



UHD TV

Chassis : UWJ52

Model : UE40JU6000K
UE48JU6000K
UE55JU6000K

SERVICE Manual

UHD TV



UE**JU6000K

Contents

1. Precautions
2. Product specifications
3. Disassembly and Reassembly
4. Troubleshooting
5. Wiring Diagram

Contents

1. Precautions	1-1
1-1. Safety Precautions	1-1
1-1-1. Warnings	1-1
1-1-2. Servicing the LED TV	1-1
1-1-3. Fire and Shock Hazard	1-1
1-1-4. Product Safety Notices	1-2
1-2. Servicing Precautions	1-3
1-2-1. General Servicing Precautions	1-3
1-3. Static Electricity Precautions	1-4
1-4. Installation Precautions	1-5
2. Product Specifications	2-1
2-1. Product information	2-1
2-2. Product specification	2-2
2-2-1. Feature & Specifications	2-2
2-2-2. Detailed Specifications	2-3
2-3. Accessories	2-15
2-4. Viewing the Functions	2-16
2-5. NEW Key Features	2-17
2-5-1. 15" New UI	2-17
2-5-2. Multi Screen	2-18
2-5-3. Instant On	2-19
2-6. HDMI 60P Mode	2-20
2-7. Supported Formats	2-21
3. Disassembly and Reassembly	3-1
3-1. Disassembly and Reassembly	3-1
3-1-1. TV Disassembly	3-1
4. Troubleshooting	4-1
4-1. Troubleshooting	4-1
4-1-1. Previous Check	4-1
4-2. How to Check Fault Symptom	4-2
4-2-1. Video	4-2
4-2-2. WIFI Module	4-4
4-2-3. Apps / Photos, Videos & Music	4-7
4-3. Factory Mode Adjustments	4-8
4-3-1. Detail Factory Option	4-8
4-3-2. Entering Factory Mode	4-9
4-3-3. Factory Data	4-10
4-4. White Balance	4-18
4-4-1. Calibration	4-18
4-4-2. Service Adjustment	4-18
4-4-3. Adjustment	4-20
4-5. RS-232C	4-21
4-6. AV Control Tab	4-22
4-7. Updating the TV's Software	4-28

5. Wiring Diagram5-1

5-1. Wiring Diagram.....5-1

5-2. Connector5-2

ANNEX. Exploded View & Part List [UE40JU6000KXZF TH01] ANNEX-1

1-1. Exploded View..... ANNEX-1

1-1-1. Parts List..... ANNEX-2

2-1. Electrical Parts List..... ANNEX-3

ANNEX. Exploded View & Part List [UE48JU6000KXZF TD01] ANNEX-1

1-1. Exploded View..... ANNEX-1

1-1-1. Parts List..... ANNEX-2

2-1. Electrical Parts List..... ANNEX-3

ANNEX. Exploded View & Part List [UE55JU6000KXZF ED01] ANNEX-1

1-1. Exploded View..... ANNEX-1

1-1-1. Parts List..... ANNEX-2

2-1. Electrical Parts List..... ANNEX-3

1. Precautions

1-1. Safety Precautions

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

1-1-1. Warnings



For continued safety, do not attempt to modify the circuit board.
Disconnect the AC power and DC power jack before servicing.

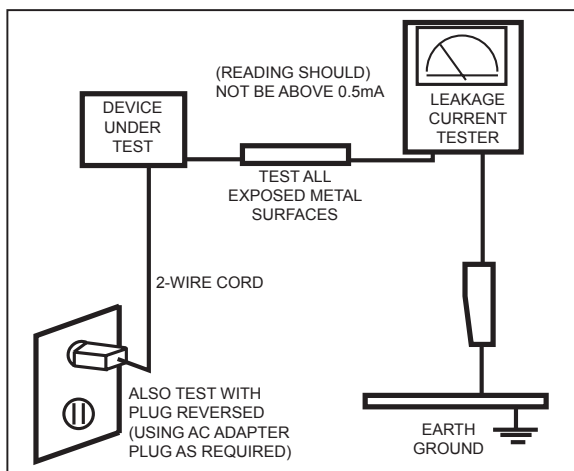
1-1-2. Servicing the LED TV

1. When servicing the LED TV, Disconnect the AC line cord from the AC outlet.
2. It is essential that service technicians have an accurate voltage meter available at all times. Check the calibration of this meter periodically.

1-1-3. Fire and Shock Hazard

Before returning the monitor to the user, perform the following safety checks:

1. Inspect each lead dress to make certain that the leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the monitor.
2. Inspect all protective devices such as nonmetallic control knobs, insulating materials, cabinet backs, adjustment and compartment covers or shields, isolation resistor/capacitor networks, mechanical insulators, etc.
3. Leakage Current Hot Check:




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).

4. 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, conduit, etc.) and all exposed metal parts, including: 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 the test.

1-1-4. Product Safety Notices

Some electrical and mechanical parts have special safetyrelated characteristics which are often not evident from visual inspection. The protection they give may not be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by  on schematics and parts lists. A substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire and/or other hazards. Product safety is under review continuously and new instructions are issued whenever appropriate.

1-2. Servicing Precautions



An electrolytic capacitor installed with the wrong polarity might explode.



Before servicing units covered by this service manual, read and follow the Safety Precautions section of this manual.



If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions, always follow the safety precautions.

1-2-1. General Servicing Precautions

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

Some semiconductor (solid state) devices can be easily damaged by static electricity. Such components are commonly called Electrostatically Sensitive Devices (ESD). Examples of typical ESD are integrated circuits and some field-effect transistors. The following techniques will reduce the incidence of component damage caused by static electricity.

1. 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. To avoid a shock hazard, be sure to remove the wrist strap before applying power to the monitor.
2. After removing an ESD-equipped assembly, place it on a conductive surface such as aluminum foil to prevent accumulation of an electrostatic charge.
3. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ESDs.
4. Use only a grounded-tip soldering iron to solder or desolder ESDs.
5. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ESDs.
6. 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.
7. 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.



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

8. Minimize body motions when handling unpackaged replacement ESDs. Motions such as brushing clothes together, or lifting your foot from a carpeted floor can generate enough static electricity to damage an ESD.

1-4. Installation Precautions



1. For safety reasons, more than a people are required for carrying the product.
2. Keep the power cord away from any heat emitting devices, as a melted covering may cause fire or electric shock.
3. Do not place the product in areas with poor ventilation such as a bookshelf or closet. The increased internal temperature may cause fire.
4. Bend the external antenna cable when connecting it to the product. This is a measure to protect it from being exposed to moisture. Otherwise, it may cause a fire or electric shock.
5. Make sure to turn the power off and unplug the power cord from the outlet before repositioning the product. Also check the antenna cable or the external connectors if they are fully unplugged. Damage to the cord may cause fire or electric shock.
6. Keep the antenna far away from any high-voltage cables and install it firmly. Contact with the highvoltage cable or the antenna falling over may cause fire or electric shock.
7. When installing the product, leave enough space (0.4m) between the product and the wall for ventilation purposes. A rise in temperature within the product may cause fire.
8. If an equipment is provided with a replaceable battery, and if replacement by an incorrect type could result in an explosion (for example, with some lithium batteries), the following applies:

**CAUTION**

- Risk of explosion if battery is replaced by an incorrect type dispose of used batteries according to the instructions.
- Do not dispose of batteries in a fire.
- Do not short circuit, disassemble or overheat the batteries.
- Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.
- Do not be exposed to excessive heat such as sunshine, fire or the like.

2. Product Specifications

2-1. Product information

Model	UE**JU6000K		
Front View	 <p>* W : Width H : High D : Depth</p>		
Detail View			
Front Color	Black		
Dimensions (W x H x D)	40"	Body	917.7 X 535.7 X 62.6 mm
		With stand	931.2 X 596.1 X 201.4 mm
	48"	Body	1087.1 X 630.9 X 63.3 mm
		With stand	1087.1 X 700.5 X 277.8 mm
	55"	Body	1242.6 X 718.5 X 63.2 mm
		With stand	1242.6 X 787.5 X 277.8 mm
Weight	40"	Body	7.8 Kg
		With stand	8.0 Kg
	48"	Body	11.0 Kg
		With stand	11.3 Kg
	55"	Body	15.9 Kg
		With stand	16.2 Kg
Panel Type	Ultra Clear		
Internal Memory	4GB		
DDR	2GB		
Feature	Media Play (Movie, Photo, Music)		

2-2. Product specification

2-2-1. Feature & Specifications

■ Feature

- UHD TV, RF, 3-HDMI, 1-COMPONENT, 1-A/B(COMMON USE FOR COMPONENTY), 1-USB2.0, 1-USB3.0, HEADPHONE

■ Specifications

Model	UE**JU6000K		
Item	Description		
Screen Size (Diagonal)	40 inches	48 inches	55 inches
LCD Panel	UHD 60 Hz		
Scanning Frequency	Horizontal : 60 kHz ~ 73 kHz (Automatic) Vertical : 47 Hz ~ 63 Hz (Automatic)		
Display Colors	16.7M color		
Display Resolution	3840 X 2160		
Input Signal	Analog 0.7 Vp-p ± 5% positive at 75Ω, internally terminated		
Input Sync Signal	H/V Separate, TTL, P. or N.		
Maximum Pixel Clock Rate	74.25MHz		
AC Power Voltage & Frequency	AC220-240V 50/60Hz		
Environmental Considerations	Operating Temperature : 50°F ~ 104°F (10°C ~ 40°C) Operating Humidity : 10% ~ 80%, non-condensing Storage Temperature : -4°F ~ 113°F (-20°C ~ 45°C) Storage Humidity : 5% ~ 95%, non-condensing		
Sound (Output)	20 W (10 W X 2)		
Note : Dolby Digital Plus/Pulse, USB2.0/3.0, Film mode, Energy Saving			

2-2-2. Detailed Specifications



NOTE

Design and specifications are subject to change without prior notice.

Item		UE40JU6000KXZF
General Information	Product	UHD
	Series	6
	Country	FRANCE
Display	Inch	40"
	Resolution	3,840 x 2,160
	Ultra Clear Panel	Ultra Clear
Video	Picture Engine	UHD Up-scaling
	PQI (Picture Quality Index)	800
	Dynamic Contrast Ratio	Mega Contrast
	Micro Dimming	Micro Dimming Pro
	Precision Black (Local Dimming)	N/A
	Nano Crystal Color	N/A
	Wide Color Enhancer (Plus)	Yes
	PurColor	N/A
	Auto Depth Enhancer	N/A
	Contrast Enhancer	Yes
	Auto Motion Plus	N/A
	Film Mode	Yes
	Natural Mode Support	Yes
	Peak Illuminator	N/A
Audio	Dolby Digital Plus	Yes
	Virtual Surround	DTS Studio Sound
	DTS Codec	DTS Premium Sound 5.1
	3D Sound	N/A
	Sound Customizer	N/A
	Sound Output (RMS)	20W(L:10W, R:10W)
	Speaker Type	2CH(Down Firing + Bass Reflex)
	Woofer	N/A
	HD Audio	Yes
	Wallmount Sound Mode	Yes
	Multiroom Link	Yes
	TV SoundConnect	N/A
Smart TV	Samsung SMART TV	Yes
	Apps	Yes

2. Product specifications

Item		UE40JU6000KXZF
Smart TV	Game	Yes (GB,GG,IM,JE,IE,FR,DE,IT,ES,NL,BE,LU,SE,FI,AX,NO,DK,GL,FO,PL,CZ,SK,HU,AT,CH,GR,RO,BG)
	Multi-Link Screen	N/A
	ACR (Advertisement)	N/A
	Info Widget	N/A
	Vertical Enhancement	N/A
	Connected EPG	N/A
Smart Interaction	Voice Interaction	N/A
	Voice Control	N/A
	Face recognition	N/A
	Motion control	N/A
Convergence	TV to Mobile - Mirroring	Yes
	Mobile to TV - Mirroring, DLNA	Yes
	RVU	N/A
	Samsung SMART View	Yes
	Wireless TV On - Samsung WOL	N/A
	Notification - BLE	N/A
	Briefing On TV	N/A
	WiDi	N/A
	WiFi Direct	Yes
Tuner/Broadcasting	Digital Broadcasting	DVB-T2/C
	2 Tuner	N/A
	CI/CI+/2CI+	CI+ (1.3)
	Analog Tuner	Yes
	MHP / MHEG / HbbTV / ACAP / GINGA / OHTV	HbbTV 1.5(FR) / HbbTV1.0(ES,PT,DE,AT,SZ)
Connectivity	HDMI	3
	USB	2
	Component In (Y/Pb/Pr)	1
	Composite In (AV)	1 (Common Use for Component Y)
	Ethernet (LAN)	1
	Headphone	1
	Audio Out (Mini Jack)	N/A
	Digital Audio Out (Optical)	1
	RF In (Terrestrial / Cable input / Satellite input)	1/1(Common Use for Terrestrial)/0
	Ex-Link (RS-232C)	N/A
	IR Out	N/A
	CI Slot	1

Item		UE40JU6000KXZF
Connectivity	Scart	N/A
	MHL	Yes
	HDMI 3D Auto Setting	N/A
	HDMI A / Return Ch. Support	Yes
	HDMI Quick Switch	N/A
	Wireless LAN Adapter Support	N/A
	Wireless LAN Built-in	Yes
	Anynet+ (HDMI-CEC)	Yes
Design	Design	U6400 design (Deco Mold)
	Bezel Type	VNB
	Slim Type	Slim
	Front Color	Black
	Light Effect (Deco)	N/A
	Stand Type	Y-Feet
	Swivel (Left/Right)	N/A
Additional Feature	Samsung 3D	N/A
	3D Converter	N/A
	Camera Built-in	N/A
	Instant On	Yes
	Processor	Quad-Core
	21:9 Immersive Picture Mode	N/A
	SCSA Support	N/A
	Accessibility	Voice guide(EU 17 countries)/ Enlarge/ High contrast
	Digital Clean View	Yes
	One Connect (Jack)	N/A
	Auto Channel Search	Yes
	Auto Power Off	Yes
	BD Wise Plus	Yes
	Caption (Subtitle)	Yes
	Channel List USB-Clone	Yes
	Connect Share™ (HDD)	Yes
	ConnectShare™ (USB 2.0)	Yes
	Sports Mode	Advanced
	Embedded POP	Yes
	EPG	Yes
	Extended PVR	Yes
	Game Mode	Yes
	OSD Language	27 European Languages

