# ENGLISH

51

#### 

- How to install	68
- How to delete	

### CONNECTION TYPES......69

X-ray Generator and Detector	
Connection of Detector - PC	
Mode of connecting Network	
- Trigger Cable Instruction	70
- Detector and PC(Wired mode)	72
- Detector and PC(Wireless mode)	75

### **CALIBRATION SOFTWARE ... 77**

- Calibration Software	77
Settings	
Calibration	
User BPM	
Validation	
Exposure Index	
- Image Functions	82
- Log	84

### USAGE......85

- Launching the Program	
- Checking IP Address and Ping Test.	
- Checking Save Location	
- Apply	
- Checking and Changing Detector Se 89	ettings .
- Checking and Changing Calibration	
Software Settings	90
- Calibration	92
- User BPM	94
- Validation	
- El (Exposure Index)	
- Exit	
- About	
- General PopUp	102

### SERVICE MANUAL ...... 104

Detector Wired IP Address Setting	104
- Wireless AP configuration	106
- Detector Firmware Update	108
- Storage of installation date	110
- Power Options Setting	111
· Web monitoring	112

Internal Information

Web monitoring

MAINTENANCE114
----------------

- Cleaning	1	14
- Inspection	1	14

TROUBLESHOOTING......115

SOLUTION FOR FIRE	NALL
BLOCK	116

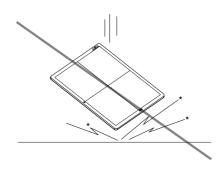
SUPPLEMENT. WIRELESS AP SET UP INSTRUCTION (MODEL : Cisco Linksys EA9200)......118

# SAFETY INFORMATION

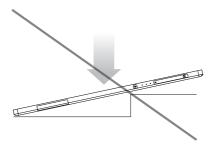
#### Preparation

- Be sure to connect the cables to the proper connectors. Otherwise, the detector may malfunction or may be damaged.
- The power supply provided by LG is designed for the detector from LG. Please contact supply, if any other type of power supply is needed to be used.
- · Be sure to fully charge the battery before use. Charge the battery on the day of examination or on the previous day.
- Battery slowly discharges even when not in use. The battery may have expired if it discharges immediately after being fully charged. You can purchase an optional battery to replace an exhausted one.
- The battery charger provided by LG is designed for the dedicated battery.
- When the detector will not be used for some time, remove the battery.

#### Handling



· Handle the detector carefully, as it may become damaged if it is hit, dropped, or receives a strong jolt.



- Be sure to use the detector on a flat place so it will not bend. Otherwise, the detector may be damaged.
- Be sure to check the detector daily and confirm that it works properly. Sudden heating of the room in cold areas
  will cause condensation to form on the detector. In this case, wait until condensation disappears before performing
  exposure. If the detector is used with condensation formed on it, problems may occur in the quality of the detector.
  When an air-conditioner is going to be used, be sure to raise/lower the temperature gradually so that a difference
  in temperature in the room and in the detector does not occur, to prevent forming of condensation. Follow the

recommended proper Room temp.

- Do not use the detector near devices generating a strong magnetic field. Doing so may produce image noise or artifacts.
- Keep the connectors free from being in contact with the patient.
- · Connectors are intended to be connected to an external device and must follow IEC standards.
- Do not apply excessive weight to the detector. Otherwise, the detector may be damaged.



Overall Pressure: 150kg (330.6lb) over the whole area of detector window.



Partial Pressure: 100kg (220.4lb) on an area 40mm (1.5 inch) in diameter

#### **Disinfection and Cleaning**

- Do not spray disinfectants or detergents on the detector.
- When cleaning the detector, be sure to turn off the power, and unplug the power cable from the AC outlet.
- Do not use any flammable chemicals such as thinner, benzene for cleaning. Otherwise, fire or electric shock may
  result.
- Wear waterproof gloves to protect your hands from direct contact with disinfectants or detergents.General Description.

#### **Overview**

14HJ701D is wireless Flat Panel Digital X-ray Detector that can generate images of any part of the body, and designed for a faster approach to digital radiography systems.

This model utilize a combination a amorphous silicon TFT glass and high performance scintillator, along with a pixel pitch 127um and 3.9lp/mm of resolution, assure sharp and high contrast image quality.

