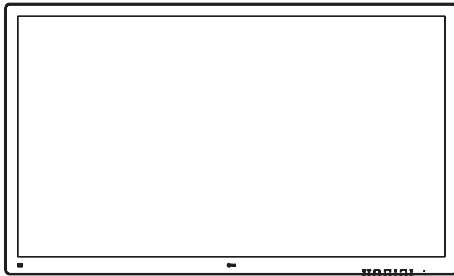# LG
Life's Good

MEDICAL MONITOR
SERVICE MANUAL

CHASSIS : LM2HA

MODEL : 55MH5K   55MH5K-WX

CAUTION

BEFORE SERVICING THE CHASSIS, READ THE SAFETY PRECAUTIONS IN THIS MANUAL.

P/NO : MFL71804643 (2304-REV00)

CONTENTS

SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Exploded View.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and it's components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.
If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 MΩ and 5.2 MΩ.
When the exposed metal has no return path to the chassis the reading must be infinite.
An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)
Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.
Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.
Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which is corresponds to 0.5 mA.
In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit

AC Volt-meter

To Instrument's exposed METALLIC PARTS

0.15uf

1.5 Kohm/10W

Good Earth Ground such as WATER PIPE, CONDUIT etc.
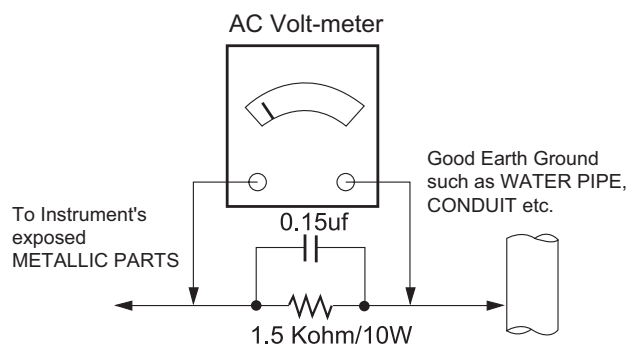
When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1
*Base on Adjustment standard

SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

1. General Specification

No.	Item		Content		Remark
1	Customer		BRAND		BRAND : LGE Product
2	User Model Name		55MH5K		
3	Sale region		Worldwide		
4	Feature		55" UHD LCD Medical Monitor (with Direct Bonding Glass)		
5	Chassis Name		LM2HA		"PCB, Product spec., Adjustment spec."
6	General Scope	External SW &Adj.	Input,PIP/PBP,Hotkey1,Hotkey2,Brightness-,Brightness+,OK,Contrast-,Contrast+,Menu		10 Tack Key
		Function	Picture Mode, Ratio, S.E.S, Six Color, LG Calibration Studio, Factory calibration, PBP/PIP, RS-232C, User Preset		
7	Input / Output	SDI IN	4ea (12G-SDI)		
		SDI OUT	4ea (12G-SDI)		
		SFP	Support 1Rx SFP module		Not supported 2Rx & TxRx SFP module
		DVI-D IN	1ea		
		DVI-D OUT	1ea		
		HDMI IN	1ea (HDMI2.0, UHD, Support HDR)		
		DP IN	1ea (DP1.2, UHD, Not support HDR)		
		DP OUT	1ea (DP1.2, UHD, Not support HDR)		
		USB UP	1ea (USB3.0 Upstream)		
		USB IN	1ea (USB3.0 Downstream)		USB downstream Port(Up to 5V 0.9A DC)
		SERVICE ONLY	1ea		
		RS232C	1ea		
		AC IN	1ea		
		POAG	1ea		
		SOUND	N/A (No speaker, No HP out)		
8	Power Code		Length	2.8m ± 0.05	Refer to Suffix standard and power cord Table.
			Weight	378g ± 10%	
			Color	White	
9	Cable	DVI	Length	1.8m ± 0.05m	Not support
			Weight	0.11kg ± 10%,	
			Color	Black	
			Impedance	CABLE(Differential) Impedance : 100Ω±10Ω	
		DisplayPort	Length	1.80m±0.05m	
			Weight	0.10kg ± 10%	
			Color	Black	
			Impedance	CABLE(Differential) Impedance : 100Ω±10Ω	

No.	Item		Content		Remark
9	Cable	HDMI	Length	1.80m ± 0.05m	
			Weight	0.09kg ± 10%	
			Color	Black	
			CABLE(Differential) Impedance: 100Ω±10Ω		
10	Power	PSU	Input: 100-240 V~ 50-60 Hz 2.5 – 1.25A Output: 20.5V, 9.0A		
11	Power Rating		Input : AC100~240V 50~60Hz, 24V 7.5A		
12	Accessory Box		Weight : 0.8kg		

2. Engineering Specification

No.	Item	Spec			Remarks
1	Operating Frequency	SDI	Horizontal	N/A	None EDID. Refer to Support resolution
			Vertical	N/A	
		DVI	Horizontal	30 - 83 kHz	
			Vertical	56 - 61 Hz	
		HDMI	Horizontal	30 - 135 kHz	
			Vertical	56 - 61 Hz	
		DP	Horizontal	30 - 135 kHz	
			Vertical	56 - 61 Hz	
2	Resolution	SDI	Max.	12G-SDI (4096x2160 @60Hz)	12G-SDI : 3840x2160 @60Hz (Recommend) 3G-SDI : 1920x1080 @60Hz
			Recommend	12G-SDI (3840x2160 @60Hz)	
		DVI	Max.	1920x1080 @ 60Hz	
			Recommend	1920x1080 @ 60Hz	
		HDMI	Max.	3840×2160 @ 60Hz	
			Recommend	3840×2160 @ 60Hz	
		DP	Max.	3840×2160 @ 60Hz	
			Recommend	3840×2160 @ 60Hz	
3	Input Voltage	Voltage: AC100~240V 50~60Hz, 20.5V 9.0A			PSU

3. Signal Timing (Resolution)
3.1. Signal（Video & Sync）
3.1.1. H/V Timing : DisplayPort

No.	Section	Pol.	Dot Clock [MHz]	Frequency [kHz]/[Hz]	Total Cycle (E)	Display (A)	Front Porch(B)	Sync. (D)	Back Porch(F)	Resolution	Remark
1	H(Pixels)	-	25.175	31.469	800	640	16	96	48	640 x 480	
	V(Lines)	-		59.94	525	480	10	2	33		
2	H(Pixels)	+	40	37.879	1056	800	40	128	88	800 x 600	
	V(Lines)	+		60.317	628	600	1	4	23		
3	H(Pixels)	-	65	48.363	1344	1024	24	136	160	1024 x 768	
	V(Lines)	-		60	806	768	3	6	29		
4	H(Pixels)	+	79.99	54.347	1472	1152	32	96	192	1152 x 864	
	V(Lines)	+		60.05	905	864	1	3	37		
5	H(Pixels)	+	74.25	45	1650	1280	110	40	220	1280 x 720	
	V(Lines)	+		60	750	720	5	5	20		
6	H(Pixels)	+	108	63.981	1688	1280	48	112	248	1280 x 1024	
	V(Lines)	+		60.02	1066	1024	1	3	38		
7	H(Pixels)	+	108	60	1800	1600	24	80	96	1600 x 900	
	V(Lines)	+		60	1000	900	1	3	96		
8	H(Pixels)	+	148.5	67.5	2200	1920	88	44	148	1920 x 1080	
	V(Lines)	-		60	1125	1080	4	5	36		
9	H(Pixels)	+	241.5	88.79	2720	2560	48	32	80	2560 x 1440	
	V(Lines)	-		59.95	1481	1440	3	5	33		
10	H(Pixels)	+	266.64	66.66	4000	3840	8	144	8	3840 x 2160	
	V(Lines)	-		30	2222	2160	54	5	3		
11[1)]	H(Pixels)	+	533.28	133.32	4000	3840	48	32	80	3840 x 2160	
	V(Lines)	-		60	2222	2160	54	5	3		

* 1) : DP Preferred timing

3.1.2. H/V Timing : HDMI / DVI

No.	Section	Pol.	Dot Clock [MHz]	Frequency [kHz]/[Hz]	Total Cycle (E)	Display (A)	Front Porch(B)	Sync. (D)	Back Porch(F)	Resolution	Remark
1	H(Pixels)	-	25.175	31.469	800	640	16	96	48	640 x 480	
	V(Lines)	-		59.94	525	480	10	2	33		
2	H(Pixels)	+	40	37.879	1056	800	40	128	88	800 x 600	
	V(Lines)	+		60.317	628	600	1	4	23		
3	H(Pixels)	-	65	48.363	1344	1024	24	136	160	1024 x 768	
	V(Lines)	-		60	806	768	3	6	29		
4	H(Pixels)	+	79.99	54.347	1472	1152	32	96	192	1152 x 864	
	V(Lines)	+		60.05	905	864	1	3	37		
5	H(Pixels)	+	74.25	45	1650	1280	110	40	220	1280 x 720	
	V(Lines)	+		60	750	720	5	5	20		
6	H(Pixels)	+	108	63.981	1688	1280	48	112	248	1280 x 1024	
	V(Lines)	+		60.02	1066	1024	1	3	38		
7	H(Pixels)	+	108	60	1800	1600	24	80	96	1600 x 900	
	V(Lines)	+		60	1000	900	1	3	96		
8[1)]	H(Pixels)	+	148.5	67.5	2200	1920	88	44	148	1920 x 1080	
	V(Lines)	-		60	1125	1080	4	5	36		
9	H(Pixels)	+	241.5	88.79	2720	2560	48	32	80	2560 x 1440	
	V(Lines)	-		59.95	1481	1440	3	5	33		
10	H(Pixels)	+	297	67.5	4400	3840	176	88	296	3840 x 2160	
	V(Lines)	-		30	2250	2160	8	10	72		
11[2)]	H(Pixels)	+	594	135	4400	3840	176	88	296	3840 x 2160	
	V(Lines)	-		60	2250	2160	8	10	72		

* (1) : DVI Preferred timing.
* (2) : HDMI Preferred timing.
* Mode 9,10,11 can be supported to only HDMI.

