and 2 wire.</p>	 <p>A close-up photograph of a component within the chassis. Four screws are numbered 1, 2, 3, and 4, each circled in red. Two wires are also circled in red. A timestamp '10 12:29 PM' is visible in the bottom right corner.</p>
<p>5. Remove wires between PCBs.</p>	 <p>A photograph showing the internal components of the device chassis. Three red circles highlight wires located between the main green PCB and the lower yellow PCB. A timestamp '10 2:08 PM' is visible in the bottom right corner.</p>

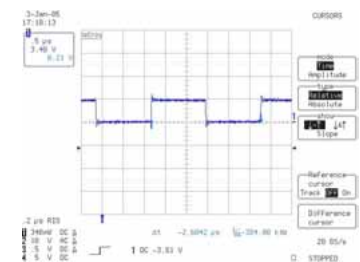
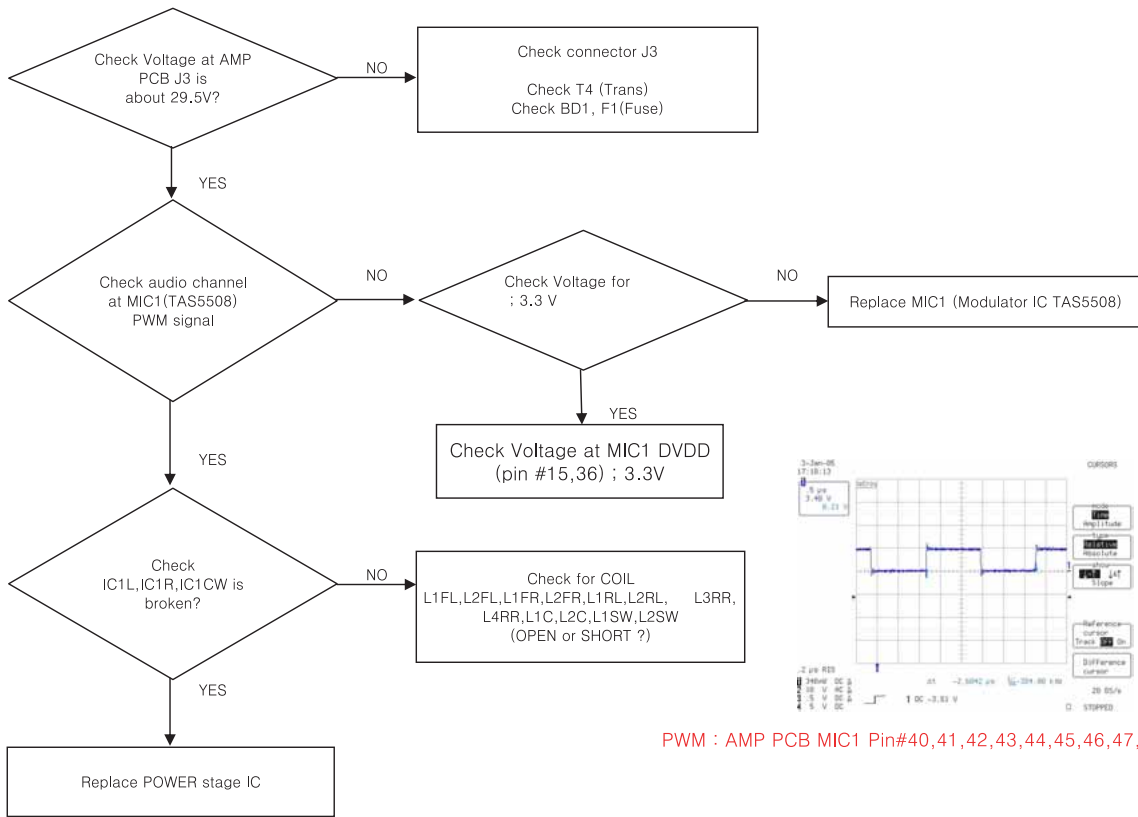
Order(Description)	Picture
6. Remove 6 screw on the PCBs.	 A photograph showing the internal components of a device chassis. The main green PCB is on the left, and a yellow power supply unit is on the right. Six screws are circled in red: one on the left PCB, two on the top right PCB, and three on the bottom right PCB. A red timestamp '13 2:08 PM' is visible in the bottom right corner.
7. Unfasten 7 screw on the rear-cabinet.	 A photograph showing the rear panel of a device chassis. Seven screws are circled in red along the bottom edge of the panel. A red timestamp '13 2:08 PM' is visible in the bottom right corner.

6. TroubleShooting

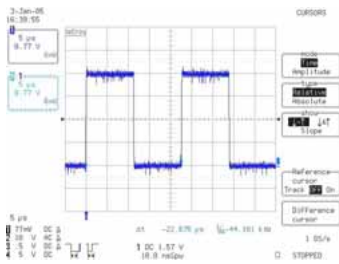
1. NO Power



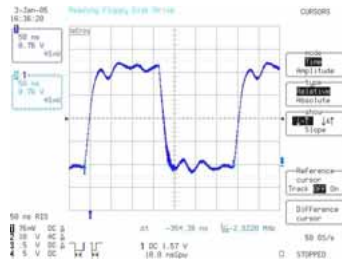
2. NO Output



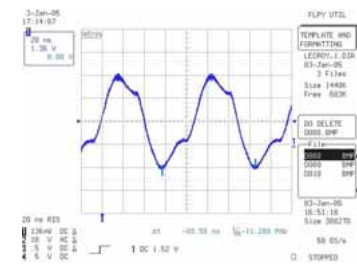
PWM : AMP PCB MIC1 Pin#40,41,42,43,44,45,46,47,49,50,51,52



LCLK : AMP PCB J7 Pin#11

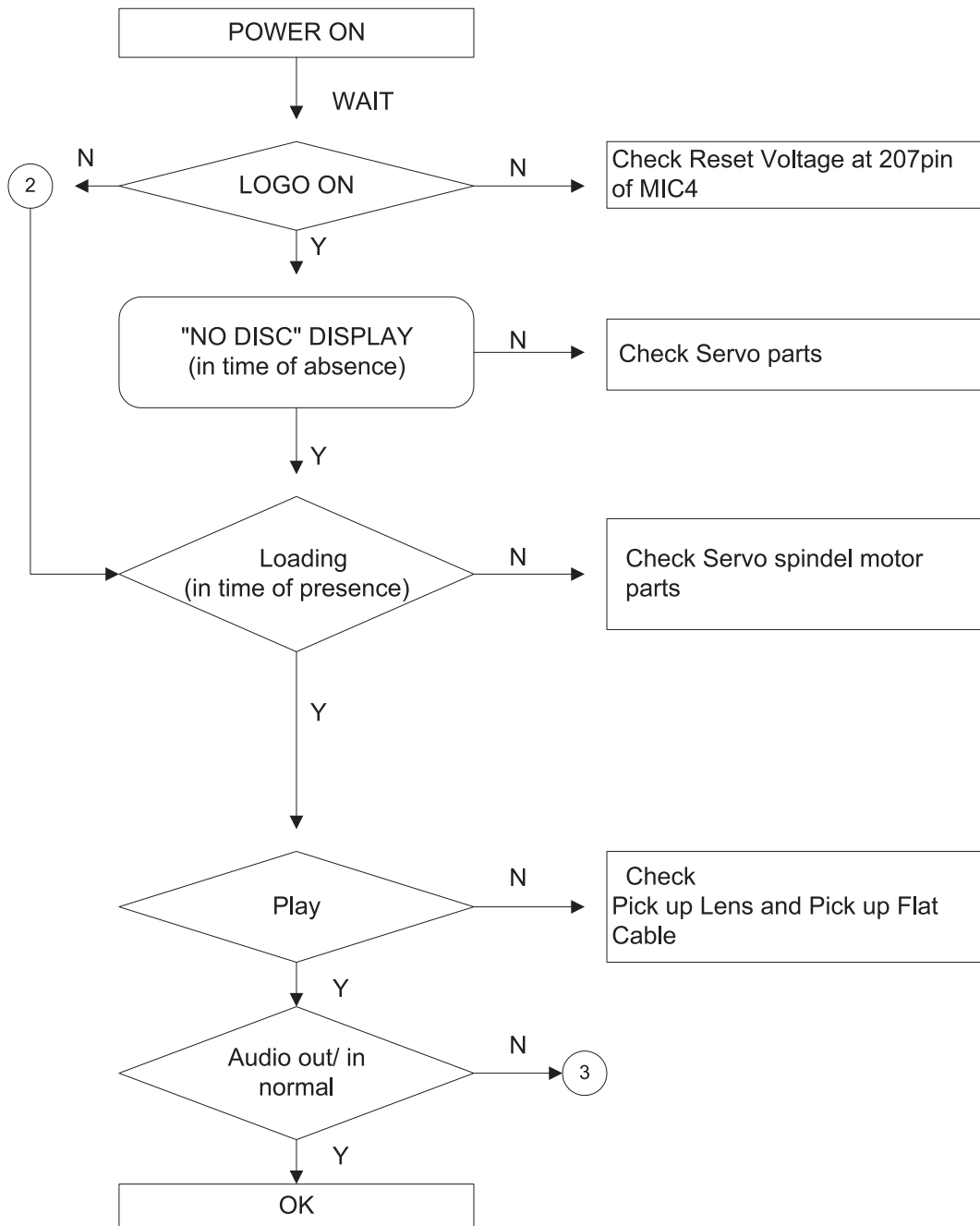


BCLK : AMP PCB J7 Pin#12

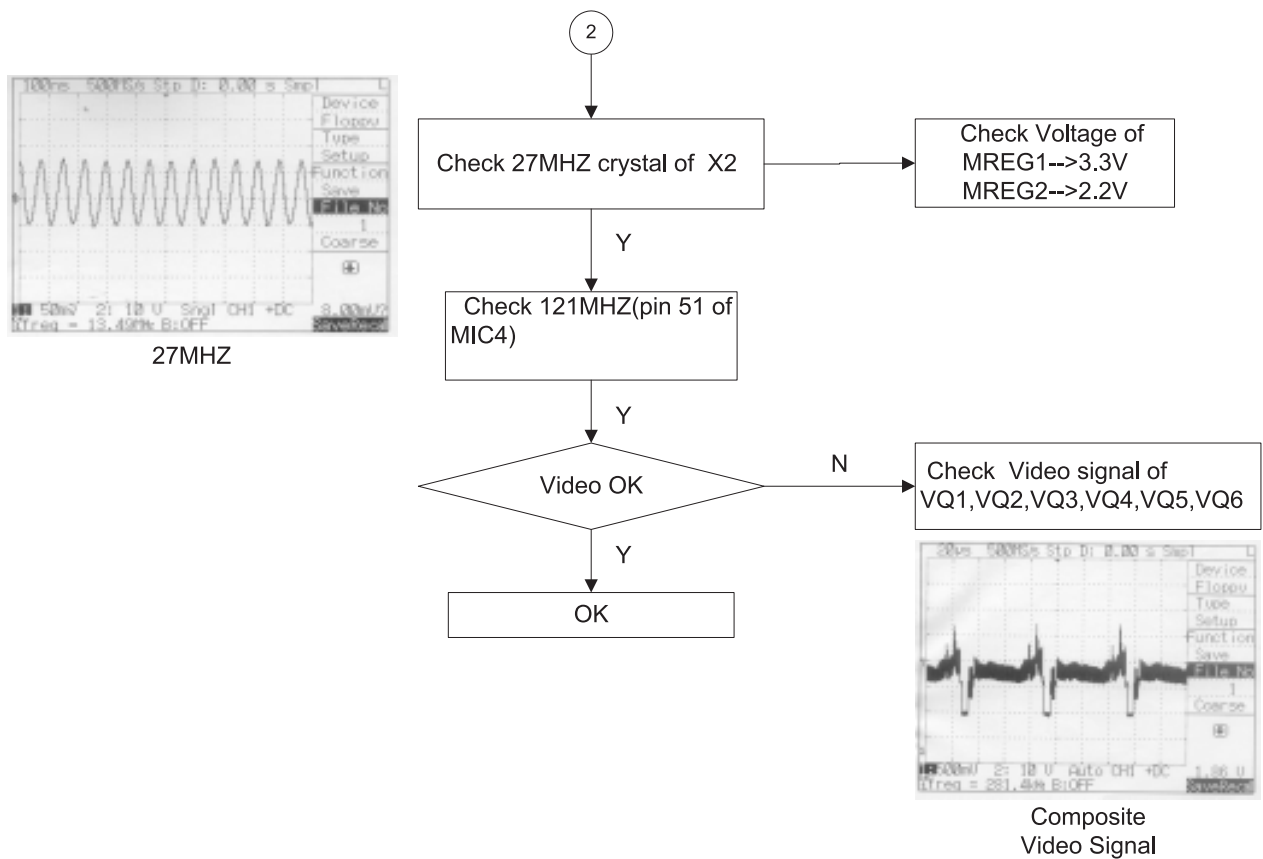


MCLK : MAIN PCB J7 Pin#21

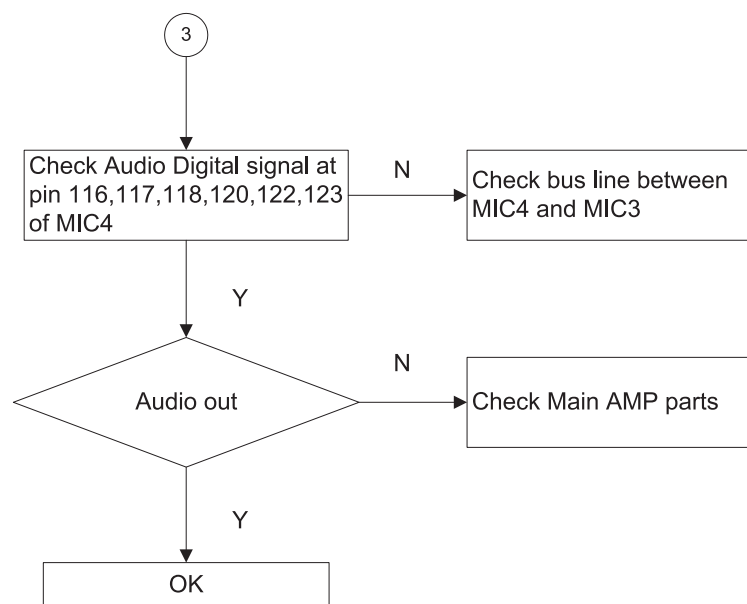
1. Initial operation after power on



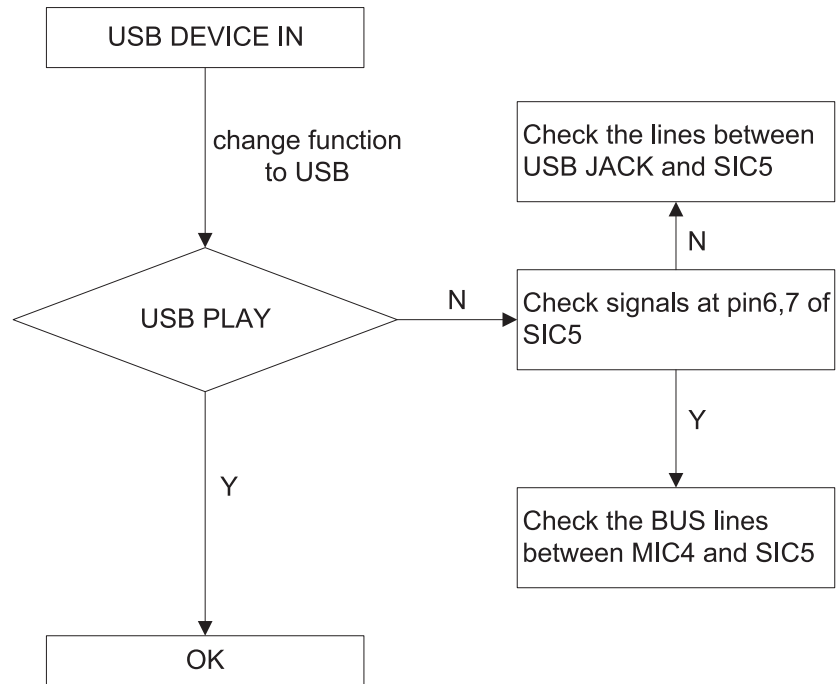
2. Logo operation



3. Audio operation

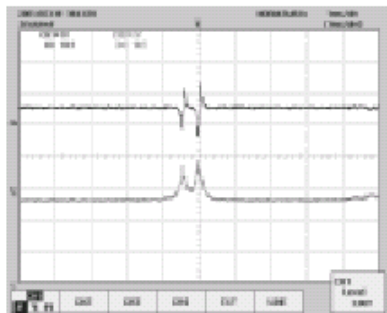
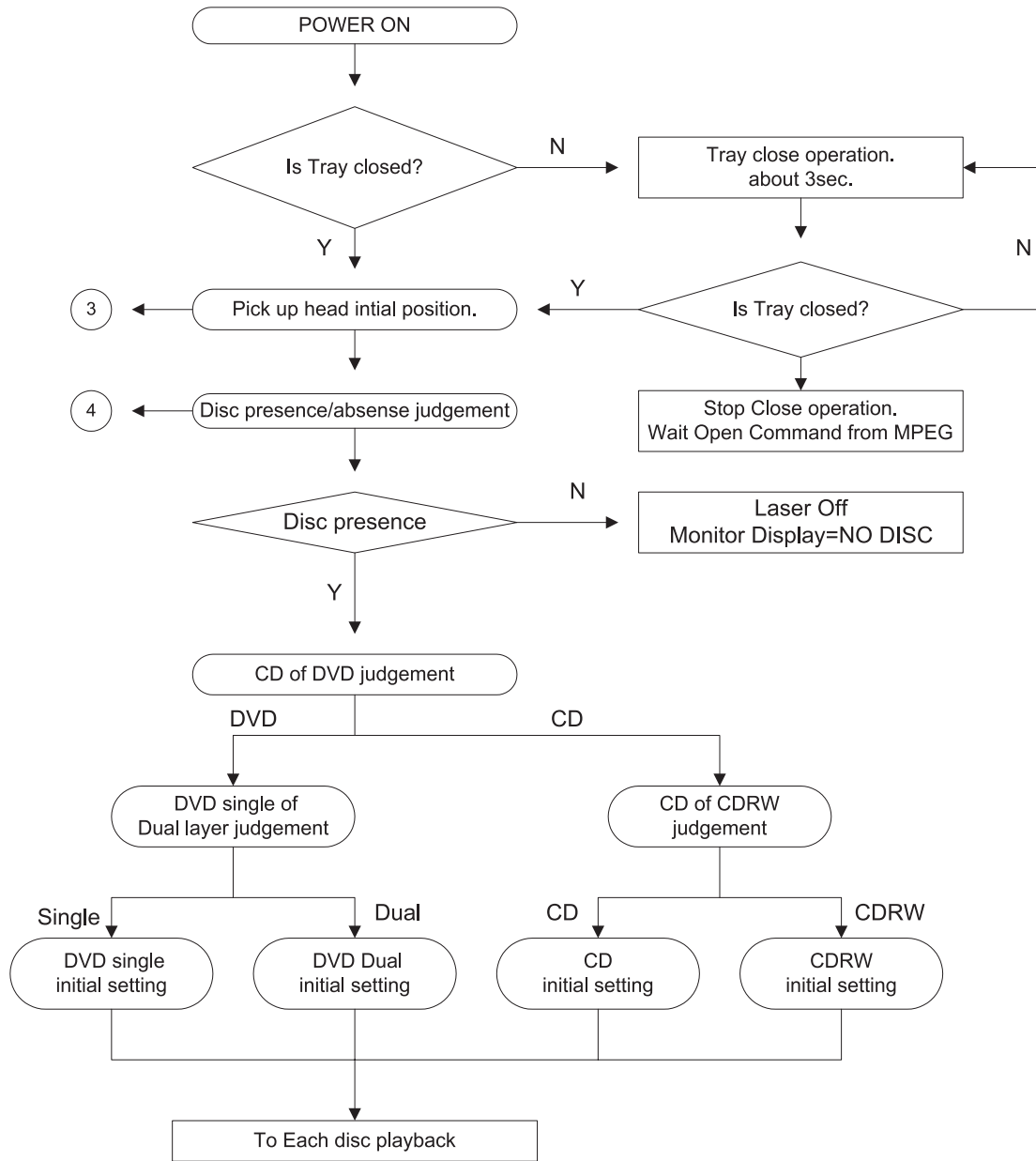


