

Battery Charger Adapter

Item	Spec	Units
Model	DA-65J19	
Manufacturer	Asian Power Devices Inc. (APD)	
Size	134.0 x 59.8 x 31 (5.2 x 2.3 x 1.2)	mm (inch)
Weight	Typ. 335 (0.7)	g (lb)
Input	100-240 V ~, 50-60 Hz, 1.5-0.7 A	
Output	19 V --- 3.42 A	
Class	I	
Cable length	1500 (59)	mm (inch)

Control Box

Item	Desc.	Specification	Units
Model	LG Control Box	LG Control Box	
Size		125.0 x 255.0 x 109.8 (4.9 x 10.0 x 4.3)	mm (inch)
Weight		Typ. 1.3 (2.8)	kg (lb)
Input	AC Power	100-240 V ~, 50/60 Hz, 1.4-0.7 A	
Output	DXD 1	24 V --- 2.1A, Trigger signals, Ethernet data for Detector A.	
	DXD 2	24 V --- 2.1A, Trigger signals, Ethernet data for Detector B. Control Box supports 2 Detector connection. Usage is, one is for bucky stand, the other is for table (bed). Generally, X-ray room of hospital installs 2 detectors, bucky stand and table type, it's for more convenient and efficient working environment. These 2 detectors are not operated simultaneously, control box selects the operating detector by AWS command.	
	Ethernet	Transmission image/command between the detector and PC	
	Sync	Transmission control signals between the detector and X-ray generator	

Cables

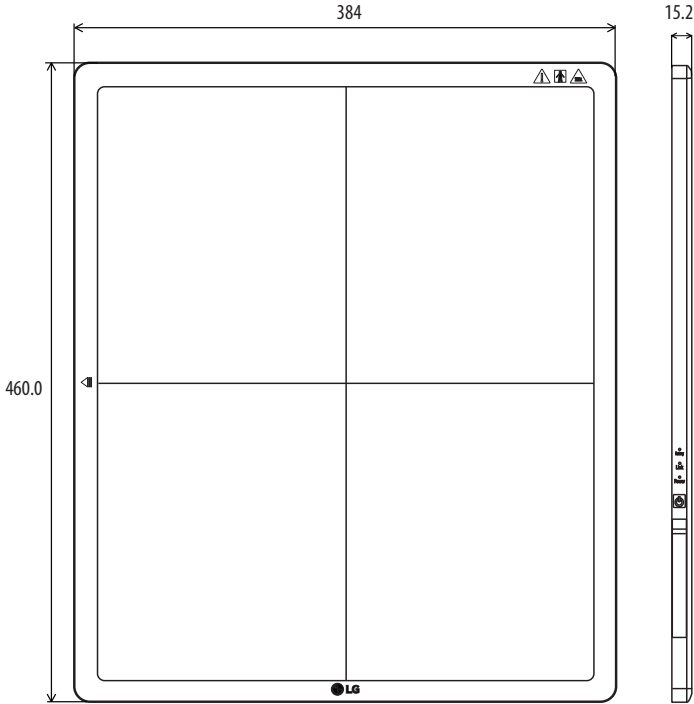
Category	Length	Qty
Main Cable	1 m	1
LAN Cable (optional)	10 m	1
Power Cord (110 V or 220 V)	1.5 m	2
Trigger Cable (optional)	15 m	1

Detector

Unit: mm

Front

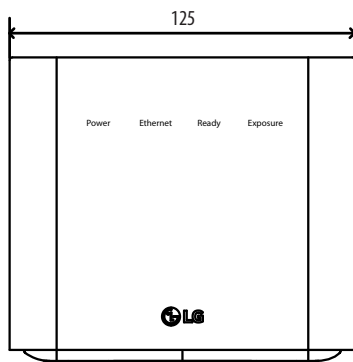
Side



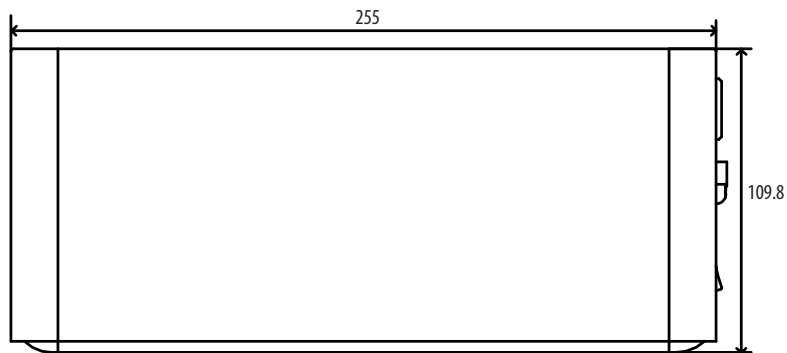
Control Box

Unit: mm

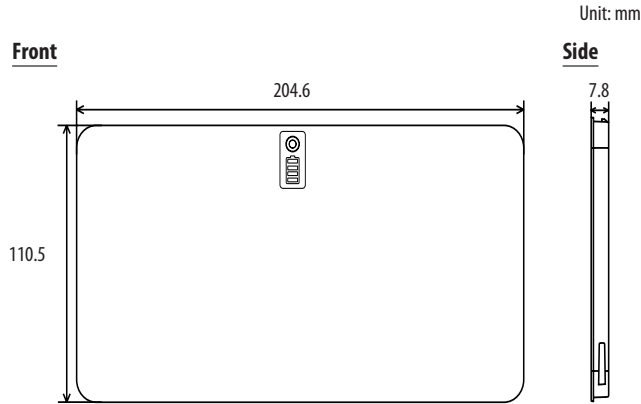
Front



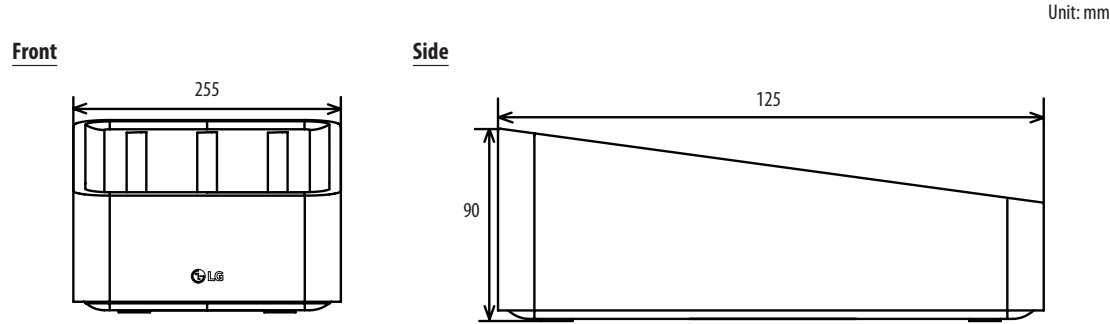
Side



Battery



Battery Charger



ENVIRONMENTAL REQUIREMENT

PC system requirement

PC Specification	
CPU	intel i5
Memory	4 GB
Disk capacity	At least 10 GB, 500 GB recommended
Network card	dual ethernet 100/1000 bps
OS	Windows 7/8.1/10(32bit, 64bit)
Monitor	Min. Resolution 1280x720

CALIBRATION SOFTWARE

How to install

Run the calibration software installation file. Once the installation file has been executed, follow the installation instructions on the screen.