14HJ701D is X-ray imaging acquisition device that is based on flat-panel. This device should be integrated with an operating PC and a X-ray generator. It can do to utilize as digitalizing X-ray images and transfer for radiography diagnostic. Data transmission between detector and PC is possible by wire (cable) and wireless (WIFI).

#### **Product Component**

- Detector: 14HJ701D
- Control Box : LG Control Box
- AC power cord for Control Box
- Battery Charger : LG Battery Charger
- 2 Battery packs
- AC Power adapter for Charger : 65 W
- AC Power cord for AC Power adapter
- Main Cable
  - Detector and Control Box link cable (Supply DC power, Ehternet data, control signals of X-ray generator)
  - Trigger Cable (X-ray generator to Control Box, transmit control signal between detector and X-ray generator)
  - LAN cable (Control Box to PC, exchanges Ethernet data between PC and detector)
- CD: User's manual, Calibration Software
- User's manual(book type), Inspection Report

#### **Basic Accessories**



Detector 1 EA



Installation CD 1 EA



AC Power cord for AC Power adapter



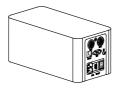
Main cable 1EA



Charger 1 EA



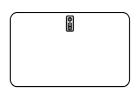
AC Power adapter 1 EA



Control Box 1EA



Inspection Report 1EA



Battery 2 EA



AC Power cord for Control Box 1EA



Manual 1 EA

#### **Optional Accessories**



Trigger Cable 1EA

LAN cable 1EA

Optional accessories can not be included in accordance with production suffix.

#### 

• Need to use the authorized components about the below accessories. Unauthorized components may be cause of the damage and malfunction of the product.

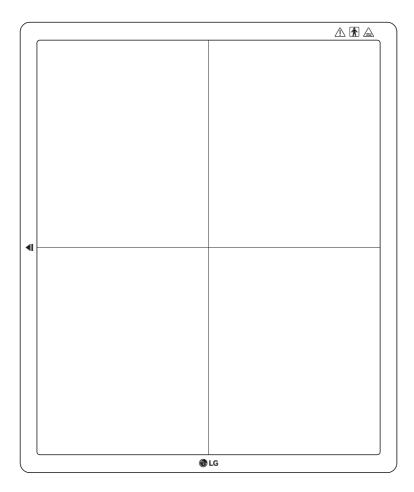
Component	Standard	
LAN CABLE	More than CAT5E Standard	
Power Cord	US – Approved Medical grade regulation	
	Others – Approved country safety regulation	

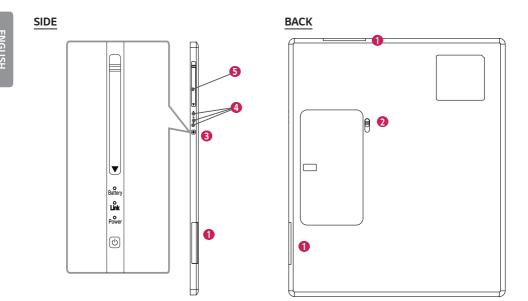
The AC/DC adaptors and etc. except the upper components need to be used only supplied by manufacturer.

# PART NAME AND FUNCTION

#### Detector

#### FRONT





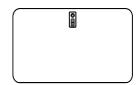
0	Wireless Antenna		
2	Battery Unlock Lever. Unlock lever to remove battery		
8	Power Button: Power on/off switch (On : press over 1 sec, Off : press over 5 sec)		
4	LED Indicator. Indicating detector's status		
6	Connection to main cable		

LED	LED Color	Status
Battery	Green	Battery is more than 30% charged.
	Orange	Battery charging stauts is 10 ~ 30%.
	Orange Blinking	Battery is less than 10 % charged.
Link	Green	Ethernet/WIFI connection
	Off	Ethernet/WIFI no connection
Power	Green	Power On
	Green Blinking	Sleep mode
	Off	Power Off

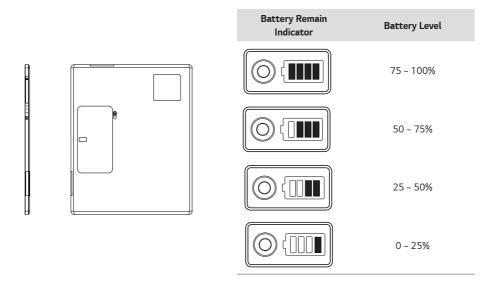
If there is no communication during "Auto Sleep/Auto Power off" time, Detector will go to Sleep mode/Power off. This function only works when Detector is not connected with "Detector and Control Box link cable". If the Detector receives the communication message during Sleep mode, The Detector will wake up.