4. USB operation

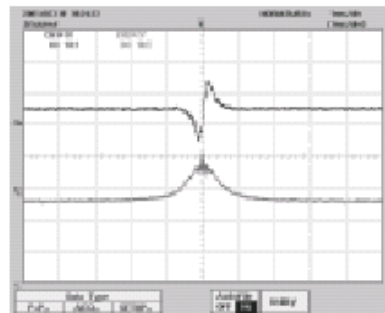


4. DVD SERVO

1. Initial operation after power ON

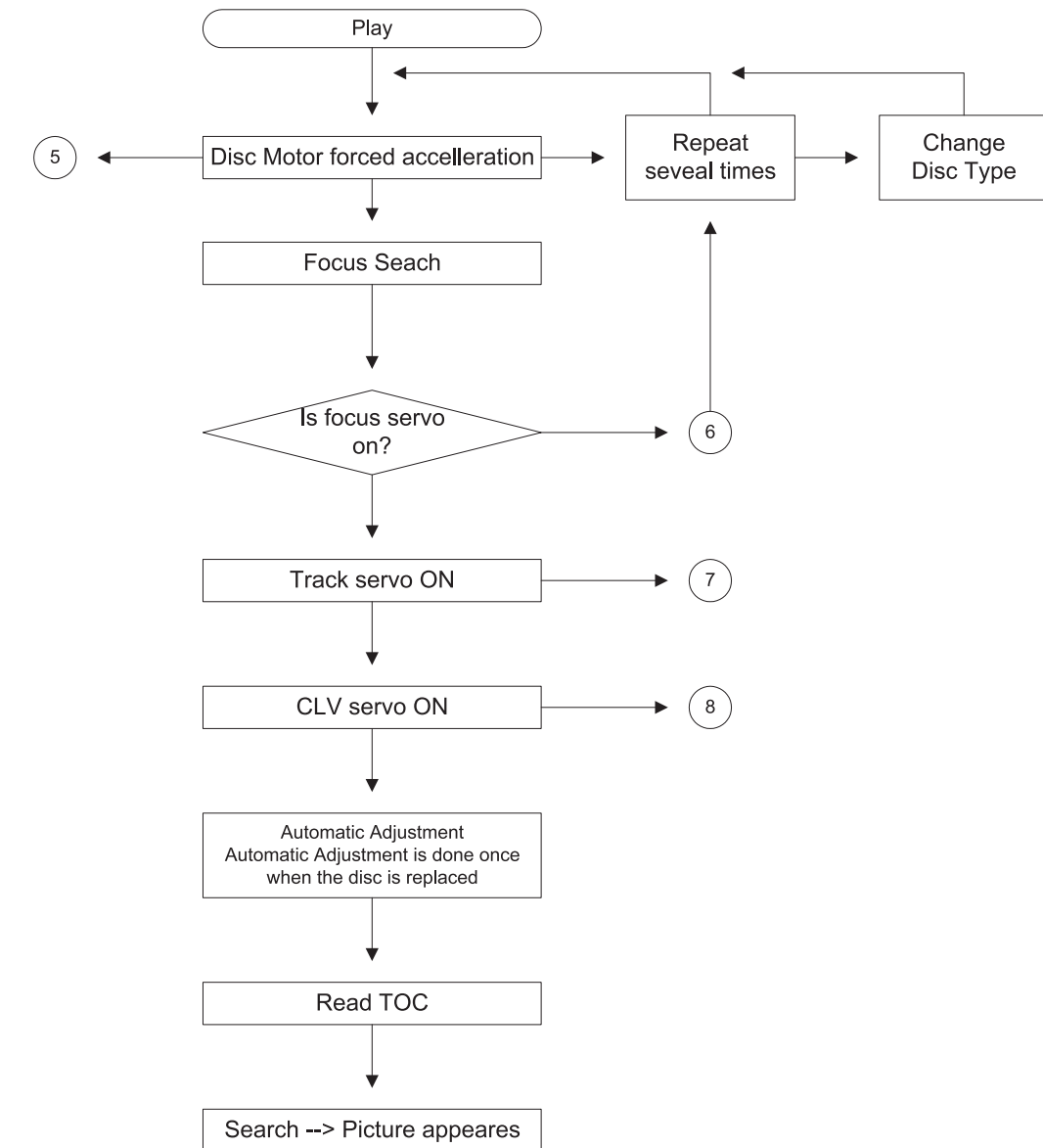


(DVD Dual)



(DVD Single)

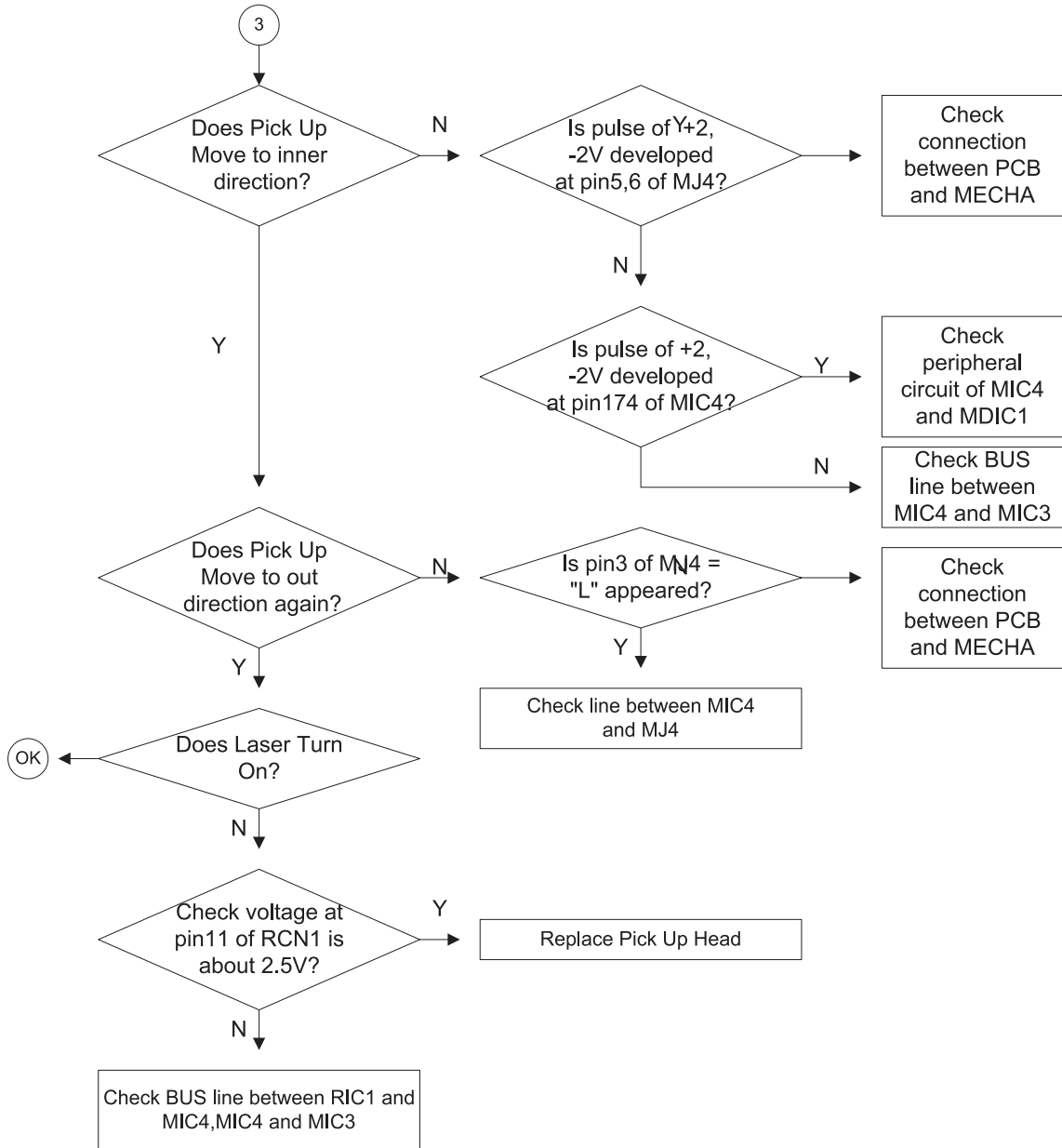
2. Play operation



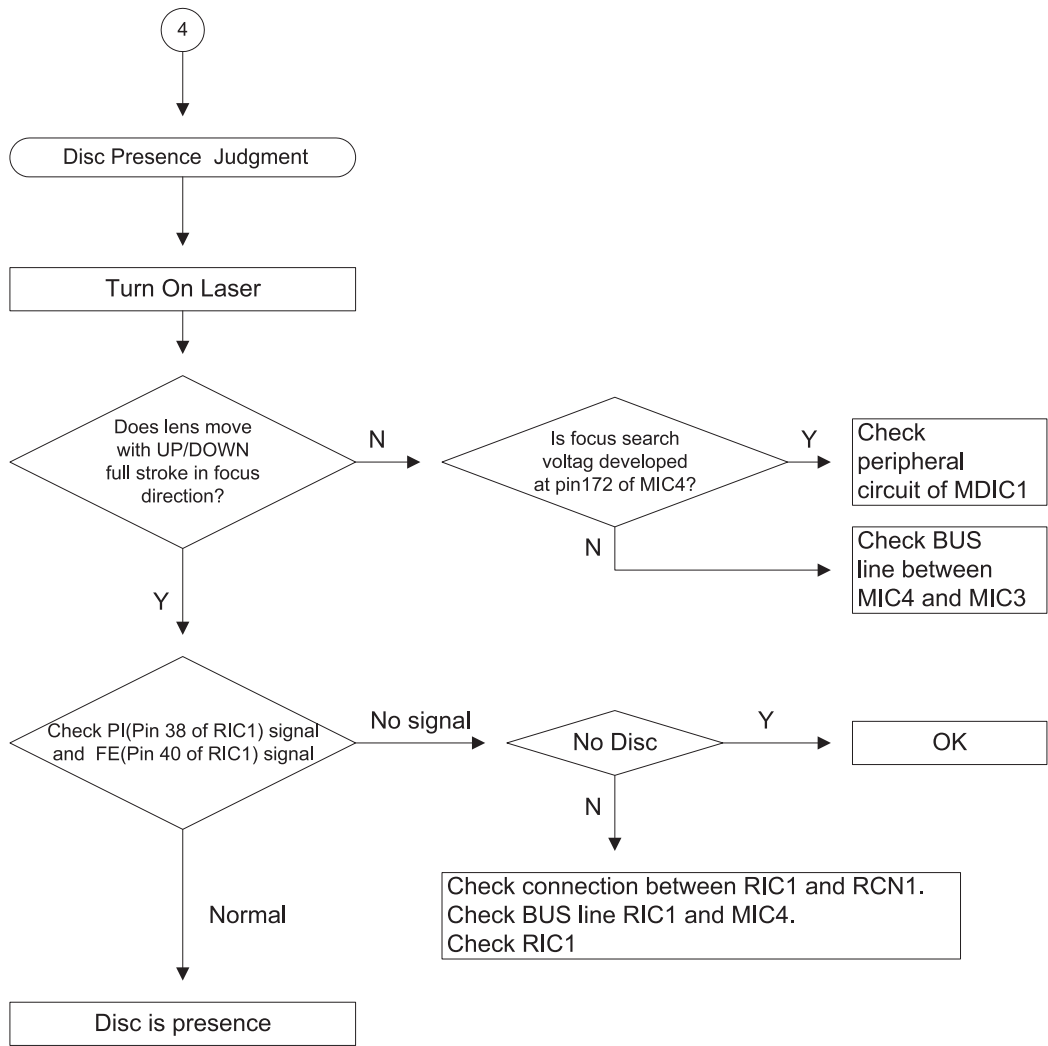
3. PickUp Head Initial Postion

PickUp Head Initial Postion

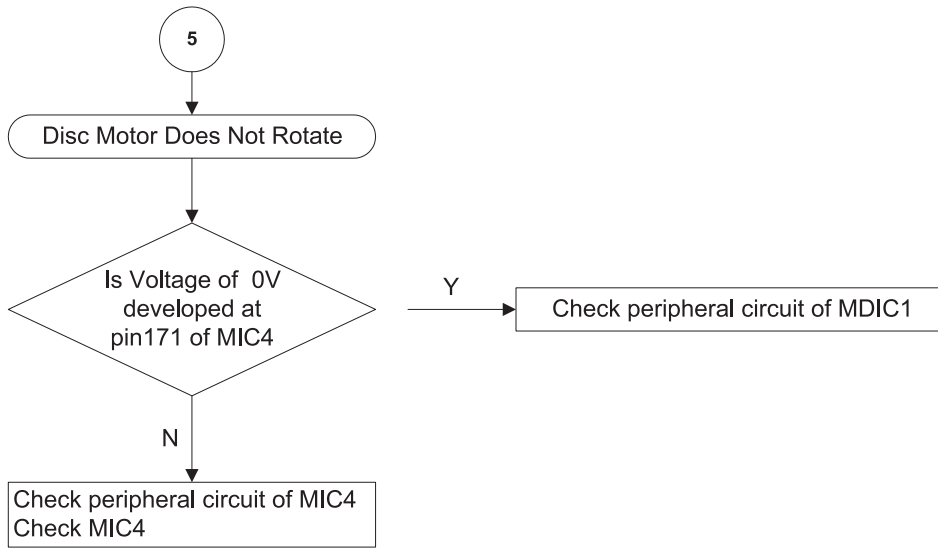
1. Move Pick Up Head to inner direction until pin3 of MJ4="L"
2. If pin3 of MJ4="L", then move Pick Up Head to outer direction for a short time.
3. Ture On the Laser of Pick Up Head to judge that disc is presence or not.