2. Product specifications

Item		UE40JU6000KXZF
Additional Feature	Picture-In-Picture	Yes
	BT HID Built-in	N/A
	USB HID Support	Yes
	Smart Evolution Support	N/A
	Teletext (TTXT)	Yes
	Time Shift	Yes
	Ultra Clean View	Yes
Eco Feature	Eco Mark	N/A
	Eco Label	N/A
	Eco Sensor	Yes
	Energy Efficiency Class	A
Accessory	3D Active Glasses (Included)	N/A
	Remote Controller Model	TM1240A
	Batteries (for Remote Control)	Yes
	Samsung Smart Touch Control (Included)	N/A
	Ultra Slim Wall Mount Supported	N/A
	Mini Wall Mount Supported	Yes
	Vesa Wall Mount Supported	Yes
	Floor Stand Support	Yes
	TV Camera (Included)	N/A
	IR Extender Cable (Included)	N/A
	Wireless Keyboard (Included)	N/A
	Composite to Scart Gender (Included)	N/A
	User Manual	Yes
	E-Manual	Yes
	ANT-Cable	N/A
	Power Cable	Yes
	Slim Gender Cable	N/A

Item		UE48JU6000KXZF
General Information	Product	UHD
	Series	6
	Country	FRANCE
Display	Inch	48"
	Resolution	3,840 x 2,160
	Ultra Clear Panel	Ultra Clear
Video	Picture Engine	UHD Up-scaling
	PQI (Picture Quality Index)	800
	Dynamic Contrast Ratio	Mega Contrast
	Micro Dimming	Micro Dimming Pro
	Precision Black (Local Dimming)	N/A
	Nano Crystal Color	N/A
	Wide Color Enhancer (Plus)	Yes
	PurColor	N/A
	Auto Depth Enhancer	N/A
	Contrast Enhancer	Yes
	Auto Motion Plus	N/A
	Film Mode	Yes
	Natural Mode Support	Yes
	Peak Illuminator	N/A
Audio	Dolby Digital Plus	Yes
	Virtual Surround	DTS Studio Sound
	DTS Codec	DTS Premium Sound 5.1
	3D Sound	N/A
	Sound Customizer	N/A
	Sound Output (RMS)	20W(L:10W, R:10W)
	Speaker Type	2CH(Down Firing + Bass Reflex)
	Woofer	N/A
	HD Audio	Yes
	Wallmount Sound Mode	Yes
	Multiroom Link	Yes
	TV SoundConnect	N/A
Smart TV	Samsung SMART TV	Yes
	Apps	Yes
	Game	Yes (GB,GG,IM,JE,IE,FR,DE,IT,ES,NL,BE,LU,SE,FI,AX,NO,DK,GL,FO,PL,CZ,SK,HU,AT,CH,GR,RO,BG)
	Multi-Link Screen	N/A
	ACR (Advertisement)	N/A

2. Product specifications

Item		UE48JU6000KXZF
Smart TV	Info Widget	N/A
	Vertical Enhancement	N/A
	Connected EPG	N/A
Smart Interaction	Voice Interaction	N/A
	Voice Control	N/A
	Face recognition	N/A
	Motion control	N/A
Convergence	TV to Mobile - Mirroring	Yes
	Mobile to TV - Mirroring, DLNA	Yes
	RVU	N/A
	Samsung SMART View	Yes
	Wireless TV On - Samsung WOL	N/A
	Notification - BLE	N/A
	Briefing On TV	N/A
	WiDi	N/A
	WiFi Direct	Yes
Tuner/Broadcasting	Digital Broadcasting	DVB-T2/C
	2 Tuner	N/A
	CI/CI+/2CI+	CI+ (1.3)
	Analog Tuner	Yes
	MHP / MHEG / HbbTV / ACAP / GINGA / OHTV	HbbTV 1.5(FR) / HbbTV1.0(ES,PT,DE,AT,SZ)
Connectivity	HDMI	3
	USB	2
	Component In (Y/Pb/Pr)	1
	Composite In (AV)	1 (Common Use for Component Y)
	Ethernet (LAN)	1
	Headphone	1
	Audio Out (Mini Jack)	N/A
	Digital Audio Out (Optical)	1
	RF In (Terrestrial / Cable input / Satellite input)	1/1(Common Use for Terrestrial)/0
	Ex-Link (RS-232C)	N/A
	IR Out	N/A
	CI Slot	1
	Scart	N/A
	MHL	Yes
	HDMI 3D Auto Setting	N/A
	HDMI A / Return Ch. Support	Yes
	HDMI Quick Switch	N/A

Item		UE48JU6000KXZF
Connectivity	Wireless LAN Adapter Support	N/A
	Wireless LAN Built-in	Yes
	Anynet+ (HDMI-CEC)	Yes
Design	Design	U6400 design (Deco Mold)
	Bezel Type	VNB
	Slim Type	Slim
	Front Color	Black
	Light Effect (Deco)	N/A
	Stand Type	Y-Feet
	Swivel (Left/Right)	N/A
Additional Feature	Samsung 3D	N/A
	3D Converter	N/A
	Camera Built-in	N/A
	Instant On	Yes
	Processor	Quad-Core
	21:9 Immersive Picture Mode	N/A
	SCSA Support	N/A
	Accessibility	Voice guide(EU 17 countries)/ Enlarge/ High contrast
	Digital Clean View	Yes
	One Connect (Jack)	N/A
	Auto Channel Search	Yes
	Auto Power Off	Yes
	BD Wise Plus	Yes
	Caption (Subtitle)	Yes
	Channel List USB-Clone	Yes
	Connect Share™ (HDD)	Yes
	ConnectShare™ (USB 2.0)	Yes
	Sports Mode	Advanced
	Embedded POP	Yes
	EPG	Yes
	Extended PVR	Yes
	Game Mode	Yes
	OSD Language	27 European Languages
	Picture-In-Picture	Yes
	BT HID Built-in	N/A
	USB HID Support	Yes
	Smart Evolution Support	N/A
	Teletext (TTXT)	Yes

2. Product specifications

Item		UE48JU6000KXZF
Additional Feature	Time Shift	Yes
	Ultra Clean View	Yes
Eco Feature	Eco Mark	N/A
	Eco Label	N/A
	Eco Sensor	Yes
	Energy Efficiency Class	A+
Accessory	3D Active Glasses (Included)	N/A
	Remote Controller Model	TM1240A
	Batteries (for Remote Control)	Yes
	Samsung Smart Touch Control (Included)	N/A
	Ultra Slim Wall Mount Supported	N/A
	Mini Wall Mount Supported	Yes
	Vesa Wall Mount Supported	Yes
	Floor Stand Support	Yes
	TV Camera (Included)	N/A
	IR Extender Cable (Included)	N/A
	Wireless Keyboard (Included)	N/A
	Composite to Scart Gender (Included)	N/A
	User Manual	Yes
	E-Manual	Yes
	ANT-Cable	N/A
	Power Cable	Yes
	Slim Gender Cable	N/A

Item		UE55JU6000KXZF
General Information	Product	UHD
	Series	6
	Country	FRANCE
Display	Inch	55"
	Resolution	3,840 x 2,160
	Ultra Clear Panel	Ultra Clear
Video	Picture Engine	UHD Up-scaling
	PQI (Picture Quality Index)	800
	Dynamic Contrast Ratio	Mega Contrast
	Micro Dimming	Micro Dimming Pro
	Precision Black (Local Dimming)	N/A
	Nano Crystal Color	N/A
	Wide Color Enhancer (Plus)	Yes
	PurColor	N/A
	Auto Depth Enhancer	N/A
	Contrast Enhancer	Yes
	Auto Motion Plus	N/A
	Film Mode	Yes
	Natural Mode Support	Yes
	Peak Illuminator	N/A
Audio	Dolby Digital Plus	Yes
	Virtual Surround	DTS Studio Sound
	DTS Codec	DTS Premium Sound 5.1
	3D Sound	N/A
	Sound Customizer	N/A
	Sound Output (RMS)	20W(L:10W, R:10W)
	Speaker Type	2CH(Down Firing + Bass Reflex)
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	HD Audio	Yes
	Wallmount Sound Mode	Yes
	Multiroom Link	Yes
	TV SoundConnect	N/A
Smart TV	Samsung SMART TV	Yes
	Apps	Yes
	Game	Yes (GB,GG,IM,JE,IE,FR,DE,IT,ES,NL,BE,LU,SE,FI,AX,NO,DK,GL,FO,PL,CZ,SK,HU,AT,CH,GR,RO,BG)
	Multi-Link Screen	N/A
	ACR (Advertisement)	N/A

2. Product specifications

Item		UE55JU6000KXZF
Smart TV	Info Widget	N/A
	Vertical Enhancement	N/A
	Connected EPG	N/A
Smart Interaction	Voice Interaction	N/A
	Voice Control	N/A
	Face recognition	N/A
	Motion control	N/A
Convergence	TV to Mobile - Mirroring	Yes
	Mobile to TV - Mirroring, DLNA	Yes
	RVU	N/A
	Samsung SMART View	Yes
	Wireless TV On - Samsung WOL	N/A
	Notification - BLE	N/A
	Briefing On TV	N/A
	WiDi	N/A
	WiFi Direct	Yes
Tuner/Broadcasting	Digital Broadcasting	DVB-T2/C
	2 Tuner	N/A
	CI/CI+/2CI+	CI+ (1.3)
	Analog Tuner	Yes
	MHP / MHEG / HbbTV / ACAP / GINGA / OHTV	HbbTV 1.5(FR) / HbbTV1.0(ES,PT,DE,AT,SZ)
Connectivity	HDMI	3
	USB	2
	Component In (Y/Pb/Pr)	1
	Composite In (AV)	1 (Common Use for Component Y)
	Ethernet (LAN)	1
	Headphone	1
	Audio Out (Mini Jack)	N/A
	Digital Audio Out (Optical)	1
	RF In (Terrestrial / Cable input / Satellite input)	1/1(Common Use for Terrestrial)/0
	Ex-Link (RS-232C)	N/A
	IR Out	N/A
	CI Slot	1
	Scart	N/A
	MHL	Yes
	HDMI 3D Auto Setting	N/A
	HDMI A / Return Ch. Support	Yes
	HDMI Quick Switch	N/A

Item		UE55JU6000KXZF
Connectivity	Wireless LAN Adapter Support	N/A
	Wireless LAN Built-in	Yes
	Anynet+ (HDMI-CEC)	Yes
Design	Design	U6400 design (Deco Mold)
	Bezel Type	VNB
	Slim Type	Slim
	Front Color	Black
	Light Effect (Deco)	N/A
	Stand Type	Y-Feet
	Swivel (Left/Right)	N/A
Additional Feature	Samsung 3D	N/A
	3D Converter	N/A
	Camera Built-in	N/A
	Instant On	Yes
	Processor	Quad-Core
	21:9 Immersive Picture Mode	N/A
	SCSA Support	N/A
	Accessibility	Voice guide(EU 17 countries)/ Enlarge/ High contrast
	Digital Clean View	Yes
	One Connect (Jack)	N/A
	Auto Channel Search	Yes
	Auto Power Off	Yes
	BD Wise Plus	Yes
	Caption (Subtitle)	Yes
	Channel List USB-Clone	Yes
	Connect Share™ (HDD)	Yes
	ConnectShare™ (USB 2.0)	Yes
	Sports Mode	Advanced
	Embedded POP	Yes
	EPG	Yes
	Extended PVR	Yes
	Game Mode	Yes
	OSD Language	27 European Languages
	Picture-In-Picture	Yes
	BT HID Built-in	N/A
	USB HID Support	Yes
	Smart Evolution Support	N/A
	Teletext (TTXT)	Yes

2. Product specifications

Item		UE55JU6000KXZF
Additional Feature	Time Shift	Yes
	Ultra Clean View	Yes
Eco Feature	Eco Mark	N/A
	Eco Label	N/A
	Eco Sensor	Yes
	Energy Efficiency Class	A+
Accessory	3D Active Glasses (Included)	N/A
	Remote Controller Model	TM1240A
	Batteries (for Remote Control)	Yes
	Samsung Smart Touch Control (Included)	N/A
	Ultra Slim Wall Mount Supported	N/A
	Mini Wall Mount Supported	Yes
	Vesa Wall Mount Supported	Yes
	Floor Stand Support	Yes
	TV Camera (Included)	N/A
	IR Extender Cable (Included)	N/A
	Wireless Keyboard (Included)	N/A
	Composite to Scart Gender (Included)	N/A
	User Manual	Yes
	E-Manual	Yes
	ANT-Cable	N/A
	Power Cable	Yes
	Slim Gender Cable	N/A