3.1.3. Video input: DP / HDMI / DVI

EDID 2Page Video Short Block Description										
EDID NO.	Horizontal size	Vertical size	P/I	V-freq(Hz)	Ratio	DVI (FHD)	HDMI1.4 (UHD30)	HDMI2.0 (UHD60 HDR)	HDMI2.0 (UHD60 SDR)	DP (UHD60)
1	640	480	P	59.94/60	4:03		■	■	■	■
2	720	480	P	59.94/60	4:03			■	■	
3	720	480	P	59.94/60	16:09	■	■	■	■	
4	1280	720	P	59.94/60	16:09	■	■	■	■	■
5	1920	1080	I	59.94/60	16:09	■	■	■	■	
90(10)	1920	1080	P	59.94/60	16:09	■ (Native)	■ (Native)	■ (Native)	■ (Native)	■ (Native)
12	720	576	P	50	16:09	■	■	■	■	
13	1280	720	P	50	16:09	■	■	■	■	
14	1920	1080	I	50	16:09	■	■	■	■	
1F	1920	1080	P	50	16:09	■	■	■	■	
20	1920	1080	P	23.97/24	16:09			■	■	
22	1920	1080	P	29.97/30	16:09		■	■	■	
5D	3840	2160	P	23.98/24	16:09			■	■	
5E	3840	2160	P	25	16:09			■	■	
5F	3840	2160	P	29.97/30	16:09			■	■	
60	3840	2160	P	50	16:09			■	■	
61	3840	2160	P	59.94/60	16:09			■	■	

3.1.4. SDI Input(with SFP) for 32HL714S (max 12G-SDI)
- Equipment: Omnitek 4K Tool Box
- Supported Timing : max 12G-SDI

SMPTE	Interface	Signal Type	Image Format	Signal Format	Sampling Structure	Pixel Depth	Frame Rate	SDI	SFP	Remark
259M	SD-SDI		720 x 486 1)	4:2:2	YCbCr	10bit	59.94i	O	O	
			720 x 576	4:2:2	YCbCr	10bit	50i	O	O	
292M	HD-SDI		228 x 1080	4:2:2	YCbCr	10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
							60i, 59.94i, 50i, 48i, 47.95i	O	O	
			1920 x 1080	4:2:2	YCbCr	10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
							60i, 59.94i, 50i, 48i, 47.95i	O	O	
			1280 x 720	4:2:2	YCbCr	10bit	60p, 59.94p, 50p, 30p, 29.97p, 25p	O	O	
ST 425-1	3G-SDI	Level A	1280 x 720	4:2:2	RGB / YCbCr	10bit	60p, 59.94p, 50p, 30p, 29.97p, 25p	O	O	
		Level A / Level B-DL	228 x 1080	4:2:2	RGB / YCbCr	12bit / 10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
							60i, 59.94i, 50i, 48i, 47.95i	O	O	
				4:2:2	YCbCr	10bit	60p, 59.94p, 50p, 48p, 47.95p	O	O	
						12bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
							60i, 59.94i, 50i	O	O	
			1920 x 1080	4:2:2	RGB / YCbCr	12bit / 10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
							60i, 59.94i, 50i, 48i, 47.95i	O	O	
				4:2:2	YCbCr	10bit	60p, 59.94p, 50p, 48p, 47.95p	O	O	
						12bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
							60i, 59.94i, 50i	O	O	
ST 425-5	Quad-Link 3G-SDI 2)	Level A / Level B-DL	4096 x 2160	4:2:2	RGB & YCbCr	12bit / 10bit	30p, 29.97p, 25p, 24p, 23.98p	O		2-sample interleave division square division
				4:2:2	YCbCr	10bit	60p, 59.94p, 50p	O		
						12bit	30p, 29.97p, 25p, 24p, 23.98p	O		
			3840 x 2160	4:2:2	RGB & YCbCr	12bit / 10bit	30p, 29.97p, 25p, 24p, 23.98p	O		
				4:2:2	YCbCr	10bit	60p, 59.94p, 50p	O		
						12bit	30p, 29.97p, 25p, 24p, 23.98p	O		
ST 2081-10 (Mode 1)	6G-SDI		4096 x 2160	4:2:2	YCbCr	10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
			3840 x 2160	4:2:2	YCbCr	10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
ST 2082-10 (Mode 1)	12G-SDI		4096 x 2160	4:2:2	RGB & YCbCr	12bit / 10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
				4:2:2	YCbCr	10bit	60p, 59.94p, 50p, 48p, 47.95p	O	O	
						12bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
			3840 x 2160	4:2:2	RGB & YCbCr	12bit / 10bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	
				4:2:2	YCbCr	10bit	60p, 59.94p, 50p, 48p, 47.95p	O	O	Recommended 60P
						12bit	30p, 29.97p, 25p, 24p, 23.98p	O	O	

BLOCK DIAGRAM
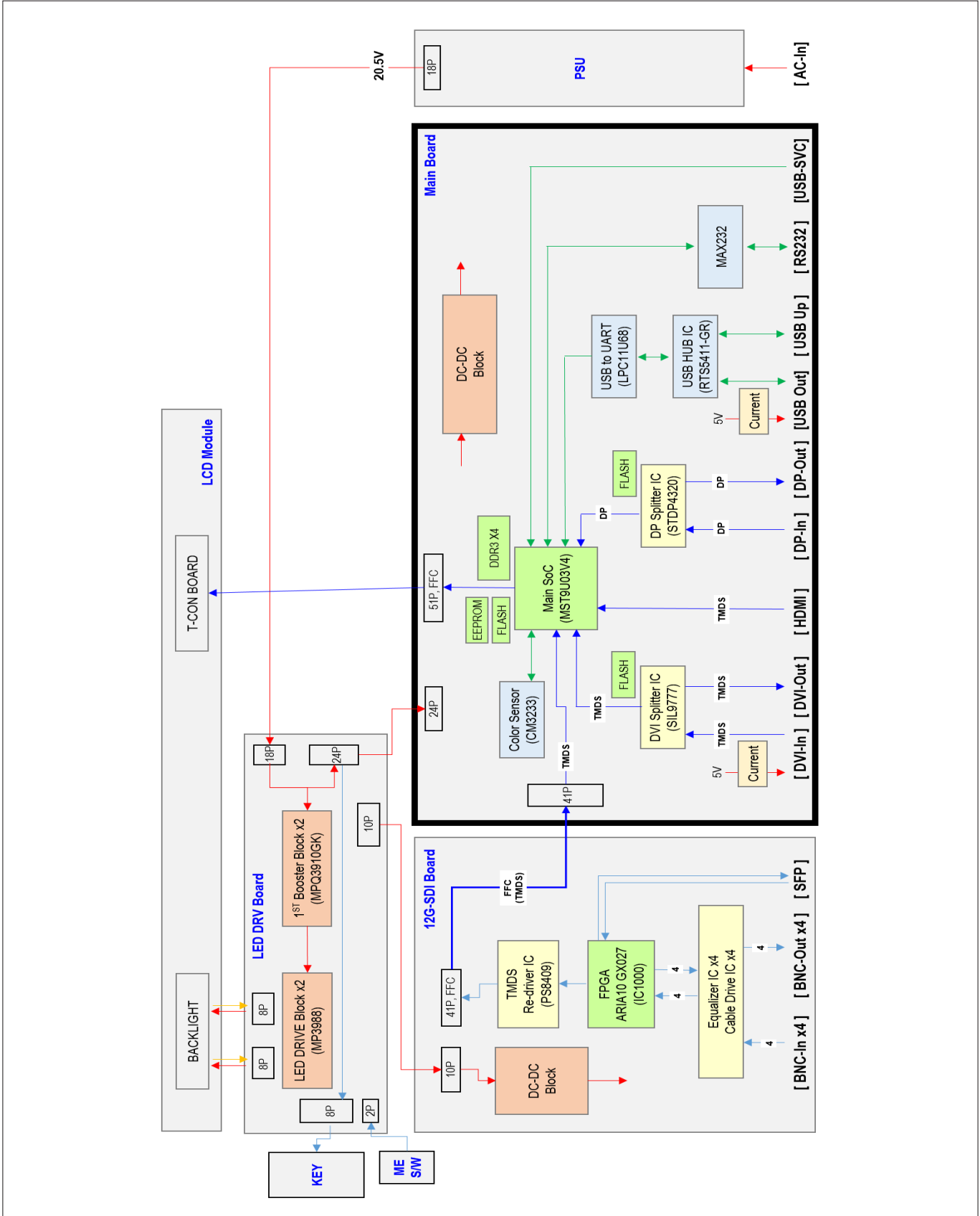
EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the EXPLODED VIEW.

It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.

Do not modify the original design without permission of manufacturer.

* When module or mainboard is defected by any reason, monitor should be changed to new one.

TROUBLE SHOOTING GUIDE

First of all, Check whether there is SVC Bulletin in GSCS System for these model.

1. Breakdown repair : No Power

```
┌─────────────────────┐   N   ┌─────────────────────┐   Y   ┌─────────────────────┐
│ Check voltage level │──────▶│ Check harness       │──────▶│ Replace Power       │
│ (20.5V) of P110(18pin)      │ connection          │       │ Supply Unit and     │
│ on LED DRV Board    │       │ of Power Board to LED│      │ recheck             │
│                     │       │ DRV Board           │       │                     │
└─────────────────────┘       └─────────────────────┘       └─────────────────────┘
         │ Y
         ▼
┌─────────────────────┐   N   ┌─────────────────────┐
│ Check voltage level │──────▶│ Check harness       │
│ (20.5V) of P900(1pin)       │ connection          │
│ on the Main Board   │       │ of LED DRV Board to Main│
│                     │       │ Board               │
└─────────────────────┘       └─────────────────────┘
         │ Y
         ▼
┌─────────────────────┐   N   ┌─────────────────────┐
│ Check voltage level │──────▶│ Check Switch On status of│
│ (2~5V) of           │       │ Mechanical SW       │
│ ME_SW_OUTPUT        │       │                     │
└─────────────────────┘       └─────────────────────┘
         │ Y
         ▼
┌─────────────────────┐   N   ┌─────────────────────┐
│ Check voltage level (3.3V│─▶│ Replace IC904 & IC901│
│ & 5V) of IC904 &  IC901   │ │ and recheck         │
│ Output              │       │                     │
└─────────────────────┘       └─────────────────────┘
         │ Y
         ▼
┌─────────────────────┐   N   ┌─────────────────────┐
│ Check voltage level │──────▶│ Replace IC906 & IC909│
│ (0.95V & 1.5V) of IC906     │ and recheck         │
│ & IC909 Output      │       │                     │
└─────────────────────┘       └─────────────────────┘
         │ Y
         ▼
┌─────────────────────┐   N   ┌─────────────────────┐
│ Check clock frequency│─────▶│ Replace X400 and recheck│
│ (12Mhz) of X400     │       │                     │
└─────────────────────┘       └─────────────────────┘
         │ Y
         ▼
┌─────────────────────┐
│ Replace IC402       │
│ (Flash memory)      │
└─────────────────────┘
```