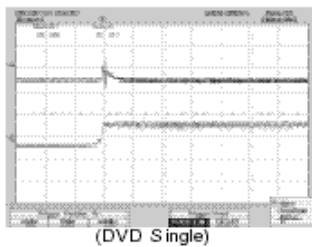
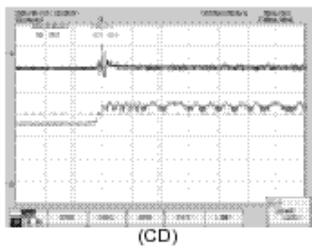
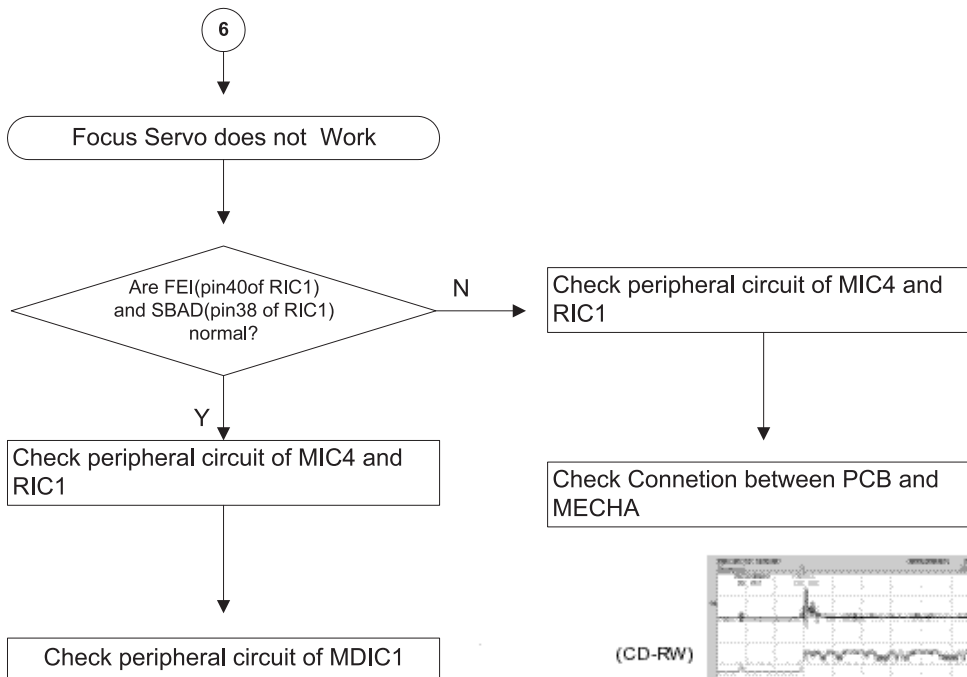
4. Disc Presence/Absence Judgment



5. Disc Motor Does Not Rotate

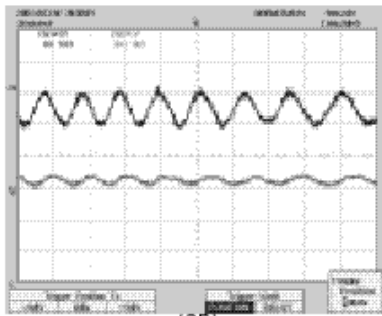
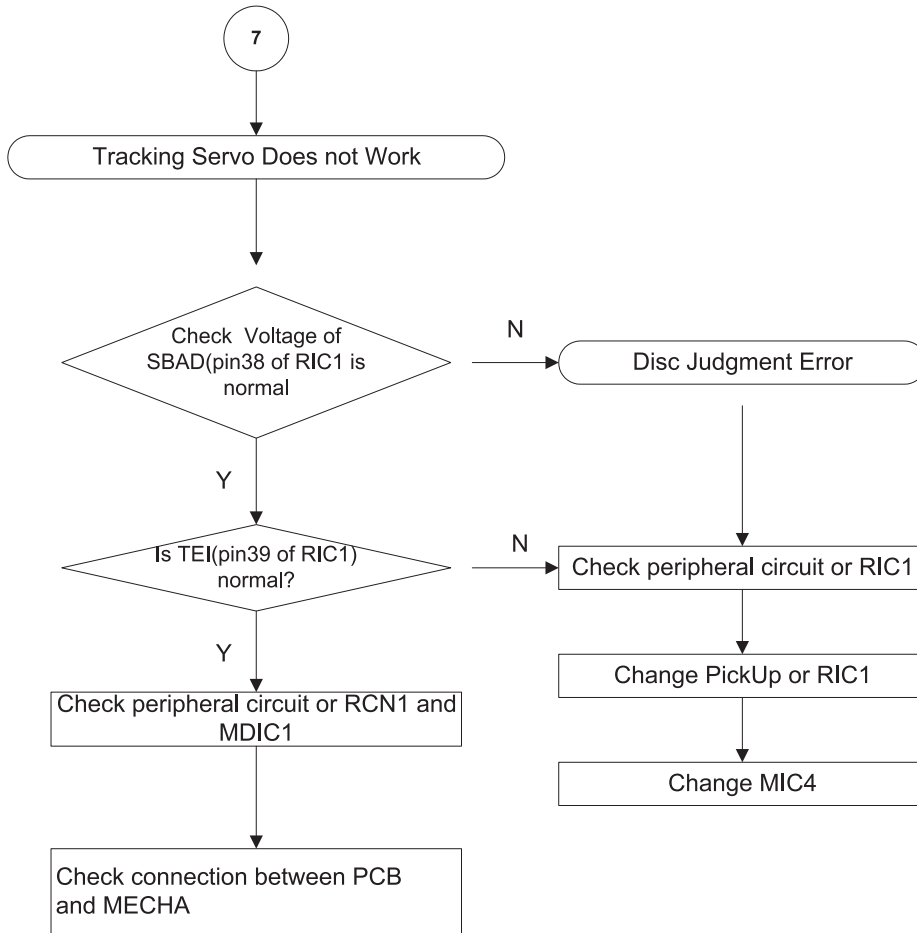


6. Focus Servo does not Work

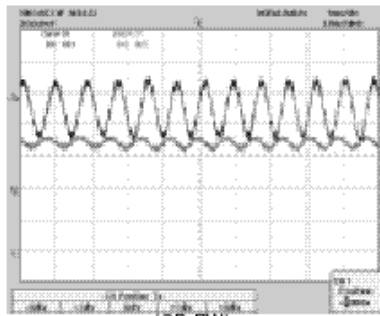


(CD-RW)

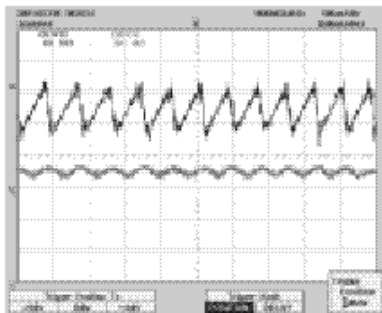
7. Tracking Servo Does Not Work



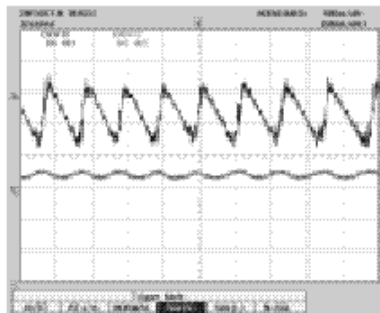
(CD)



(CD-RW)



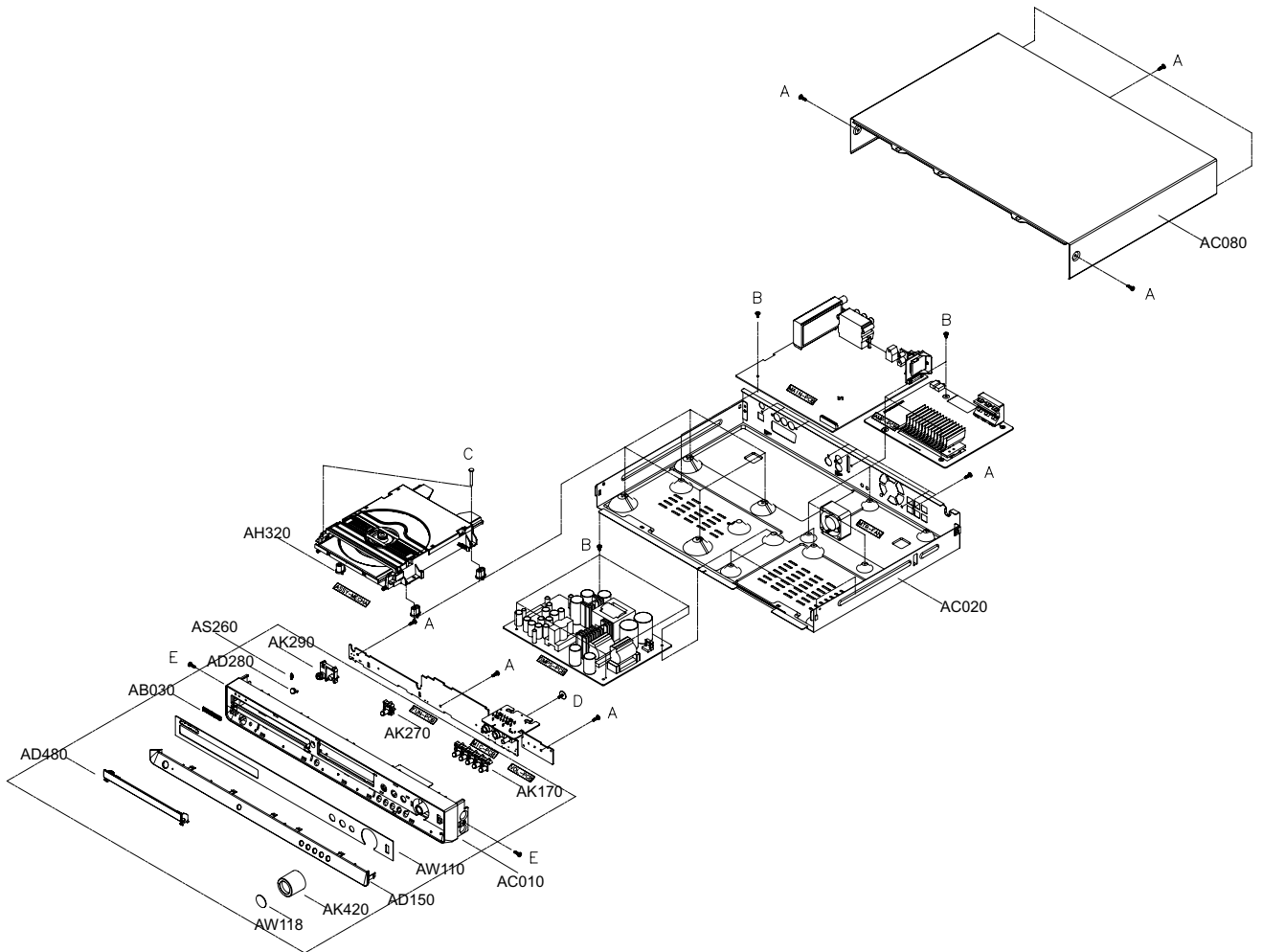
(DVD Single)



(DVD Dual)

7.Exploded Views and Parts List

1. Total Exploded View



2. Parts List

LOC	PART CODE	PART NAME	MATERAIL SPEC	DESCRIPTION	Q'ty	SNA
AW118	AH64-04085A	WINDOW-KNOB	PC 1.0T		1	
AK420	AH64-04079B	KNOB-VOLUME	ABS CR PLANTING		1	SNA
AD480	AH64-04078B	DOOR-CD	ABS+PMMA	EXP	1	
	AH64-04078C			KOR	1	
AD150	AH64-04077B	DECO-FRONT	ABS	EXP	1	
	AH64-04077C			KOR	1	
AW110	AH64-04083B	WINDOW-FRONT	PC 1.0T	HT-X20/EUR	1	
	AH64-04083C			HT-KX20	1	
	AH64-04083D			HT-THX25/EUR	1	
	AH64-04083E			HT-TX25H/KOR	1	
	AH64-04083F			HT-TX25/EUR	1	
	AH64-04083G			HT-TX22/EUR	1	
	AH64-04083H			HT-TKX22/CIS	1	
	AH64-04083J			HT-X20/XAA	1	
	AH64-04083K			HT-X20/NOEUR	1	
	AH64-04083L			HT-TX22/NOEUR	1	
	AH64-04083M			HT-TX25/NOEUR	1	
	AH64-04083N			HT-THX25/NOEUR	1	
	AH64-04083P			HT-THX22/EUR	1	
	AH64-04083Q			HT-TKX25/CIS	1	
	AH64-04083R			HT-THX22/NOEUR	1	
AB030	AH64-03746A	BADGE-SAMSUNG	AL 35mm		1	
AC010	AH64-04076B	CABINET-FRONT	HIPS	94HB	1	SNA
AK170	AH64-04080B	KNOB-FUNCTION	ABS CR PLANTING		1	
AK270	AH64-04081B	KNOB-OPEN	ABS CR PLANTING		1	
AD280	AH64-03266B	DECO-POWER	ABS CR PLANTING		1	
AS260	AH61-02218A	SPRING-DOOR	SUS 303		1	
AK290	AH64-04082B	KNOB-POWER	ABS MIKLY		1	
AH320	AH61-01825A	HOLDER-MECHA	ABS BLACK		1	
AC020	AH64-03790L	CABINET-BOTTOM	SECC 0.6T	NO HDMI EUR	1	SNA
	AH64-03790M			HDMI EUR	1	
	AH64-03790N			NO HDMI NOEUR	1	
	AH64-03790P			HDMI NOEUR	1	
	AH64-03790C			KOR	1	
AC080	AH64-03791E	CABINET-TOP	PCM 0.5T		1	
A	6003-000275	TAPTITE SCREW	BH 3 * 12 BLK		14	
B	6003-001561	TAPTITE SCREW	BH 3 * 6 SIL		8	
C	6003-000280	TAPTITE SCREW	BH 3 * 20 SIL		4	
D	6003-000198	TAPTITE SCREW	BWH 3 * 10 SIL		1	
E	6003-000126	TAPTITE SCREW	PH 3*10 BLK		2	