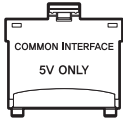
2-3. Accessories



NOTE

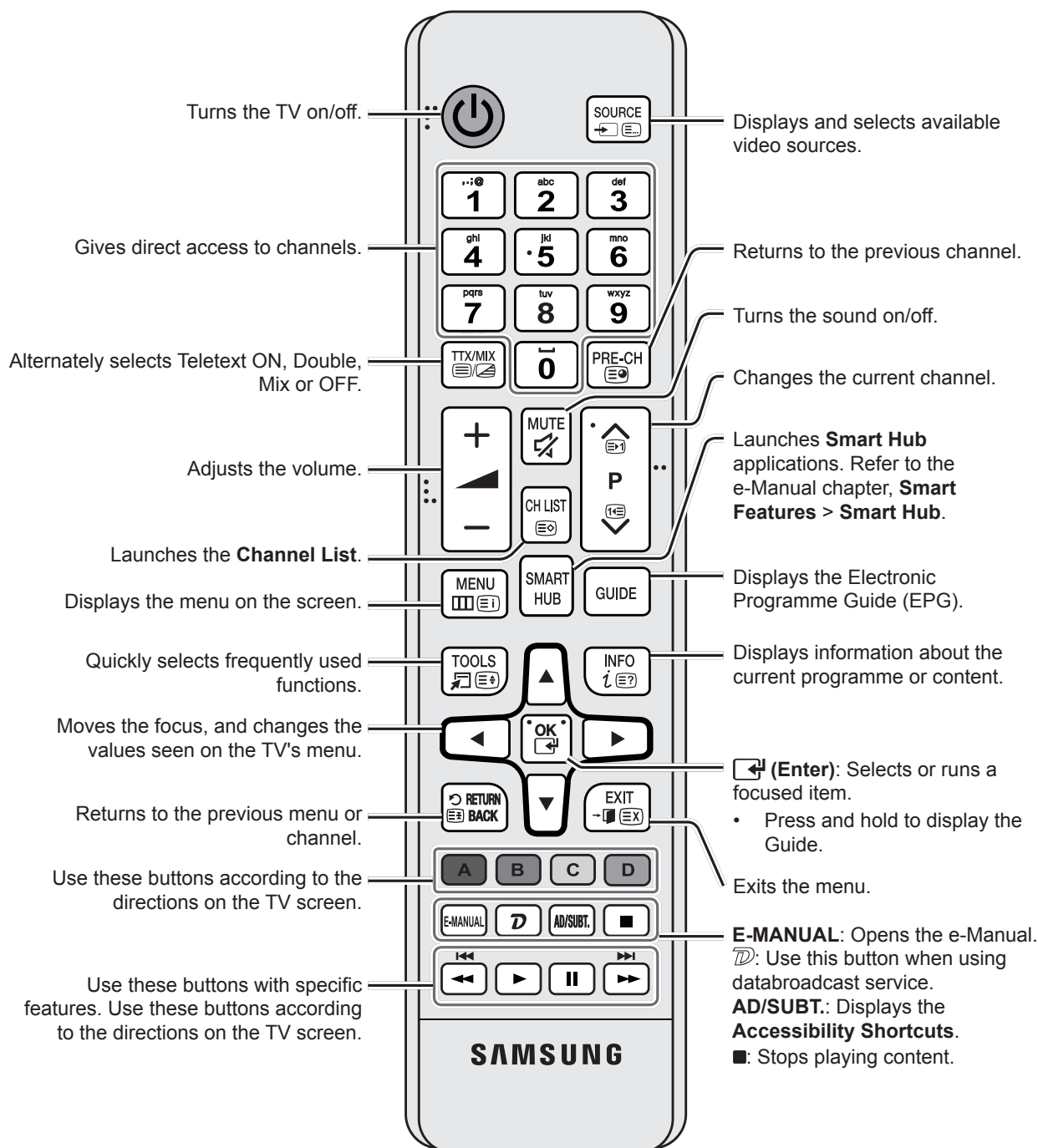
- The items' colors and shapes may vary depending on the model.
- Cables not included in the package contents can be purchased separately.
- The part code for some accessories may differ depending on your region.

Product	Code. No	Product	Code. No
• Remote Control	BN59-01199G	• Power Cord	3903-000950
• Batteries (AAA x 2)	4301-000121	• User Manual	BN68-07539C

Image	Product	Code. No
	• CI Card Adapter	3709-001791

2-4. Viewing the Functions

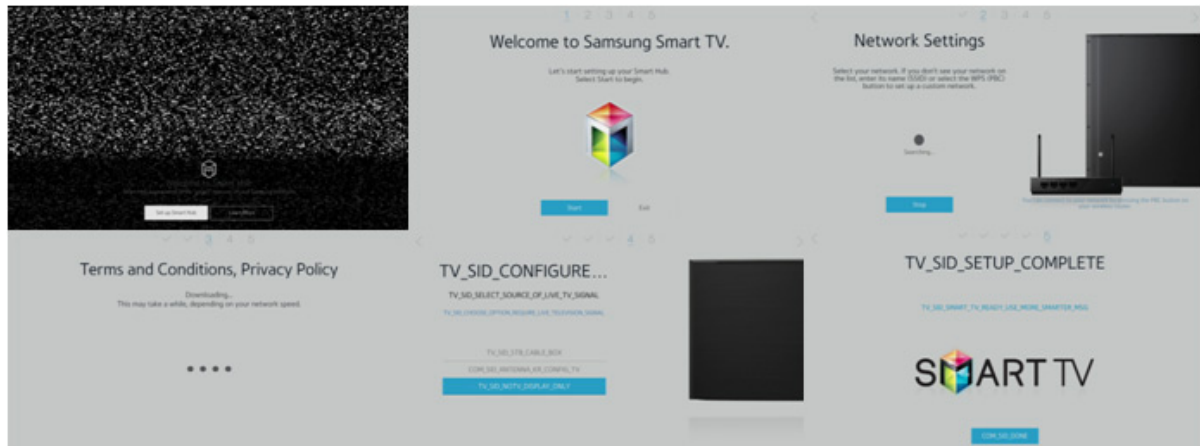
■ The Remote Control



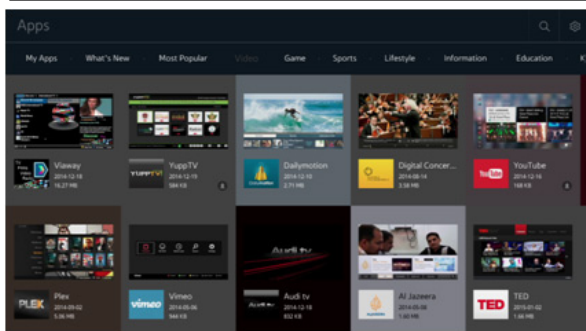
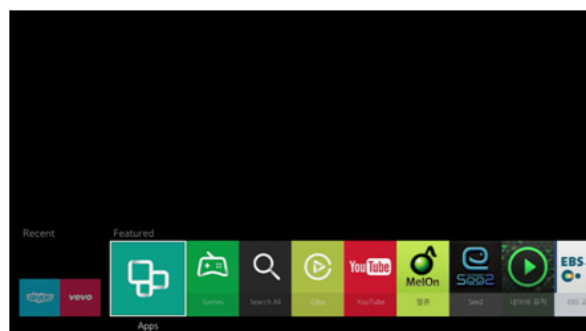
2-5. NEW Key Features

2-5-1. 15" New UI

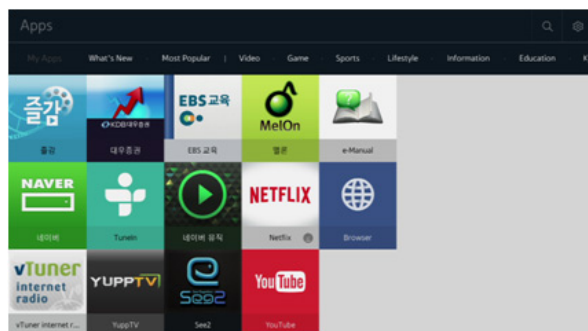
■ SMART HUB START



■ After Smart HUB setup



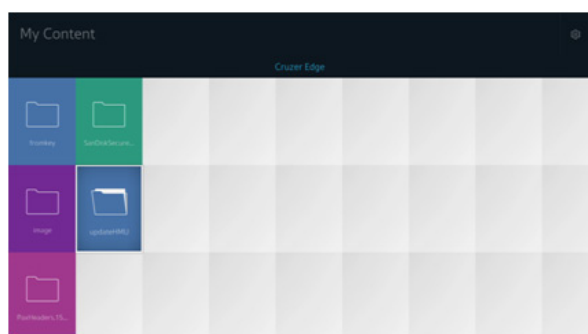
<Videos contents>



<My Apps>



<Web browser>



<My contents>

2-5-2. Multi Screen

■ Using Multi-Link Screen



NOTE

- UHD and FHD contents and channels cannot be viewed simultaneously.
- Launching Smart Hub while using Multi-Link Screen automatically terminates Multi-Link Screen.
- Certain TV features and apps may not be supported by Multi-Link Screen. If this is the case, exit from Multi-Link Screen and then use the feature.

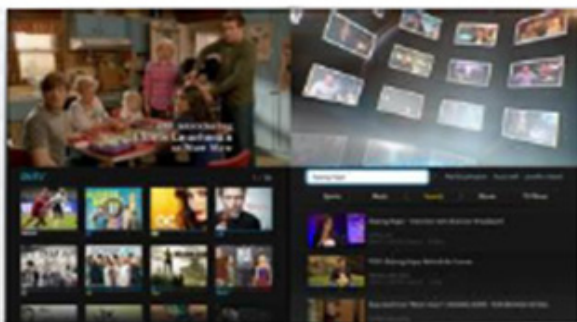
Selecting a Feature

1. Press the Samsung Smart Control's M.SCREEN button while Multi-Link Screen is running. The Options menu appears.
2. Select a feature from the Options menu. This initializes the selected feature.



NOTE

Features supported by Multi-Link Screen vary depending on the country.



<TV + Video clip>



<TV + Web search>



<TV + App>



<TV +TV (dual tuner only)>

■ Using Multiple Functions in a Single Screen(Multi-Link Screen)

Menu > Picture > Open Multi-Link Screen

This function may not be available depending on the country or region.

This allows you to search the Web, use apps, and much more simultaneously while watching TV.



NOTE

- Before using Multi-Link Screen, make sure the TV is connected to the Internet. Using Multi-Link Screen requires an Internet connection.
- Before using Smart Hub with Multi-Link Screen, go to the On TV Settings (**Smart Hub > On TV Settings > On TV Setup**) and finish configuring Smart Hub.

2-5-3. Instant On

■ Enabling the TV to Boot Faster

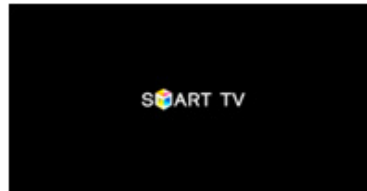
MENU > System > General > Samsung Instant On

Set Fast Boot on to have the TV boot up faster.

<Cold Boot>



Detachable power



SMART TV

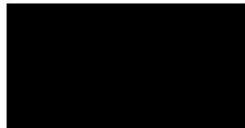


5.3sec

<Instant On>



Remocon on



1.3sec

2-6. HDMI 60P Mode

■ HDMI UHD 60P MODE

If an external UHD player is connected to the TV, follow these steps to convert the TV's HDMI connector optimized to the UHD signals.



NOTE

Each HDMI connector can be individually optimized for **HDMI UHD 60P MODE**.

1. Turn off the external UHD player that is connected to the TV.
2. Navigate to **Picture > Picture Options > HDMI UHD 60P MODE**, and set the UHD-connected HDMI connector to **On**.
3. When done, turn on the external UHD player.



NOTE

- After setting the HDMI connector to **On**, It takes some time to complete the conversion.
- **HDMI UHD 60P MODE** is specific to a UHD source, and does not operate properly for any other source. If you want to play a non-UHD source in **HDMI UHD 60P MODE**, set the converted HDMI connector to **Off**.

2-7. Supported Formats

■ Supported Image resolution

File Extension	Type	Resolution
*.jpg *.jpeg	JPEG	15360x8640
*.png	PNG	4096x4096
*.bmp	BMP	4096x4096
*.mpo	MPO	15360x8640

■ Supported Music File Formats

File Extension	Type	Codec	Comments
*.mp3	MPEG	MPEG1 Audio Layer 3	-
*.m4a *.mpa *.aac	MPEG4	AAC	-
*.flac	FLAC	FLAC	Supports up to two channels.
*.ogg	OGG	Vorbis	Supports up to two channels.
*.wma	WMA	WMA	WMA 10 Pro supports up to 5.1 channels. WMA lossless audio is not supported. Supports up to M2 profile.
*.wav	wav	wav	-
*.mid *.midi	midi	midi	Type 0, type 1 and supported.
*.ape	ape	ape	-

- Sound or video may not work if they have standard bit rates/frame rates above the TV's compatibility.
- If the Index Table is wrong, the Seek (Jump) function does not work.
- When playing video over a network connection, the video may not play smoothly because of data
- Some USB/digital camera devices may not be compatible with the player.

■ Supported Video Code

File Formats	Container	Video Codecs	Resolution	Frame rate (fps)	Bit rate (Mbps)	Audio Codec			
*.avi *.mkv *.asf *.wmv *.mp4 *.mov *.3gp *.vro *.mpg *.mpeg *.ts *.tp *.trp *.mov *.flv *.vob *.svi *.m2ts *.mts *.divx	AVI MKV ASF MP4 3GP MOV FLV VRO VOB PS TS SVAF	H.264 BP/MP/HP	4096x2160	UHD: MAX 30 FHD: MAX 30 HD : MAX 60 UHD: 60	60	AC3 LPCM ADPCM (IMA, MS) AAC HE-AAC WMA Dolby Digital Plus MPEG(MP3) DTS (Core, LBR) G.711(A-Law, μ-Law			
		Motion JPEG							
		HEVC(H.265)							
		DivX 3.11/4/5/6	1920x1080	FHD: 30 HD : 60	30				
		MPEG4 SP/ASP							
		Microsoft MPEG-4 v1 , v2 , v3							
		Window Media Video v7(WMV1), v8(WMV2)							
		Window Media Video v9(VC1)							
		MPEG2							
		MPEG1							
		VP6							
		H.263 Sorrenson							
		MVC			60				
		*.webm	WebM	VP8	1920x1080		6~30	20	Vorbis

■ Other Restrictions



NOTE

- Codecs may not function properly if there is a problem with the content data.
- Video content does not play or does not correctly if there is an error in the content or container.
- Sound or video may not work if they have standard bit rates/frame rates above the TV's compatibility.ratings
- If the Index Table is wrong, the Seek(Jump) function does not work.
- When playing video over a network connection, the video may not play smoothly because of datatransmission speeds.
- Some USB/digital camera devices may not be compatible with the player.