How to delete

You can delete the Calibration Software in the following ways:

Deleting from the Control Panel

- 1 Select Control Panel from the Start menu.
- 2 Select Programs and Features in Control Panel.
- 3 Select the LG DXD Calibration on the lists.
- 4 When the program installation and deletion screen appears on the screen, select the **Delete** button.
- 5 Follow the deletion instructions on the screen and click the **Next** button to proceed.

Deleting with the installation file

- 1 Run the calibration software installation file, then follow the deletion instructions on the screen.

! NOTE

- When using the installation file to delete the program, the **installation file** must be the same version as the current software.

CONNECTION TYPES

X-ray Generator and Detector

Select Trigger Mode in accordance with the acquisition method.

- Auto Mode : Detector detects the image obtained after the X-ray.
- Manual Mode : Detector acquires image by pressing generator exposure switch.

Connection of Detector - PC

The connection mode used between the detector and PC.

- Wired Mode: Uses the Control Box to connect the detector to a PC.

Mode of connecting Network

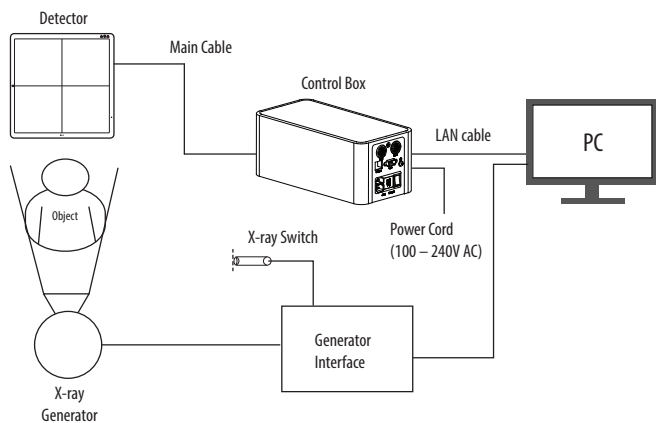
Wired or wireless modes are set automatically depending on whether or not the main cable is connected when the detector is turned on.

- 1 If the main cable is connected when the power is turned on: Wired mode.
- 2 If the main cable is not connected when the power is turned on: Wireless mode.
- 3 If the cable is disconnected while in wired mode: Switches to wireless mode.
- 4 If the cable is connected while in wireless mode: Maintains wireless mode. (charging)

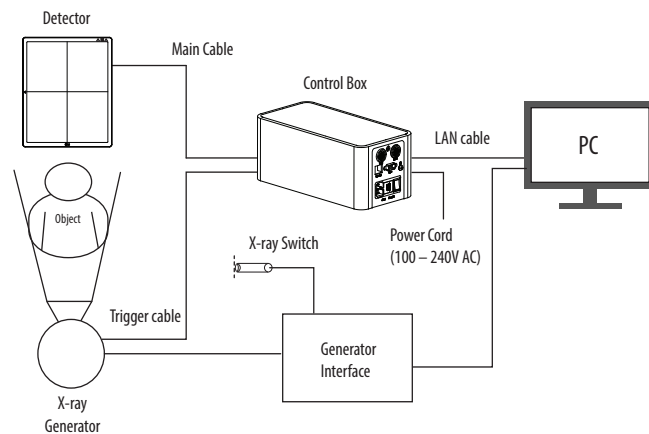
Mode	Generator - Detector	Detector - PC
Case 1	Auto Mode	Wired Mode
Case 2	Manual Mode	Wired Mode
Case 3	Manual Mode	Wired Mode
Case 4	Manual Mode	Wireless Mode

Detector and PC

Auto Mode

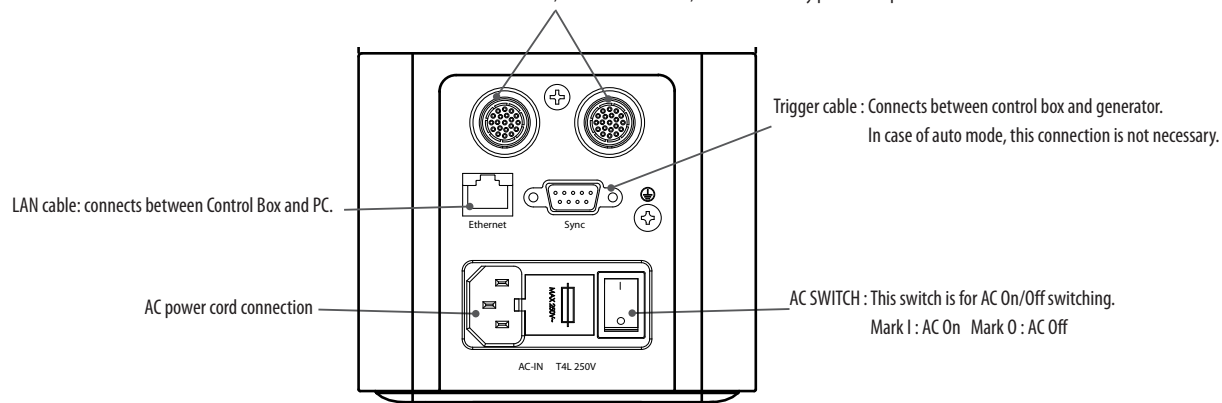


Manual Mode



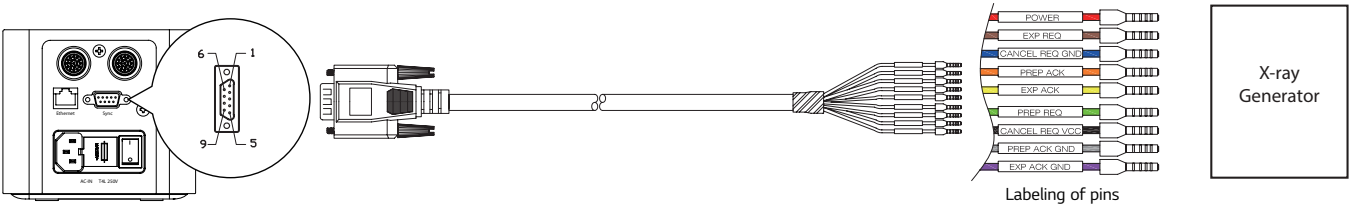
Main cable : Connects between Control Box and detector.

2 detectors can be connected, in case of 1 detector, connection of any port is acceptable.



Trigger Cable

- Trigger cable is connected between control box and x-ray generator.

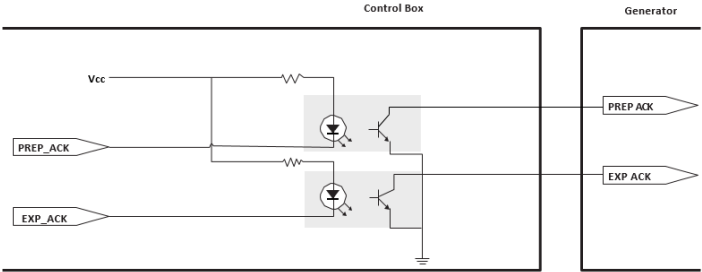
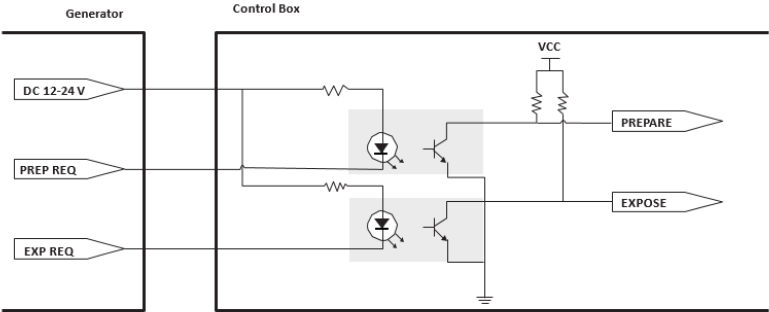


NC : No Connection

No.	COLOR	Description	
1	RED	DC 12~24V --- of signals	Use
2	BRN	Expose signal from generator to Control Box	Use
3	BLU	CANCEL REQ GND	NC
4	ORG	Prepare Acknowlge signal from Control Box to generator	Use
5	YEL	Expose Acknowlge signal from Control Box to generator	Use
6	GRN	Prepare signal from generator to Control Box	Use
7	BOK	CANCEL REQ VCC	NC
8	GRY	PREP ACK GND	NC
9	VIO	GND of signals	Use

Trigger cable and X-ray generator connection is implemented by expert of X-ray system manufacture. Description of each pin is common language of this industry.