User can set the Sleep/Power off times using the Calibration Software.

#### **Battery and Charger**



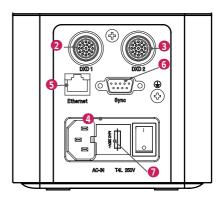
- 1 Battery: Li-ion polymer battery (Charging time Typ. 4 Hrs)
- Battery pack itself shows the remaining battery percentage.



- 2 Battery charger. 3 ports cradle type
- 3 LED Indicator. Following LEDs are located to each battery 3 batteries.

LED	Green	Completion of charging
	Orange	On charging
	Orange Blinking	Error (Connection error, etc)





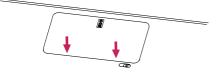
1	LED	POWER	Green	Power normal operation
			Off	Power off (AC power cord no connection or Power error.)
		Ethernet	Green	Ethernet normal operation
			Off	Ethernet disconnected.
		Ready	Green	Ready signal from X-ray generator is active.
			Off	Ready signal from X-ray generator is inactive.
			Orange blink	Error
		Exposure	Orange	Exposure signal from X-ray generator is active.
			Off	Exposure signal from X-ray generator is inactive.
			Orange blink	Error
2	DXD 1	Connecting the Control Box and the detector A. This connector supply power (24 V 2.1 A) to the detector, transmits X-ray synchronization signals and Ethernet image data.		
•	DXD 2	<ul> <li>24 V 2.1 A, Trigger signals, Ethernet data for Detector B</li> <li>Control Box supports 2 Detector connection.</li> <li>Usage is, one is for bucky stand, the other is for table(bed).</li> <li>Generally, X-ray room of hospital installs 2 detectors, bucky stand and table type, it's for more convinient and efficient working environment.</li> <li>These 2 detectors are not operated simutaniously, control box selects the operating detector by AWS command.</li> </ul>		
4	AC-IN	Connects AC power cord		
6	Ethernet	Ethernet port to transmit image/command between the detector and PC.		
6	Sync	This is to synchronize the detector and X-ray generator.		
0	Fuse	T4L 250V		

# **BATTERY INSTALLATION**





- 1 Check the battery mounting hole direction.
- 2 Insert into the hole on the side with the indicator.



3 Press the opposite side to secure the battery indicator.

# **SPECIFICATION OF EACH PART**

The product specifications are subject to change without prior notice for product improvements.

"~" refers to alternating current (AC), "---" refers to direct current (DC).

#### Detector

ltem	Specification	Units
Model	14HJ701D	
Sensor type	Amorphous Silicon with TFT	
Scintillator Type	Csl:TI	
Total Pixel Matrix	3328 x 2816	Pixels
Total Pixel Area	422.655 (16.63) x 357.632 (14.08)	mm (inch)
Pixel Pitch	127	um
Effective Pixel Matrix	3323 x 2751	pixels
A/D Conversion	16	bits
Data Transfer	802.11 a/g/n/ac Wireless LAN, typ. 200Mbps with 802.11ac Gigabit Ethernet typ. 500Mbps	
Preview time	2	sec
Energy range	40 ~ 150	kVp
MTF	Typ. 85%, min. 70% at 0.5 lp/mm	%
DQE	Typ. 63%, min. 50% at 0.1 lp/mm	%
Defective lines	Less than 20	Lines
Defective pixels	Less than 9630	Pixels
Dimension	384.0 x 459.5 x 15.0 (15.1 x 18.0 x 0.5)	mm (inch)
Weight	Тур. 2.95 (6.5)	kg (lb)
Window material	Carbon Fiber	
Trigger mode	Manual Mode	
	Auto Mode (Auto Exposure Detection)	
Power consumption	Typ. 26 (Charging & Operating)	W
	Typ. 16 (Operating only – no charging)	
	Typ. 7 (Standby only – no charging)	
Wireless	Standard:	
	802.11 a/g/n/ac compliance	
	Peak mode: 866 Mbps	
	Frequency: 2.4 GHz / 5 GHz	
	Bandwidth: 20 MHz / 40 MHz / 80 MHz	
	MIMO: 2X2	
Rating	24 V 2.1 A, 7.5 V 3850 mAh (Battary: LBQ7222L)	
Applied part	Type : BF Type, Location : Front of Detector (only for effective area)	