2. Breakdown repair : No Raster

```
┌─────────────────────┐   N   ┌─────────────────────────┐   N   ┌──────────────────────┐
│ Check Module Backlight │─────▶│ Check Booster voltage (53.19V) │─────▶│ Replace IC200 &IC201 │
│         On           │       │   (C210 & C212 voltage)   │       │  (Booster DC-DC IC)  │
└─────────────────────┘       │   (C211 & C213 voltage)   │       └──────────────────────┘
          │ Y                  └─────────────────────────┘
          │                              │ Y
          │                  ┌─────────────────────────┐   N   ┌──────────────────────┐
          │                  │ Check LED Driver Output voltage │─────▶│ Replace IC300 & IC301 │
          │                  │        (106.3V)         │       │ Replace IC400 & IC401 │
          │                  │    (P300_1pin voltage)   │       │    (LED Driver IC)   │
          │                  │    (P400_8pin voltage)   │       └──────────────────────┘
          │                  └─────────────────────────┘
          ▼
┌─────────────────────┐   N   ┌──────────────────────┐
│ Check voltage level (12V) │─────▶│ Replace IC900 and   │
│ of Module Power (Check │       │      recheck        │
│  Position: C439)     │       └──────────────────────┘
└─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐   N   ┌──────────────────────┐
│   Check FFC cable   │─────▶│ Replace FFC cable    │
│  (defective parts & │       │    and recheck       │
│  connection status) │       └──────────────────────┘
└─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐
│ Replace LCD Module and │
│      recheck        │
└─────────────────────┘
```

3. Breakdown repair : No Raster - HDMI

```
┌─────────────────────┐
│   Check if Monitor  │
│ supports video(timing)│
└─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐
│  Check HDMI Cable   │
│  (defective parts & │
│  connection status) │
└─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐   N   ┌─────────────────────┐
│     Check JK301     │──────▶│  Replace HDMI Jack  │
│  (defective parts)  │       │     and recheck     │
└─────────────────────┘       └─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐   N   ┌─────────────────────┐
│   Check I2C Signal  │──────▶│    F/W download     │
│ (Check position: JK301)│    │                     │
└─────────────────────┘       └─────────────────────┘
          │ Y
          ▼
┌─────────────────────┐
│  Replace Main scaler│
│      (IC400)        │
└─────────────────────┘
```

4. Breakdown repair : No Raster – DVI In / Out

DVI In

```
┌─────────────────────────┐
│ Check if Monitor         │
│ supports video(timing)   │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│ Check DVI Cable          │
│ (defective parts &       │
│ connection status)       │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐   N   ┌─────────────────────────┐
│ Check P200               │──────▶│ Replace DVI Jack         │
│ (defective parts)        │       │ and recheck              │
└─────────────────────────┘       └─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐   N   ┌─────────────────────────┐
│ Check voltage level (5V, │──────▶│ Replace IC902 &          │
│ 1.0V) of IC902, IC913    │       │ IC913 and recheck        │
│ Output                   │       └─────────────────────────┘
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐   N   ┌─────────────────────────┐
│ Check I2C Signal         │──────▶│ F/W download             │
│ (Check position : P200)  │       └─────────────────────────┘
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│ Replace Main scaler      │
│ (IC400)                  │
└─────────────────────────┘
```

DVI out

```
┌─────────────────────────┐
│ Check if Monitor         │
│ supports video(timing)   │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│ Check DVI Cable          │
│ (defective parts &       │
│ connection status)       │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│ Check if DVI-IN signal is │
│ coming in                │
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐   N   ┌─────────────────────────┐
│ Check P201               │──────▶│ Replace DVI Jack         │
│ (defective parts)        │       │ and recheck              │
└─────────────────────────┘       └─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐   N   ┌─────────────────────────┐
│ Check I2C Signal         │──────▶│ F/W download             │
│ (Check position : P201)  │       └─────────────────────────┘
└─────────────────────────┘
           │ Y
           ▼
┌─────────────────────────┐
│ Replace Main scaler      │
│ (IC400)                  │
└─────────────────────────┘
```

5. Breakdown repair : No Raster – DP In / Out

DP In

```
┌─────────────────────────┐
│ Check if Monitor        │
│ supports video(timing)  │
└───────────┬─────────────┘
            │ Y
┌───────────┴─────────────┐
│ Check DP Cable          │
│ (defective parts &      │
│ connection status)      │
└───────────┬─────────────┘
            │ Y
┌───────────┴─────────────┐   N   ┌──────────────────┐
│ Check JK300             │──────▶│ Replace DP Jack  │
│ (defective parts)       │       │ and recheck      │
└───────────┬─────────────┘       └──────────────────┘
            │ Y
┌───────────┴─────────────┐   N   ┌──────────────────┐
│ Check voltage level     │──────▶│ Replace IC910    │
│ (3.3V0 of IC910 Output  │       │ and recheck      │
└───────────┬─────────────┘       └──────────────────┘
            │ Y
┌───────────┴─────────────┐   N   ┌──────────────────┐
│ Check voltage level     │──────▶│ Replace IC302    │
│ (1.2V) of IC302 Output  │       │ and recheck      │
└───────────┬─────────────┘       └──────────────────┘
            │ Y
┌───────────┴─────────────┐   N   ┌──────────────────┐
│ Check clock frequency of│──────▶│ Replace X400 and │
│ X400                    │       │ recheck          │
└───────────┬─────────────┘       └──────────────────┘
            │ Y
┌───────────┴─────────────┐
│ FW download - IC401     │
│ (Flash memory)          │
└─────────────────────────┘
```

DP Out

```
┌─────────────────────────┐
│ Check if Monitor        │
│ supports video(timing)  │
└───────────┬─────────────┘
            │ Y
┌───────────┴─────────────┐
│ Check DP Cable          │
│ (defective parts &      │
│ connection status)      │
└───────────┬─────────────┘
            │ Y
┌───────────┴─────────────┐
│ Check if DP-IN signal is│
│ coming in               │
└───────────┬─────────────┘
            │ Y
┌───────────┴─────────────┐   N   ┌──────────────────┐
│ Check JK302             │──────▶│ Replace DP Jack  │
│ (defective parts)       │       │ and recheck      │
└───────────┬─────────────┘       └──────────────────┘
            │ Y
┌───────────┴─────────────┐
│ FW download - IC401     │
│ (Flash memory)          │
└───────────┬─────────────┘
            │ Y
┌───────────┴─────────────┐
│ Replace IC400 and       │
│ recheck                 │
└─────────────────────────┘
```

6. Breakdown repair : No Raster – SDI In/Out

SDI In

Check voltage level (20.5V) of P2(1pin) on 12G-SDI Board
— N → Power Board to 12G-SDI Board Harness 연결 확인

↓ Y

Check if Monitor supports video(timing)

↓ Y

Check SDI Cable (defective parts & connection status)

↓ Y

Check JK2000,2004,2001,2005 (defective parts)
— N → Replace SDI Jack and recheck

↓ Y

Check voltage level (5V, 7V) of IC1701, IC1700 Output
— N → Replace IC1701 & IC1700 and recheck

↓ Y

Check voltage level (3.3V, 2.5V) of IC1702, IC1703 Output
— N → Replace IC1702 & IC1703 and recheck

↓ Y

Replace 12G-SDI Board

SDI Out

Check if Monitor supports video(timing)

↓ Y

Check SDI Cable (defective parts & connection status)

↓ Y

Check if SDI signal is coming in

↓ Y

Check JK2002,2006,2003,2007 (defective parts)
— N → Replace SDI and recheck

↓ Y

Replace 12G-SDI Board

DISASSEMBLE GUIDE

Monitor Exploded Method

[Notice] The image quality correction value is not reflected when replacing the module or main board separately. If the module or main board is defective, please exchange the product.

■ **Tool Description**

General drivers

1. Disassemble the screws securing the rear door.
2. Disassemble the Back Door.
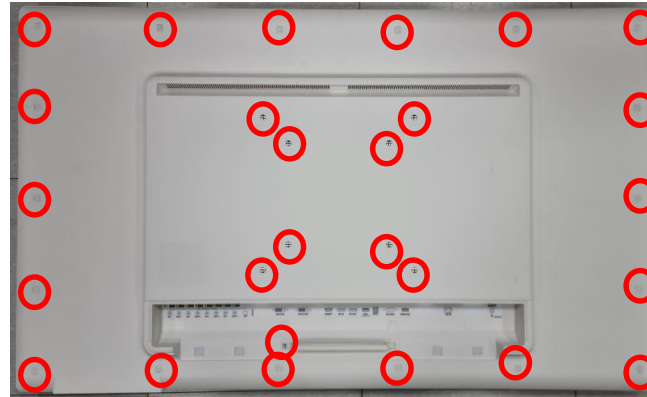
3. Disassemble the VESA screw and B/C screw.
4. Disassemble the B/C Assy.
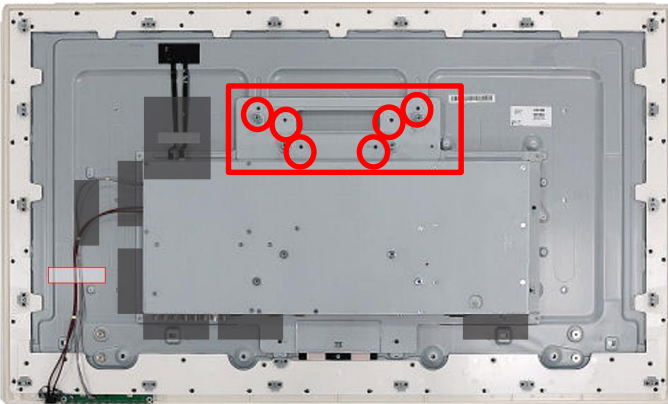
※ Caution

5. Disassemble the VESA Metal fixing screw.
6. Disassemble the VESA Metal.
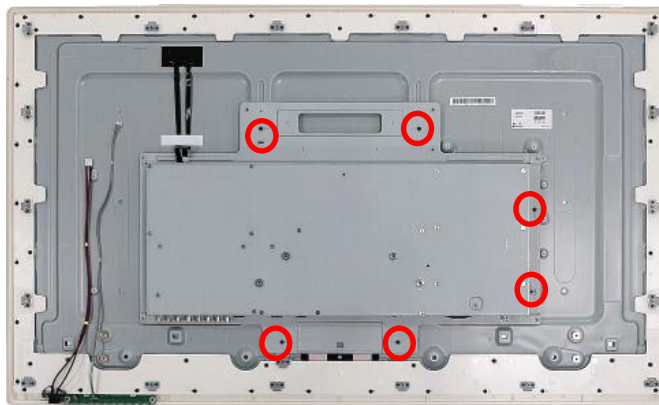
7. Disassemble rear shield metal fixing screws, separate cables, and remove tapes.
8. Disassemble the Rear shield Metal.
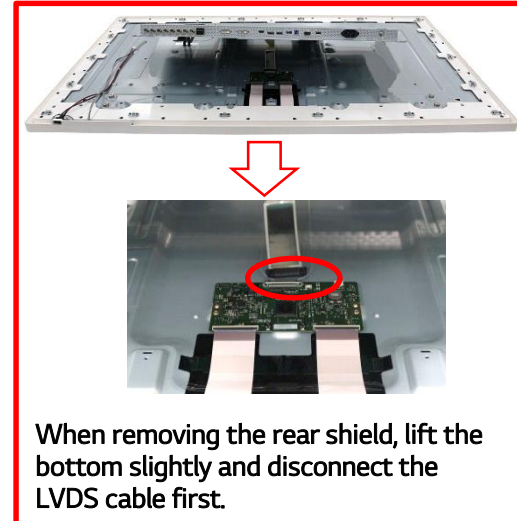
When removing the rear shield, lift the bottom slightly and disconnect the LVDS cable first.