Block diagram of Trigger Cable connection

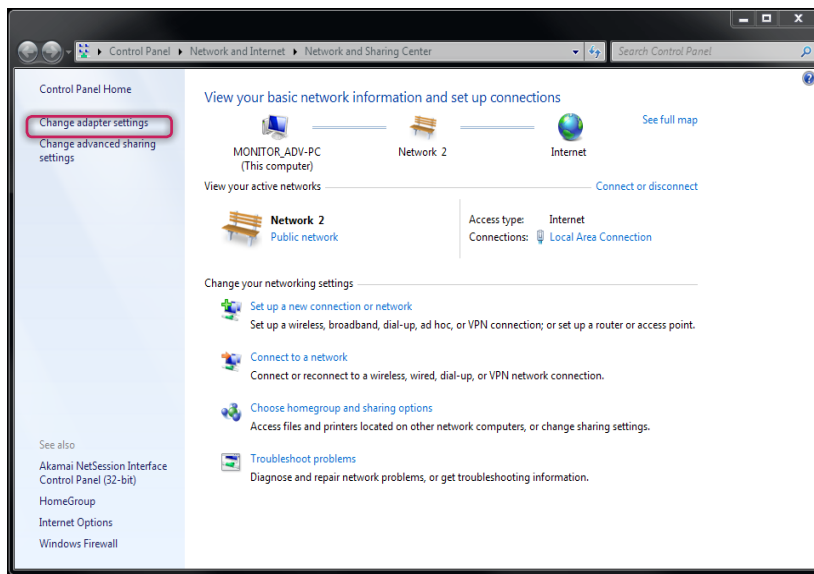


Connect - Wired Connection

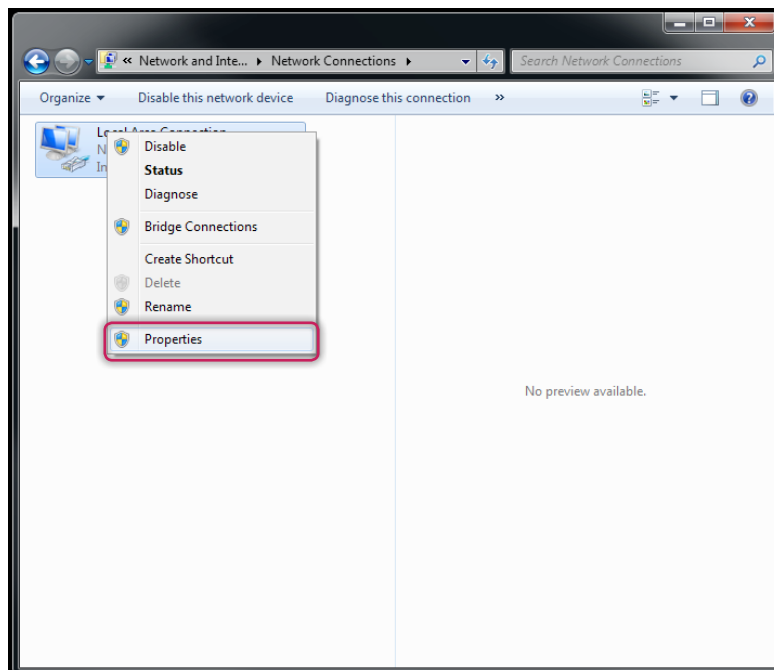
- 1 Use the LAN cable to connect a PC to the Control Box and connect the detector to the Control Box with the main cable.
- 2 Follow the steps below to set up the PC.

❶ Launch the **Network and Sharing Center** and click **Change adapter settings**.

- (Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings)

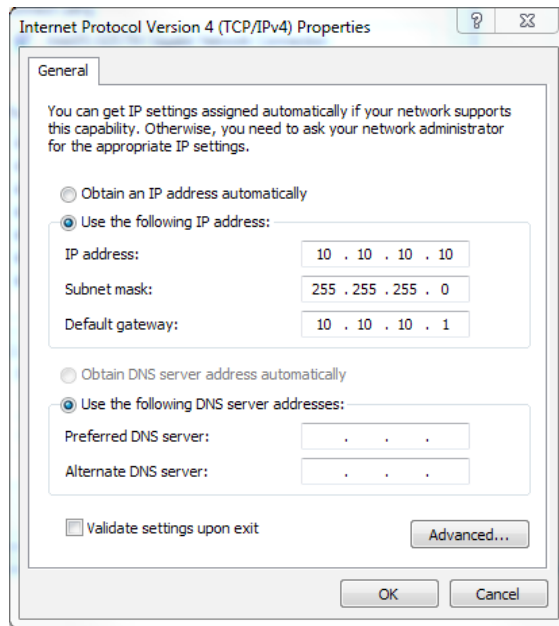
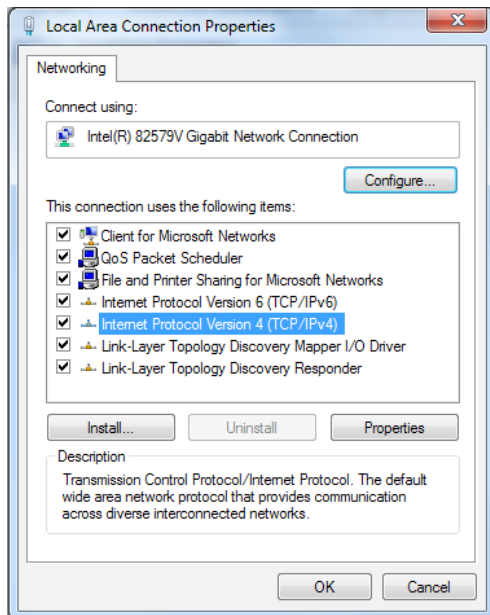


2 Right-click Local Area Connection, and click **Properties**.

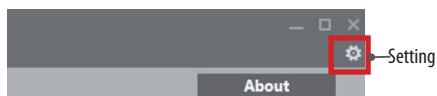


3 Select **Internet Protocol Version 4 (TCP/IPv4)**, and then click **Properties** to set the IP address as follows:

- IP address: 10.10.10.2 - 10.10.10.254 (set an IP address other than 10.10.10.100)
- **Subnet Mask:** 255.255.255.0
- **Default Gateway:** 10.10.10.1

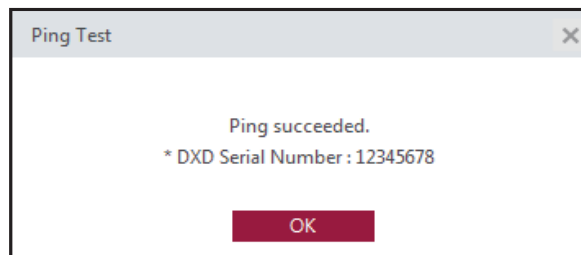


- 4 Run the LG DXD Calibration program. Go to **Settings** > **DXD** > **Connection&File Save**, enter DXD IP (10.10.10.100), then run the **Ping** to check the connection.