#### 

- Maximum wireless signal rate derived from IEEE standard specifications. Actual data throughput will vary. Network conditions and environmental factors, including volume of network traffic, building materials and construction, and network overhead, lower actual data throughput rate.
- Recommended Maximum operable distance: 2 m (From the Access Point)
- Wireless antennas: The module adopts the latest 802.11ac technology. The transmitter of the module is powered by host equipment (Detector). The antennas are 2 printed-dipole antennas.
- Wireless module: 802.11 a/b/g/n/ac USB2.0 module is implemented. It supports 2T2R (2 transmit 2 receive) MIMO technology, which delivers throughput up to 300 Mbps.

#### **Battery**

ltem	Specification	Units
Model	LBQ7222L	
Rating	7.5 V, 3850 mAh, 30 Wh	
Size	204.1 x 10.5 x 7.8 (8.0 x 0.4 x 0.3)	mm (inch)
Weight	Тур. 240 (0.5)	g (ib)
Output Norminal voltage	7.5	VDC
Cycle time	Max. 800	Cycles
Operation Temp	10 - 35	C
Charging time	Тур. 4	Hours
Capacity	Тур. 4000	mAh
Battery performance	1400 shots acquired for 3.2 hours	Images
	(cycle time 8s , without sleep , with Full charged battery)	

#### **Battery Charger**

Item Specification		Units
Model	LG Battery Charger	
Size	125 x 255.0 x 90.0 (4.9 x 10.0 x 3.5)	mm (inch)
Weight	Тур. 900 (1.9)	g (ib)
Input	19 V 3.42 A	
Output Norminal voltage	8.7	VDC

### **Battery Charger Adapter**

ltem	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	Тур. 335	g (ib)
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**

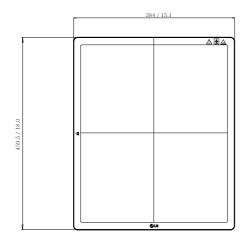
mm (inch)	Desc.	Specification	Units
Model	LG Control Box	LG Control Box	
Size		125.0 x 255.0 x 109.8 (4.9 x 10.0 x 4.3)	mm (inch)
Weight	Weight Typ. 1.3 (2.86)		kg (lb)
Input	AC Power	100-240 V ~, 50/60 Hz, 1.4-0.7 A	
	AC Inlet Fuse 1	T4L 250V	
	AC Inlet Fuse 2	T4L 250V	
	Power Fuse 1 (F101)	T 3.15AH 250V	
	Power Fuse 2 (F102)	T 3.15AH 250V	
Output	DXD 1	24 V 2.1 A, Trigger signals, Ethernet data for Detector A	
	DXD 2	24 V 2.1 A, 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 convinient and efficient working environment.	
		These 2 detectors are not operated simutaniously, 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	

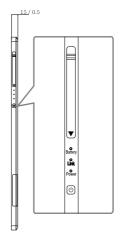
### Cables

Item	Length	Unit	Qty
Main cable	1 (39.3)	m (inch)	1
LAN cable (optional)	10 (393.7)	m (inch)	1
Power cord (110 V or 220 V)	1.5 (59.0)	m (inch)	2
Trigger cable (Optional)	15 (590.5)	m (inch)	1

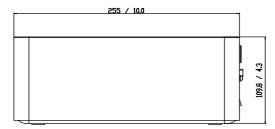
# DIMENSION (UNIT: mm/inch)