3. Disassembly and Reassembly

This section of the service manual describes the disassembly and reassembly procedures for the LED TV.



This LED TV contains electrostatically sensitive devices. Use caution when handling these components.

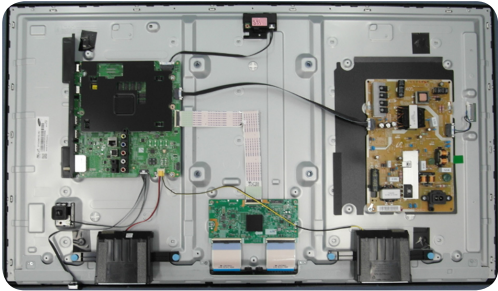
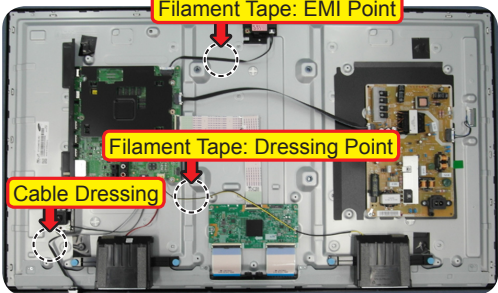
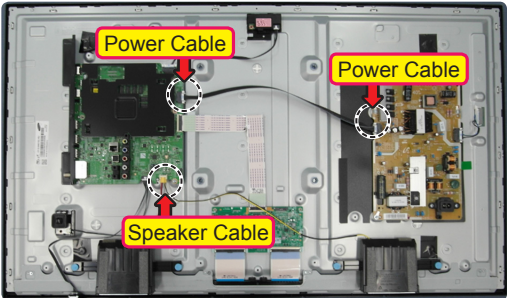
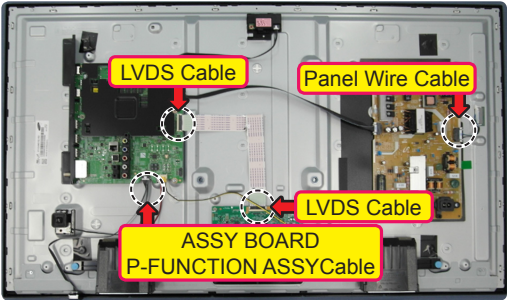
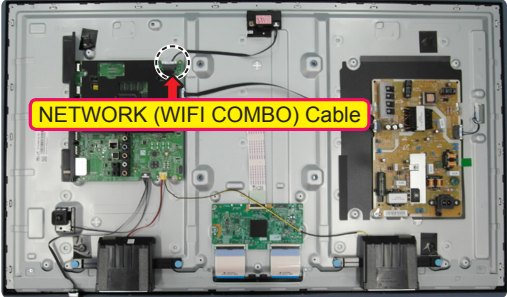
3-1. Disassembly and Reassembly



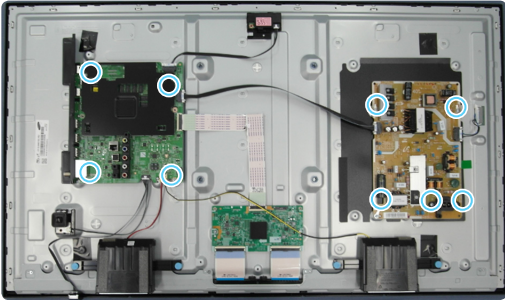


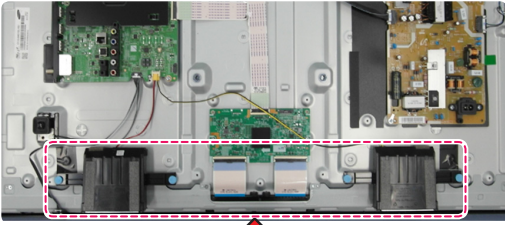
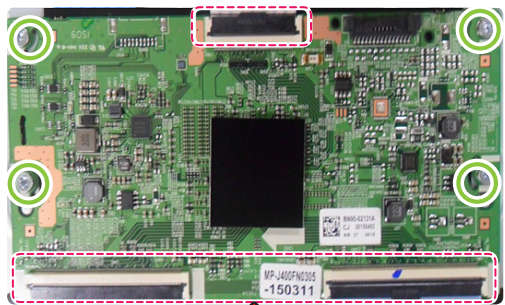




1. Disconnect the LED TV from the power source before disassembly.
2. Follow these directions carefully; never use metal instruments to pry apart the cabinet.
3. If there is no additional coment, it is same for all inches.

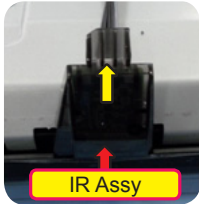
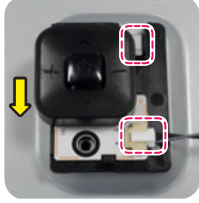

3-1-1. TV Disassembly


Description	Picture Description	Screws
1 Place TV face down on cushioned table.		
2 Remove 4 screws from the ASSY STAND P-BAS.		 6003-001782
3 Remove the screws of ASSY COVER P-REAR. <ul style="list-style-type: none"> • 40" : 16 EA • 48" : 17 EA • 55" : 18 EA 		 Torque : 7~ 8Kgf.cm. 6001-002755

Description	Picture Description	Screws
<div>4</div> <div>Remove the ASSY COVER P-REAR.</div>		
<div>5</div> <div>Remove the Electric tapes shown on the image.</div> <div><div>• EMI Point : After removing release paper from the LVDS Cable bottom, attach the LVDS Cable to the C/ Chassis and rub the attached surface.</div></div> <div><div><div>!</div><div>CAUTION</div></div><div>When assembling the TV, the electric tapes must be applied on the same locations.</div><div>Please remember to take a picture of where the tapes were first applied.</div></div>		
<div>6</div> <div>Remove the Power Cables and Speaker Cables.</div>		
Remove the LVDS Cable, Panel Wire Cable and ASSY BOARD P-FUNCTION ASSY Cable.		
Remove the NETWORK (WIFI COMBO) Cable.		

Description	Picture Description	Screws
<p>7 Remove the screws of ASSY PCB MAIN and DC VSS-LED TV PD BD.</p> <ul style="list-style-type: none"> • ASSY PCB MAIN : 4 EA • DC VSS-LED TV PD BD : 5 EA <p> NOTE LVDS Cable</p> 		<p>Torque : 7~ 8Kgf.cm.</p>  <p>6001-003016</p>
<p>8 Remove the ASSY SPEAKER on both side (L/R).</p>		
<p>9 Remove the ASSY SPEAKER (L/R).</p>	 <p>ASSY SPEAKER (L/R)</p>	
<p>10 Remove the cables and 4 screws from the ASSY T CON. Finally carefully remove the ASSY T CON.</p>	 <p>Cables</p>	<p>Torque : 7~8Kgf.cm</p>  <p>6001-003075</p>
<p>11 Remove the NETWORK (WIFI COMBO).</p> <ul style="list-style-type: none"> • Remove the NETWORK (WIFI COMBO) unit by moving it from left to right. 		

3. Disassembly and Reassemble

Description	Picture Description	Screws
<div>12</div> <div>Remove the IR unit.</div> <div><div>Remove the IR unit by moving it from up to down.</div></div>		
<div>13</div> <div>Remove the JOG unit.</div> <div><div>Remove the JOG unit by moving it from bottom to top.</div></div>		
<div>14</div> <div>Completed disassembly.</div> <div><div>Panel</div></div>		

 **NOTE**

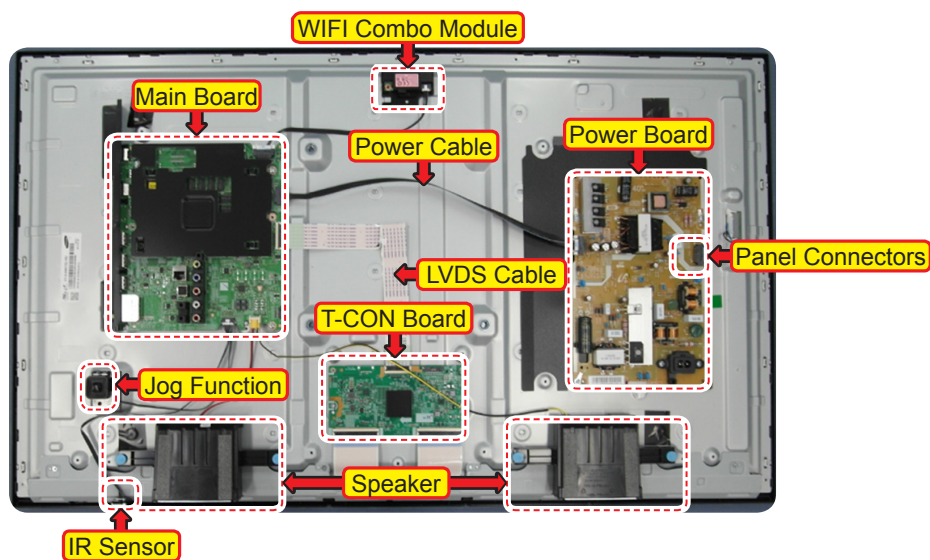
Reassembly procedures are in the reverse order of disassembly procedures.

4. Troubleshooting

4-1. Troubleshooting

4-1-1. Previous Check


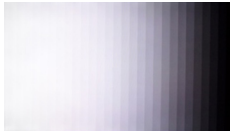
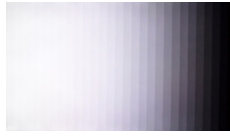
■ Check list for initial operation



4-2. How to Check Fault Symptom

4-2-1. Video

■ Customer Picture Test

Main Board	Pre FRC	Post FRC	Problem
			
Pass	Pass	Pass	Check Signal Source and other inputs
Fail	Pass	Pass	Main Board or LVDS Cable
Fail	Fail	Pass	T-Con or Board
Fail	Fail	Fail	T-Con or Panel

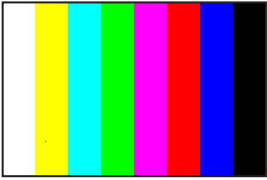
■ MAIN / T-CON

Troubleshooting

CHECK TEST PATTERNS

- 1 Verify "Pattern Sel".
- 2 Verify "US Post Pattern".

• **ENTER** : Factory mode → SVC → Info → **Test Pattern**



SOC TCON Test Pattern

SOC TCON Pattern Level

SOC TCON2 Test Pattern

SOC TCON2 Pattern Level

1 **Scaler Pattern**

Main Board

HAWK-M

↔ **LVDS** ↔

4 **SoC TCON Test Pattern**
(Not available for UHD Models)

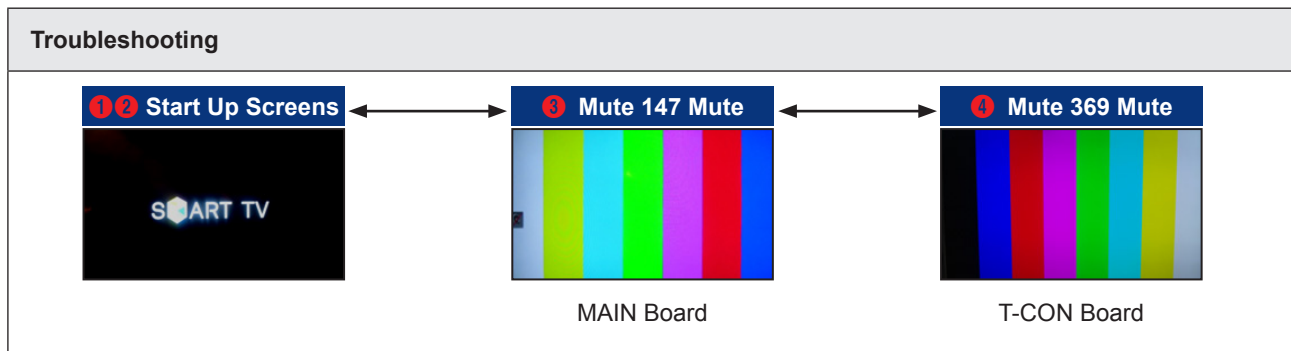
UFT BOARD

T-CON

2 **US Post Pattern**

Video Test

- 1 Power TV ON.
- 2 Verify initial Start Up Screens with Power On.
- 3 Press Mute 147 Mute to view Test Pattern from the **MAIN Board**.
- 4 Press Mute 369 Mute to view Test Pattern from **T-CON Board**.



4-2-2. WIFI Module

Troubleshooting

- ① Check **Wired MAC Address** and **Wireless MAC Address** at **Contact Samsung**.

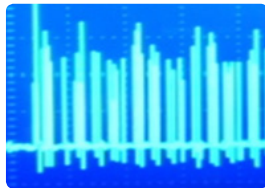
-Wired MAC Address: c4:57:6e:da:c3:54 ✓ **Wired MAC Address**
 -Wireless MAC Address: BC:14:85:5B:10:BF ✓ **Wireless MAC Address**

- ② Check **Wired MAC** and **Wireless MAC** at **Factory Mode** screen. (Success/Failure)

- Wired MAC errors : **Main Board** is defective.
- Wireless MAC errors :

Model : UE**JU6000K
 Wired MAC ---- ✓ **Wired (SUCCESS)**
 Wireless MAC ---- ✓ **Wireless (SUCCESS)**
 WIFI Version : 0000

- ③ Check the Wi-Fi Module Connector voltage.