8. Electrical Parts List

Location no.	Code no.	Description & Specification	Remarks	Location no.	Code no.	Description & Specification	Remarks
**** HT-X20 Parts List ****							
AC3	2401-000651	C-AL;2.2uF,20%,50V,GP,TP,4x7,5		KIC2	1201-001572	IC-PREAMP;2011,SIP,8P,19.2x6.5mm,SINGLE	
AIC3	1002-001392	IC-A/D CONVERTER;WM8775EDS,24BIT,SSOP,28		KQ1	0504-000128	TR-DIGITAL;-NPN,200MW,22K/22K,SOT-23,TP	
AR9	2007-000091	R-CHIP;12Kohm,5%,1/10W,TP,1608		KQ2	0501-000303	TR-SMALL SIGNAL;KSA733,PNP,250mW,TO-92,T	
BC4	2203-000206	C-CER,CHIP;100nF,10%,50V,X7R,2012		KQ3	0501-000010	TR-SMALL SIGNAL;KSC1008,NPN,800mW,TO-92,	
C12RR	2203-001634	C-CER,CHIP;33nF,10%,50V,X7R,1608		KR10	2007-000477	R-CHIP;1Mohm,5%,1/8W,TP,2012	
C2	2401-000303	C-AL;100uF,20%,25V,GP,TP,6.3x11.5		KR11	2007-000468	R-CHIP;1Kohm,5%,1/8W,TP,2012	
C2	2203-000783	C-CER,CHIP;0.33nF,5%,50V,COG,1608		KR12	2007-000766	R-CHIP;330ohm,5%,1/8W,TP,2012	
C23RR	2203-000787	C-CER,CHIP;0.33nF,5%,50V,COG,TP,2012		KR2	2007-000981	R-CHIP;5.6Kohm,5%,1/8W,TP,2012	
C29FR	2401-003564	C-AL;1000uF,20%,35V,LZ,TP,12.5X25mm		KR21	2007-000409	R-CHIP;15Kohm,5%,1/8W,TP,2012	
C2FL	2203-002793	C-CER,CHIP;1000nF,+80-20%,25V,Y5V,2012		KR26	2007-000872	R-CHIP;4.7Kohm,5%,1/8W,TP,2012	
C37RR	2305-000407	C-FILM,LEAD-PEF;470nF,5%,100V,TP,-5mm		KR27	2007-000457	R-CHIP;18Kohm,5%,1/8W,TP,2012	
CN1	3708-002023	CONNECTOR-FPC/FPC/PIC;6P,1MM,SMD-S,TIN,N		KR28	2007-000124	R-CHIP;2.2Kohm,5%,1/10W,TP,1608	
CN2	3711-005155	HEADER-BOARD TO CABLE;BOX,5P,1R,2MM,SMD-		KR3	2007-000586	R-CHIP;22Kohm,5%,1/8W,TP,2012	
CN3	3708-001765	CONNECTOR-FPC/FPC/PIC;24P;0.5mm,SMD-S,SN		KR32	2007-000082	R-CHIP;3.3Kohm,5%,1/10W,TP,1608	
CN5	3711-000471	HEADER-BOARD TO CABLE;3WALL,4P,1R,2mm,ST		KR33	2007-000123	R-CHIP;1.5Kohm,5%,1/10W,TP,1608	
EB1	3301-001272	BEAD-SMD;120ohm,2x1.25x1mm,-,TR,-,-,-		KR9	2007-001177	R-CHIP;8.2Kohm,5%,1/8W,TP,2012	
EBD2	3301-001495	BEAD-SMD;120ohm,2012,2500mA,TP,115ohm/1		L2RL	AH27-00055A	COIL CHOKE;DBF-1310A,HT-DS600,10uH,-,-,2	
EL6	3301-001069	BEAD-SMD;120ohm,1.6x0.8x0.8mm,200mA,TP,		LED1	0601-001238	LED;ROUND,RED,3.1mm,697nm,3.8x5.2mm	
EMR6	2007-000694	R-CHIP;3.3ohm,5%,1/8W,TP,2012		LED2	0601-001432	LED;ROUND,BLUE,3mm,455nm	
FC4	2401-001975	C-AL;47uF,20%,16V,GP,TP,5x11mm,5mm		MC1	2203-000595	C-CER,CHIP;0.22nF,5%,50V,COG,2012	
FC5	2203-000260	C-CER,CHIP;10nF,10%,50V,X7R,2012		MC13	2203-000626	C-CER,CHIP;0.022nF,5%,50V,COG,1608	
FCON1	3708-000453	CONNECTOR-FPC/FPC/PIC;21P;1.25MM,STRAIGH		MC143	2203-005148	C-CER,CHIP;100nF,10%,16V,X7R,1608	
FCON2	3711-003409	HEADER-BOARD TO CABLE;BOX,3P,1R,2mm,STRA		MC15	2203-001607	C-CER,CHIP;0.22nF,5%,50V,NP0,1608	
FCON3	AH39-20008M	LEAD CONNECTOR ASSY;5264,5395,2P;150MM,1		MC19	2203-000646	C-CER,CHIP;0.025nF,5%,50V,COG,TP,1608	
FCW2	AH39-00859A	WIRE HARNESS;HT-Q20,-,1007,3P,110mm,-,AW		MC21	2203-001083	C-CER,CHIP;0.015nF,5%,50V,NP0,1608	
FCW3	AH39-00753A	LEAD CONNECTOR;HT-P50,4P,2mm,490,2854#28		MC22	2401-002042	C-AL;220uF,20%,10V,GP,TP,6.3x11.5	
FD1	0401-001099	DIODE-SWITCHING;1N4148WS,75V,150mA,SOD-3		MC23	2203-000681	C-CER,CHIP;0.027nF,5%,50V,COG,1608	
FD2	0401-001090	DIODE-SWITCHING;1SS355,80V,100MA,SOD-323		MC3	2401-001164	C-AL;33uF,20%,16V,GP,TP,5x11mm,5mm	
FJ1	3406-001047	SWITCH-ROTARY;5V DC,0.5mA,-,12mm		MC5	2203-000384	C-CER,CHIP;0.015nF,5%,50V,COG,1608	
FR1	2001-000022	R-CARBON(S);330HM,5%,1/2W,AA,TP,2.4X6.4M		MC52	2203-000062	C-CER,CHIP;47nF,+80-20%,50V,Y5V,1608	
FR10	2007-000097	R-CHIP;47Kohm,5%,1/10W,TP,1608		MC59	2401-000414	C-AL;10uF,20%,16V,GP,TP,4x7,5	
FR12	2001-000020	R-CARBON(S);220HM,5%,1/2W,AA,TP,2.4X6.4M		MC68	2402-001198	C-AL,SMD;330uF,20%,6.3V,GP,TP,6.6X6.6X7	
FR14	2007-000300	R-CHIP;10Kohm,5%,1/8W,TP,2012		MC71	2203-001086	C-CER,CHIP;0.005nF,0.25pF,50V,NP0,1608	
FR15	2007-000023	R-CHIP;120ohm,5%,1/8W,TP,2012		MC8	2203-000440	C-CER,CHIP;1nF,10%,50V,X7R,1608	
FR16	2007-000572	R-CHIP;220ohm,5%,1/8W,TP,2012		MCON1	3708-000266	CONNECTOR-FPC/FPC/PIC;32P;1.25MM,STRAIGH	
FR2	2007-000241	R-CHIP;1.5Kohm,5%,1/8W,TP,2012		MCON1	3711-000820	HEADER-BOARD TO CABLE;BOX,2P,1R,2.5MM,ST	
FR22	2007-000116	R-CHIP;120ohm,5%,1/10W,TP,1608		MCON1	3711-004110	HEADER-BOARD TO CABLE;3WALL,12P,1R,2MM,S	
FR3	2001-001165	R-CARBON(S);560HM,5%,1/2W,AA,TP,2.4X6.4M		MCON2	AH39-00855A	WIRE HARNESS;HT-Q20,-,1007,15P;110mm,-,A	
FR3	2007-000267	R-CHIP;1.8Kohm,5%,1/8W,TP,2012		MCON2	3710-001422	SOCKET-BOARD TO CABLE;12P,1R,2mm,ANGLE,S	
FR4	2007-000493	R-CHIP;2.2Kohm,5%,1/8W,TP,2012		MCON2	3709-001287	CONNECTOR-CARD SLOT;10P,1.5mm,SMD-A,AU10	
FR5	2007-000686	R-CHIP;3.3Kohm,5%,1/8W,TP,2012		MCON3	3708-000219	CONNECTOR-FPC/FPC/PIC;21P;1.25MM,STRAIGH	
FZD2	0403-001064	DIODE-ZENER;RLZ5.1B,4.94-5.2V,500mW,LL-3		MCON6	3708-000448	CONNECTOR-FPC/FPC/PIC;6P;1.25MM,STRAIGH	
HIS_P	AH62-00157A	HEAT SINK		MCON8	AH40-00130A	TUNER;KST;MW104FV1-E50LCE,HT-Q40,FM,	
HIS-M	AH62-00062G	HEAT SINK-TR;HT-DS400,AL EXTR,-,-,-,-,-		MIC1	1204-002361	IC-MODULATOR;TAS5508PAG,TQFP,64P,-,PLAST	
HOLDE	AH61-02117A	HOLDER-IC;HT-Q20,ABS+GF,-,-,-,-,COMMON P		MIC2	3722-000363	JACK-PHONE;9PAU,BLK,ANGLE	
HOLDE	AH61-02114A	HOLDER-VFD;HT-Q20,ABS,-,-,-,-,-		MICV1	2101-001068	VR-ROTARY;10KB,-,1/20W,SIDE	
IC1	1204-002555	IC-PAL/NTSC DECODER;ES8381FPC,PQFP,256P,		ML8	2703-000185	INDUCTOR-SMD;3.3uH,10%,2012	
IC10	0801-002683	IC-CMOS LOGIC;74HC245,TRANSCIEVER,TSSOP		MQ1	1203-003526	IC-VOL. DETECTOR;KIA7029AP,TO-92,3P,4.58	
IC11	1003-001450	IC-MOTOR DRIVER;BA5954FM,SOP,28P,300MIL,		MR10	2007-000113	R-CHIP;33ohm,5%,1/10W,TP,1608	
IC12	1003-001508	IC-MOTOR DRIVER;FAN8082DTF,SOP,8P,200MIL,		MR18	2007-000081	R-CHIP;2.7Kohm,5%,1/10W,TP,1608	
IC13	1201-001842	IC-OP AMP;TL3472CD,SO,TP,8P,-,DUAL,-,PAL		MR131	2007-000118	R-CHIP;390ohm,5%,1/10W,TP,1608	
IC14	0801-002518	IC-CMOS LOGIC;74LXC157,2-INPUT MULTIPLEX		MR2	2007-000882	R-CHIP;4.7ohm,5%,1/10W,TP,1608	
IC1L	1201-002270	IC-AUDIO AMP;TAS5142,PSOP,3.36P;15.9x11mm		MR23	2007-000072	R-CHIP;47ohm,5%,1/10W,TP,1608	
IC2	1103-001334	IC-EEPROM;K524A60X81,1KX8BIT,SOP,8P,5X4MM		MR3	2007-000695	R-CHIP;3.3ohm,5%,1/10W,TP,1608	
IC3	0904-002088	IC-USC;UBI9022,8BIT,QFP,48P,9x9mm,48M		MR300	2007-000552	R-CHIP;20ohm,5%,1/10W,TP,1608	
IC4	1105-001573	IC-DRAM;K4S281632,-,128Mbit,8Mx16Bit,T		MR33	2007-002425	R-CHIP;1ohm,5%,1/10W,TP,1608	
IC5	1107-001505	IC-FLASH MEMORY;49BV162AT,16Mbit,1Mx16/2		MR75	2011-000475	R-NET;33ohm,5%,1/16W,CHIP,8P,TP,32	
J3	AH39-00854A	WIRE HARNESS;HT-Q20,-,1007,9P,130mm,-,AW		MR8	2007-000539	R-CHIP;200ohm,5%,1/10W,TP,1608	
JP6	AH37-00005A	JACK-RCA;1P,S-440B,YELLOW,-,SHIELD PLAT		MR80	2007-000084	R-CHIP;4.7Kohm,5%,1/10W,TP,1608	
KC11	2401-001887	C-AL;0.1uF,20%,50V,-,TP,4x7mm,5		PC1	2401-001102	C-AL;330uF,20%,16V,GP,TP,8x11.5mm,5	
KC14	2203-001058	C-CER,CHIP;0.56nF,5%,50V,COG,2012		PC21	2401-001508	C-AL;47uF,20%,16V,GP,TP,6.3x5.5	
KC15	2203-005550	C-CER,CHIP;82nF,10%,50V,X7R,TP,2012,-		PC3	2401-000118	C-AL;1000uF,20%,10V,GP,TP;10x12.5,5	
KC16	2401-000480	C-AL;10uF,20%,50V,GP,TP,5x11.5		PC7	2401-001364	C-AL;470uF,20%,16V,GP,TP;10x12.5,5	
KC17	2203-000716	C-CER,CHIP;3.3nF,10%,50V,X7R,2012		PCB	AH41-01061A	PCB-FRONT;HT-X20,PHENOL,2,-,-,-,-,-,FRON	
KC20	2203-000727	C-CER,CHIP;3.9nF,10%,50V,X7R,2012		PIC2	1203-002935	IC-POSITIVE ADJUST REG.;A1C1117ACE,TO-252,3P	
KC21	2401-000598	C-AL;1uF,20%,50V,GP,TP,4x7,5		PQ2	0501-000407	TR-SMALL SIGNAL;KSD471A-Y,NPN,800mW,TO-9	
KC25	2401-000487	C-AL;10uF,20%,50V,GP,TP,6.3x5mm,5		PQ3	0501-000002	TR-SMALL SIGNAL;KSA812,PNP,150MMW,SOT-23,	
KC27	2203-000609	C-CER,CHIP;22nF,10%,50V,X7R,TP,2012		PQ6	0504-000156	TR-DIGITAL;KSR2103,PNP,200MW,22K/22K,SOT	
KCON1	AH39-00918A	WIRE HARNESS;HT-XQ100N,4P;50MM,2.0MM,510		PR10	2001-000027	R-CARBON;100OHM,5%,1/4W,AA,TP,2.4X6.4MM	
KCW2	3711-000028	HEADER-BOARD TO CABLE;BOX,4P,1R,2MM,STRA		PS300	AH59-01822B	SPEAKER SYSTEM;SATELLITE&CENTER SPEAKER	
KD1	0403-000139	DIODE-ZENER;1N4734A,5%,1000mW,DO-41,TP		PS300	AH59-01832B	SPEAKER SYSTEM;PS-X20,SUBWOOFER SPK SYST	
KIC1	1204-002233	IC-VOLUME/TONE CONT.;PT2399S,SO,16P,300M		Q4	0501-000632	TR-SMALL SIGNAL;2SB1197K,PNP,200mW,SOT-2	
				Q9	0505-000110	FET-SILICON;2N7002,N,60V,115mA,7.5ohm,0.	
				R12FR	2007-000052	R-CHIP;10Kohm,1%,1/10W,TP,1608	
				R150	2007-000941	R-CHIP;47Kohm,5%,1/8W,TP,2012	
				R2	2007-000134	R-CHIP;33Kohm,5%,1/10W,TP,1608	