#### Detector

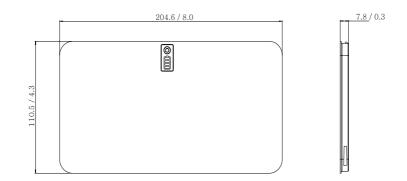




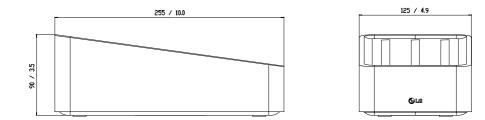
### **Control Box**



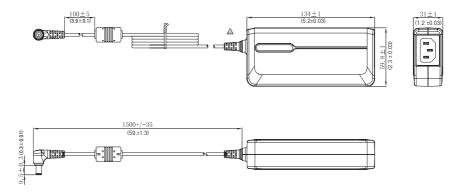




### **Battery Charger**



### **Battery Charger Adapter**



# **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	
AP	Cisco model is recommended(ex : Linksys EA9200)	
etc		

### **Environmental Requirements**

Item	Min.	Тур	<b>Max. (</b> %)	Units
Temperature (Storage)	-20		60	C
Temperature (Operation)	10		35	C
Humidity (Storage)			85	Non-condensing, Relative
Humidity (Operation)			80	Humidity
Pressure (Storage)	50		106	kPa
Pressure (Operation)	70		106	kPa

# **INSTALLING 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.

#### 

• 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
- Manaul 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.
- Wireless Mode: Uses a wireless AP to connect the detector to a PC.

#### Mode of connecting Network

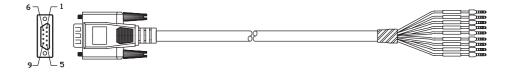
Wired or wireless modes are set automatically depending on whether or not the main cable is connected when the detector is turned on.

- 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	Auto Mode	Wireless Mode
Case 3	Manual Mode	Wired Mode
Case 4	Manual Mode	Wireless Mode



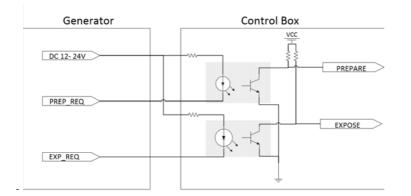
Connects a Trigger cable to Port A of the Control Box when there is X-ray generator interface.

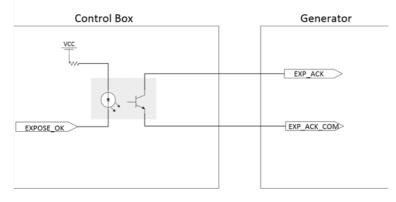


1			
	POWER		
	EXP REQ		
	CANCEL REQ GND		
	PREP ACK		
	EXP ACK		
	PREP REQ		
	CANCEL REQ VCC		
ļ	PREP ACK GND		
	EXP ACK GND	ÞĒ	
/			

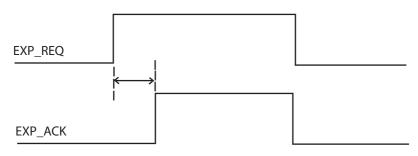
No.	COLOR	Description	
1	RED	POWER	Use
2	BRN	EXP REQ	Use
3	BLU	CANCEL REQ GND	NC
4	ORG	PREP ACK	NC
5	YEL	EXP ACK	Use
6	GRN	PREP REQ	Use
7	BOK	CANCEL REQ VCC	NC
8	GRY	PREP ACK GND	NC
9	VIO	EXP ACK GND	Use

Label pin map





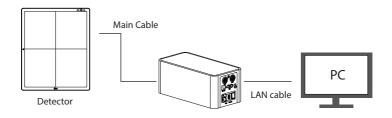
<Assembly Diagram>



<Timing Chart>

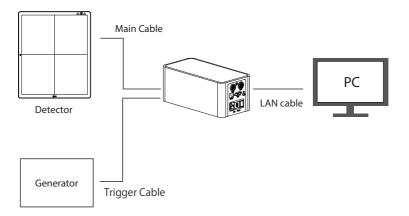
#### Detector and PC(Wired mode)

Auto Mode





#### Manual Mode



#### MAKING CONNECTIONS - Wired Connection

- 1 Connect the PC to the control box using a LAN cable. Connect the detector to the control box using a link cable.
- 2 Configure the PC settings as below:
- Open the **Network and Sharing Center**.
- (Control Panel > Network and Internet > Network and Sharing Center)