Wi-Fi Signal
(500mv P-P)



Pins	1	2	3	4	5	6
Standby	0	0	0	0	0.8	0
Power ON	0	.04Vdc Wi-Fi Sig.	.04Vdc Wi-Fi Sig.	5.3Vdc	3.3Vdc	3.3Vdc

- All Measurements in the Chart are DC Volts with Multi Meter.



Voltage is normal, but Wi-Fi Sig. pins (DC Ref.) If you do not measure, Wi-Fi Module can possibly defective.

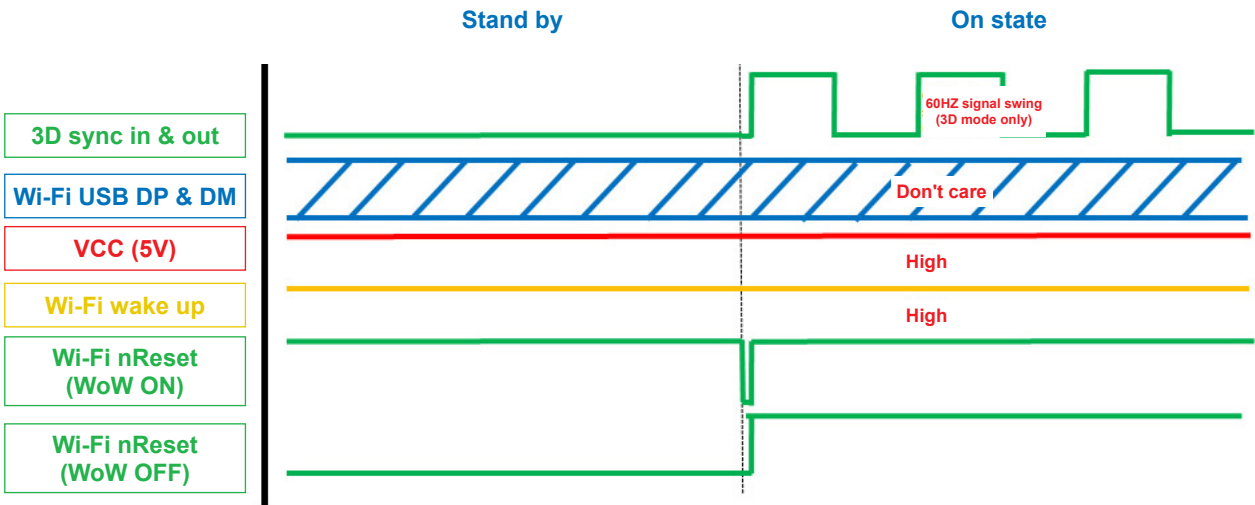
■ WIFI Combo Pin Map



Pin #		Signal	I/O	Description
1	Wi-Fi	GND	GND	Ground
2		USB DP	I/O	WiFi USB interface
3		USB DM	I/O	WiFi USB interface
4		Vcc	I	5V Power
5		Wake up	I	WiFi Wake up
6		Reset	O	WiFi Block Reset

■ 15' WIFI Combo

- Waveforms of combo Module Pins (3.3V except VCC 5V)



4-2-3. Apps / Photos, Videos & Music

■ Read Before Playing Photo, Video, or Music Files

Limitations on use of photo, video, and music files

- The TV supports MSC (Mass Storage Class) USB devices only. MSC is a class designation for mass storage devices. Types of MSC devices include external hard drives, flash card readers, and digital cameras. (USB hubs are not supported.) These kinds of devices must be connected directly to the TV's USB port. The TV may not be able to recognize the USB device or read the files on the device if it is connected to the TV via a USB extension cable. Do not disconnect the USB device while transferring files. Power the TV "ON".
- When connecting an external hard drive, use the USB (HDD) port. We recommend that you use an external hard drive with its own power adapter.
- Certain digital cameras and audio devices may not be compatible with the TV.
- If there are multiple USB devices connected to the TV, the TV might not be able to recognize some or all the devices. USB devices that use high-power input should be connect to the USB [5V, 1A] port.
- The TV supports the FAT, exFAT, and NTFS file systems.
- After sorting files in the Folder view mode, the TV can display up to 1000 files per folder. If the USB device contains more than 8,000 files and folders, however, some files and folders might not be accessible.
- The PTP (pier to pier) connection mode is available only for digital cameras. If you connect a smartphone or tablet to the TV using PTP mode, the TV will not recognize it.

■ Web Browser

- Select Web Browser. The browsing screen may differ from the one on your computer.
- The web browser is not compatible with Java applications.
- You can download the supported types of files, such as videos, mp3 files, and images, but you cannot download files that are not supported by the TV. If you attempt to download an unsupported file, you will receive an error message instead.
- The web browser may not be able to access certain websites.
- The TV does not support playback of flash videos.
- E-commerce for online purchases is not supported.
- With websites that have scrollable windows, scrolling a window can result in corrupted characters.
- ActiveX is not supported.
- Certain options are not accessible in Link Browsing mode. (Switch to Pointer Browsing to activate those options.)
- Only a limited number of fonts are supported. Certain symbols and characters may not be displayed properly.
- The response to remote commands and the resulting on-screen display may be delayed while a webpage is loading.
- Loading a webpage may be delayed or suspended completely with certain operating systems.
- The copy and paste operations are not supported.
- When composing an email or a simple message, certain functions such as the font size and color selection may not be available.
- There is a limit to the number of bookmarks and the size of the log file that can be saved.
- The number of windows that can be opened concurrently differs with the search conditions and the TV model.
- The web browsing speed will differ with the network environment.
- Embedded videos can play at the same time the PIP (picture-in-picture) function is operating.
- The web browser supports .mp3 audio files only.
- If the Clock (MENU > System > Time > Clock) has not been set, the browsing history will not be saved.
- The browsing history is saved from latest to oldest, with the oldest entries being overwritten first.
- Depending on the types of video/audio codecs supported, it might not be possible to play certain video and audio files while playing Flash content.
- Video sources from PC-optimized streaming service providers may not play properly on our proprietary web browser.
- Using the on-screen QWERTY keyboard automatically disables PIP (except when you are entering a URL).

4-3. Factory Mode Adjustments

4-3-1. Detail Factory Option


NOTE

If you replace the main board with new one, please change the factory option as well.
The options you must change are "**Type**".

■ UE**JU6000KXZF

Inches		40"	48"	55"
PANEL	Vendor	SEC	KOHS	KOHS
	Code	BN95-02280A	BN95-02281A	BN95-02282A
	Spec.	CY-GJ040HGLV5V	CY-GJ048HGLV4V	CY-GJ055HGEV3V
SMPS BOARD	Vendor	HANSOE	DYREL	DYREL
	Code	BN96-35335A	BN96-35336A	BN96-35336A
	Spec.	L40S5_FHSV	L55S5_FDYV	L55S5_FDYV
MAIN BOARD	Chassis Ass'y	BN91-16628Z	BN91-16628X	BN91-16628W
	PBA Ass'y	BN94-09749P	BN94-09749Q	BN94-09749R
Byte	Item			
0	Factory Reset	-		
1	Type	40A6AU2VJ	48A6AU2VJ	55B6AU1VJ
2	Local set	EU_FRANCE	EU_FRANCE	EU_FRANCE
3	SW Model	UJU6000	UJU6000	UJU6000
4	BOM Model	6000	6000	6000
5	Tuner	DVB-T2/C	DVB-T2/C	DVB-T2/C
6	Ch table	NONE	NONE	NONE

4-3-2. Entering Factory Mode

To enter 'Service Mode' Press the remote -control keys in this sequence :

- If you do not have Factory remote control



- If you have Factory remote control



- Some items are not available without a factory remote.

Option		
Control	T-HKM6AKUC-XXXX.XX T-HKMAKUS-XXXX	Main SW Version Sub Version (Main, Jak)
Debug		
SVC	rel-hawkall-atsc-rca-hawk-m-uhd_XXXXXXX.X (Perf)	Bluetooth Version E-Manual Version
ADC/WB	BT Version : Not Support E-MANUAL : HMUATSCJ-X.XXX CAMERA VERSION : **** BLASTER VERSION : Not Support	
Advanced	E-POP Version : HAWKMUD-XXXX.X EDID SUCCESS HDCP SUCCESS CALIB : AV/COMP/PC/HDMI/ OPTION : 40A6AU2VJ,EU_GER,6070,NONE DTCP Not Support TCON[SDC FU11A] EEPROM[3333] Model : UE**JU6000K Wired MAC ---- Wireless MAC ---- WIFI Version : 0000 CO Nf/ W/ M/ D/ HX PO AO O SO N/ RO SC/ Six Factory Data Ver : XXX / EERC Version : XXX CPLD/LD : N/A SmartControl : 0 Date of purchase : --/------	FRC SW Version TCON Version Condition of Wired Mac Condition of Wireless Mac

4-3-3. Factory Data

■ Option

Factory Menu Name	Data	Range
Factory Reset	-	
Type	40A6AU2VJ 48A6AU2VJ 55B6AU1VJ	
Local Set	EU_FRANCE	
SW Model	UJU6000	
BOM Model	6000	
TUNER	DVB-T2/C	
Ch Table	NONE	
MRT Option		
Engineer Option		

■ Control

Factory Menu Name	Data	Range
EDID		
EDID ON/OFF	Off	
EDID WRITE ALL	...	
EDID WRITE HDMI	...	
EDID WRITE PC	...	
HDMI EDID Ver	...	
HDMI EDID Port	...	
Sub Option		
RS-232 Jack	Debug	RS-232 mode setting
EXT Link Support	ON	
Serial Log On/Off	OFF	
Watchdog	OFF	
FRC Monitoring	OFF	
Checksum	0x0000	
Fast Boot In Production	OFF	
Uart Enable	ON	
EEPROM RESET		
ECO IC TYPE	MC8121	
Info Link Server Type	development	
Info Link Country	None	
TTX Group	User OSD	

Factory Menu Name	Data	Range
Visual Test	Disable	
OPTION_SWU		
RF Remocon Support	OFF	
CDD mode	...	
DPMS Support	OFF	
T-CON Device	Status OK	
RM		
LMN 1ST THRESHOLD	80	
LMN 2ND THRESHOLD	60	
LMN 3RD THRESHOLD	40	
EOS Click	OFF	
BP PMS Reset	1	
FAnet Thread	2	
User InstantOn Default Value	ON	
CI COLD Version	1	
ACM_MC	ON	
HotkeyList	7K_SC	
UNIQUE TRIPLET	ON	
FS_FAV	OFF	
Private Range USE	ON	
SCSA Support	ON	
OCM Reboot	ON	
SPI Protection		
FKP Server Type	Default	
Hotel Option		
Hospitality Mode	OFF	
Power On		
Menu OSD		
Operation		
Music Mode		
External Source		
Eco Solution		
Cloning		
Shop Option		
Exhibition Mode	OFF	
3D CUBE	OFF	
Peak Mode	OFF	

4. Troubleshooting

Factory Menu Name	Data	Range
Metadata	ON	
Asia Option		
Unbalance	OFF	
AF Level adjust	0	
TX Power Level	0	
Mono Last Memory	OFF	
H Shaking	0	
SOUND		
High Devi	OFF	
Carrier_Mute	ON	*If the broadcast signal is not good, TV will complement the characteristics of the signal (most use when weak signal comes from the growing area countries)
Pilot Level High Thld	0x20h	*If the noise comes from weakness-electromagnetic field, TV will be set Mute automatically (Only default on in North America)
Pilot Level Low THLD	0x10h	
Carrier2 Amp High ThLD	9	
Carrier2 Amp Low THLD	6	
Amp Volume	0xc4h	
Amp Scale	0x9ah	* The High threshold value of stereo signal(If Pilot level is greather than High threshold value, recognize Stereo signal)
Amp EQ Check Sum	0x010951E4	* The Low threshold value of stereo signal(If Pilot level is less than Low threshold value, recognize Mono signal)
Amp Local Check Sum	0x00000000	
Subwoofer Support	0	
Woofer Type	0	
Woofer Volume	0xc6h	
Woofer Scale	0x56h	
Woofer Check sum	NONE	
PEQ Inx	1	
PEQ Test	Ready	
Amp Model	NTP7415	
Speaker EQ	ON	
Bottom CheckSum	NONE	
Wall Filter Type	0	
SRS Tuning Parm	0	
SPDIF PCM Gain	-9	
AudioDock BT Delay	90	

Factory Menu Name	Data	Range
3D_Glass BT delay	50	
Mic Scale	OFF	
India Sound	0	
Speaker Delay Normal	0	
NTV CU Delay	0	
Lipsync Inx	13	
Lipsync CheckSum	0x644C	
Lipsync USB Test	Ready	
Lipsync BT CheckSum	0x0000	
TP VOLUME	0xc9h	
TP Scale	0x64h	
TP EQ CheckSum	NONE	

■ Debug

Factory Menu Name	Data	Range
Spread Spectrum		
DDR Margin		
BT_ON_OFF	ON	
RF Mute Time	600ms	
FRC		
Tuner Margin	3	
MPEG Margin	20	
H.264 Margin	15	
CAM Wait Time	0	European specifications
TCON_TEMP READ	0	
TEMP LAST	6000	
DCC VERSION	0xDA3C	
DCC CHK SEL	0	
DCC CHECK LOCAL	0x0	
DCC CHECK TOTAL	0x0	
Voice Debug	OFF	
Power Mnagement		
Cert Option	Waiting	
RM_BIST_DTV	0	
RM_BIST_ATV	0	
RM_BIST_CABLE	0	
SerDES Check		