Monitor Exploded Method

9. Remove the hex screws and SDI JACK fixing screws.
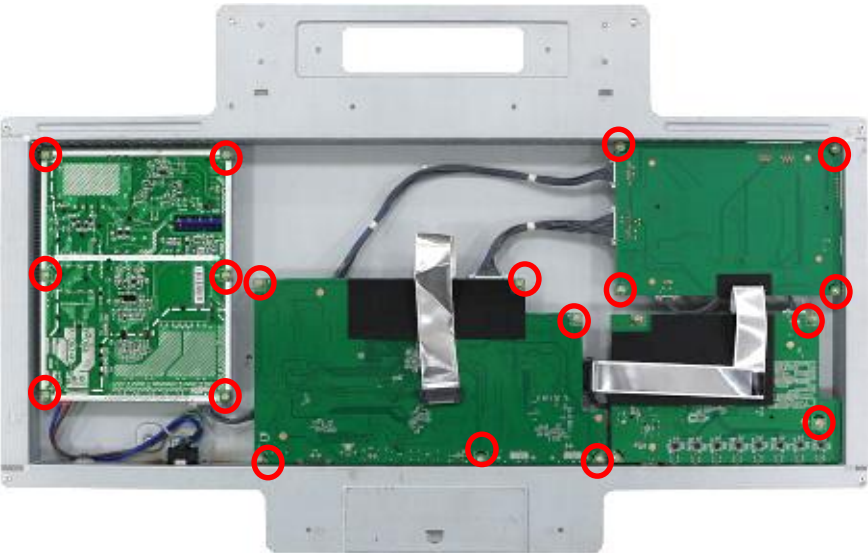
10. Remove the PCB screws.

◼ **Tool Description**

General drivers

* Indicator board rework guide
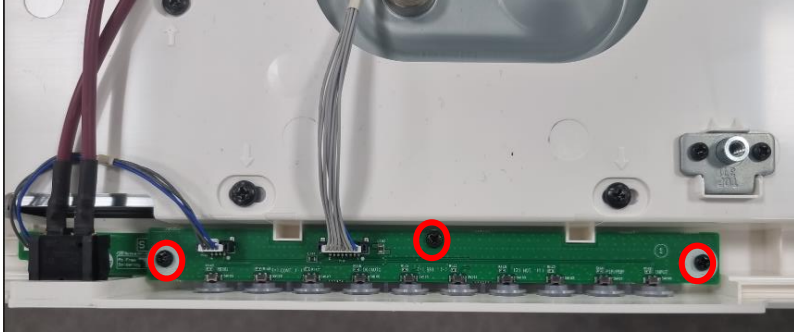
1. Remove the screw 3EA fastened to the Control PCB and
   remove the Control PCB.

2. Using a tool, Slightly push each key on the button (in the direction of the red arrow) so that
   it falls off the double-sided tape on the sheet. (Be careful not to break the button)

3. Detach the control button.

4. Detach the indicator board using the tool.

FIRMWARE UPDATE GUIDE

1. How to Monitor Firmware update by United JIG

There are two ways to update the monitor firmware.
1. How to use the update jig
2. How to use a USB memory stick

Both methods are the same, so you can choose the method that is convenient for you.

1. How to Monitor Firmware update by United JIG

■ Need Software to download ISP file. And Method of JIG connection.
   : DebugTool Driver (JIG Driver Program)
   : ISP_Tool_V4.5.x.x.x (ISP Execute TOOL Program)
   : SW.bin file

Step1. Connect United JIG Jig(Photo #1.) with Monitor & PC.

Photo #1

Connect PC USB Port

Connect the Monitor
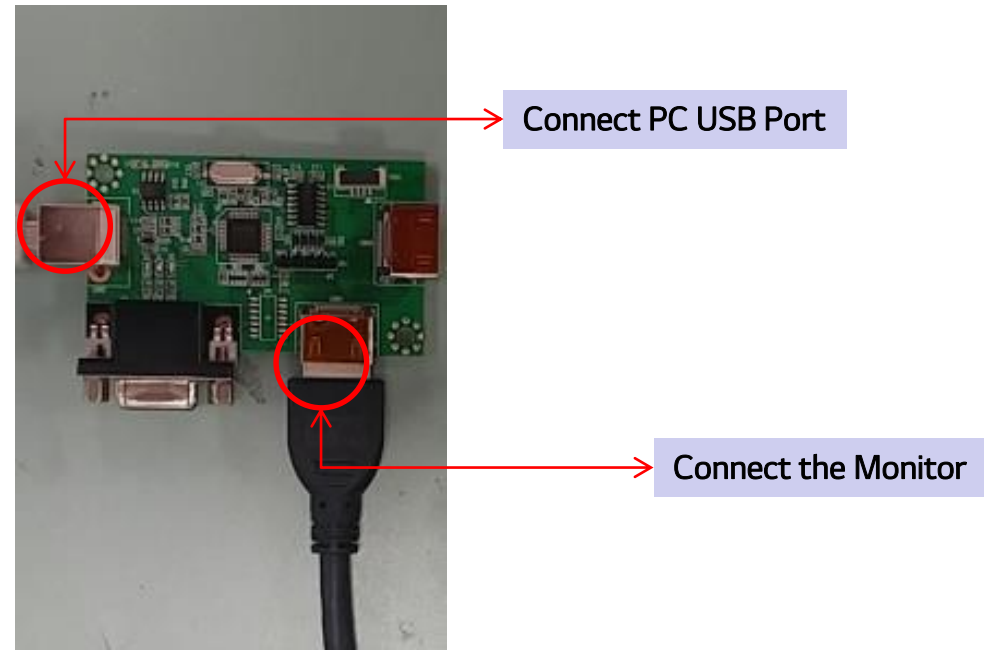
1. How to Monitor Firmware update by United JIG

Step2. Install MSTAR Driver

1) If connect USB Cable to Jig, you can see pop-up screen as below.

2) Find drive file of your PC Windows version and selection(install).

3) If finish installing driver, please <u>re-booting PC.</u>

Find

Next

Driver Program

JIG 드라이버
프로그램

Find drive file of your PC Windows version and selection(install).

이름

📁 Linux_x86_64
📁 win98_me
📁 win2000_7.0_xp_vista_x86_x64
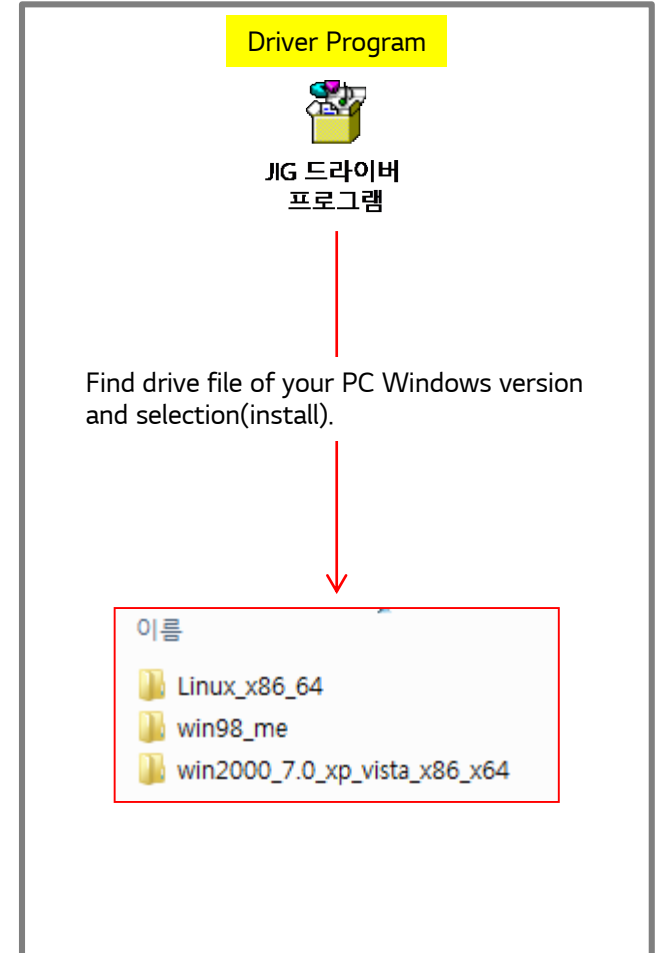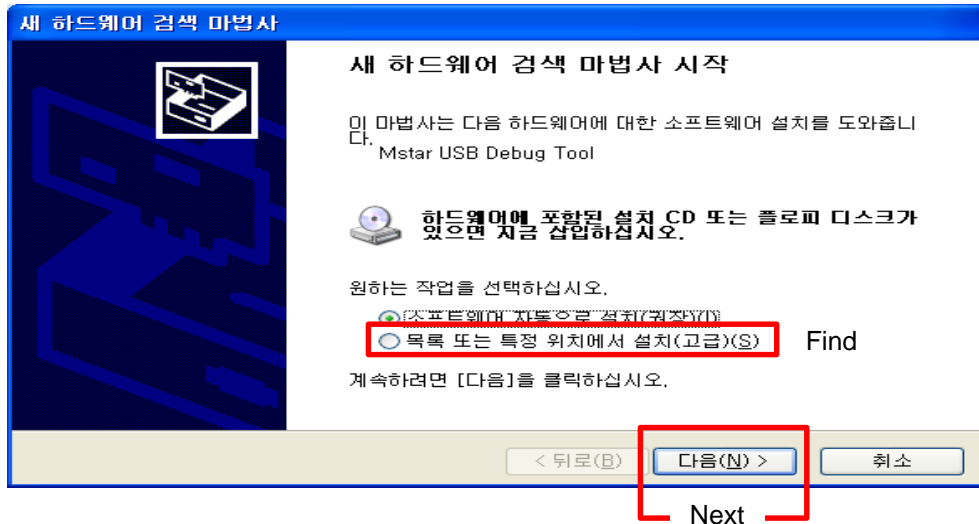
1. How to Monitor Firmware update by United JIG

Step3. ISP Execution TOOL Program

ISP execution Tool Program

ISP 실행 TOOL
프로그램

If unZIP, you can see ex_ file.