· · · · · · · · · · · · · · · · · · ·	Network and Internet      Network and Sharing Center     Op     Sainth Carter Panel	- • ×
Control Rund Home Change adapter settings Change advanced shering settings	View your basic network information and set up connections           Image: Imag	Ð
See sho Adamai NetSession Interface Control Panel (22-bit) HomoSiroup Internet Options Windows Firmwall	Connect to a network     Connect to a network     Connect to a network     Connect to reacconnect to a univelex, univel, dial-up, or VPN network connection.     Connect horsegroup and dualog option     Access These and pointer located on other network computer, or change sharing settings.     Transferators problem     Transferators problem     Depote and region network problems, or get transferators	

2 Right-click on Local Area Connection and enter Properties.

					2
Organize 🔻	<ul> <li>Network and Inte          Network     </li> <li>Disable this network device</li> </ul>	Diagnose this connection	Search Network Co	nnections	(
	Create Shortcut		No preview availad	ole.	

#### 3 Select Internet Protocol Version 4 (TCP/IPv4), then enter Properties to set the following IP address.

- IP address: 10.10.10.2 to 10.10.10.254 (Set it to an IP address other than 10.10.10.10.)
- Subnet mask: 255.255.255.0
- Gateway: 10.10.10.1

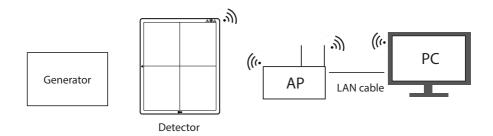
Local Area Connection Properties	Internet Protocol Version 4 (TC	CP/IPv4) Properties 🛛 💡 🔀
Networking	General	
Connect using:		ned automatically if your network supports u need to ask your network administrator is.
Configure This connection uses the following items:	Obtain an IP address au	itomatically
Gentectan declar declaring roma:	Ose the following IP add	lress:
QoS Packet Scheduler	IP address:	10 . 10 . 10 . 10
File and Printer Sharing for Microsoft Networks     Internet Protocol Version 6 (TCP/IPv6)	Subnet mask:	255 . 255 . 255 . 0
	Default gateway:	10 . 10 . 10 . 1
Link-Layer Topology Discovery Responder	Obtain DNS server addre	ess automatically
Install Uninstall Properties	O Use the following DNS set	erver addresses:
Description	Preferred DNS server:	
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication	Alternate DNS server:	
across diverse interconnected networks.	Validate settings upon e	exit Advanced
OK Cancel		OK Cancel

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

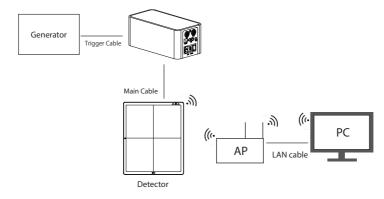
Calibration	User BPM	Validation	EI	
D	XD	Calibratio		Firmware Update
Connection	& File Save			
DXD Serial	Number			
DXD IP		10	. 10 .	10 . 100
Timeout		5000	msec. (500~1	0000) Ping
Save Locat	ion	C:\Users	\heuser\Docu	ments\LG Open
				Apply
Ping Tes	t			×
		Ping succeed	led.	
	* DXD	Serial Number	: 12345678	
			_	
		OK		

#### Detector and PC(Wireless mode)

Auto Mode



Manual Mode



#### 

Please install the AP and Detector as near as possible without obstacles in between them.

#### MAKING CONNECTIONS-Wireless Connection

- 1 The Default Wireless Settings as below.
  - SSID : LGEDXD
  - Password : lgedxd2000
- 2 It is possible to change the Wireless Settings using LG DXD Calibration Software.
- Please see the Service manual (Wireless AP configuration) for details.
- 3 Please reboot the Detector after removing the main cable on Detector. (If the main cable is disconnected when the power is turned on: Wireless mode)
- 4 PC settings and connection with Detector are same with wired Connection. Please refer to the "MAKING CONNECTIONS - Wired Connection".
- Tip : Refer to Wireless AP Set Up Guide
  - "Supplement. Wireless AP Set Up Instruction (Model : Cisco Linksys EA9200)"

# **CALIBRATION SOFTWARE**

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

#### 

- To ensure optimal image quality, you should calibrate every month for the first three months after the purchase and half-yearly calibration thereafter.
- It is recommended that you leave the detector on for five minutes before calibrating.