4. Troubleshooting

Factory Menu Name	Data	Range
EU_CIS	0	
Stress Mode	OFF	
Log Analyzer	ON	
Error Popup On/Off	OFF	
Deadlock KILL	OFF	
CES Mode ON/Off	NONE	
CES Option	OFF	
CES Convergence Option	OFF	
TCON Demura Bypass	OFF	
BT DUT	OFF	
Reproduce Module	ON	
21_9		

■ SVC

Factory Menu Name	Data	Range
Self Test(for HW)		
Info		
Upgrade		
T-CON Usb Download	NG	* UpgradeT-CON eeprom
T-CON CheckSum	0x33	* virsion of T-CON eeprom
T-CON2 Usb Download	Failure	
T-CON2 CheckSum		
PANEL EEPROM UPGRADE	Failure	
PANEL FLASH UPGRADE	Failure	
Logic Usb D/L	...	
SUBMICOM UPGRADE	Ready	* Upgrade Sub-Micom Program
SUBMICOM JP USB UPGRADE	Ready	
BT UPGRADE		* Upgarde BT(There is upgrade program in Main-Image)
BT FREPAIRING	ON	
Function Upgrade	Failure	
FRC3D FW UPGRADE		
FRC3D LD UPGRADE		
FRC2 3D FW UPGRADE		
Camera Upgade		* Upgarde Camera module(There is upgrade program in Main-Image)
Mic Upgrade		* Upgarde MIC in Camera module(There is upgrade program in Main-Image)

Factory Menu Name	Data	Range
Jump UPGRADE	Failure	
IR Blaster Upgrade	Failure	
IR Blaster delay time	50	
NTV Cu Update	Failure	
UD LDC PROFILE UPGRADE	Failure	
Pic Data USB Update	P:066/M:002	
Audio Data USB Update		
Eco Data USB Update	E:066/M:002	
CI CPLD Upgrade	Failure	
TCON DEMURA FW UPGRADE	NG	
Reset		
OPTION_HDMI		
DVB CI		European specifications
Test Pattern		* the Output of test pattern from each IC
Other setting		
SVC Panel	ORIGINAL	
Tizen		
S/N		

■ ADC/WB

Factory Menu Name	Data	Range
ADC		
AV Calibration	NA	
Comp Calibration	NA	
PC Calibration	NA	
HDMI Calibration	NA	
ADC Result		
1st_Y_GH	255	
1st_Y_GL	246	
1st_Cb_BH	...	
1st_Cb_BL	...	
1st_Cr_RH	...	
1st_Cr_RL	..	
2nd_R_L	129	
2nd_G_L	129	
2nd_B_L	129	
2nd_R_H	109	

4. Troubleshooting

Factory Menu Name	Data	Range
2nd_G_H	109	
2nd_B_H	109	
White Balance		
R-Offset	128	
G-Offset	128	
B-Offset	128	
R-Gain	128	
G-Gain	128	
B-Gain	128	
WB-W2_R_Offset	128	
WB_W2_B_Offset	128	
WB_W2_R_Gain	152	
WB_W2_B_Gain	79	
WB_N_R_Offset	128	
WB_N_B_Offset	128	
WB_N_R_Gain	138	
WB_N_B_Gain	122	
MGA		
MGA On/Off	OFF	
R1_Gain	512	
G1_Gain	512	
B1_Gain	512	
R2_Gain	512	
G2_Gain	512	
B2_Gain	512	
R3_Gain	512	
G3_Gain	512	
B3_Gain	512	
R4_Gain	512	
G4_Gain	512	
B4_Gain	512	
R5_Gain	512	
G5_Gain	512	
B5_Gain	512	
R6_Gain	512	
G6_Gain	512	
B6_Gain	512	

Factory Menu Name	Data	Range
R7_Gain	512	
G7_Gain	512	
B7_Gain	512	
R8_Gain	512	
G8_Gain	512	
B8_Gain	512	
R9_Gain	512	
G9_Gain	512	
B9_Gain	512	
R10_Gain	512	
G10_Gain	512	
B10_Gain	512	
SPI White Balance		
SPI MGA		
WB Data to SPI		

■ Advanced

4-4. White Balance

4-4-1. Calibration

1. Into the Factory Mode.
2. Select **ADC/WB** menu.
3. Select **ADC** menu.

Option	AV Calibration
Control	Comp Calibration
Debug	PC Calibration
SVC	HDMI Calibration
ADC/WB	
Advanced	

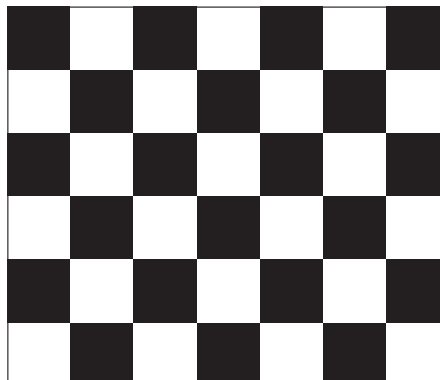
4-4-2. Service Adjustment

You must perform Calibration in the Lattice Pattern before adjusting the White Balance.

■ Color Calibration

- Adjust Specification

Source	Setting Mode	Pattern	Use Equipment
HDMI	1280 x 720@60 Hz	Pattern #24 (Chess Pattern)	CA210 & Master MSPG925 Generator



(Chess Pattern)

- Use other equipment only after comparing the result with that of the Master equipment.

Input mode	Calibration	Pattern
CVBS IN (Model_#1)	Perform in NTSC B&W Pattern #24	Lattice
Component IN (Model_#6)	Perform in 720p B&W Pattern #24	Lattice
PC Analog IN (Model_#21)	Perform in VESA XGA (1024x768) B&W Pattern #24	Lattice
HDMI IN	Perform in 720p B&W Pattern #24	Lattice

Method of Color Calibration (AV)

1. Apply the NTSC Lattice (N0. 3) pattern signal to the AV IN 1 port.
2. Press the Source key to switch to "AV1" mode.
3. Enter Service mode.
4. Select the "ADC" menu.
5. Select the "AV Calibration" menu.
6. In "AV Calibration Off" status, press the "▶" key to perform Calibration.
7. When Calibration is complete, it returns to the high-level menu.
8. You can see the change of the "AV Calibration" status from Failure to Success.

Method of Color Calibration (Component)

1. Apply the 720p Lattice (N0. 6) pattern signal to the Component IN 1 port.
2. Press the Source key to switch to "Component1" mode.
3. Enter Service mode.
4. Select the "ADC" menu.
5. Select the "Comp Calibration" menu.
6. In "Comp Calibration Off" status, press the "▶" key to perform Calibration.
7. When Calibration is complete, it returns to the high-level menu.
8. You can see the change of the "Comp Calibration" status from Failure to Success.

Method of Color Calibration (PC)

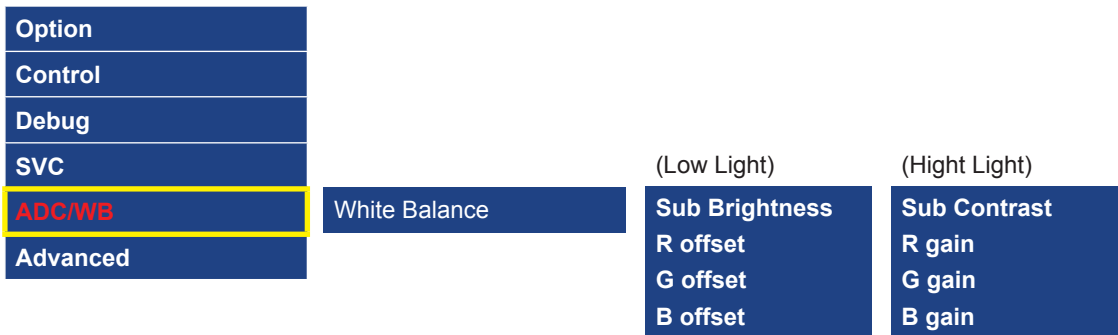
1. Apply the VESA XGA Lattice (N0. 21) pattern signal to the PC IN port.
2. Press the Source key to switch to "PC" mode.
3. Enter Service mode.
4. Select the "ADC" menu.
5. Select the "PC Calibration" menu.
6. In "PC Calibration Off" status, press the "▶" key to perform Calibration.
7. When Calibration is complete, it returns to the high-level menu.
8. You can see the change of the "PC Calibration" status from Failure to Success.

Method of Color Calibration (HDMI)

1. Apply the 720p Lattice (N0. 6) pattern signal to the HDMI1/DVI IN port.
2. Press the Source key to switch to "HDMI1" mode.
3. Enter Service mode.
4. Select the "ADC" menu.
5. Select the "HDMI Calibration" menu.
6. In "HDMI Calibration Off" status, press the "▶" key to perform Calibration.
7. When Calibration is complete, it returns to the high-level menu.
8. You can see the change of the "HDMI Calibration" status from Failure to Success.

4-4-3. Adjustment

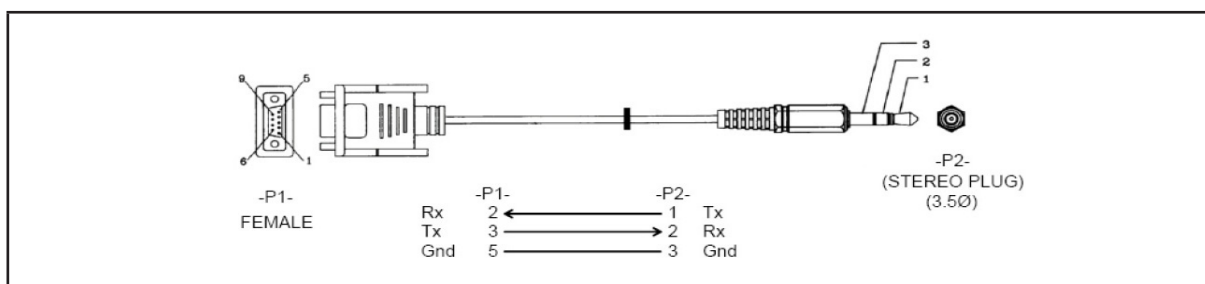
- 1. Into the Factory Mode.
- 2. Select **ADC/WB** menu.
- 3. Select **White Balance** menu.



4-5. RS-232C

• RS232C Control

- Port : COM#(Serial)
- Baud rate : 9600
- Data Bit : 8 bit
- Parity : None
- Stop Bits : 1
- Flow Control : None



• Description of RS232C

Pin#	Name	Full Name	Pin#	Name	Full Name	Pin#	Name	Full Name
1	CD	Carrier Detect	4	DTR	Data Terminal Ready	7	RTS	Request To Send
2	RxD	Received Data	5	GND	Signal Ground	8	CTS	Clear To Send
3	TxD	Transmitted Data	6	DSR	Data Set Ready	9	RI	Ring Indicator

4-6. AV Control Tab

Control Item				Cmd1	Cmd2	Cmd3	Value
General	Power	Power		0x00	0x00	0x00	0x00
		Off					0x01
		On					0x02
	Volume	Direct		0x01	0x00	0x00	(0~100)
		Up				0x01	0x00
		Down				0x02	0x00
	Mute			0x02	0x00	0x00	0x00
		Ch.	Direct	0x04	-		
			Continuous	0x03	0x00	0x01	0x00
			Down			0x02	0x00

Control Item				Cmd1	Cmd2	Cmd3	Value
Input	Source List	TV	TV	0x0a	0x00	0x00	0x00
			AV			0x01	0x00
		AV	AV1				0x01
			AV2				0x01
			AV3				0x02
		S-Video	S-Video1			0x02	0x00
			S-Video2				0x01
			S-Video3				0x02
		Component	Component1			0x03	0x00
			Component2				0x01
			Component3				0x02
		PC	PC1			0x04	0x00
			PC2				0x01
			PC3				0x02
		HDMI	HDMI1			0x05	0x00
			HDMI2				0x01
			HDMI3				0x02
			HDMI4				0x03
		DVI	DVI1			0x06	0x00
			DVI2				0x01
			DVI3				0x02
		RVU	RVU			0x07	0x00

Control Item				Cmd1	Cmd2	Cmd3	Value
PICTURE	Mode	Dynamic(Entertain)		0x0b	0x00	0x00	0x00
		Standard					0x01
		Movie					0x02

Control Item				Cmd1	Cmd2	Cmd3	Value
PICTURE	Mode	Natural					0x03
		CAL-NIGHT					0x04
		CAL-DAY					0x05
		BD Wise					0x06
		Relax					0x07
	BackLight (CellLight)		0~20		0x01	0x00	(0~20)
	Contrast		0~100		0x02	0x00	(0~100)
	Brightness		0~100		0x03	0x00	(0~100)
	Sharpness		0~100		0x04	0x00	(0~100)
	Color		0~10		0x05	0x00	(0~100)
	Tint	G/R			0x06	0x00	(0~100)
	Advanced Settings	Black Tone	Off		0x07	0x00	0x00
			Dark				0x01
			Darker				0x02
			Darkest				0x03
		Dynamic Contrast	Off			0x01	0x00
			Low				0x01
			Medium				0x02
			High				0x03
		Shadow Detail	-2 ~ 2			0x02	(-2~2)
		Gamma	-3 ~ 3			0x03	(-3~3)
		RGB Only Mode	Off			0x05	0x00
			Red				0x01
			Green				0x02
			Blue				0x03
		Color Space	Auto			0x06	0x00
			Native				0x01
			Custom				0x02
		White Balance	R-Offset(LCD)			0x07	(0~50)
		White Balance	G-Offset(LCD)			0x08	(0~50)
		White Balance	B-Offset(LCD)			0x09	(0~50)
		White Balance	R-Gain(LCD)			0x0a	(0~50)
		White Balance	G-Gain(LCD)			0x0b	(0~50)
		White Balance	B-Gain(LCD)			0x0c	(0~50)
		White Balance	Reset(LCD)			0x0d	0x00
		Flesh Tone	-15 ~ 15			0x0e	(-15~15)