ISP_Tool.ex_

Please change ex_ to exe
And Execution.

ISP_Tool
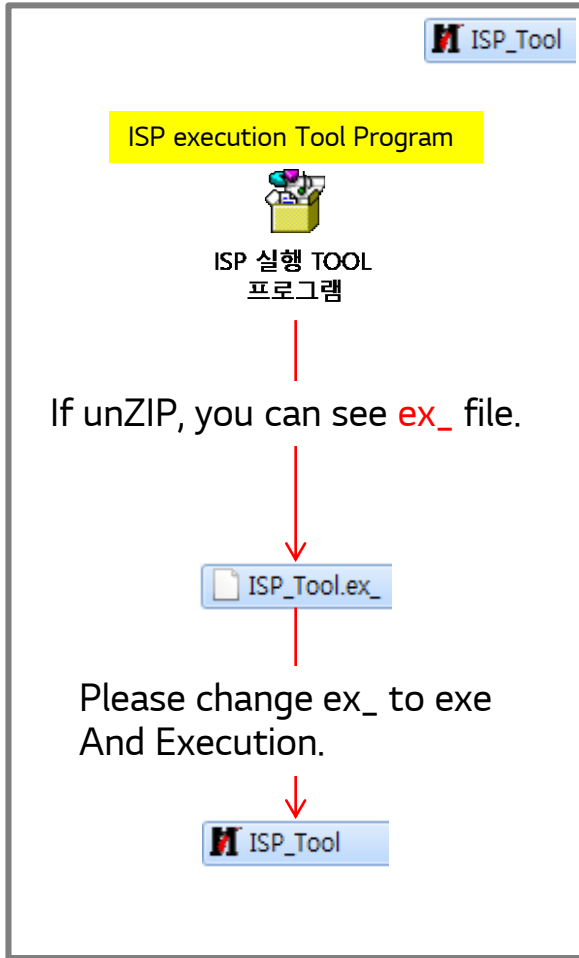
1) Config (program / JIG setting)
    : Check Use "USB", "Auto release".
    : Adjust I2C Speed suitably
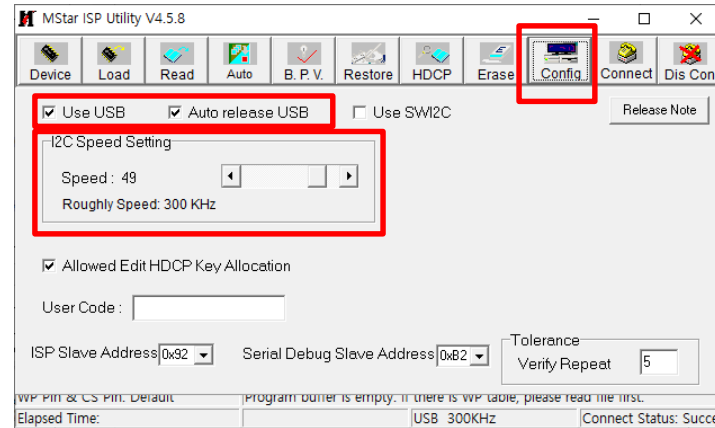
2) Connect (Connect JIG and Flash memory)
    : After Monitor AC Power On and connect JIG and Cable.
    : If push the Connect Icon,
      you can see Flash memory name on the pop-up screen.
    : Push OK.
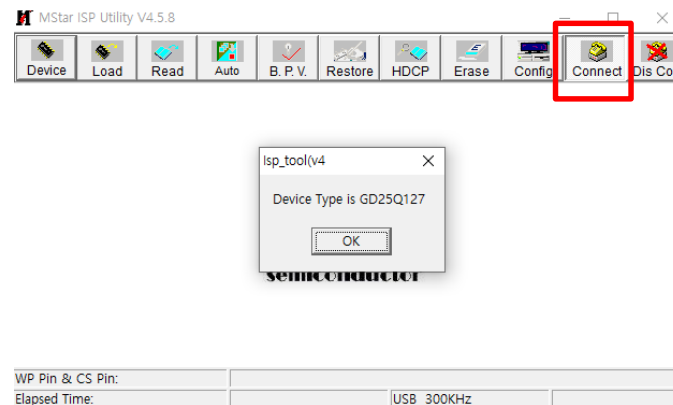
Occur error massage,
re-try again.
(connection check)
(restart program)
(reboot)
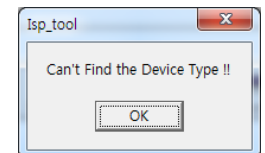
3) Read (prepare Bin file)
: Push "Read" icon and prepare ISP bin file. ※ Read is recommended after Connect Success.
: Check : End Addr. ※ Sometimes the value 0x1FFFF is displayed as an example, in which case you need to read it again.
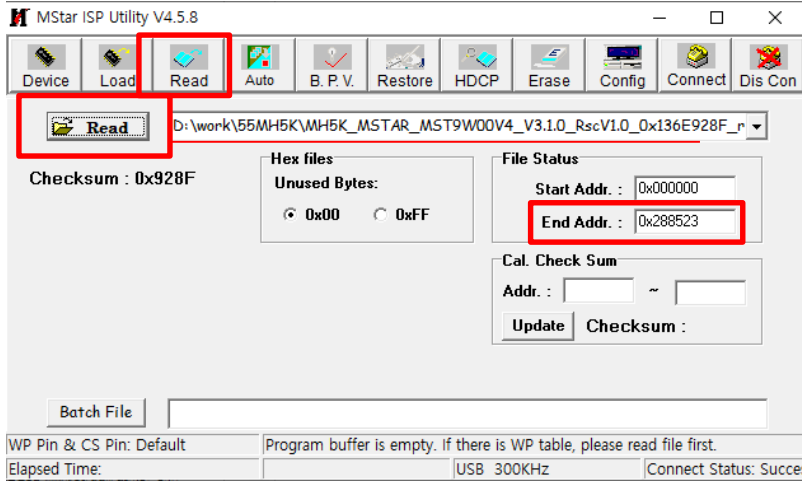
4) Auto (Download)
: After check A and B and push the "Run".
: You can see download time and finish message .
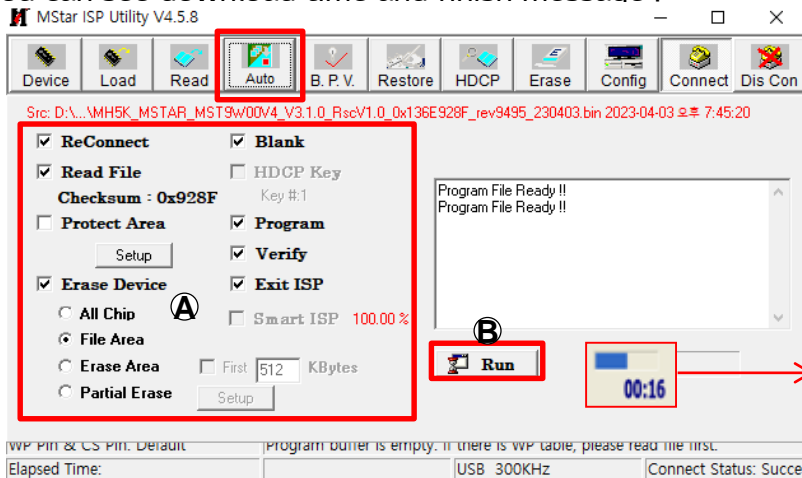
2. How to Monitor Firmware update by USB Memory stick

1. Please prepare an USB memory stick. (Except for the external HDD disk)
   [Note] The file system must use the following format. (NTFS, FAT, FAT32)

2. Please make a new folder like as LG_MNT of USB memory stick. (Ex. E:₩LG_MNT)

3. Please copy monitor FW(MH5K_MSTAR_MST9W00V4_V3.X.X_XXXX_revXXXX_XXXXXX.bin) to the folder
   [Note] The downloading feature does not work properly when using the download file from the company security.

4. Please insert the USB memory stick to the **"SERVICE ONLY"**
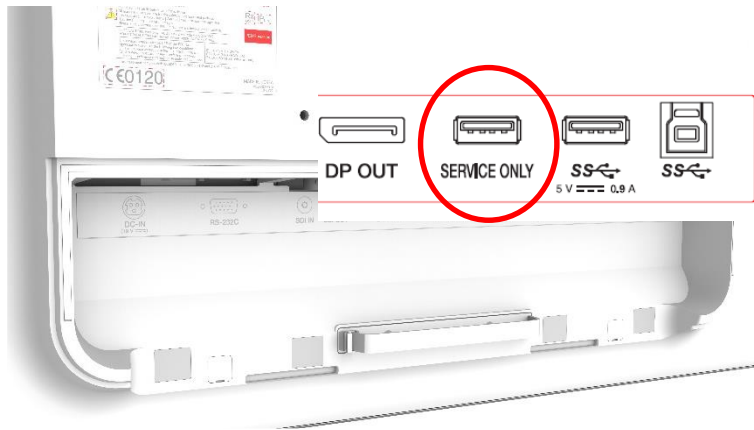
2. How to Monitor Firmware update by USB Memory stick

[Description]