### **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.

DXD					About
Connection & File Save			Detector Parameters		
DXD Serial Number			Trigger Mode	Auto	Manual
DXD IP	10 . 10 .	10 100	Sensitivity	15	(1~32)
Timeout	5000 msec. (500-14	XXXX) Ping	Trigger Sensitivity	15	(0 - 256)
Save Location	C:\Users\beuser\Docu	nents\LG	Window Time	5 00	0 msec (0~65536
			Frame Width	3072	
			Frame Height	3072	
	1	NUTR	Press 'Reset' to load factory-default Detector Parameters		l(nor)
Network Options			Silvi		Carlos
Current Status:	Change 1915 1P	Werten Tellap	Power Options		
Installation Info.			Auto Sleep	Off	
Date Format	YYYY/MM/DD	*	Auto Power-Off	Off	
Current Date	2016/09/01	Reputer -			
					Exit
ite Tir	né Type	Det	ails		

<Settings Screen: Detector>

	Calibration 5	w					About
Calibration Param	ters				Image Edit		
Target Gain			1	(0.0-255.0)	Rotation	0	
Gain Margin			0.3	(0.0 - 1.0)	Fip	None	
Offset Margin			45	(0=65535)	Invert	The second	
Std Margin			20	(0-65535)			
Ref sat value			13000	(200-65535)			
				(0-65535)			
Surr Margin			25	(9-00030)			
Cut Edge		т	5 (0-1407)				
	1			R 5			
		(0~1663)		(0-1663)			
			22				
					Ress Reset to load factory default Calibration SW	Settings.	Revet
						Save	Cancel
							Exit
Date	Time	Тура		Deta			
2016-09-01	11-23-31 11-23:38	Setting			succeeded to 10.10.10.100 succeeded to 10.10.10.00		

• Calibration SW: Configures the settings required for to calibrate software algorithms.

<Settings Screen: Calibration SW>

• Firmware Update: Checks the firmware version of the detector or performs the firmware update.

	Calibration !	U Den	nware Update	About
1000	Calculation -			
urrent Firmware			New Firmware	
Version	0.09.22		Firmware File	Open
			Status	Epidate
				Exit
e	Time	Туре	Details	
16-09-01 16-09-01	11:23:31 11:23:38	Settings Settings	Ping succeeded to 10.10.10.10 Ping succeeded to 10.10.10.10	

<Settings Screen: Firmware Update>

#### Calibration

Calibration involves the following procedures:

- · Dark and Bright images are obtained from the detector.
  - Dark Image: An image obtained without generating X-rays.
  - Bright Image: An image obtained by generating X-rays without a phantom or any other object on the detector.
- Generate Avgdark, Offset, and Gain: Used for Corrected Image calculations.
  - Corrected Image: An image generated by applying calibration results to a raw image.
- Generate Bad Pixel Map: Bad pixel values are calibrated using surrounding pixel values.

🚯 LG DX	D Calibration	100				_ ¤ ×
	User B	PM Validation				0
Navigator	1997 - C.	008		D DE TABLE	History	Open
					New	2
					Dark Image(s)	Count 0 North Low
Histogram	. 80223				Bright Image(s)	Court 0 Acceletion
4 Window 4		2			Calibration	Calibration
Level					Offset Remove	Count 0
BPM Analy	ysis					
Item	Count					
Rows Columns	0					
Cass 0	0	-			Result	
Class 1	0				Result	
Class 2	0					
Oats 3	0					
Class 4	Ó					
Call 5-8						
Smage not 1	Loudel					
Date		Time .	Type	Details		
2016-09-0		11/23/33	Settings	Ping succeeded to 10.10.10.100		
2016-09-0		11-20-34	Settings	Ping successied to 10.10.10.100		
2016-09-0	03	11:24:43	Settings	Connected to detector successfully		

<Calibration Screen>

#### **User BPM**

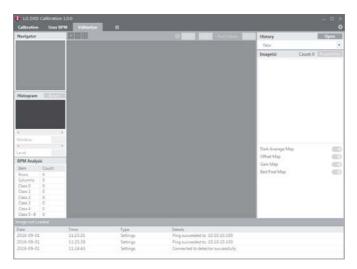
This is used to assign additional bad pixels in BPM.raw after calibrating.