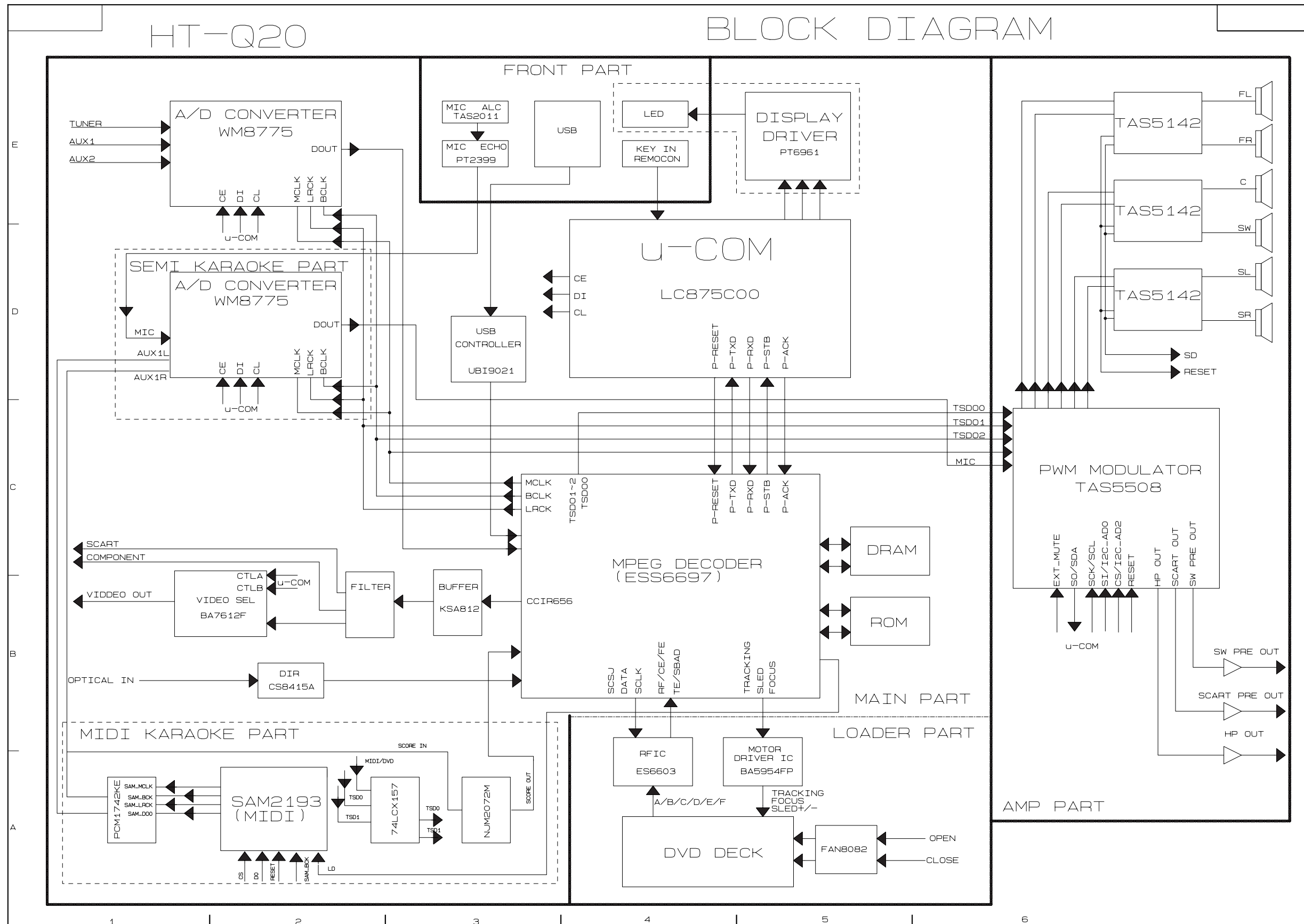
Location no.	Code no.	Description & Specification	Remarks	Location no.	Code no.	Description & Specification	Remarks
R2RL	2007-000312	R-CHIP;10ohm,5%,1/4W,TP,3216		X1	2801-004284	CRYSTAL-SMD;27MHZ,10PPM,28-AA,20PF,30OH	
R3FR	2007-000092	R-CHIP;15Kohm,5%,1/10W,TP,1608		X2	2801-003863	CRYSTAL-UNIT;48MHZ,30ppm,28-AAA,18PF,80u	
R46	2007-000253	R-CHIP;1.5ohm,5%,1/4W,TP,3216		XD19	0401-001110	DIODE-SWITCHING;-80V,100MA,SOD-523,TP	
R8SW	2007-000462	R-CHIP;18ohm,5%,1/8W,TP,2012		X-TAL	2802-001174	RESONATOR-CERAMIC;10MHZ,0.5%,BK,8X3.5X3MM	
RC14	2401-000804	C-AL;220uF,20%,16V,GP,TP,8x9mm,5		ZD1	0403-001062	DIODE-ZENER;UDZ4.7,4.75-4.75V,200MW,SOD	
RC22	2401-001938	C-AL;22uF,20%,25V,GP,TP,5x11mm,5mm			0402-000012	DIODE-RECTIFIER;UF4007,1KV,1A,DO-41,TP	
RC27	2203-001126	C-CER,CHIP;0.68nF,10%,50V,X7R,1608			0501-000362	TR-SMALL SIGNAL;KSC2328A-Y,NPN,1000mW,TO	
RC3	2203-000189	C-CER,CHIP;100nF,+80-20%,25V,Y5V,1608			0501-000422	TR-SMALL SIGNAL;KTA1273,PNP,-30V,-30V,2	
RC31	2203-001652	C-CER,CHIP;470nF,+80-20%,16V,Y5V,1608			0501-000630	TR-SMALL SIGNAL;KTA1268,PNP,300mW,TO-92	
RC35	2401-001355	C-AL;470uF,20%,10V,GP,TP,8x11.5mm,5			1203-002597	IC-PWM CONTROLLER;KA5Q1265RF-YDTU,TO-3PF	
RC36	2203-000257	C-CER,CHIP;10nF,10%,50V,X7R,1608			1203-003365	IC-PWM CONTROLLER;FSDM0365RNC,DIP,8P,9.6	
RC44	2203-002398	C-CER,CHIP;22nF,10%,50V,X7R,1608			1203-000473	IC-VOL. REFERENCE;FAN431A,TO-92,3P,4.58K	
RC47	2203-000888	C-CER,CHIP;4.7nF,10%,50V,X7R,1608			2001-000003	R-CARBON;330ohm,5%,1/8W,AA,TP,1.8X3.2mm	
RC49	2203-005015	C-CER,CHIP;150nF,+80-20%,16V,Y5V,1608			2001-000302	R-CARBON;100HM,5%,1/8W,AA,TP,1.8X3.2MM	
RC54	2203-005065	C-CER,CHIP;100nF,+80-20%,10V,Y5V,1608			2001-000319	R-CARBON;120KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RD2	0407-000116	DIODE-ARRAY;DAP202K,80V,100mA,CK2-3,SOT-			2001-000440	R-CARBON;10HM,5%,1/8W,AA,TP,1.8X3.2MM	
REM_E	0609-001189	MODULE REMOCON;HORIZONTAL,16.4MM,TR			2001-000449	R-CARBON;2.2KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR10	2007-000070	R-CHIP;0ohm,5%,1/10W,TP,1608			2001-000458	R-CARBON;2.20HM,5%,1/8W,AA,TP,1.8X3.2MM	
RR11	2007-001038	R-CHIP;56Kohm,1%,1/10W,TP,1608			2001-000472	R-CARBON;2.7KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR16	2007-001179	R-CHIP;8.2Kohm,5%,1/10W,TP,1608			2001-000508	R-CARBON;220KOHM,5%,1/8W,AA,TP,1.8X3.2M	
RR17	2007-000483	R-CHIP;10HM,5%,1/8W,TP,2012			2001-000554	R-CARBON;270KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR24	2007-000458	R-CHIP;18Kohm,5%,1/10W,TP,1608			2001-000660	R-CARBON;33KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR33	2007-000120	R-CHIP;680ohm,5%,1/10W,TP,1608			2001-000666	R-CARBON;330OHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR44	2007-000060	R-CHIP;100Kohm,1%,1/10W,TP,1608			2001-000702	R-CARBON;39KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR52	2007-000077	R-CHIP;470ohm,5%,1/10W,TP,1608			2001-000734	R-CARBON;4.7KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR54	2007-000071	R-CHIP;22ohm,5%,1/10W,TP,1608			2001-000780	R-CARBON;470OHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR67	2007-000308	R-CHIP;10ohm,5%,1/8W,TP,2012			2001-000786	R-CARBON;47KOHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR79	2007-000122	R-CHIP;1.2Kohm,5%,1/10W,TP,1608			2001-000857	R-CARBON;560OHM,5%,1/8W,AA,TP,1.8X3.2MM	
RR83B	2007-000106	R-CHIP;220Kohm,5%,1/10W,TP,1608			2001-000869	R-CARBON;560OHM,5%,1/8W,AA,TP,1.8X3.2MM	
SC7L	2203-000998	C-CER,CHIP;0.047nF,5%,50V,C0G,1608			2001-000924	R-CARBON;680OHM,5%,1/8W,AA,TP,1.8X3.2MM	
SCREW	6003-000276	SCREW-TAPTITE;BH,+,-,B,M3,L10,ZPC(WHT),S			2001-000947	R-CARBON;7.5KOHM,5%,1/8W,AA,TP,1.8X3.2M	
SIC	1201-000163	IC-OP AMP;4560,SOP,8P,173MIL,DUAL,100V/m			2003-000738	R-METAL OXIDE(S);56Kohm,5%,2W,AA,TP,4x12	
SL1L	2703-000404	INDUCTOR-SMD;220uH,10%,3225			2201-000286	C-CERAMIC DISC;1nF,10%,1000V,Y5P,-,8x5mm	
SPK1	3716-001243	TERMINAL-BLOCK;12P,14mm,-,-			2401-000471	C-AL;10uF,20%,50V,BP,TP,5x11.5mm	
SR2R	2007-000094	R-CHIP;22Kohm,5%,1/10W,TP,1608			2401-000649	C-AL;2.2uF,20%,50V,BP,TP,5x11.5	
SW5	3404-000165	SWITCH-TACT;12V,50mA,160gf,6x6mm,SPST			2401-001479	C-AL;470uF,20%,10V,GP,TP,6.3x11mm,5	
UC1	2401-001952	C-AL;4.7uF,20%,50V,GP,TP,5x7mm,5mm			2401-002300	C-AL;47#F,20%,50V,GP,TP,6.3x11.5mm	
UC100	2203-000979	C-CER,CHIP;47nF,10%,50V,X7R,TP,2012			2401-003036	C-AL;100uF,20%,16V,GP,TP,5x11mm,5mm	
UC17	2203-000972	C-CER,CHIP;47nF,10%,16V,X7R,1608			AH81-02501A	FUSE;382type,4A,250V,-,-,-,-,-	
UC3	2409-000123	C-EDL;47000uF,4uA,5.5V,-,BK,-,5mm			AH81-02505A	DIODE-ZENER;1N5239B,0.5W,9.1V,DO-35 Glas	
UC57	2401-003221	C-AL;100uF,20%,16V,GP,TP,8X5,2.5			AH81-02521A	DIODE-SWITCHING;1N4148,500mW,DO-35,-,-,-	
UC58	2401-000485	C-AL;10uF,20%,50V,GP,TP,6.3X5MM,2.5			AH81-02524A	C-FILM MPEF;0.1uF,100V,5%,TP,-,-,-	
UC6	2401-000759	C-AL;220nF,20%,50V,GP,TP,5x11mm,5mm			AH81-02526A	C-CERAMIC DISK;100pF,1KV,10%,-----	
UC62	2203-000236	C-CER,CHIP;0.1nF,5%,50V,C0G,1608			AH81-02532A	INDUCTOR-RADIAL-CHOKE COIL;15uH,10%,---	
UC64	2203-000975	C-CER,CHIP;47nF,10%,25V,X7R,TP,1608,-			AH81-02539A	VARIATOR;10D471,470V,-,-,-,-,-	
UC67	2203-005249	C-CER,CHIP;100nF,10%,50V,X7R,1608			AH81-02544A	PHOTO COUPLER;LTV817B,If 50mA,Vceo 35V,V	
UD11	0404-000156	DIODE-SCHOTTKY;RB441Q,40V,350MA,DO-34,TP			AH81-02551A	IC-REGULATOR;KA78R12,TO-220F-4L,Vo = 12V	
UD11A	0404-001089	DIODE-SCHOTTKY;RB551V,30V,20V,500MA,SOD-3			AH81-02553A	THERMISTOR;3D15,-,-,-,-,-	
UIC1	0903-001405	IC-MICROCONTROLLER;LC87F5CC8A,8Bit,QFP,1			AH81-02558A	CONNECTOR;5096-02C,7.92mm,-----	
UIC2	1003-001708	IC-VFD;S5G5128A,LQFP,64P,1063MIL,-,-,-			AH81-02565A	C-FILM MPEF-MPP FILM;0.1uF,275VAC-PCX2-3	
UL2	2007-000076	R-CHIP;330ohm,5%,1/10W,TP,1608			AH81-02591A	C-AL-LARGE TYPES;330uF,250V,22*30mm,-40	
UQ1	0501-000341	TR-SMALL SIGNAL;KSC1623-L,NPN,200mW,SOT-			AH81-02605A	C-FILM MPEF-MYLAR;0.047uF,100V,5%,TP,-,-	
UR1	2007-000109	R-CHIP;1Mohm,5%,1/10W,TP,1608			AH81-02611A	RESISTOR-CARBON FILM;1/8W,15 ohm,1%,TP,-	
UR11	2007-000090	R-CHIP;10Kohm,5%,1/10W,TP,1608			AH81-02612A	RESISTOR-CARBON FILM;1/8W,150 ohm,1%,TP,-	
UR110	2007-000102	R-CHIP;100Kohm,5%,1/10W,TP,1608			AH81-02617A	RESISTOR-SURGE;1/2W,1.5M ohm,5%,SURGE RE	
UR134	2007-001196	R-CHIP;820Kohm,5%,1/10W,TP,1608			AH81-02620A	RESISTOR-METAL OXIDE FILM;1W,120 ohm,5%,TP-	
UR15	2007-001010	R-CHIP;51Kohm,5%,1/10W,TP,1608			AH81-02625A	RESISTOR-METAL OXIDE FILM;3W,56K ohm,5%,TP-	
UR2	2007-000402	R-CHIP;150ohm,5%,1/10W,TP,1608			AH81-02628A	DIODE-FAST RECOVERY RECTIFIERS;FR104,400	
UR26	2007-000074	R-CHIP;100ohm,5%,1/10W,TP,1608			AH81-02630A	DIODE-SCHOTTKY BARRIER RECTIFI;SR306,60V	
UR54	2007-000078	R-CHIP;1Kohm,5%,1/10W,TP,1608			AH81-02631A	DIODE-SUPER FAST RECTIFIERS;SF35G,300V,3	
USB	3722-002313	JACK-USB;4P/1C,AU30U,BLK,STRAIGHT,A,TYP			AH81-02632A	DIODE-SUPER FAST RECTIFIERS;SFF1604G,200	
VC20	2401-000918	C-AL;22uF,20%,16V,GP,-,6.3x7,5			AH81-02635A	DIODE-ZENER;1N5242B,500mW,12V,DO-35 Glas	
VC22	2401-000042	C-AL;100uF,20%,16V,GP,TP,6.3x7,5			AH81-02637A	DIODE-ZENER;DZ4.7BSB,4.77V,500mW,DO-34 G	
VC38	2401-001092	C-AL;330uF,20%,10V,GP,-,8x11.5,2.5m			AH81-02638A	DIODE-BRIDGE;DB105G,600V,1A,DB,-,-,-	
VC5	2203-000280	C-CER,CHIP;0.01nF,0.5pF,50V,C0G,1608			AH81-02639A	DIODE-BRIDGE;GBU605G,600V,6A,GBU,-,-,-	
VFD	AH07-00188A	VF DISPLAY;HNV-12SNO2T,HT-Q20,104.14X16.			AH81-02642A	C-FILM MPEF-MYLAR;0.0047uF,100V,5%,TP,-,	
VIC1	1204-001978	IC-VIDEO PROCESS;LA73054,-,36P,-,SSOP,7V			AH81-02643A	C-FILM MPEF-MYLAR;0.0082uF,100V,5%,TP,-,	
VJ4	3722-002283	JACK-SCART;21P+3P,-,SN,BLK,-			AH81-02647A	C-CERAMIC DISK;470pF,400VAC-Y1,20%,---	
VJ5	3722-002042	JACK-PIN;2P/2C,NI,WHT/RED,ANGLE			AH81-02650A	C-CERAMIC DISK;2200pF,400VAC-Y1,20%,---	
VL20	2703-000275	INDUCTOR-SMD;33uH,10%,2012			AH81-02651A	C-AL;6800uF,6.3V,12.5*25mm,-40 to +	
VL7	2703-002238	INDUCTOR-SMD;1uH,5%,2012			AH81-02652A	C-AL;330uF,10V,6.3*11mm,-40 to +85C	
VL8	2007-000029	R-CHIP;0ohm,5%,1/8W,TP,2012			AH81-02654A	C-AL;1000uF,10V,10*12.5mm,-40 to +85C	
VQ10	0504-000152	TR-DIGITAL;KSR2101,PNP,200mW,4.7K/4.7K,S			AH81-02660A	C-AL;100uF,50V,8*12mm,-40 to +85C,-	
VQ14	0501-002184	TR-SMALL SIGNAL;KTD1304,NPN,200mW,SOT-23			AH81-02661A	C-AL;68uF,250V,16*25mm,-40 to +85C,	
VR14	2007-001167	R-CHIP;75ohm,5%,1/10W,TP,1608			AH81-02663A	C-AL;1000uF,25V,10*20mm,-40 to +105	
VR39	2007-000119	R-CHIP;560ohm,5%,1/10W,TP,1608			AH81-02670A	C-AL-LOW IMPEDANCE TYPE;3300uF,10V,12.5*	
VR61	2007-000075	R-CHIP;220ohm,5%,1/10W,TP,1608			AH81-02671A	C-AL-LOW IMPEDANCE TYPE;1000uF,25V,12.5*	
VR62	2007-000309	R-CHIP;10ohm,5%,1/10W,TP,1608			AH81-02672A	C-AL-LOW IMPEDANCE TYPE;2200uF,50V,18*35	
VR9	2007-000125	R-CHIP;3.9Kohm,5%,1/10W,TP,1608			AH81-02674A	CONNECTOR;SW0500-15,2mm,-,-,-,-,-	
X1	2801-004132	CRYSTAL-UNIT;13.5MHz,10ppm,ATS-49U,24pF			AH81-02678A	CONNECTOR;YMW025-09R,2.5mm,-,-,-,-,-	

Location no.	Code no.	Description & Specification	Remarks
AH81-02681A		TRANS;ORTP-760C T1,EER2828,-,-,-,-,-	
AH81-02682A		TRANS;ORTP-760 T2,EER4242,-,-,-,-,-	
AH81-02698A		WIRE-JUMPER;TIN 0.6(7.5mm),-,-,-,-,-	
AH81-02700A		WIRE-JUMPER;TIN 0.6(8.5mm),-,-,-,-,-	
AH81-02702A		WIRE-JUMPER;TIN 0.6(9.5mm),-,-,-,-,-	
AH81-02704A		WIRE-JUMPER;TIN 0.6(10.5mm),-,-,-,-,-	
AH81-02706A		WIRE-JUMPER;TIN 0.6(11.5mm),-,-,-,-,-	
AH81-02708A		WIRE-JUMPER;TIN 0.6(13.5mm),-,-,-,-,-	
AH81-02709A		WIRE-JUMPER;TIN 0.6(14.5mm),-,-,-,-,-	
AH81-02711A		WIRE-JUMPER;TIN 0.6(16.5mm),-,-,-,-,-	
AH81-02712A		WIRE-JUMPER;TIN 0.6(17.5mm),-,-,-,-,-	
AH81-02714A		WIRE-JUMPER;TIN 0.6(18.5mm),-,-,-,-,-	
AH81-02752A		C-FILM MPEF-METAL FILM;0.01uF,AC630V,10%	
AH81-02754A		IC-REGULATOR;KA378R33,3A,3.3V,TO-220F-4L	
AH81-02756A		IC-REGULATOR;KA7808.8V,TO-220,-,-,-,-	
AH81-02764A		IC-REGULATOR;KA278R05,2A,5V,TO-220F-4L,-	
AH81-02790A		INDUCTOR-RADIAL-BEAD CORE;BFS3550R2F(RAD	
AH81-02791A		INDUCTOR-RADIAL-LINE FILTER;DY-30M2,-,-,	
AH81-02795A		C-AL;330uF,16V,6.3*11mm,-40 to +85C	
AH81-02812A		RESISTOR-CARBON FILM;1/8W,1.5K ohm,1%,TP	
AH81-02816A		C-AL;1uF,50V,5*11mm,-40 to +85C,-,-	
AH81-02834A		PCB;196.8*135*1.6t,(###CEM),-,-,-	
AH81-02838A		RESISTOR-CARBON FILM;1/8W,18Kohm,1%,TP,-	
AH81-03185A		SPEAKER;FRONT SPEAKER SYSTEM,FOR PS-X2	
AH81-03186A		SPEAKER;CEN. SPEAKER SYSTEM,FOR PS-X20	
AH81-03187A		SPEAKER;REAR SPEAKER SYSTEM,FOR PS-X2	
AH81-02177B		SPEAKER;PS-Q20,SPK CORD # CONNECTOR,FR	
AH81-03188A		SPEAKER;SUBWOOFER SPK SYSTEM,FOR PS-X2	
AH81-03153A		SPEAKER;SPEAKER UNIT,SEIZE: 3.5",SHI	
AH81-03154A		SPEAKER;SPEAKER UNIT,SEIZE: 3.5",NOT	
AH81-01431C		A/S PART-NET FRAME;PSWS100E,-,-,-,NET FR	
AH81-03155A		SPEAKER;SPEAKER UNIT,SEIZE: 6.5",NOT	
3809-001832		FPC CABLE-FLAT;30V,80,50mm,32P,1.25mm,AW	
AH68-01980A		LABEL-POP LABEL;HT-X20,XEF,RAINBOW,-,-,-	
AH69-01972B		PAD-PAPER;HT-X20,OTHER,T3,W478,L426,-,YE	
AH39-00257F		CBF-POWER CORD;MAX980,-,CP2,250V,2.5A,18	
3809-001798		CABLE-FLAT;30V,80,180,21P,1.25mm,UL2896	
AH92-02719A		ASSY PCB-FRONT;HT-KX20/XFO-FRONT,2 LAYER	
4301-000116		BATTERY-ALKALINE;9V,-,-,17.5x26.5x48.5mm	
6801-001557		CARD-WARRANTY;Ukraine,XEU,RUS,MOJO80g,-,	
AH39-40001V		CABLE-AUDIO CABLE;-,-,1P-1P,3000mm,-,-,-	
AH42-00021A		ANT FM T;T18011F-1,75 ohm,1800mm	
AH46-00034B		DISC-RUSSIA 200 SONGS;12 CM,-,HT-UP30K	
AH44-00114A		SMPS;HT-Q20,-,AC/DC,500W,110-240V,5	
AH59-01787N		REMOCON-ASSY;HT-X20/EUR,SAMSUNG,237*48,-	
AH92-02507A		ASSY PCB-AMP;HT-Q20Europe,-	
AH92-02635D		ASSY PCB-MAIN;HT-X20,CIS	
AH97-02155A		ASSY DVD DECK-SDM D1FL;BASIC-TYPE,CMS-S7	

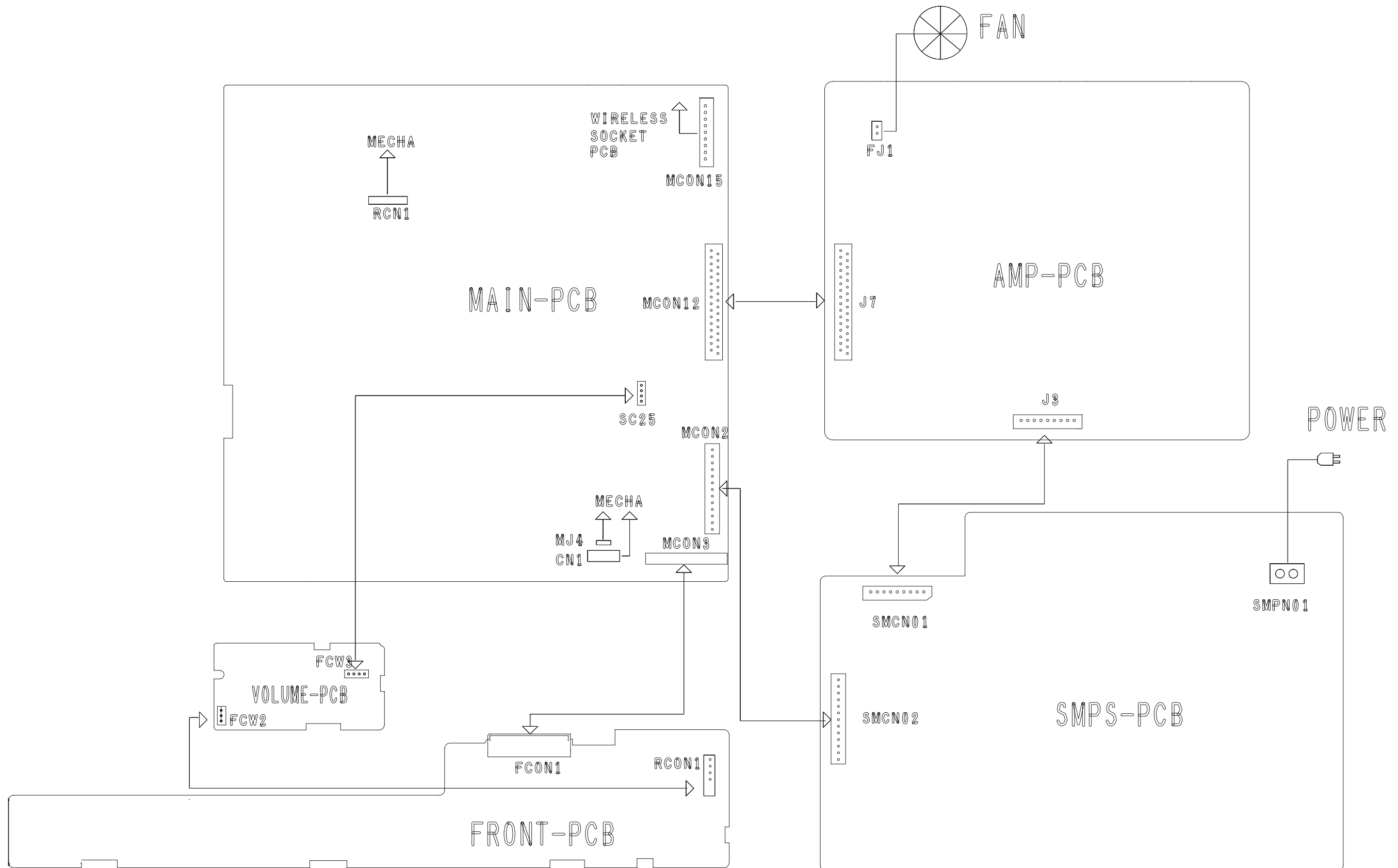
Location no.	Code no.	Description & Specification	Remarks
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9. Block Diagram