A screenshot of the LG DXD Calibration program window. The window has a title bar with standard Windows controls. Below the title bar is a menu bar with 'Calibration', 'User BPM', 'Validation', and 'EI'. The 'Calibration' menu is highlighted. Below the menu bar is a sub-menu bar with 'DXD', 'Calibration SW', and 'Firmware Update'. The 'DXD' sub-menu is highlighted. The main area of the window is titled 'Connection & File Save'. It contains the following fields and buttons:

- DXD Serial Number: A text input field.
- DXD IP: A text input field with the value '10.10.10.100'.
- Timeout: A text input field with the value '5000' and a label 'msec. (500~10000)'.
- Save Location: A text input field with the value 'C:\Users\heuser\Documents\LG' and an 'Open' button.
- A 'Ping' button.
- An 'Apply' button at the bottom right.

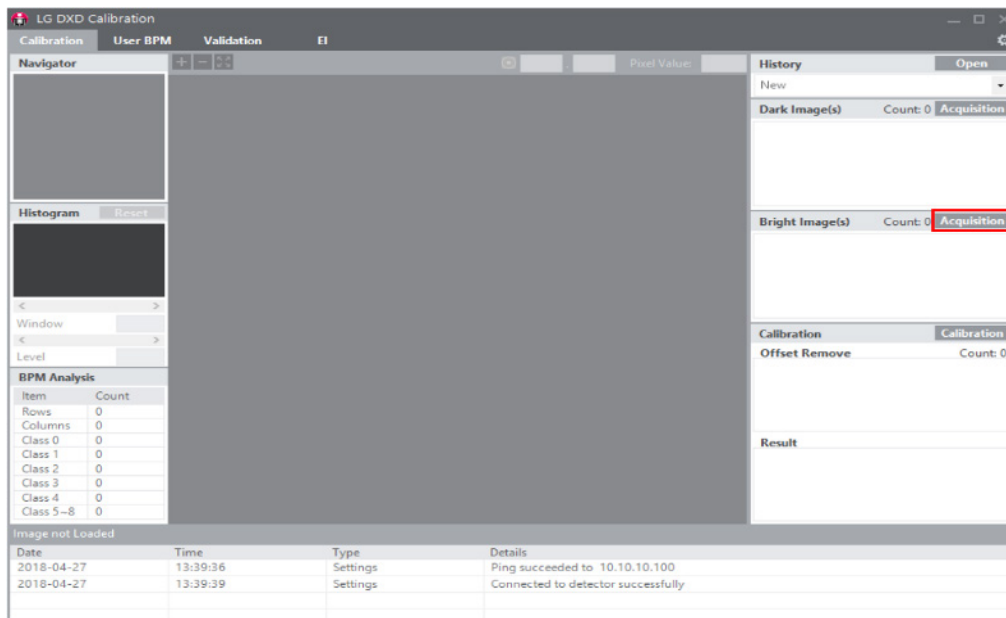
If following screen is popup after “ping” click, connection is successful, everything for system operation is ready.



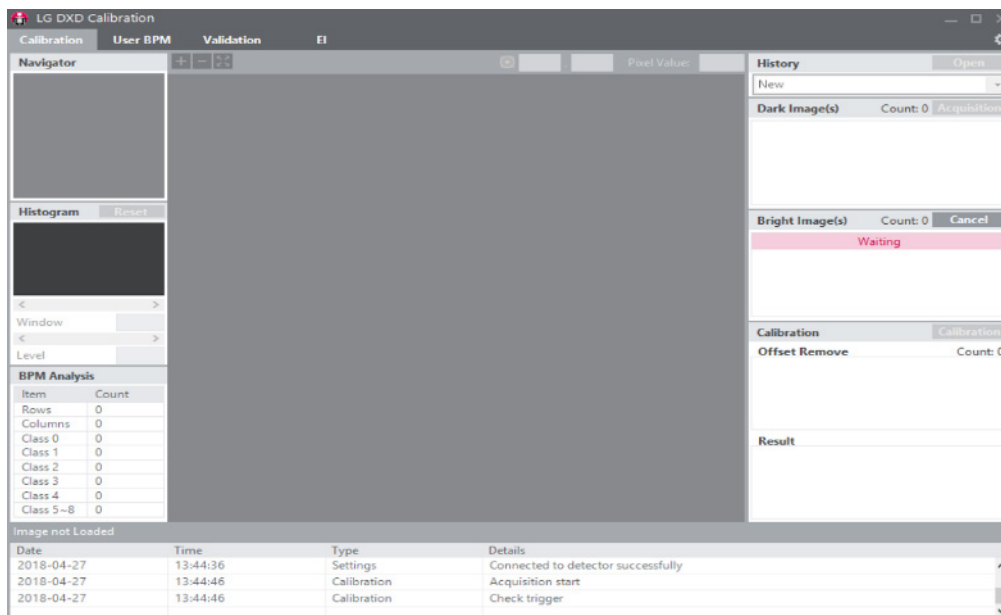
How to acquire bright image with X-Ray shot. This procedure is also applied for pediatric patient.

X-ray generator connection is explained in this manual page from 39 to 41.

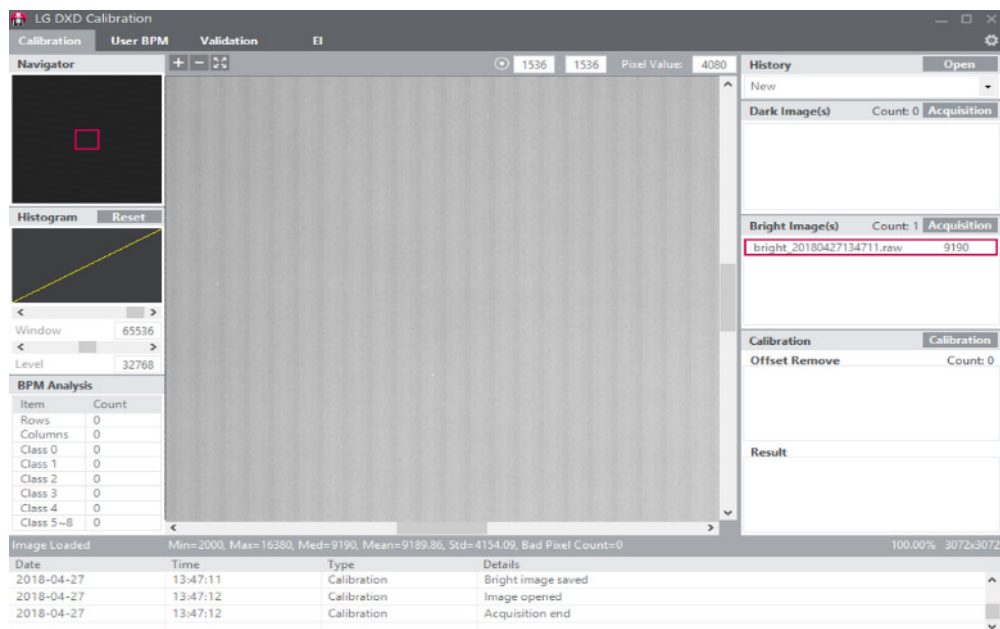
- 1 Click the "Acquisition" Button next to Bright Image(s) text.