- Customer Condition
    1. If the FW of USB must include a higher version more than version of current monitor, the updating feature will be normally worked.
    2. User can choice whether or not performing a updating feature by the selection of user.
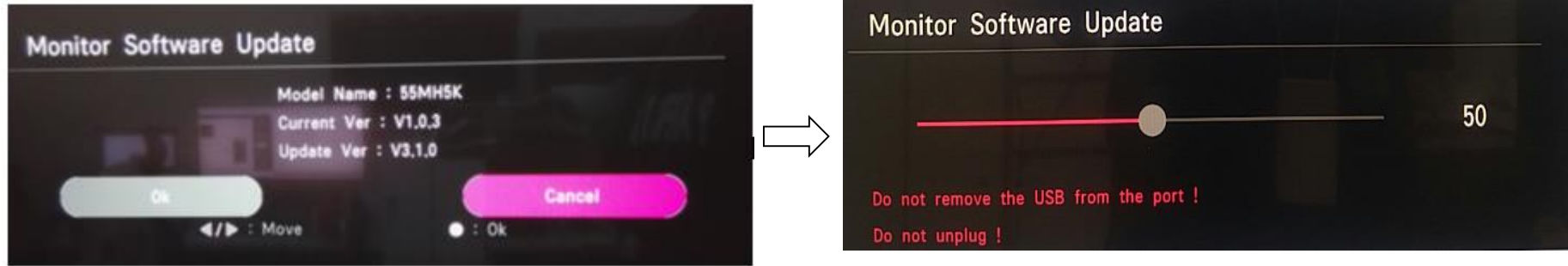
- Factory Condition (Aging On)
    1. After searching the highest version in LG_MNT folder of USB, the updating feature has been automatically performed regardless of the current version of monitor.
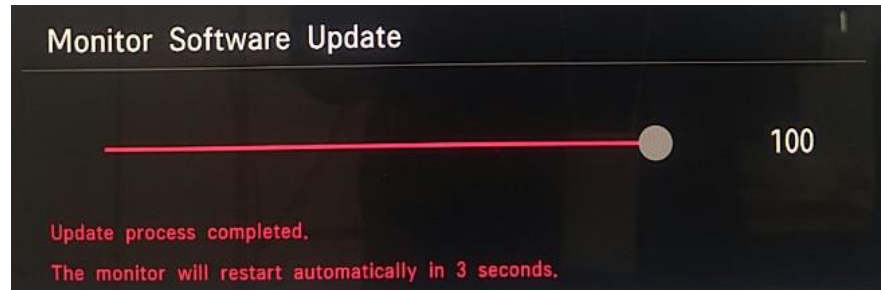
[Common] When the updating feature is completed, monitor will turn off/on automatically after 3 seconds.

2. How to Monitor Firmware update by USB Memory stick

[Troubleshooting]

Q. The power turns off suddenly during updating FW in the status of progress bar, monitor does not work.

→ The power cable should be removed and reconnected after inserting an USB memory stick including FW in the determined folder.
   [Note] After searching the highest version in LG_MNT folder of USB, the recovering feature has been automatically performed

→ After 40 seconds, the monitor will be normally recovered by itself.

Q. The power turns off suddenly during updating PD FW under 50% status of progress bar, how can I do?

→ After turning on the power, the updating will be progress again from the beginning percentage.

3. How to update DP Splitter Firmware

1. Connect the United jig to a PC and monitor

- Using HDMI to DVI cable

PC

MNT

- Using USB cable
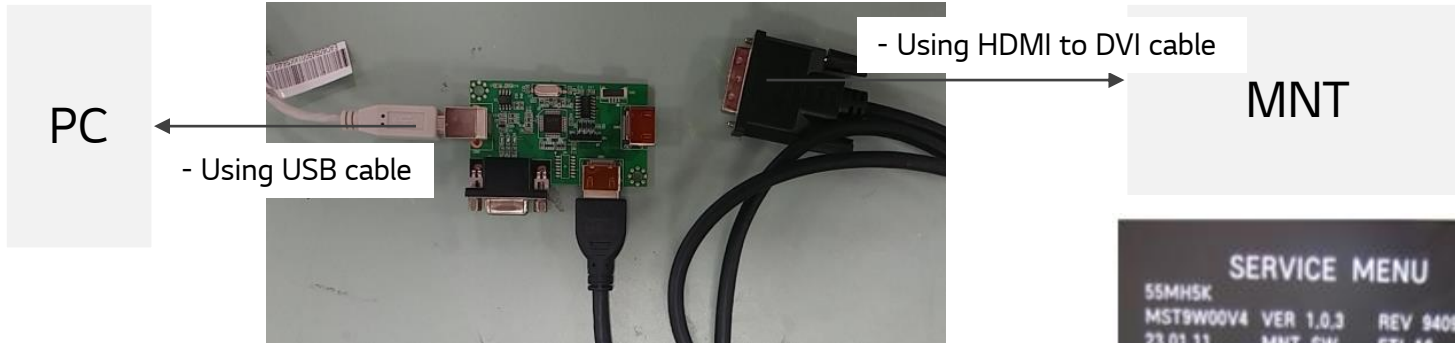
2. Enter the service menu using the following method
   1) 'Setting > General > Information' and
      Operate the control key in the following order.
   2) ▲ Press 2 times
   3) ▼ Press 2 times
   4) ▶ Press 5 times
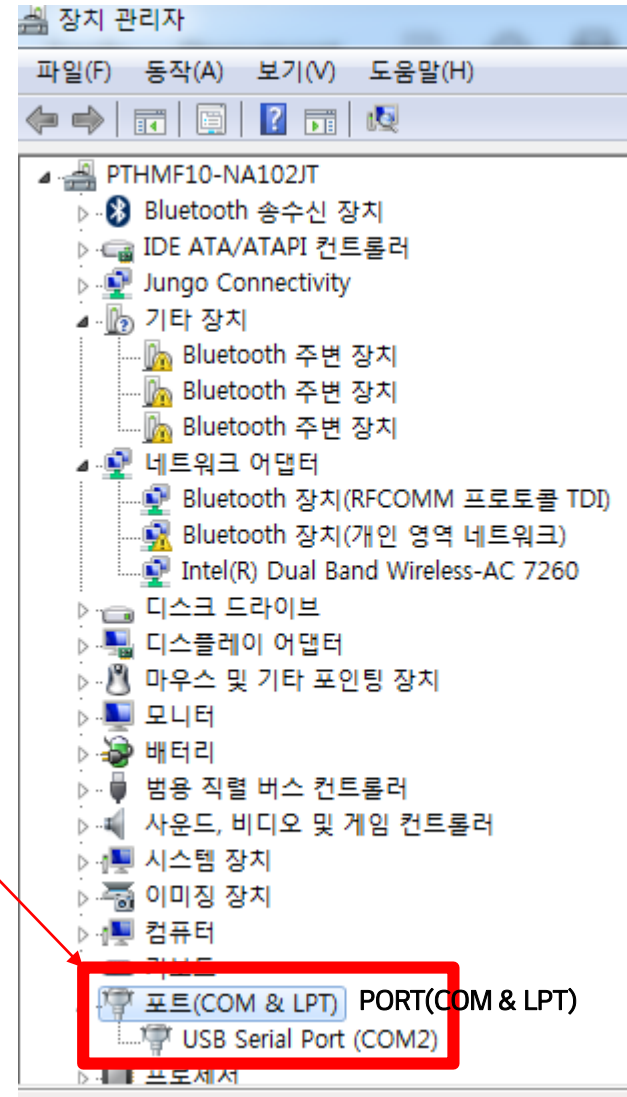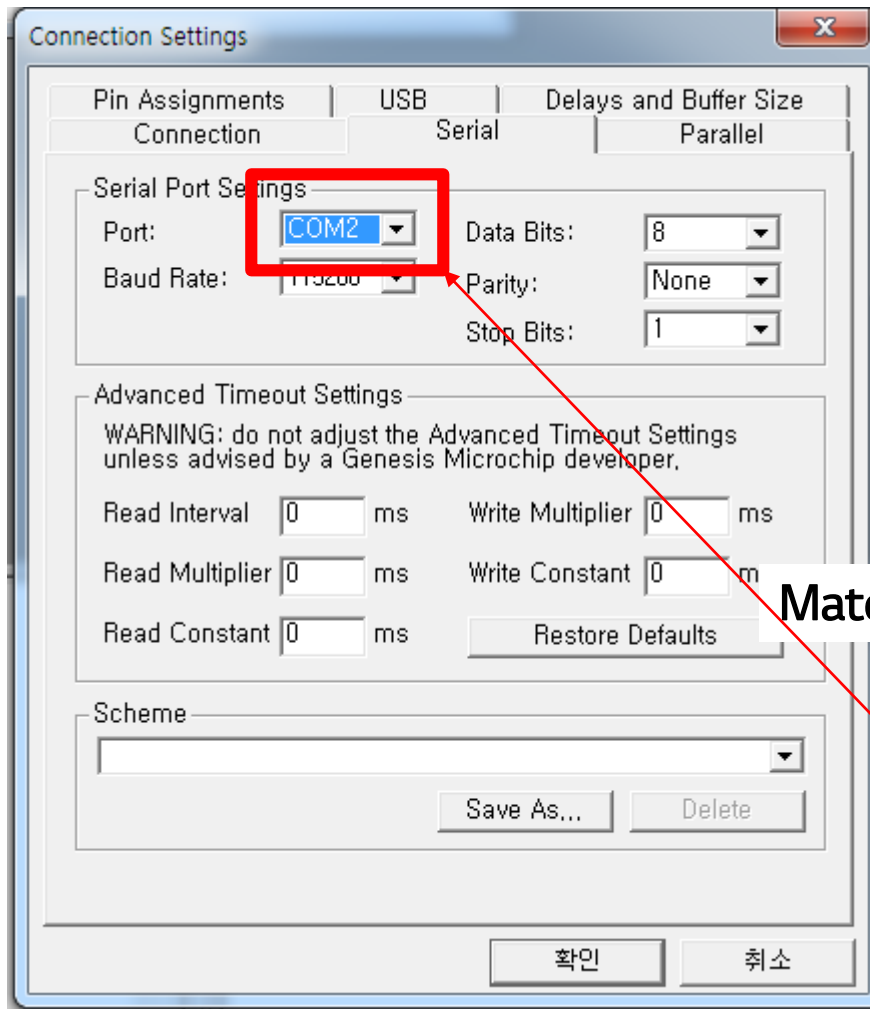
3. Move to DP Split Update menu and turn OFF to ON.
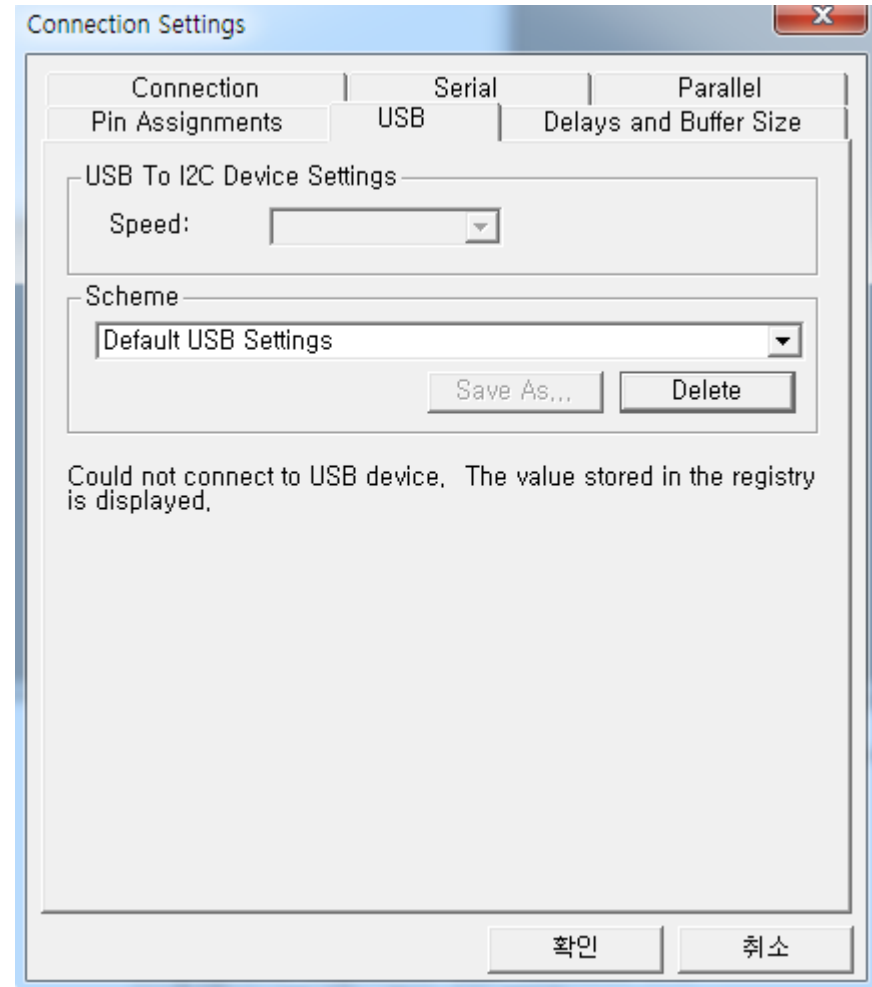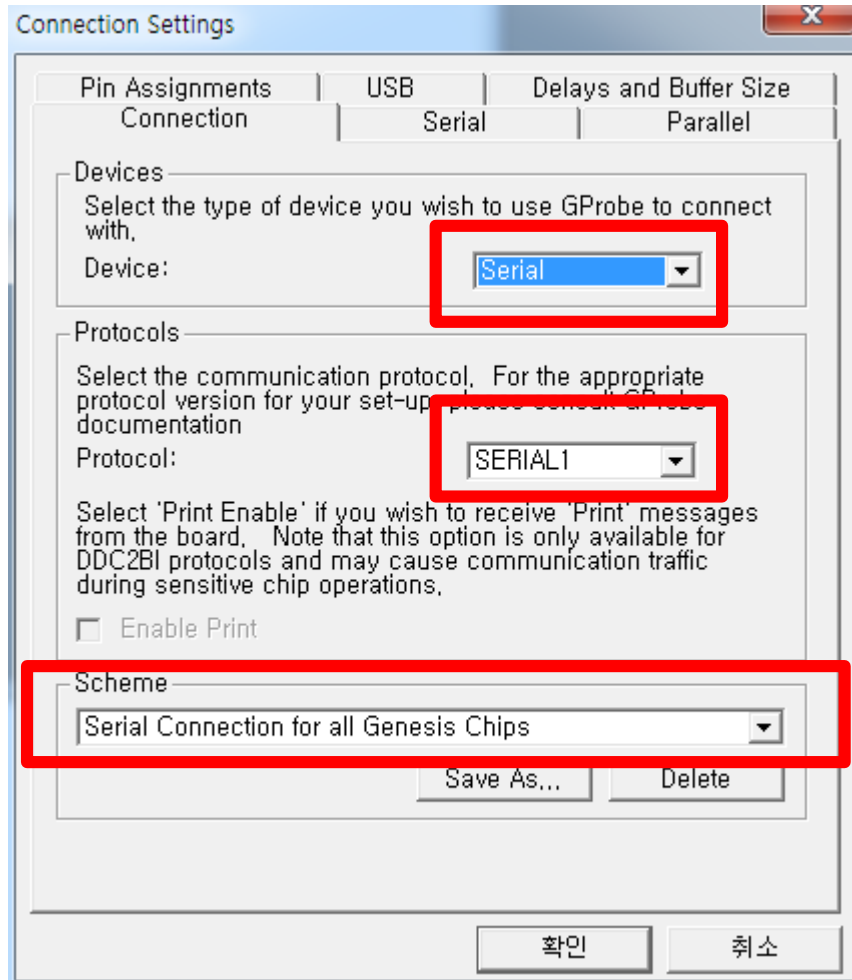
4. Run the Gprobe program to update the firmware.