New function of 12"
(only PDP TV)

Not support

4. Troubleshooting

Control Item				Cmd1	Cmd2	Cmd3	Value	
PICTURE	Advanced Settings	Edge Enhancement	Off			0x0f	0x00	Not support
			On				0x01	
		xvYCC	Off			0x10	0x00	
			On				0x01	
		Motion Lighting	Off			0x11	0x00	
			On				0x01	
		Color Space Custom Color	Red			0x12	0x00	
			Green				0x01	
			Blue				0x02	
			Yellow				0x03	
			Cyan				0x04	
			Magenta				0x05	
		Color Space Custom Color Red Value	0~100			0x13	0~100	
		Color Space Custom Color Green Value	0~100			0x14	0~100	
		Color Space Custom Color Blue Value	0~100			0x15	0~100	
		LED Motion Plus	Off		0x0a	0x07	0x00	
			On(Normal)				0x01	
			Cinema				0x02	
			Ticker				0x03	
	Picture Option	Color Tone	Cool		0x0a	0x00	0x00	Change Normal → Standard mode
			Standard				0x01	
			Warm1				0x02	
			Warm2				0x03	
		Digital Noise Filter	Off			0x02	0x00	
			Low				0x01	
			Medium				0x02	
			High				0x03	
			Auto				0x04	
			Auto Visualization				0x05	
		MPEG Noise Filter	Off			0x03	0x00	
			Low				0x01	
			Medium				0x02	
			High				0x03	
			Auto				0x04	

Control Item				Cmd1	Cmd2	Cmd3	Value
PICTURE	Picture Option	HDMI Black Level	Normal			0x04	0x00
			Low				0x01
		Film Mode	Off			0x05	0x00
			Auto1				0x01
			Auto2				0x02
			Cinema Smooth				0x03
		Auto Motion Plus	Off			0x06	0x00
			Clear				0x01
			Standard				0x02
			Smooth				0x03
			Custom				0x04
			Demo				0x05
	Screen Adjustment	Picture Size	16:9	0x0b	0x0a	0x01	0x00
			Zoom1				0x01
			Zoom2				0x02
			Wide Fit				0x03
			4:3				0x04
			Screen Fit				0x05
			Smart View I				0x06
			Smart View II				0x07
			Auto Wide				0x08
			Wide Zoom				0x09
			Zoom				0x0a
	Reset Picture	Reset Picture		0x0b	0x0b	0x00	0x00
	3D	3D Mode	Off	0x0b	0x0c	0x00	0x00
			2D → 3D				0x01
			Side By Side				0x02
			Top Bottom				0x03
			Line By Line				0x04
			Vertical Line				0x05
			Checker BD				0x06
			Frame Sequence				0x07
		3D → 2D	Off			0x01	0x00
			On				0x01

New function of 12"
(only PDP TV)

New function of 12"
(only DVB TV)

4. Troubleshooting

Control Item				Cmd1	Cmd2	Cmd3	Value
PICTURE	3D	3D View Point				0x02	(-5~5)
		Depth				0x03	(1~10)
		3D Auto View	Off			0x05	0x00
			Message Notice				0x01
			On				0x02

Control Item				Cmd1	Cmd2	Cmd3	Value
Sound	Sound Mode	Standard		0x0c	0x00	0x00	0x00
		Music					0x01
		Movie					0x02
		Clear Voice					0x03
		Amplify					0x04
	Equalizer	Balance			0x01	0x00	(0~20)
		100hz				0x01	(0~20)
		300hz				0x02	(0~20)
		1khz				0x03	(0~20)
		3khz				0x04	(0~20)
		10khz				0x05	(0~20)
		Reset				0x06	0x00
	SRS TruSurround HD (echo)	Off			0x02	0x00	0x00
	Virtual Surrond (echo)	On					0x01
	SRS TruDialog (echo)	Off			0x03	0x00	0x00
	Dialog Clarify (X9)	On					0x01
	Preferred Language	English			0x04	0x00	0x00
		Spanish					0x01
		French					0x02
		Korean					0x03
		Japanese					0x04
	Multi-Track Sound	Mono			0x05	0x00	0x00
		Stereo					0x01
		SAP					0x02
	Auto Volume	Off			0x06	0x00	0x00
		ON					0x01

Control Item				Cmd1	Cmd2	Cmd3	Value
Sound	Auto Volume	Night					0x02
	Speaker Select	TV Speaker			0x07	0x00	0x00
		External Speaker					0x01
	Sound Select	Main			0x08	0x00	0x00
		Sub					0x01
	Sound Reset	Sound Reset			0x09	0x00	0x00
	3D Audio	Off			0x0a	0x00	0x00
		Low					0x01
		Medium					0x02
		High					0x03
	Auto Stereo	Manual			0x0b	0x00	0x00
		Auto					0x01

Only for korea model

Control Item				Cmd1	Cmd2	Cmd3	Value
KEY	Key Generation			0x0d	0x00	0x00	refer to table
OSD	Show/Hide Control	Show		0x0e	0x00	0x00	0x00
		Hide					0x01
Get Status	Power (On/Off)			0xf0	0x00	0x00	0x00
	Volume(0~100)			0xf0	0x01	0x00	0x00
	Mute (On/Off)			0xf0	0x02	0x00	0x00
	Channel Number			0xf0	0x03	0x00	0x00
	Source (TV/AV/.../HDMI/...)			0xf0	0x04	0x00	0x00
	Picture Size			0xf0	0x05	0x00	0x00
	3D (On/Off)			0xf0	0x06	0x00	0x00
	Picture Mode			0xf0	0x07	0x00	0x00
	Sound Mode			0xf0	0x08	0x00	0x00

4-7. Updating the TV's Software

- [MENU/123](#) → [MENU](#) → [Support](#) → [Software Update](#)

You can view your TV's software version and update it if necessary.

■ Updating the TV's software to the latest version

- [MENU/123](#) → [MENU](#) → [Support](#) → [Software Update](#) → [Update now](#)

You can update your TV's software by downloading the update from the Internet directly to your TV or copying the update from a USB device that contains it to your TV.

- This function requires an Internet connection.
- Save the update package in the USB device's top-level folder. Otherwise, the TV will not be able to locate the update package.



DO NOT turn off the TV's power until the update is complete. The TV will turn off and on automatically after completing the software update. All video and audio settings return to the default settings after a software update.

■ Updating the TV automatically

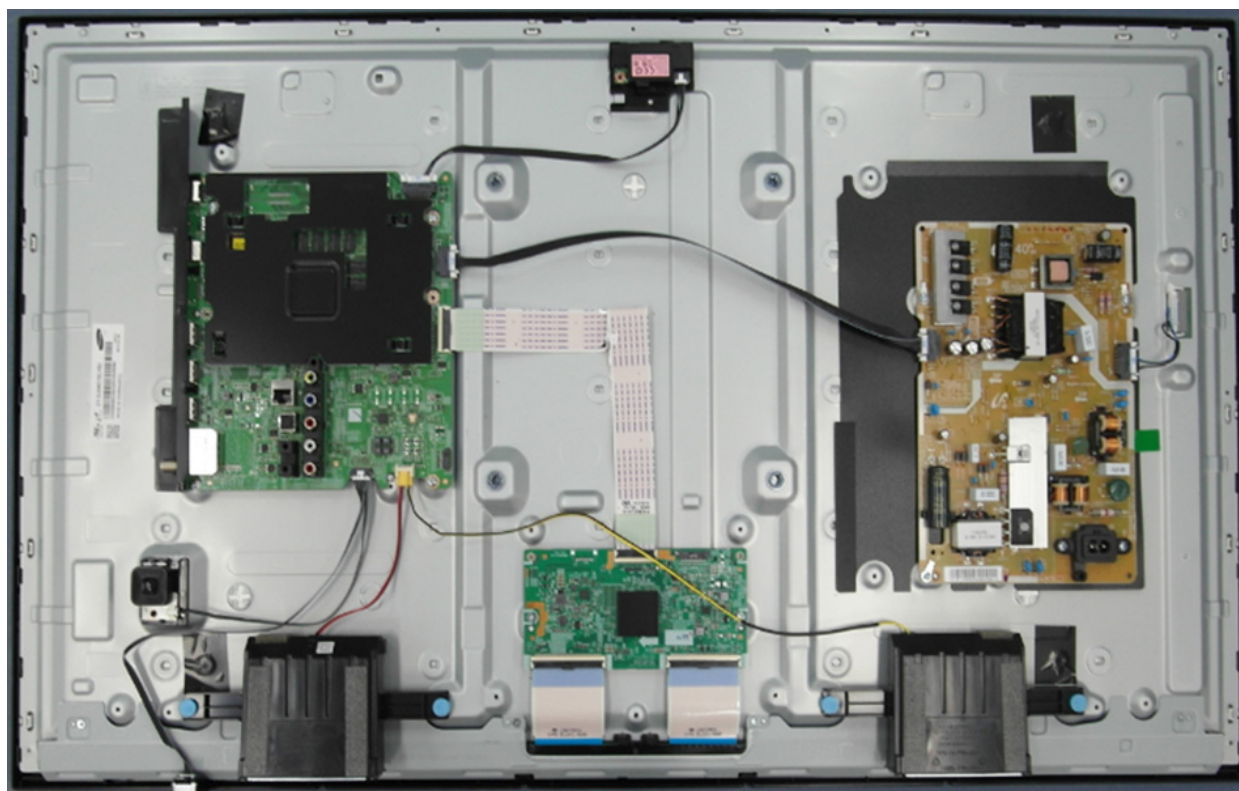
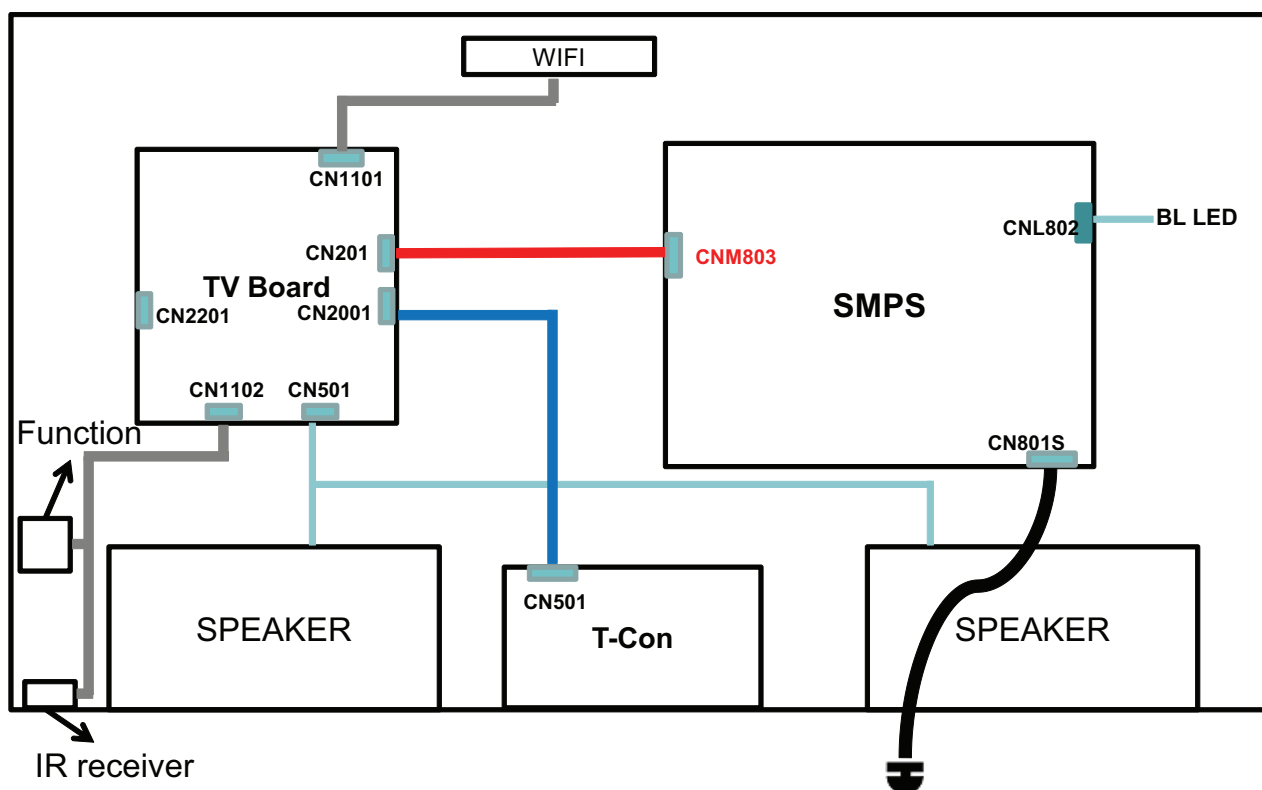
- [MENU/123](#) → [MENU](#) → [Support](#) → [Software Update](#) → [Auto Update](#)

If the TV is connected to the Internet, you can have the TV's software update itself automatically while you are watching the TV. When the background update is completed, it is applied the next time the TV is turned on.

- This function may take a longer time if a different networking function is running concurrently.
- This function requires an Internet connection.
- If you agree to the Smart Hub terms and conditions, Auto Update is set to On automatically. If you do not want the TV's software to update itself automatically, set Auto Update to Off.