- 2 Implement "X-ray Shot". Calibration SW will wait X-Ray acknowledge signal from DXD and it will display waiting sign.



- 3 Acquired bright image is displayed in list view, please check its name and median value. Actual file is saved "Image" folder in the workspace.

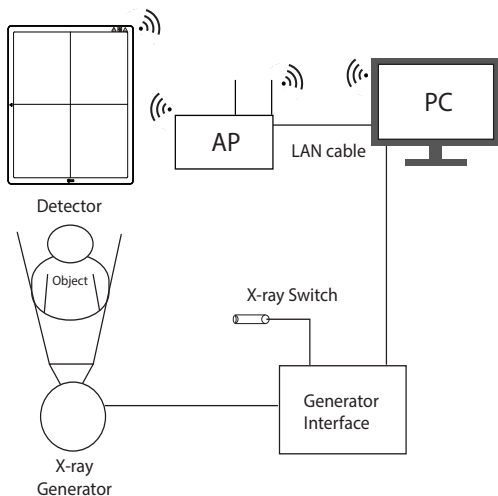


! NOTE

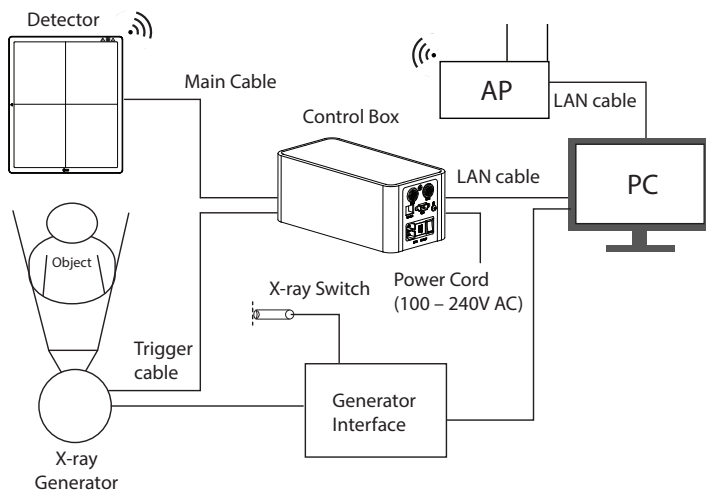
- These acquisition steps are all same to User BPM, Validation and EI image acquisition.
- Calibration SW support Window level adjustment, but does not support other image post-processing function.
- The process of obtaining the image for pediatric patients is same with other patients.

Connecting Detector to PC (Wireless Mode)

Auto Mode



Manual Mode



! NOTE

- Make sure the AP and detector are installed as close as possible without any obstacles between them.

Connect - Wireless Connection

- 1 The wireless factory default settings are as follows:
 - SSID : LGEDXD
 - Password : lgedxd2000
- 2 Wireless network settings can be changed by the LG DXD Calibration Software.
 - For details about the wireless settings of the detector, refer to the service manual "Connecting Detector to PC (Wireless Mode)".
- 3 After checking the wireless settings of the detector, remove the main cable from the detector and reboot.
(when turning the power on after removing the main cable: wireless mode)
- 4 Use the same method as in the wired mode to set up and connect a PC.

! NOTE

- Refer to the wireless access point setup guide.
 - "Specification of Wireless Module (LGSWFAC73)"

CALIBRATION SOFTWARE

To ensure that optimal image quality, the detector must be calibrated. The Calibration Software is generates and verifies the values/images required necessary for calibration.

! NOTE

- To ensure optimal image quality, you should calibrate every month during the first three months after the purchase, and half-yearly calibration thereafter.
- It is recommended that detector should be aging condition(continuous dark image reading mode after power on) at least 15 minutes.

Calibration Software

The features of the Calibration Software include **Settings**, **Calibration**, **User BPM**, **Validation** and **Exposure Index**.

Settings

Settings include **DXD** settings, **Calibration SW** settings and **Firmware Update**.

- **DXD:** Configures the settings required to obtain calibration images and detector settings.
 - Detail explanation of each icons is explained at the back page.

LG DXD Calibration

Calibration User BPM Validation EI

DXD Calibration SW Firmware Update About

Connection & File Save

DXD Serial Number: 12345678

DXD IP: 10 . 10 . 10 . 100

Timeout: 5000 msec. (3000~10000) Ping

Save Location: C:\Users\heuser\Documents\LG Open

Apply

Network Options

Current Status: Wired Change DXD IP Wireless Setup

Installation Info.

Date Format: YYYY/MM/DD

Current Date: 2017/09/07 Register

Detector Parameters

Trigger Mode: ☐ Auto ☒ Manual

Sensitivity: 15 (0~63)

Window Time: 5 00 msec (1~40)

Frame Width: 3072

Frame Height: 3072

! Press 'Reset' to load factory-default Detector Reset

Save Cancel

Power Options

Auto Sleep: Off

Auto Power-Off: Off

Save Cancel

Exit

Date	Time	Type	Details
2017-09-07	12:16:40	Settings	Connected to detector successfully
2017-09-07	12:18:52	Settings	Ping succeeded to 10.10.10.100
2017-09-07	12:18:54	Settings	Connected to detector successfully

- **Calibration SW:** Configures the settings required for to calibrate software algorithms.
 - Detail explanation of each icons is explained at the back page.


LG DXD Calibration

Calibration
User BPM
Validation
EL

DXD
Calibration SW
Firmware Update
About

Calibration Parameters

Target Gain
(0.0~255.0)

Gain Margin
(0.0~1.0)

Offset Margin
(0~1000)

Std Margin
(0~1000)

Ref sat value
(28000~65534)

Surr Margin
(0~3000)

Cut Edge

T (6~1000)

L (6~1000)
R (6~1000)

B (6~1000)