1 MAIN Part

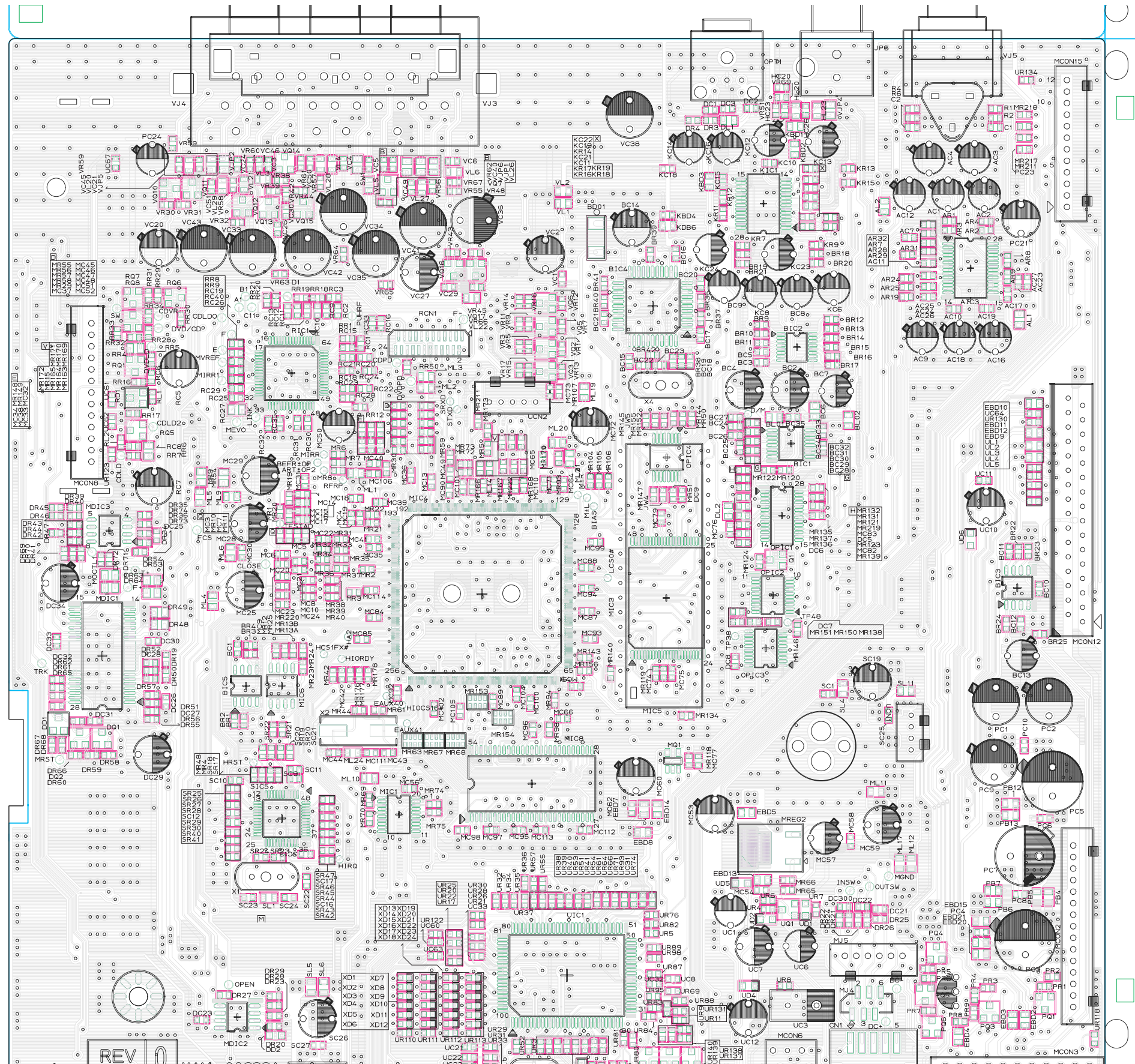


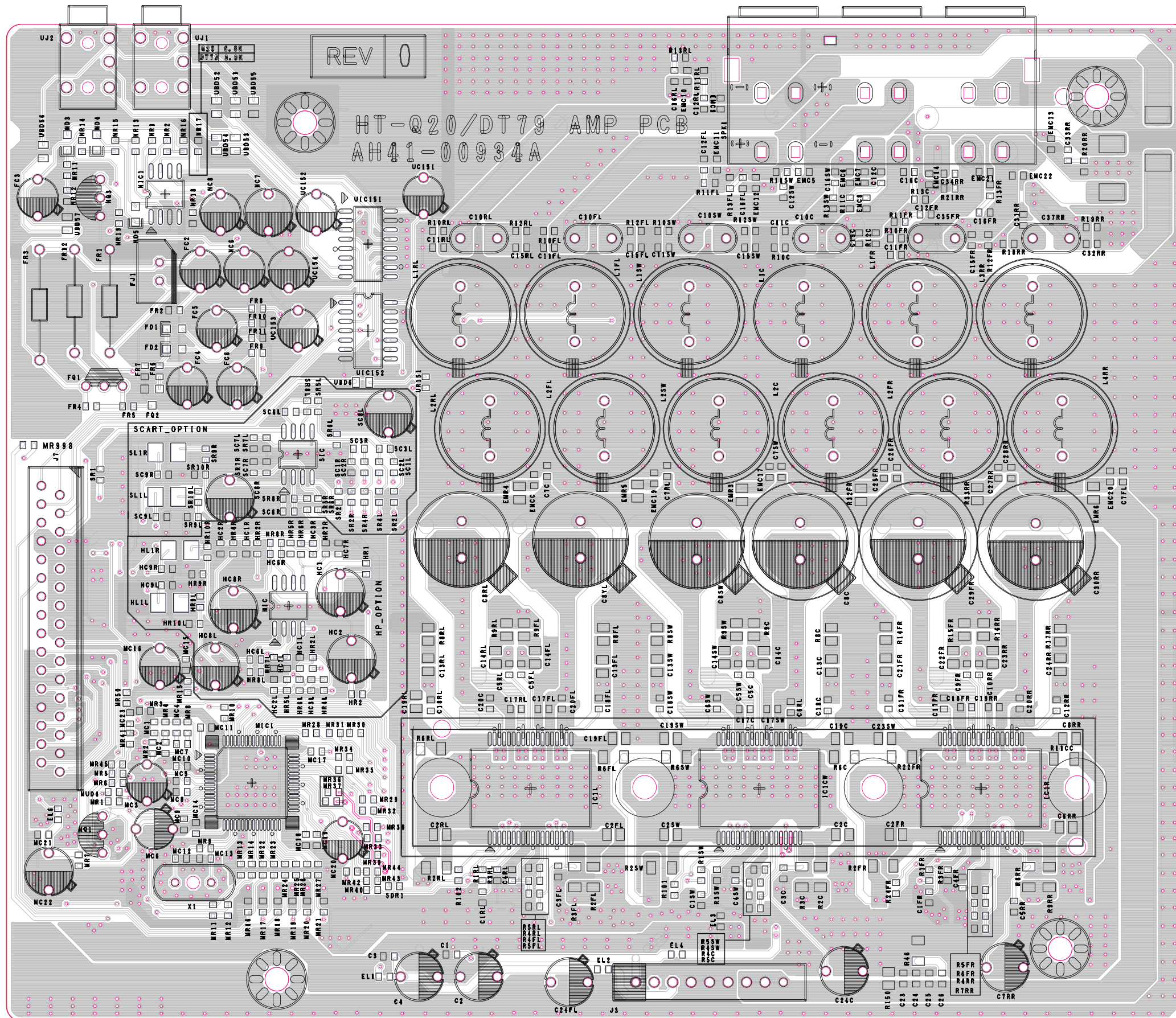
10. Wiring Diagram



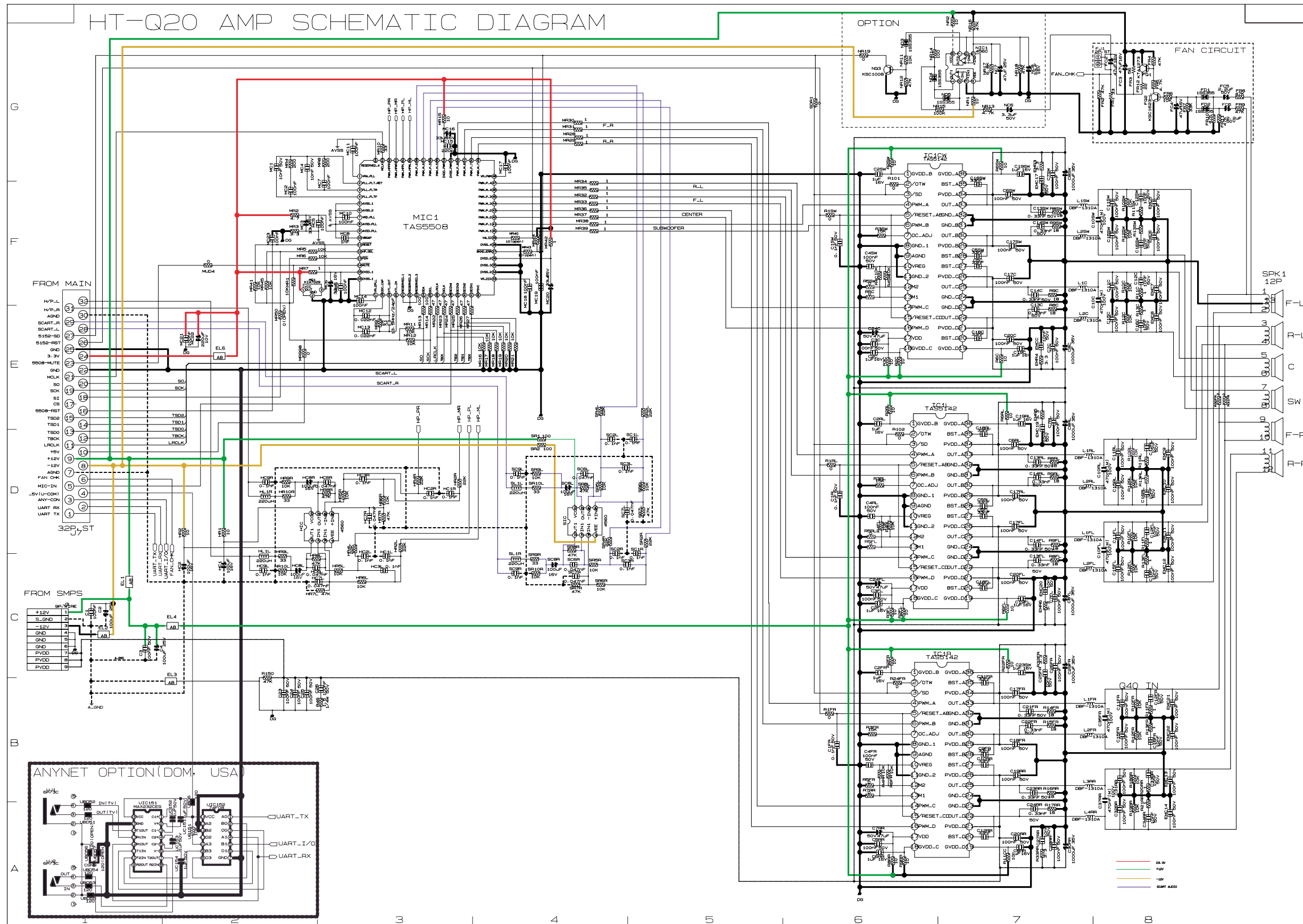
11. PCB Diagram

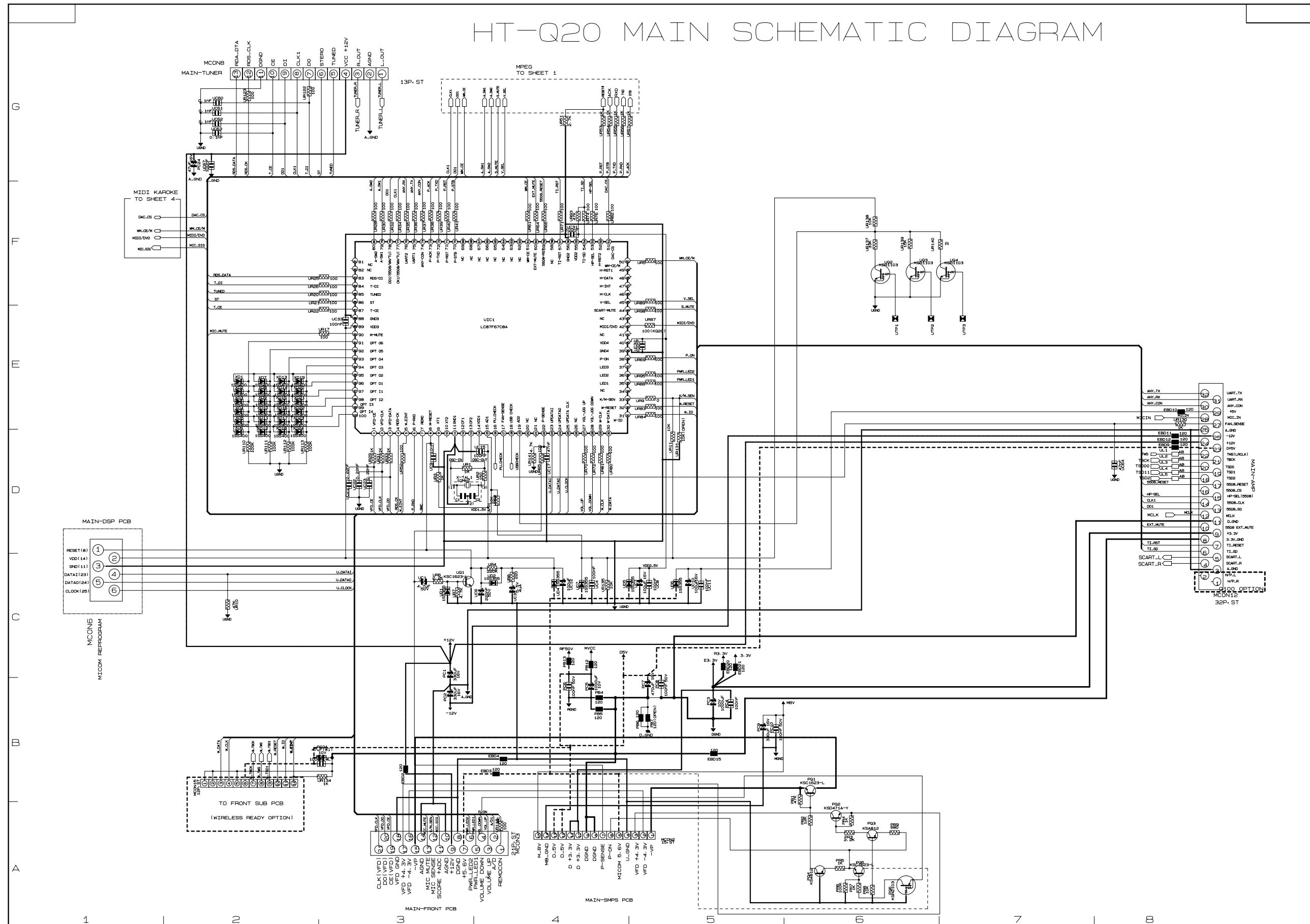
1. MAIN



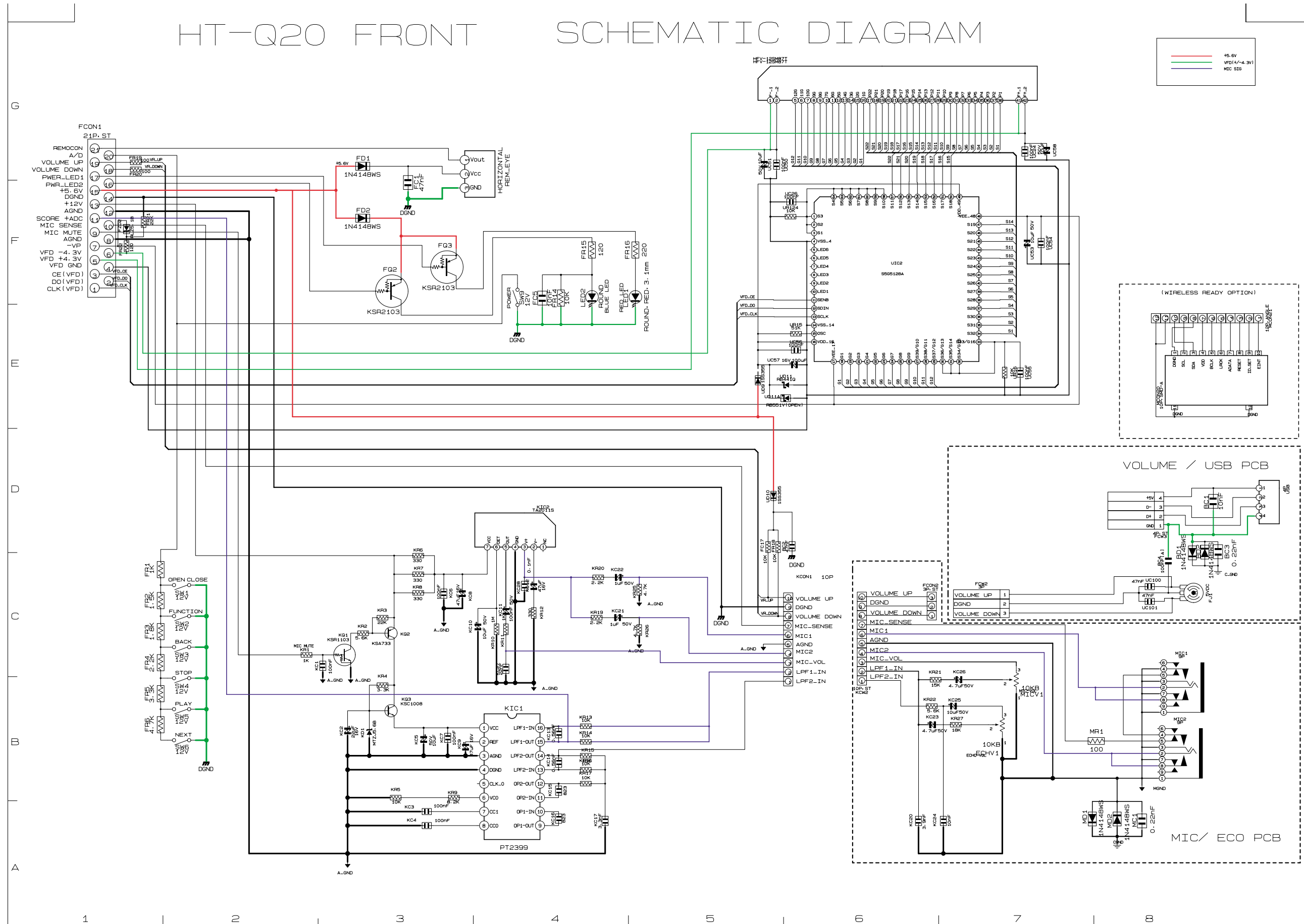


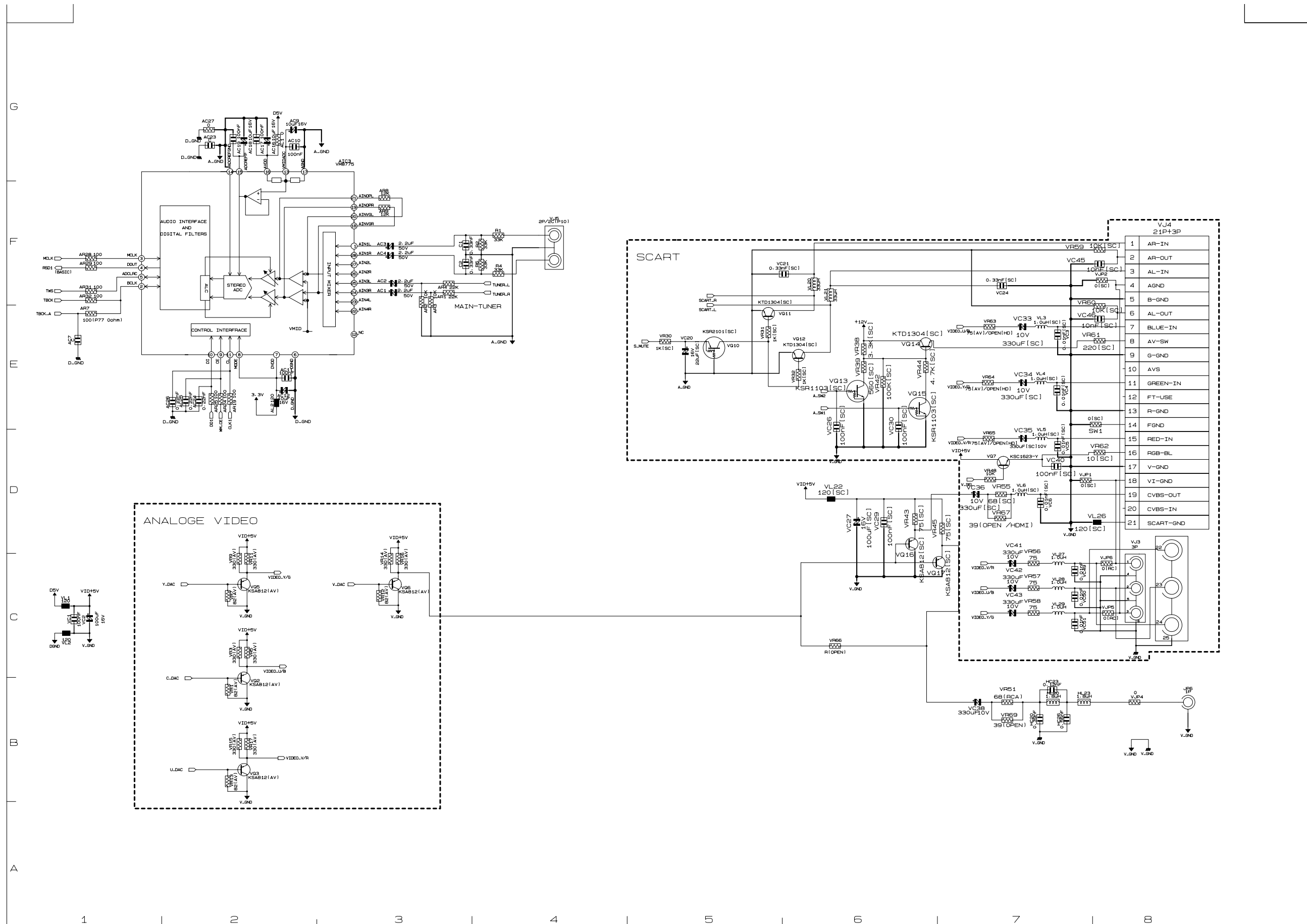