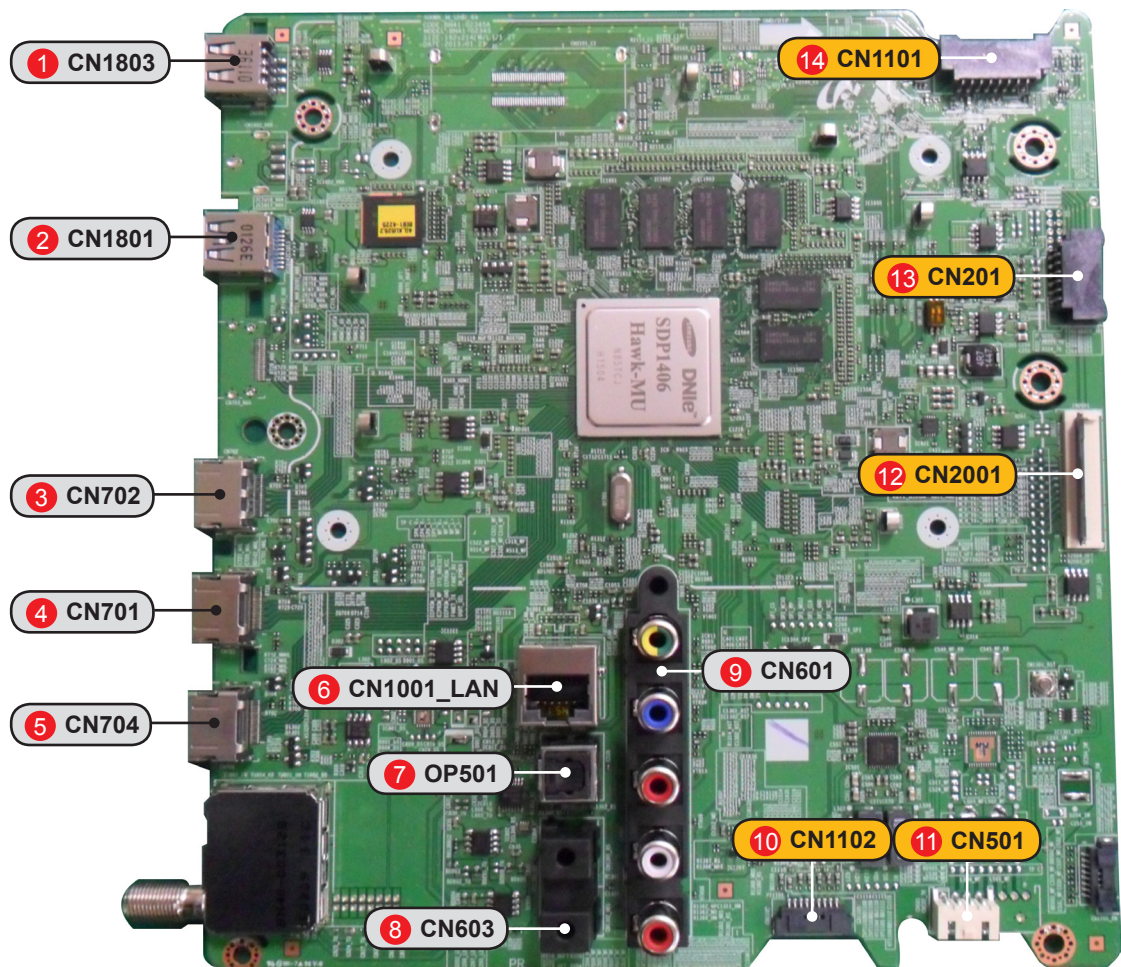
5. Wiring Diagram

5-1. Wiring Diagram



5-2. Connector

■ Main Board



■ Main Board Pin Map

1 CN1803			
1	A5V_USB3_PW	3	MOIP+_USB
2	MOIP-_USB	4	GND

2 CN1801			
1	B5V_USB1_PW	6	USB1RX+_USB30
2	USB1-_USB	7	GND
3	USB1+_USB	8	USB1TX-_USB30
4	GND	9	USB1TX+_USB30
5	USB1RX-_USB30		

③ CN702 (ARC)

1	HDMI2_RX2+_HDMI	11	GND
2	GND	12	HDMI2_RX_CLK-_HDMI
3	HDMI2_RX2-_HDMI	13	CEC
4	HDMI2_RX1+_HDMI	14	ARV1_SINGLE
5	GND	15	HDMI2_SCL_DDC_I2C
6	HDMI2_RX1-_HDMI	16	HDMI2_SDA_DDC_I2C
7	HDMI2_RX0+_HDMI	17	GND
8	GND	18	HDMI2_5V_PW
9	HDMI2_RX0-_HDMI	19	HDMI2_HOT_PLUG
10	HDMI2_RX_CLK+_HDMI		

④ CN701 (MHL)

1	HDMI3_RX2+_HDMI	11	GND
2	GND	12	HDMI3_RX_CLK-_HDMI
3	HDMI3_RX2-_HDMI	13	CEC
4	HDMI3_RX1+_HDMI	14	N.C
5	GND	15	HDMI3_SCL_DDC_I2C
6	HDMI3_RX1-_HDMI	16	HDMI3_SDA_DDC_I2C
7	HDMI3_RX0+_HDMI	17	GND
8	GND	18	HDMI3_5V_PW
9	HDMI3_RX0-_HDMI	19	HDMI3_HOT_PLUG
10	HDMI3_RX_CLK+_HDMI		

⑤ CN704 (STB/DVI)

1	HDM4_RX2+_HDMI	11	GND
2	GND	12	HDMI4_RX_CLK-_HDMI
3	HDMI4_RX2-_HDMI	13	CEC
4	HDMI4_RX1+_HDMI	14	N.C
5	GND	15	HDMI4_SCL_DDC_I2C
6	HDMI4_RX1-_HDMI	16	HDMI4_SDA_DDC_I2C
7	HDMI4_RX0+_HDMI	17	GND
8	GND	18	HDMI4_5V_PW
9	HDMI4_RX0-_HDMI	19	HDMI4_HOT_PLUG
10	HDMI4_RX_CLK+_HDMI		

⑥ CN1001_LAN (LAN)

1	LAN_TXD+_LAN	5	B1.8V_PW
2	B1.8V_PW	6	LAN_RXD-_LAN
3	LAN_TXD-_LAN	7	N.C
4	LAN_RXD+_LAN	8	GND

⑦ OP501 (OPTICAL)

1	SPDIF_OUT	3	DGND
2	B5V_PW		

⑧ CN603 (AV)

1	GND	5	TEST_SR
2	AV1_CVBS_IN	6	TEST_SL
3	COMP_AV2_SR_IN	7	COMP_AV2_SL_IN
4	IDENT_VIDEO		

⑨ CN601 (COMP)

1	COMP_YN	9	TEST_PR
2	COMP_Y_CVBS(AV1_CVBS_IN)	10	COMP_PR
3	IDENT_VIDEO	11	COMP_AV1_SL_IN
4	COMP_PBN	12	TEST_SL
5	COMP_PB	13	COMP_PB
6	IDENT_COMP	14	COMP_AV1_SR_IN
7	COMP_PRN	15	TEST_SR
8	COMP_PR	16	BT_RESET

5. Wiring Diagram

10 CN1102			
1	IR	6	KEY_INPUT1
2	GND	7	KEY_INPUT2
3	A3.3V_PW	8	LED_STB
4	SCL_AMP_ECO_I2C	9	GND
5	SDA_AMP_ECO_I2C		

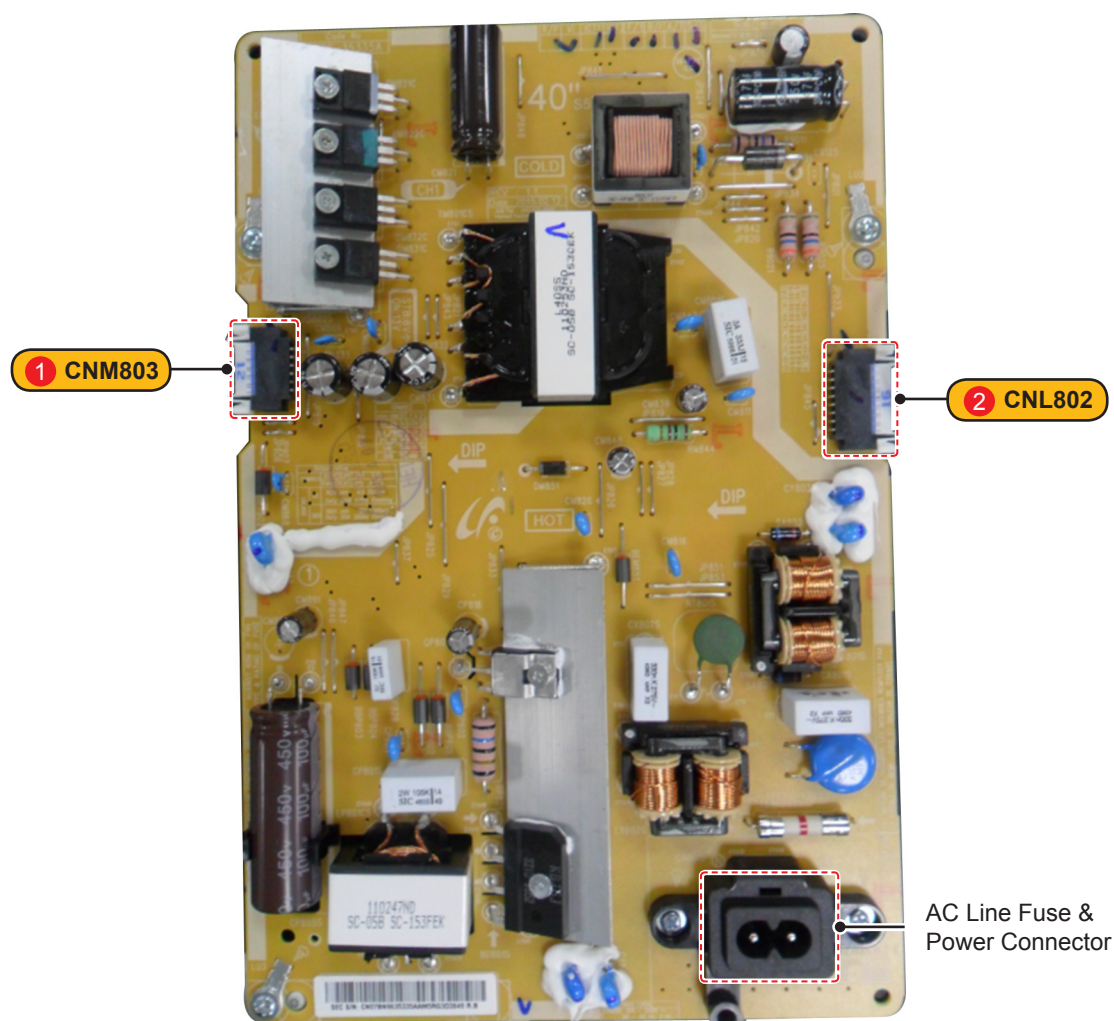
11 CN501			
1	TOP_R+_13V_+13V_AO	3	TOP_L+_13V_+13V_AO
2	TOP_R-_13V_+13V_AO	4	TOP_L-_13V_+13V_AO

12 CN2001 (Vx1)			
1	DGND	27	M_C_RX-_VBY1
2	SDA_FRC_I2C	28	VBY1_GND
3	AGING_ENABLE	29	M_B_RX+_VBY1
4	SCL_FRC_I2C	30	M_B_RX-_VBY1
5	BT_SYNC/PWM_UFT	31	VBY1_GND
6	SDA_TCON_I2C	32	M_A_RX+_VBY1
7	TCON_I2C_EN	33	M_A_RX-_VBY1
8	SCL_TCON_I2C	34	VBY1_GND
9	DGND	35	LOCKN_TX_VBY1
10	VBY1_GND	36	N.C
11	M_H_RX+_VBY1	37	VBY1_GND
12	M_H_RX-_VBY1	38	VBY1_GND
13	VBY1_GND	39	VBY1_GND
14	M_G_RX+_VBY1	40	VBY1_GND
15	M_G_RX-_VBY1	41	N.C
16	VBY1_GND	42	PANEL_13V_PW
17	M_F_RX+_VBY1	43	PANEL_13V_PW
18	M_F_RX-_VBY1	44	PANEL_13V_PW
19	VBY1_GND	45	PANEL_13V_PW
20	M_E_RX+_VBY1	46	PANEL_13V_PW
21	M_E_RX-_VBY1	47	PANEL_13V_PW
22	VBY1_GND	48	PANEL_13V_PW
23	M_D_RX+_VBY1	49	PANEL_13V_PW
24	M_D_RX-_VBY1	50	PANEL_13V_PW
25	VBY1_GND	51	PANEL_13V_PW
26	M_C_RX+_VBY1		

13 CN201			
1	GND	9	A13V_PW
2	GND	10	OVD_ON_OFF
3	A13V_PW	11	SMPS_FET_FAIL_DETECT
4	GND	12	ANA_DIMMING
5	A13V_PW	13	A5V_PW
6	SW_POWER_OUT	14	BT_WAKE
7	A13V_PW	15	POWER_DET
8	B5V_PW	16	BT_RESET

14 CN1101 (WIFI)			
1	WIFI_NRESET	4	WIFI-_USB
2	WIFI_WOL	5	WIFI+_USB
3	A5V_PW	6	GND

■ SMPS Board



■ SMPS Board Pin Map

1 CNM803 (P-Dim Control from Main Board)			
1	F.C	7	A13V
2	ANA_DIM	8	PS_ON
3	A13V	9	A13V
4	OD_ON	10	GND
5	A13V	11	GND
6	BLU_PWM	12	GND

2 CNL802			
1	2+	9	1+
2	N.C	10	N.C
3	N.C	11	N.C
4	2-	12	1-
5	N.C	13	N.C
6	N.C	14	N.C
7	N.C	15	IF2
8	N.C	16	IF1



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