Image Edit

Rotation

Flip

Invert
☐


Press 'Reset' to load factory-default Calibration SW

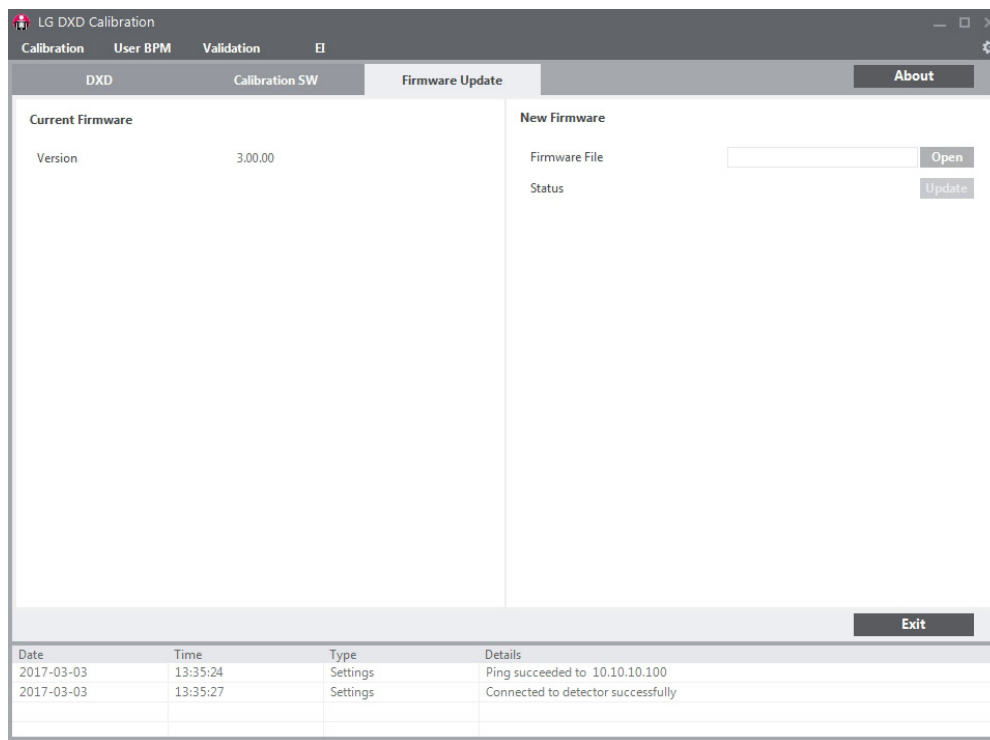
Reset

Save
Cancel

Exit

Date	Time	Type	Details
2017-12-07	13:32:21	Settings	Ping failed to 10.10.10.100
2017-12-07	13:48:46	Settings	Ping succeeded to 10.10.10.100
2017-12-07	13:48:50	Settings	Connected to detector successfully

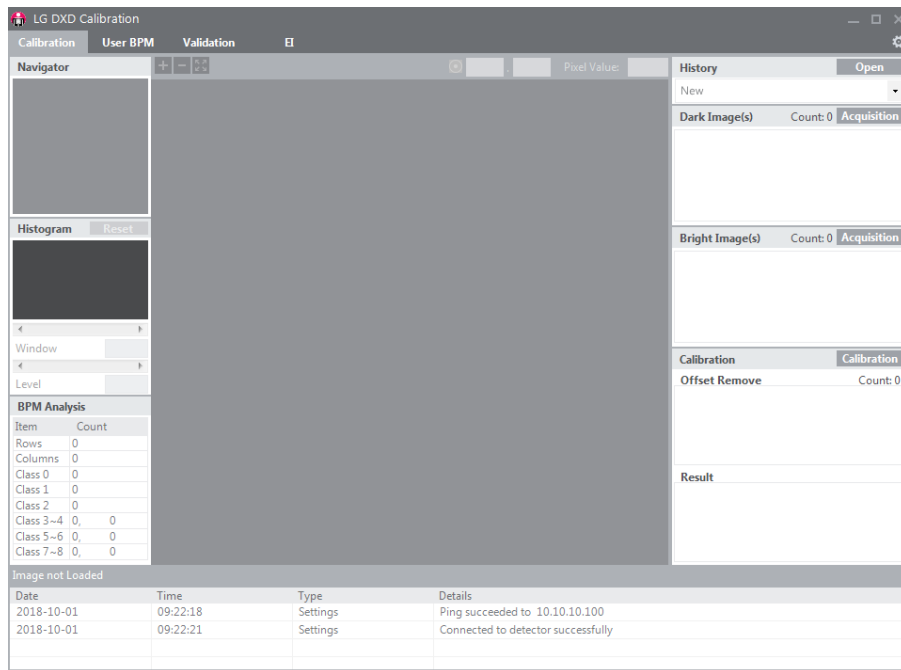
- **Firmware Update:** Checks the firmware version of the detector or performs the firmware update. You can update firmware by this menu.



Calibration

Calibration consists of the following steps:

- Obtains Dark Image and Bright Image from the detector.
 - **Dark Image(s)**: image acquired without X-ray exposure.
 - **Bright Image**ut any object (e.g. a phantom) on the detector.
- Creates **Avgdark.raw**, **Offset.raw**, **Gain.raw**, and **BPM.rawd**. Used when calculating the corrected image.
 - Corrected Image: image acquired by applying the Calibration result to the raw image.



User BPM

This is used to assign additional bad pixels in BPM.raw after calibrating.

- This page is for brief explanation, you can see details at the back pages.

BPM Analysis

Item	Count
Rows	0
Columns	0
Class 0	0
Class 1	0
Class 2	0
Class 3	0
Class 4	0
Class 5~8	0

History

Image(s)	Count	Acquisition
New	0	

Pixel View

Double click a point to update to bad/live pixel.

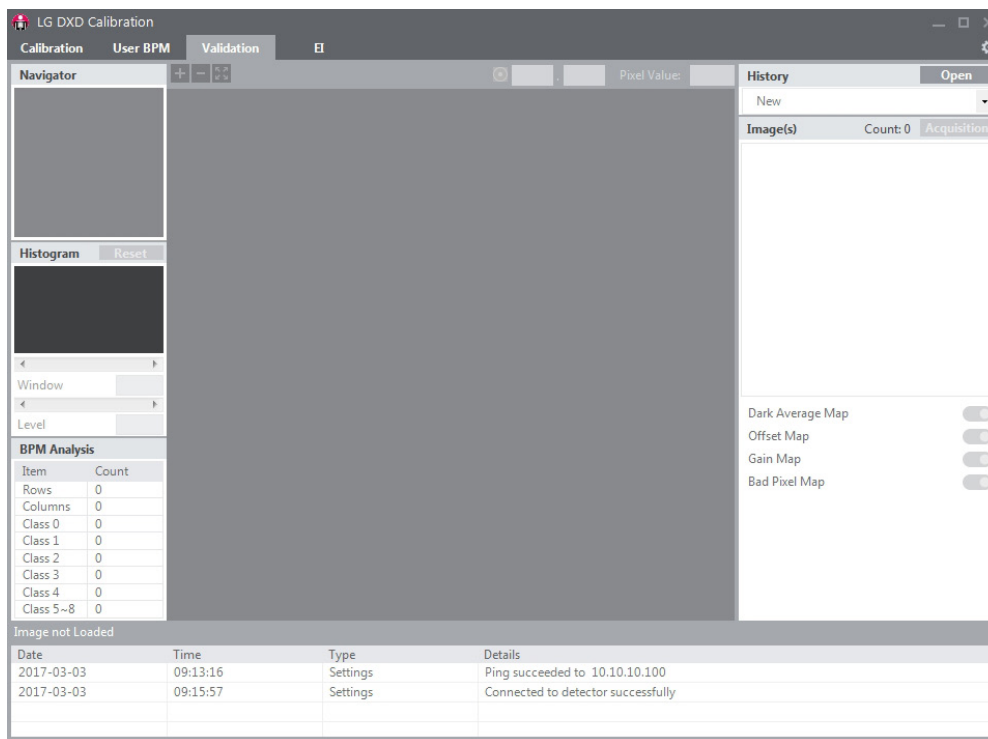
Image not Loaded

Date	Time	Type	Details
2017-03-03	09:13:16	Settings	Ping succeeded to 10.10.10.100
2017-03-03	09:15:57	Settings	Connected to detector successfully

Validation

This is used to validate the final image by applying calibration results to the image.

- This page is for brief explanation, you can see details at the back pages.



EI(Exposure Index)

This calculates and saves median output value per input dose as a linear expression and a table.

- This page is for brief explanation, you can see details at the back pages.