GProbe 5
바로 가기

SERVICE MENU

55MHSK
MST9W00V4 VER 1.0.3   REV 9409
23.01.11   MNT SW   ETI 16

Tool Option
AGING   OFF
PANEL   LD550EQE-FPA1
NVRAM INIT   NO
UI Time Out   ON

DP Split Update   OFF

12G Pattern   OFF
DEF. APD   OFF
AGING PAT   OFF
IR REMOTE   OFF
Fake DPM   ON
Scailing   BI-LINEAR
Out of Range   ON
USB 5V Out   OFF
DP 3.3V Out   OFF
SOUND EQ   ON
VOL Pre Scale
VCom Adj
Motion Align Sync   ON
Motion Position   0
Motion Range   77
Module ColorTemp   9300
HDR Current Swap   NORMAL
DEBUG INFO.   >>
PICTURE MENU   >>
LOCAL DIMMING/HDR   >>

<fig-1>

Default settings-1

Matching

PORT(COM & LPT)

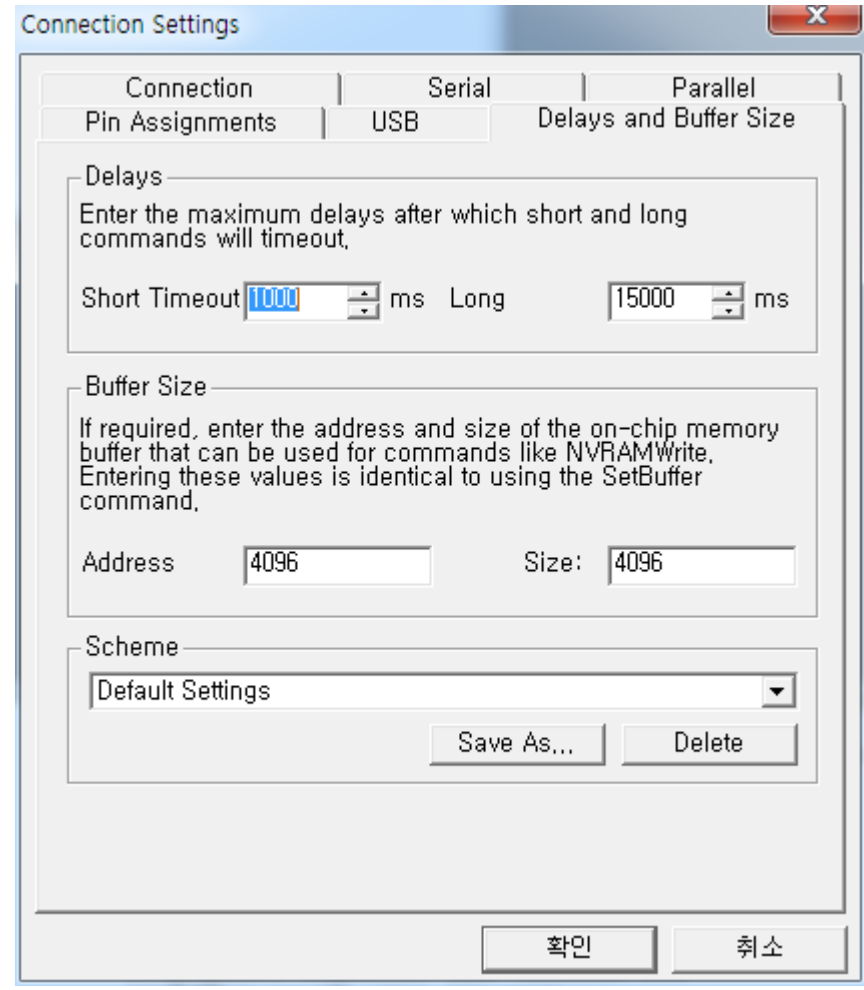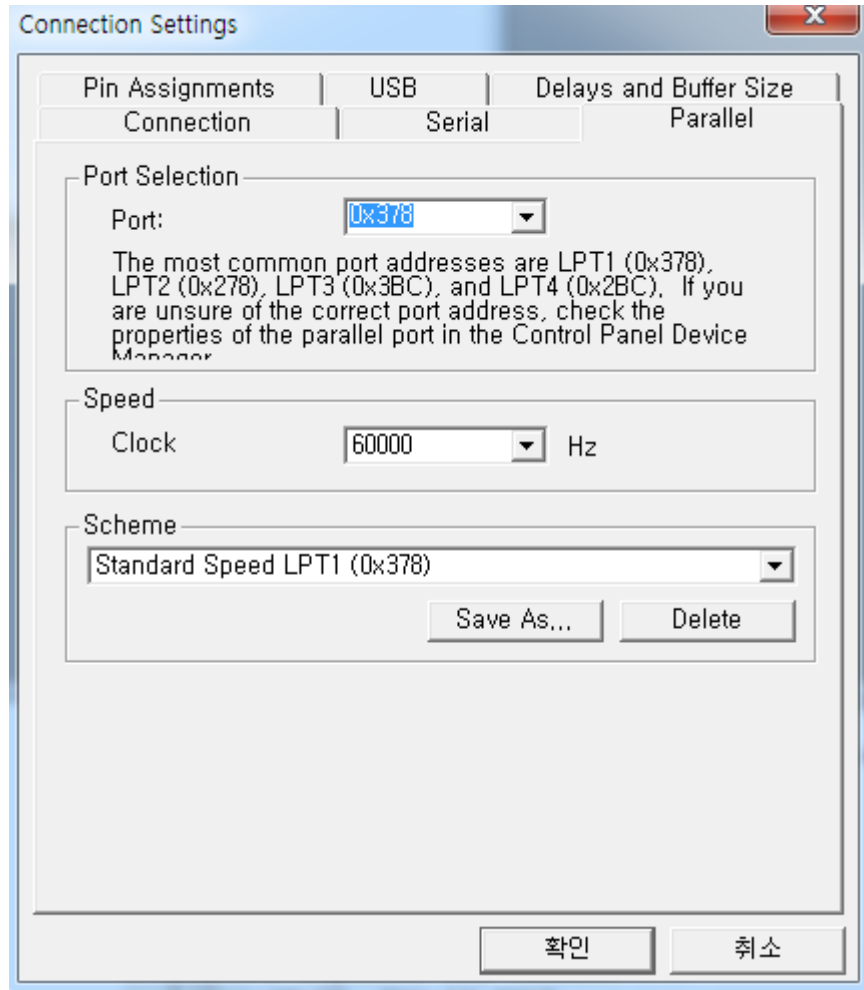# 3. How to update DP Splitter Firmware