1. AMP

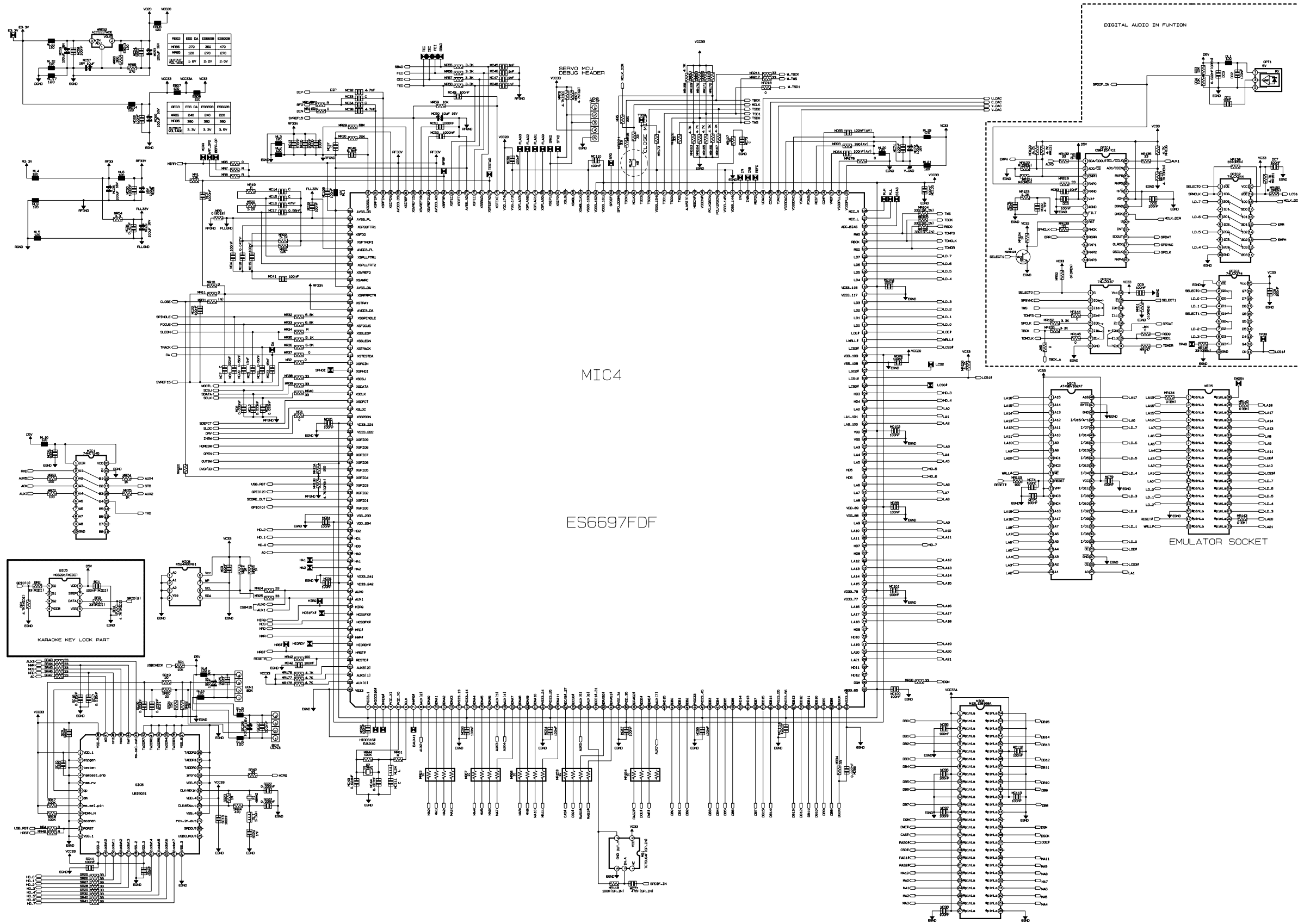


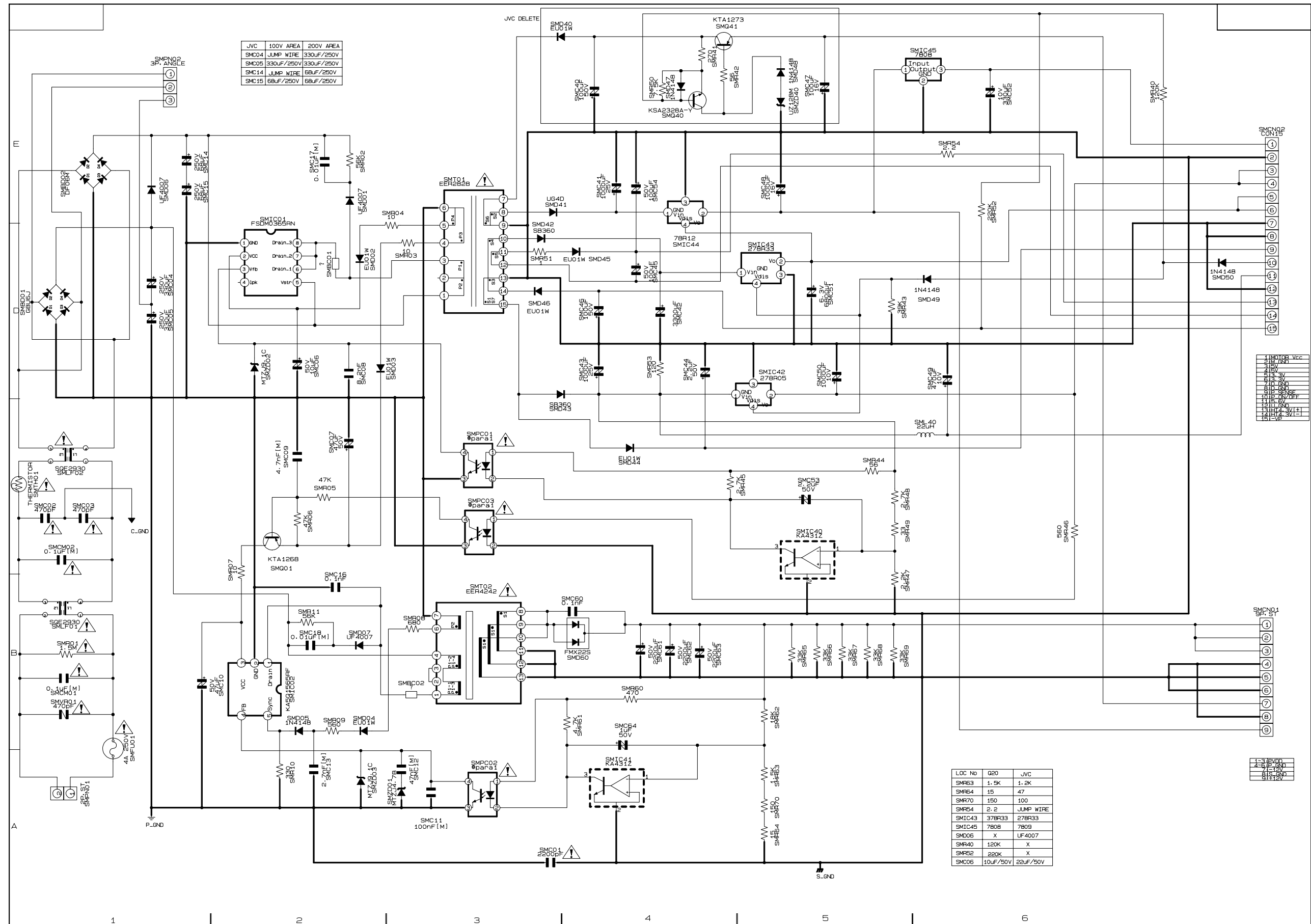


HT-Q20 FRONT SCHEMATIC DIAGRAM







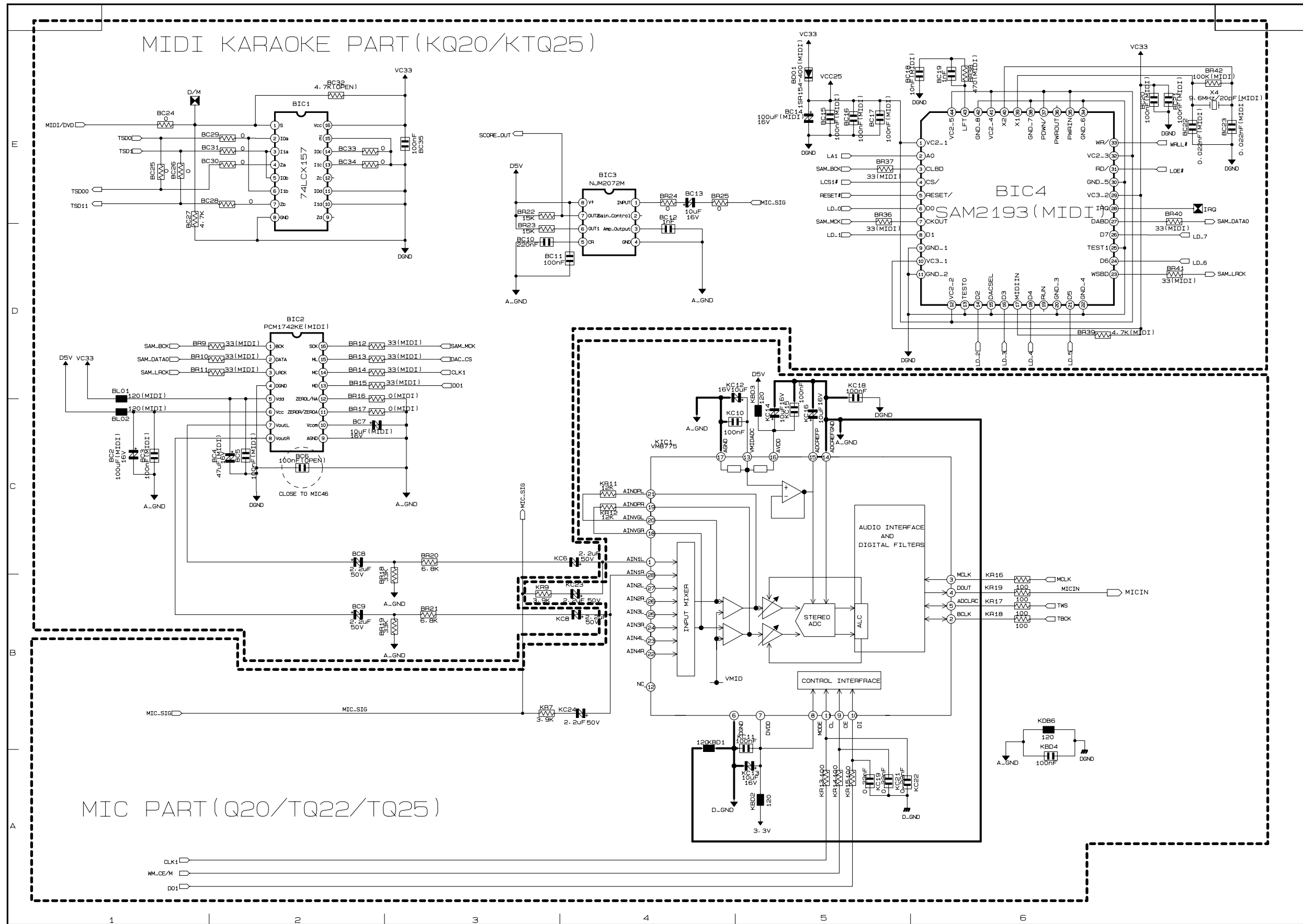


JVC	100V AREA	200V AREA
SMC04	JUMP WIRE	330UF/250V
SMC05	330UF/250V	330UF/250V
SMC14	JUMP WIRE	68UF/250V
SMC15	68UF/250V	68UF/250V