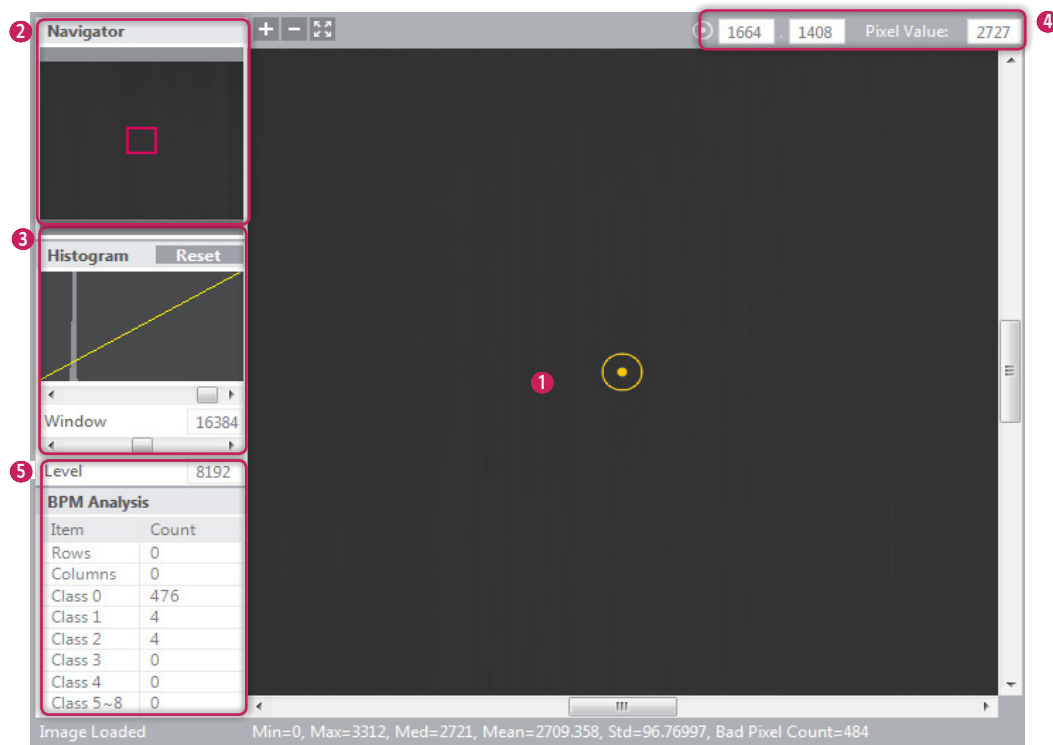
BPM Analysis

Item	Count
Rows	0
Columns	0
Class 0	0
Class 1	0
Class 2	0
Class 3	0
Class 4	0
Class 5~8	0

Image not Loaded

Date	Time	Type	Details
2017-03-03	09:13:16	Settings	Ping succeeded to 10.10.10.100
2017-03-03	09:15:57	Settings	Connected to detector successfully

Image Functions



1 Image Viewer

- **Calibration, User BPM, Validation** and **EI** menu have an image viewer to show the images acquired
- When creating or clicking an image, the image is loaded and shown in the viewer.
- Information about the image will be shown in the areas below.
 - **Image Loaded:** displays whether the image is loaded in the image area or not.
 - * When the image is loaded: **Image Loaded.**
 - * When the image is not loaded: **Image not Loaded.**
 - **Min:** the minimum pixel value in the image area.
 - **Max:** the maximum pixel value in the image area.
 - **Med:** the median value of the image.
 - **Mean:** the mean value of the image.
 - **Std:** the standard deviation of the image.
 - **Bad Pixel Count:** the number of bad pixels.
 - 16B= N, 8B= M: representation of pixel values in (x, y) in bits.
 - %: the rate of the image displayed in the image area against the entire image.
 - (W x H): the size of the entire image.

2 Navigator

- **Navigator** shows the entire area of the image acquired and also indicates the enlarged or reduced area.
- **Navigator** has a red box that indicates the area shown in the image viewer.
- **Navigator** moves the red box to wherever you click, and the selected area appears in the image viewer.

3 Histogram

- shows the **Histogram** of the image acquired.
- **Window / Level** are used to adjust Histogram to help reading the image.
- **Histogram Controls Window / Level** with the <> buttons and the scroll bar under the Histogram graph.
- When the **Reset** button is clicked, it resets to the default values.

4 Reference Point

- A reference point can be set by clicking on any location in the image viewer, and the coordinates and pixel values for the reference point will be shown on the top. You can also move the reference point by manually entering the x and y values.
 - Only numbers can be entered for a reference point.

5 BPM Analysis

- Shows the result of the analysis of the Bad Line and Bad Pixel Class based on the Bad Pixel Map after the Calibration.

Log

Shows necessary information for users to understand the process to perform Calibration Software.
Consists of **Date**, **Time**, **Type**, and **Details**, and the data will be saved in a log file.

LG DXD Calibration

Calibration User BPM Validation EI

Pixel Value:

History Open

New

Dark Image(s) Count: 0 Acquisition

Bright Image(s) Count: 0 Acquisition

Calibration Calibration

Offset Remove Count: 0

Result

Navigator

Histogram Reset

Window

Level

BPM Analysis

Item	Count
Rows	0
Columns	0
Class 0	0
Class 1	0
Class 2	0
Class 3	0
Class 4	0
Class 5	0

Image not Loaded

Date	Time	Type	Details
2017-03-03	09:13:16	Settings	Ping succeeded to 10.10.10.100
2017-03-03	09:15:57	Settings	Connected to detector successfully

OPERATION

Launching Program

- Double-click the executable file installed on the PC to launch Calibration Software.
- When launching it for the first time, you will be directed to the Settings screen.

LG DXD Calibration

Calibration User BPM Validation EI

DXD Calibration SW Firmware Update About

Connection & File Save

DXD Serial Number

DXD IP . . .

Timeout msec. (3000~10000)

Save Location

Network Options

Current Status: Wired

Installation Info.

Date Format

Current Date 2018/01/19

Detector Parameters

Trigger Mode ☐ Auto ☒ Manual

Sensitivity (0~63)

Window Time 00 msec (1~40)

Frame Width

Frame Height

! Press 'Reset' to load factory-default Detector

Power Options

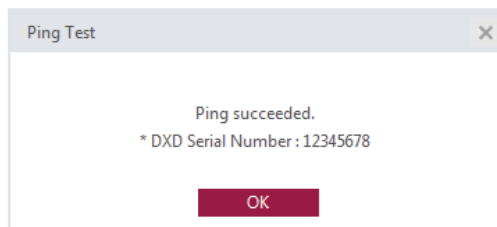
Auto Sleep

Auto Power-Off

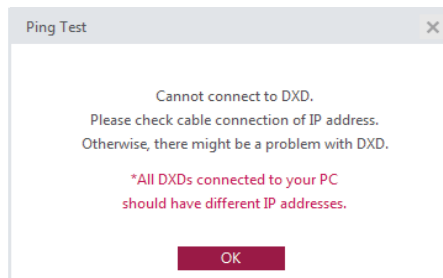
Date	Time	Type	Details
2018-01-19	15:04:12	Settings	Ping succeeded to 10.10.10.100
2018-01-19	15:04:14	Settings	Failed to load factory calibration files
2018-01-19	15:04:14	Settings	Connected to detector successfully

IP Address Check and Ping Test

- The detector has a default IP address.
- If the IP address of the detector is changed, a new IP address must be entered in the detector IP in the Calibration tool.
- After completing the IP Address and Timeout settings, click the **Ping** button to run a **Ping Test**. A pop-up message appears when the **Ping Test** is successful.