Default settings-2

3. How to update DP Splitter Firmware

Default settings-3
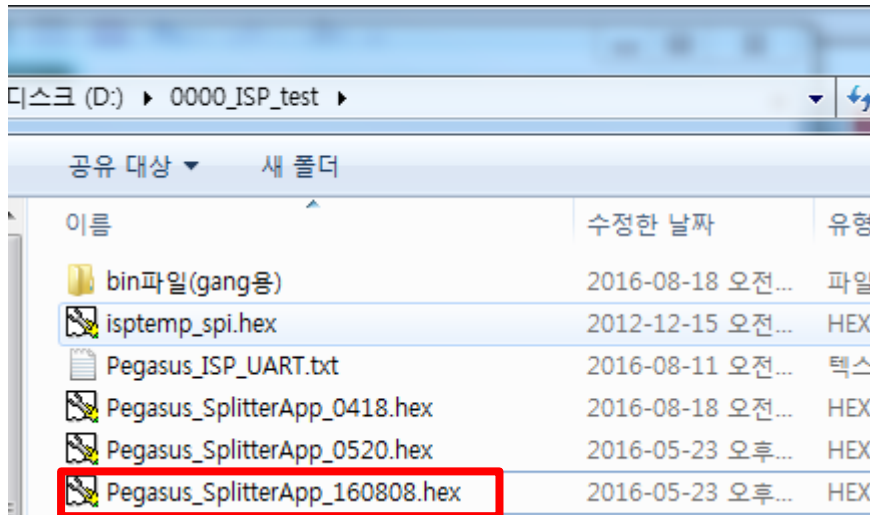
Setting commands in a text file

1. open Pegasus_ISP_UART.txt
2. Modify the red box in the figure to the right based on the firmware update file.
3. Save the file.

Pegasus_ISP_UAR
T.txt

If the firmware is up to date,


```
debugon
SetBuffer 0x1800 0x2000
Reset 0
delay 1000
RAMWrite isptemp_spi.hex
run 0x1800
SetBuffer 0x5000 450
delay 1000
FlashID
//For flash erase we need a bigger delay
setdelay 60000
FlashErase
//Set old delays back
setdelay 5000
delay 3000
//fastFlashWrite Pegasus_SplitterApp_2110.hex
//fastFlashWrite Pegasus_splitterApp_0418.hex
fastFlashWrite Pegasus_SplitterApp_160808.hex

Reset 1
```

Enter the filename here

3. How to update DP Splitter Firmware

If the connection is fine
1. enter 1 and press 'Execute' to see 0x01=0x80.
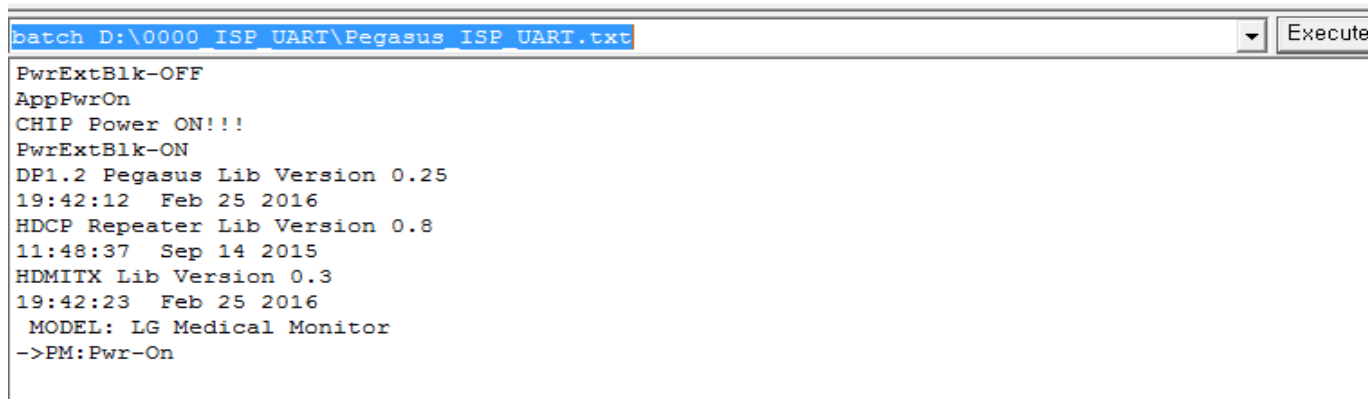
```
                                          ▼  Execute    Help
                                                              ▲
          inter
0x01=0x80
                    Successful.                               ▤
SetBuffer: Command Successful.
Reset: Command Successful.
Delay: Command Successful.
RAMWrite: Command Successful.
Run: Command Successful.
SetBuffer: Command Successful.
Delay: Command Successful.
Flash Manufacturer: 0xC2 ID: 0x13
SetDelay: Command Successful.
Erasing FLASH... Done.                                        ▼
```

To update the firmware,
1. navigate to the location of the text file and press 'Execute'.
2. The update will start, the screen will cycle off and on,
   and it will be completed when the following text appears.

```
batch D:\0000_ISP_UART\Pegasus_ISP_UART.txt          ▼   Execute
PwrExtBlk-OFF
AppPwrOn
CHIP Power ON!!!
PwrExtBlk-ON
DP1.2 Pegasus Lib Version 0.25
19:42:12  Feb 25 2016
HDCP Repeater Lib Version 0.8
11:48:37  Sep 14 2015
HDMITX Lib Version 0.3
19:42:23  Feb 25 2016
 MODEL: LG Medical Monitor
->PM:Pwr-On
```

4. How to update SDI Firmware

1. Please prepare an USB memory stick. (Except for the external HDD disk)
   [Note] The file system must use the following format. (FAT32)

2. Please make a new folder like as LG_MNT of USB memory stick. (Ex. E:₩LG_MNT)

3. Please copy SDI Software (2files :: FPGA_vx.xx_0xAAAA_yymmdd.bin , FW_vx.xx_0xAAAA_yymmdd.hex) to the folder of "LG_MNT".
   [Note] The downloading feature does not work properly when using the download file from the company security.

4. Please insert the USB memory stick to the "SERVICE ONLY"

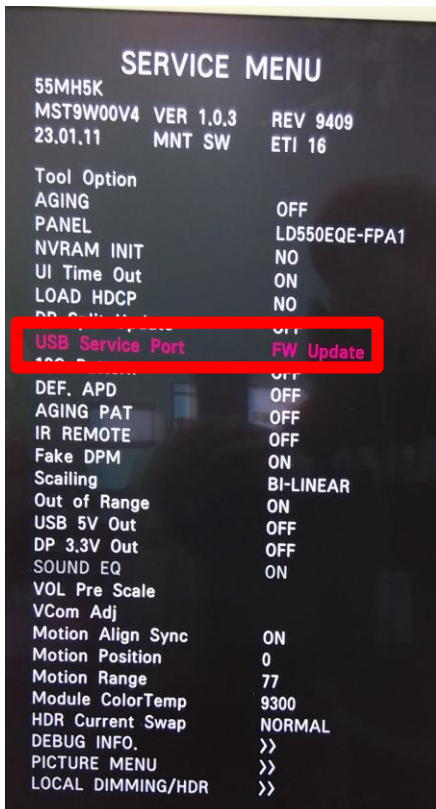※ SDI firmware updates only support upgrading from a lower version to a higher version.

.
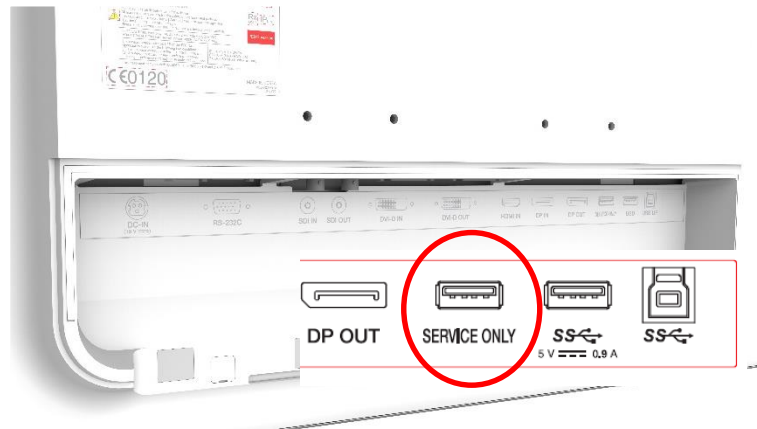
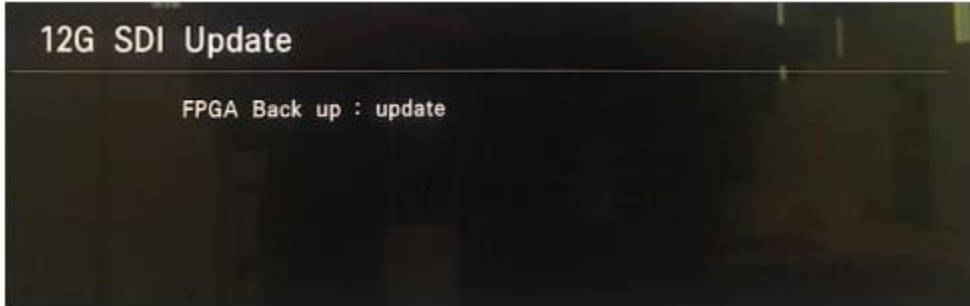# 4. How to update SDI Firmware

5. Enter the Service mode
 1) 'Setting > General > Information' and
     Operate the control key in the following order.
 2) ▲ Press 2 times
 3) ▼ Press 2 times
 4) ▶ Press 5 times

6. In the USB Service Port menu, click the ▶ key

4. How to update SDI Firmware

7. SDI SW update pop-up message is shown

8. After showing FPGA Back up, FPGA, MCU Back up, MCU update, "Update process completed." message is shown about 3 sec .
That means you are success to update