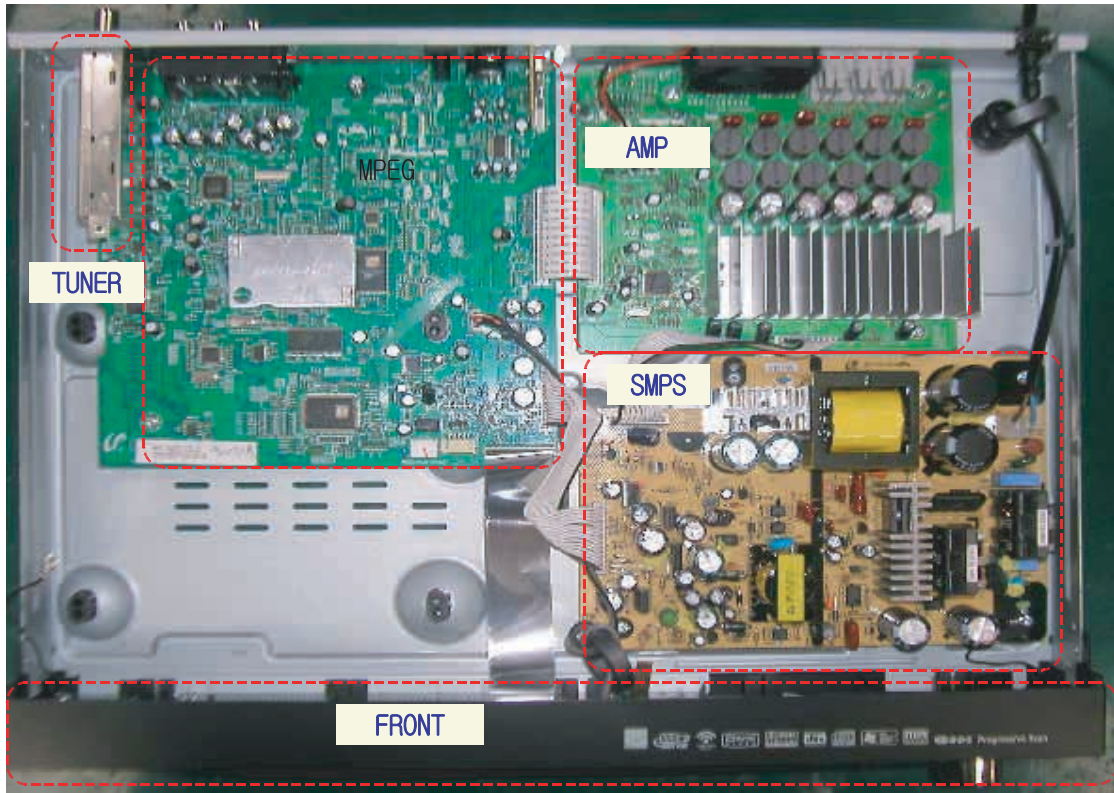
LOC No	Q20	JVC
SMR63	1.5K	1.2K
SMR64	15	47
SMR70	150	100
SMR54	2.2	JUMP WIRE
SMIC43	378R33	278R33
SMIC45	7808	7809
SMC05	X	LF4007
SMR40	120K	X
SMR52	220K	X
SMC06	10UF/50V	22UF/50V

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	MONITOR Vcc													
2	MONITOR GND													
3	4.5V													
4	1.5V													
5	3V													
6	1.8V													
7	1.2V													
8	0.9V													
9	0.6V													
10	0.3V													
11	0.15V													
12	0.075V													
13	0.0375V													
14	0.01875V													
15	0.009375V													

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	SMFU01													
2	SMR01													
3	SMR02													
4	SMR03													
5	SMR04													
6	SMR05													
7	SMR06													
8	SMR07													
9	SMR08													
10	SMR09													
11	SMR10													
12	SMR11													
13	SMR12													
14	SMR13													
15	SMR14													



13. Circuit Board Description



BLOCK Div.	Main Roles	Remarks
SMPS	<p>◇ AC Power Supply and MICOM Supply</p> <ul style="list-style-type: none"> - Power from AC-CORD is supplied to MAIN POWER TRANS through <u>Protection circuit(FUSE, VARIATOR, etc.)</u> of SMPS(STAND-BY status) - Approve operating voltage to MAIN SET from SMPS for normal operation on power-on while AC-CORD is inserted in outlet(STAND-BY). <p>◇ CONNECTOR Specification</p> <ul style="list-style-type: none"> ① M8V : IC power operating OPEN/CLOSE and ROULETTE +/- of MECHA TRAY ② P-SENSE: Power-sense and port for detecting whether AC-CORD is inserted in outlet. MICOM can recognize and POWER-ON at set only when this SENSE port is set to "H". (about +5V) ③ P/ON : POWER-ON port. When turning on power at set after recognizing P/SENSE at MICOM, this power supplies all powers to MAIN-PCB through operation of MAIN PCB TQ5 (KSC1623)(about +5V) ④ MICOM 5.6V : approve LOGIC operating power of MAIN MICOM and VFD DRIVER IC at STAND-BY status. RED LED is turned on(about +5.6V) ⑤ VP : NEGATIVE DRIVE power of VFD DRIVER(about -34V) ⑥ VFD DC : FILAMENT operating power of VFD(about +4.3V at both end during power-on ⑦ A5.6V : AD CONVERTER (WM8775), RF IC(ESS6603), USB IC(UBI9021) operating power ⑧ D5.6V : D3.3V : MPEG(ES6697)/RF/PWM Modulator(TAS5508) power 	<ul style="list-style-type: none"> * 240V - FUSE(F1) : 4A - VARIATOR(VR1) : 10D471

BLOCK Div.	Main Roles	Remarks
MAIN-PCB	<ul style="list-style-type: none"> ◇ MAIN MICOM Part <ul style="list-style-type: none"> - 10MHz oscillator - CLK : share TAS5508 , WM8775, TUNER - DATA : share TAS5508 , WM8775, S5G5128A, TUNER ◇ JACK Part <ul style="list-style-type: none"> - Various VIDEO related CONTROL part - Input : AUDIO 1,2 / VIDEO 1,2 / DIGITAL IN - Output : COMPOSITE / COMPONENT(Y/Pb/Pr) / S-VIDEO / SCART, etc. ◇ ANYNET CONTROL circuit <ul style="list-style-type: none"> - 74HC08(AND GATE) + MAX232(RECEIVER) 	HDMI (OPTION)
FRONT-PCB	<ul style="list-style-type: none"> ◇ FRONT PCB Part Take charge of control of front panel such as REMOCON operating/ main unit KEY operating / VFD and LED operating ◇ VFD and VFD DRIVER IC circuit <ul style="list-style-type: none"> - VFD operating and LED operating - RED LED during Stand-by, BLUE LED during POWER-ON - Other AD circuit(SWITCH) composition ◇ DIMMER Circuit <ul style="list-style-type: none"> - DIMMER ON/OFF operation 	
BLOCK Div.	Main Roles	Remarks
AMP-PCB	<ul style="list-style-type: none"> ◇ AMP Operating Part <ul style="list-style-type: none"> - I²S DATA from MPEG is entered to MODULATOR, and PWM OUT for each CHANNEL. Then, it is output in analog through AMP IC of FULL BRIDGE type and LPF. - Provides 80W 2Channel to IC TAS5142 ◇ PROTECTION Circuit <ul style="list-style-type: none"> - Each AMP IC detects abnormal operation, and delivers to TI-SD MICOM PORT (ACTIVE LOW) <ul style="list-style-type: none"> - PROTECTION operation type <ul style="list-style-type: none"> * SHORT CIRCUIT : short between SPK output +/- and short between SPK output and CHASSISS * OC(OVER CURRENT PROTECTION) : turning off big current at OUTPUT output * OT(OVER TEMPERATURE PROTECTION) : if IC JUNCTION temperature exceeds 155°C, it should not be over 125°C, but is not currently used. * UV(UNDER VOLTAGE PROTECTION) : should be maintained over UVP THRESHOLD ◇ FAN Operating Part <ul style="list-style-type: none"> - SIZE : 5015 - 1 stage operation: operate fan in one stage as 12V power is approved during power-on. and then operate fand in two stage when the FAN operating voltage is over 8V. FAN operating speed is increased. (FAN operating voltage: about 6.5V, FAN SPEED : about MAX4500RPM) 	
MPEG-PCB	<ul style="list-style-type: none"> ◇ MPEG Part <ul style="list-style-type: none"> - ES6688 - Implement DPL2, DTS, DD, DVD-AUDIO 	

1. Definition of Home Theater

What is Home Theater?

Home theater system is the proper combination of audio and video system at home which enable you to enjoy more dynamic sound and vivid image in a wide screen of movie theater.

This effect can be implemented with wide screen, high quality projector, Dolby digital and DTS sound effects.

Now you can enjoy surround sound field with realistic presence and Dolby digital at your home as if you are in a movie theater.

As time goes by, home theater system has become recognized as a system that helps listen sound closer to the original sound rather than video. In this 21st century, most movie and animation films will be produced for home theater and reproduce sound closer to original sound.

2. Concept of Sound

What is Sound Range?

People can listen to the sounds with frequency between 200Hz~20.000Hz

High	3,000Hz~20,000Hz	Highest sound (Ex- Woman's screaming, high sound of organ)
Middle	200Hz~3,000Hz	Most common sound in our daily lives (Ex- movie words, music)
Low	20Hz~200Hz	Lowest sound range that human can listen to (Ex- explosion sound, strong drum sound)

As time goes by, home theater system has become recognized as a system that helps listen sound closer to the original sound rather than video. In this 21st century, most movie and animation films will be produced for home theater and reproduce sound closer to original sound.

What is Sound Pressure?

- * A measure of how well speaker converts electric signal it receives to sound
- * Unit of sound pressure is decibel and mainly measures the size of sound at 1 m away after sending 1 W power from speaker.
 - * High sound pressure doesn't necessary mean good performance

What is Timbre?

- * How well the unique sound of musical instrument is expressed
- * Better if violin and cello sound are accurately distinguished. Good timbre means high quality.

2. Concept of Sound

By reproducing standard channels used during soundtrack recording of movie, it outputs 3 sounds of movie (words / music / sound effects) from 6 different speakers and provides surround dynamic sound effects so that you can even feel the direction of sound.



5.1 channel sound

5 channel

- Ⓐ Center Speaker : Voice (over 95%)
- Ⓑ Front Speaker (L/R) : Music Sound
- Ⓒ Rear Speaker (L/R) : Sound Effect

0.1 channel

- Ⓓ Subwoofer : Low Sound Effect

- * Power amp is embedded in active sub woofer
- * Require separate amp since there is no amp in passive sub woofer
- * No difference in performance of active sub woofer and passive sub woofer

4. Home Theater Sound Format

Overview

- * As home theater has recently penetrated deep into consumer's market in Korea, Dolby digital and DTS, the sound format for 5.1 channel home theater, are the mainstream in the market.
- * Expanded type of 6.1 channel or 7.1 channel are recently released in the market, but there are not much DVD title that can support expanded type.

1958 1Ch Mono/ 2Ch Stereo

1982 Matrix 3Ch Dolby Surround

1987 Matrix 4Ch Dolby Pro Logic

1995 5.1Ch Dolby Digital

1997 DTS (Digital Theater System)

1999 Matrix 6.1Ch Dolby Digital Sourround EX

Home theater format...



Stereo

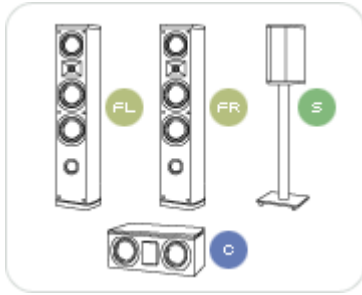
Is used in general audio and analog TV and consists of 2 channels, at front left/right



Dolby Surround

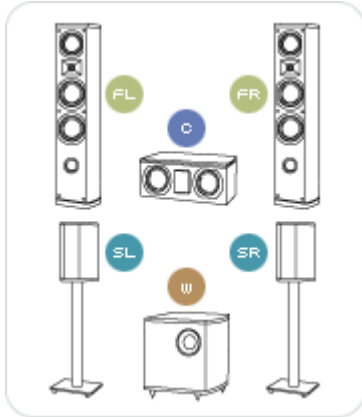
In this sound format, 4 audio channels (Front left / right / center / surround) are entered in 2 channel and reproduce in 4 channels through device with Dolby decoder.

Center channel is not completely separated so that it forms virtual center channel with help of front left / right channel.



Dolby Prologic

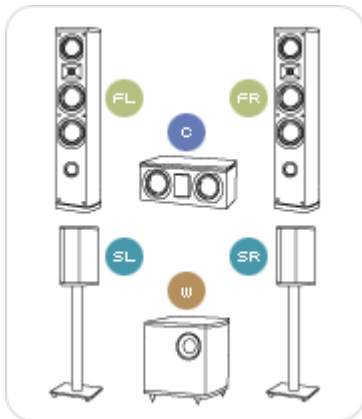
- Provide 4 channels (Front Left/Right/Center/Surround)
- Reinforced from Dolby Surround
- ① Center channel is completely separated
- ② Separation between channels gets higher



Dolby Digital

- Provide completely separate 5.1 channel (Front Left/Right, Center, Rear Left/Right, Sub Woofer)
- Main sound format of home theater
- Reinforced from Dolby Prologic
- Rear surround left/right channels give different sound
- Support sub woofer reinforcing Bass

* Dolby Digital is also called AC-301
 AC-3(Audio-Coding-3) : 3rd digital audio coding Dolby Research Center has developed.

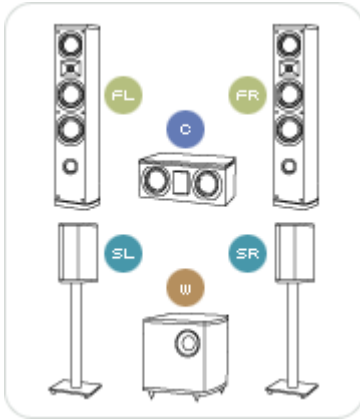


DTS(Digital Theater System)

- Technology of providing 5.1 channel sound, higher quality than Dolby Digital
- Home appliance produced to apply system installed at 1,800 theaters throughout the world.

⊗ Comparison of DTS and Dolby Digital(DD)

SPEC	구분		설명
	DTS	DD	
S/N Ratio	High	Low	Signal to Noise ratio. The higher the S/N ratio, the clearer the sound gets
Compression	Low	High	Less compression of original sound results in less loss of reproduction and clearer sound.
Sound Separation	Big	Little	The bigger the sound separation, the clearer the sound from each speaker.
Transmission	Many	Few	The more information it transmits per second, the clearer the sound gets.



Dolby Prologic

- Latest technology reproducing music CD recorded in 2 channel, cassette tape and video tape made in Dolby Prologic into 5.1 channel.
- Surround speaker that makes you feel more natural, deeper and wider than existing Dolby Prologic.
(Ex-Profound sound adds more realistic presence from 5 speakers and sub woofer when you watch soccer match.)

DTS (Digital Theater System)

THX (Abbreviation of Tomlison Holman's Experiment)

- THX is not a sound format like a Dolby or DTS, but is a standard of sound. Like standard KS mark in Korea, THX means good certification in sound effects.
- THX issues certificate when a movie, theater or home theater system satisfy proper standards.

5. Home Theater Components

- ① Display (Flat, Crjection, LCD, PDP TV, Projector, etc.)
- ② DVD Receiver or DVD Player + AV Receiver
- ③ Speaker System (2EA) ④ Rear Speaker (2EA) ⑤ Center Speaker ⑥ Subwoofer



Amp / Receiver

Amp: Device of raising output after tuning signal of CD player or DVD into unique sound timbre

Various Types and Usages of Amplifier

- For Listening to Music ;æ For Music+ Movie
- ① AV Receiver (Dedicated Lamp for Home Theater) : Preferred by Home Theater mania.
- ② DVD Receiver (DVD Player+ Amp+ Radio Tuner) : Suitable for beginner of Home Theater
- Many A/V companies adopt DVD receiver type for expansion of easy and economic Home Theater system.

Popular Korean Products

- Popular for those who pursue relatively good sound quality at low price
- Product priced between 400,000 won~600,000 won are popular.

Popular Foreign Products

- Popular for those who prefer profound sound volume/output(Hi-fi mania, Home Theater mania)
- Products in the range of middle and low price such as Denon, Yamaha, Onkyo (900,000~1.1 million won) are popular.
- There is very expensive product over 10 million won among foreign audio markers such as Meridian, McIntosh, Krell.

Type of Amp/Receiver

* Pre Amp

A device that receives, adjusts and sends signal from source devices (tape deck, CD player, radio tuner, etc.) to power amplifier.

* Power Amp

A device that amplifies the signal from Pre Amp into big sound so that speaker can vibrate.

* Integrated Amp

A device that combines pre-amp and power amp into one.

* Receiver

A device that contains tuner for radio broadcasting and integrated amp.

A/V Receiver



General Amplifier

- Support 2 channels (Left, Right Speaker)
- Mainly reproduce music
- No decoder : cannot cope with various sound formats



A/V Receiver

- Support multi-channel (support 5.1 channel)
Launch products supporting 6.1 channel and 7.1 channel recently.
- Reproduce music and movie sound realistically
- Has decoder
Can cope with various sound formats such as Dolby Digital.

DTS

- Rich input/output
- Use digital signal type and has no sound

A/V Receiver



A device of implementing home theater more conveniently with radio and A/V receiver embeded in DVD player.

How to Select Amp/Receiver

- Select the products that can support both Dolby Digital and DTS since they require both for vivid sound
 - Performance of amp gets better in output(W) but high output is a burden in narrow house.
 - Important to match output(W) and capacity(\$U) of amp and speaker.
 - It is advantageous for beginners to purchase DVD receiver type that has amp and radio tuner in DVD player
 - If the budget is tight, it is recommended to continue to upgrade after purchasing a low-priced system.
- * Computer will be of no use when it is outdated.
* But, home theater system can be utilized in various ways due to feature of A/V device.

Speaker

Speaker system consists of speaker unit and enclosure.

The type and price range are diverse from expensive big speaker to miniature thin speaker.

Difference between famous speaker and big A/V speaker

- Speaker units are similar(there are a few several speaker unit makers in the world)
- Design, finishing, assembling and tuning process of enclosure are different.
(Prestige speakers are made manually in whole processes of manufacturing)

Famous speaker brands: B&W, JBL, BOSE, Definitve, B&O, etc.



Tallboy Type

A speaker directly installed on the floor without separate speaker in the height of 90 ~ 120 cm.



Bookshelf Type

A small speaker that can be placed in bookshelf. Good for utilization of space since it can be mounted on the wall when installing home theater system in a narrow space.

Speaker Structure

Speaker Unit



- Divided into for high tone, middle tone and low tone
- Tweeter : for high pitch
Smallest unit suitable for feature of high tone reproduction
- Mid-Range : for middle tone
Mid sound reproduction ability is the most critical standard of speaker evaluation
- Woofer : for low tone
Much bigger size than other speaker unit

Enclosure



- Case of speaker unit
- Enclosure sways sound quality of reproduction
- Low tone is almost scattered without enclosure, and only high sound tone is heard.

Type of Speaker System

Full Range Speaker

A speaker system producing sound with one speaker unit.

2 Way Type

A speaker system designed using units of 2 woofers for bass and tweeter for high tone.

3 Way Type

Difference between foreign prestige speaker and big A/V maker's speaker.