- If the **Ping Test** fails, a pop-up appears as shown below. If this pop-up appears, check your PC network settings, detector-to-PC connection, status of the detector, status of the Control Box, and IP address, and run the **Ping Test** again.



Save Location Check

Calibration Software stores images acquired, logs, result files, and factory Calibration results in the specified location.

This location can be changed from **Save Location**.

Click the **Apply** button to create a folder in the specified location.

! NOTE

- Factory Calibration: C:\Users\heuser\Documents\LG DXD Calibration
- heuser: the user's name

Calibration	User BPM	Validation	EI
DXD	Calibration SW		Firmware Update
Connection & File Save			
DXD Serial Number			
DXD IP	10	10	100
Timeout	5000	msec. (3000~10000) Ping	
Save Location	C:\Users\heuser\Documents\LG		Open
Apply			

Apply

After completing the **Ping Test** and **Save Location** Check, click the **Apply** button to perform the following tasks.

- 1 Automatically create necessary folders under the specified folder in the **Save Location**.
- 2 Load and save the factory Calibration results from the detector.
- 3 Load the detector settings.

Custom folder	Auto-create a serial number folder (created when completing Apply) Condition: create a folder when there is no folder with the same serial number in the specified folder	Creating a date-time folder (created when the Calibration button is clicked)	Avgdark.raw
			Gain.raw
			Offset.raw
			BPM.raw
			El result (the applied date-time folder is created when an El is performed)
		Log	History file
			Logfile (connection logs, etc.)
		Image	Bright image
			Dark image
			User BPM image
			Validation image
			El image
			Raw image
		Factory Calibration (Created when there is no folder or file upon the completion of Apply or if the file is abnormally small in size)	Avgdark.raw
			Gain.raw
			Offset.raw
			BPM.raw

Display the network status of the detector once the Apply process is completed.

Current Status : **Wired** connection.

Wireless Wireless connection. (available only with a wireless model)

Network Options

Current Status: Wired

Change DXD IP

Wireless Setup

! NOTE

- You must complete the Apply process before moving to another menu. (**Calibration, User BPM, Validation, and EI**)

Checking and Changing Detector Settings

During the Apply process, the current settings of the detector will be loaded on the setting screen as shown below.

LG DXD Calibration

CalibrationUser BPMValidationEID

DXD

Calibration SWFirmware UpdateAbout

Connection & File Save

DXD Serial Number

DXD IP

Timeout

Save Location

Apply

Network Options

Current Status: Wired

Change DXD IPWireless Setup

Installation Info.

Date Format

Current Date

Register

Detector Parameters

Trigger Mode

Sensitivity

Window Time

Frame Width

Frame Height

! Press 'Reset' to load factory-default Detector

Reset

SaveCancel

Power Options

Auto Sleep

Auto Power-Off

SaveCancel

Exit

Date	Time	Type	Details
2018-01-19	15:04:12	Settings	Ping succeeded to 10.10.10.100
2018-01-19	15:04:14	Settings	Failed to load factory calibration files
2018-01-19	15:04:14	Settings	Connected to detector successfully

- **Detector Parameters:** Settings used when acquiring an image from the detector.
- Click the **Save** button to apply the settings entered.
- Details of the settings are as follows:
 - **Trigger Mode:** set the **Trigger Mode**.
 - * **Auto** : Enable the Auto Exposure Detection feature
 - * **Manual**: Disable the Auto Exposure Detection feature
 - **Sensitivity** : Sensitivity of the panel.
 - **Window Time**: Set the time to read the data after the X-ray exposure. (unit: 100 ms, when you enter 5, the time is set to 500 ms)
 - **Frame Width / Frame Height**: Number of pixels in the detector.
- The operations of each button are as follows:
 - **Save**: Apply the changed settings.
 - **Reset**: Load the factory settings.
 - **Cancel**: Load the last saved settings.

Checking and Changing Calibration Software Settings

Click the **Calibration SW** tab to update **Calibration Parameters**.

Calibration Parameters

These parameters are the settings used in the Calibration process. These settings can be adjusted according to the actual operating environment.

The screenshot shows the 'LG DXD Calibration' application window. The 'Calibration SW' tab is active, displaying 'Calibration Parameters' and 'Image Edit' sections. The 'Calibration Parameters' section includes input fields for Target Gain (1), Gain Margin (0.6), Offset Margin (120), Std Margin (80), Ref sat value (56000), and Surr Margin (2000). The 'Image Edit' section includes dropdowns for Rotation (0) and Flip (None), and a checkbox for Invert. Below these are buttons for 'Reset', 'Save', 'Cancel', and 'Exit'. A warning message states: 'Press \'Reset\' to load factory-default Calibration SW'. At the bottom, a log table shows the following data:

Date	Time	Type	Details
2018-10-01	09:22:18	Settings	Ping succeeded to 10.10.10.100
2018-10-01	09:22:21	Settings	Connected to detector successfully

- Details of the settings are as follows:
 - **Target Gain:** Gain in the algorithm.
 - **Gain Margin:** Set as a bad pixel if it exceeds the **Gain Margin**.
 - **Offset Margin:** Set as a bad pixel if it exceeds the **Offset Margin**.
 - **Std Margin:** Set as a bad pixel if it exceeds the **Std Margin**.
 - **Ref Sat Value:** The maximum pixel value that can be displayed
 - **Surr Margin:** Set as a bad pixel if the difference between the reference pixel value and the surrounding pixel value is greater than the **Surr Margin** in the corrected bright image.
 - **Cut Edge:** Display the pixel values to cut off from the frame image (top/bottom/left/right). After acquiring an image through **Validation** or **EI**, display the image data shown in the image viewer as a line.

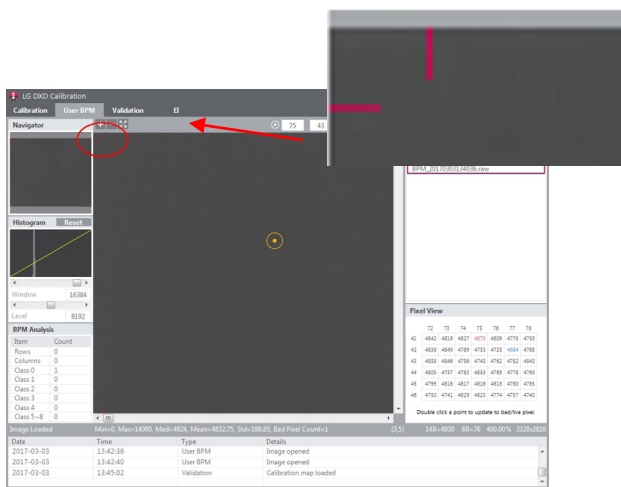


Image Edit

These settings are used in the image viewer.

- **Rotation:** Set the rotation angle of the image (**0°**, **90°**, **108°**, and **270°**)
- **Flip:** set whether to rotate the image shown in the image viewer. (**None**, **Horizontal**, and **Vertical**)
- **Invert:** reverse the image data shown in the image viewer.
- Click the **Save** button to apply the settings entered.
- The operations of each button are as follows:
 - **Save:** Apply the changed values.
 - **Reset:** load the factory values.
 - **Cancel:** load the last saved values.
 - **Exit:** returns to the last screen.

! NOTE

- You must complete the **Apply** process before proceeding with the next step.

Calibration

When all settings are completed, click the **Calibration** tab to go to the **Calibration** menu.

NOTE

- All settings must be complete before entering into the tab.