Calibratio	D Calibration 1.0 n User IIIM		π					
Navigator		198			Rent Cont	History	Op	
						New		
Histogram						Image(s)	Count 0	
Vitdos	-					Placel View		
						Pixel View		
invel.								
BPM Anal								
BPM Anal Item	Count							
BPM Anal Item	Count 0							
BPM Anal Item Rows Columns	Count 0 0							
BPM Anal Item Rows Columns Oass 0	Count 0 0 0							
BPM Anal hem Rows Columns Datt 0 Class 1	Count 0 0 0 0							
BPM Anal Bem Rows Columns Oats 0 Oats 1 Oats 2	Count 0 0 0 0 0 0 0							
BPM Anal hem Rows Columns Oast 0 Oast 1 Oast 2 Oast 3	Count 0 0 0 0 0 0 0 0 0							
BPM Anal Rows Columns Oast 0 Oast 1 Oast 2 Oast 2 Oast 3 Class 4	Count 0 0 0 0 0 0 0 0 0					De the dela sure	ierto, coleto to batilica	2
BPM Anal Bern Rows Columns Oans 0 Oans 1 Oans 2 Class 3 Class 4 Class 5–8	Count 0 0 0 0 0 0 0 0 0 0					Doutes cick a po	irt 10 update 10 bad. To a	int.
BPM Anal Rows Columns Oass 0 Oass 1 Oass 1 Oass 2 Class 3 Oass 4 Class 5–8	Count 0 0 0 0 0 0 0 0 0 0 0 0 0					Doutle cick a po	int to update to bad. We p	-
BPM Anal Rows Columns Oass 0 Class 2 Class 3 Class 4 Class 5–8 The process Date	Count 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Time .	Туре	. Dutajis		Doutse cick a po	irt 10 update 10 bad. Voe p	pinet.
BPM Anal hem Rows Columns Oass 0 Cess 1 Cess 1 Cess 1 Cess 3 Cess 4 Cess 3 Cess 4 Cess 5 Cess 4 Cess 4 Cess 5 Cess 4 Cess 4 Cess 5 Cess 4 Cess 5 Cess 4 Cess 5 Cess 4 Cess 5 Cess 4 Cess 5 Cess 5 Ces 5	Count 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11-23-31	Settings	Ping succeeded to 1		Drulle click a pr	irt 10 update 10 bad. Voe p	
BPM Anal Rows Columns Oass 0 Class 2 Class 3 Class 4 Class 5–8 The process Date	Count 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Type Settingi Settinga	Details Prog.succeeded to 1 Prog.succeeded to 1		Double click a po	irt to update to bad. Vie p	tivel.

<User BPM Screen>

#### Validation

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



<Validation Screen>

#### **Exposure Index**

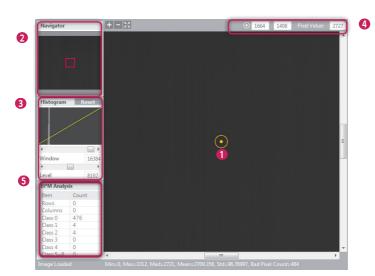
This calculates and saves median output value per input dose as a linear expression and a table.

Navigator				(a) and (a) and (a) and (a) and (a)	History		Open
				A Recently and	New		
					Image(s)	Count 0	
					mageto	Dose	Median
Histogram	• 8000						
Wedges .							
Window . 4							
Window e Level					-	Alaman D. Levil	
Window 4 Level BPM Analy					-	flasor 6 Lest	
Window 4 Level BPM Analy bem	Count				Ŀ	Al anna E Levi	
Window 4 Level BPM Analy Bem Rows	Count				Ŀ	A	
Window e Level BPM Analy Bem Rows Columns	Count 0 0				Ŀ	Riana († 144	
Window e Level BPM Analy Bem Bows Columns Class 0	Count 0 0				ŀ	A anna D Lea	
Alindow « Level BPM Analy Bern Rows Columns Class 0 Class 1	Count 0 0 0 0				Ŀ	da anna da Lond	
Window « Level BPM Analy Bern Rows Columns Class 0 Class 1 Class 2	Count 0 0 0 0 0				ŀ	Roman († 1997)	
Window « Level BPM Analy Bern Rows Columns Class 0 Class 1 Class 2 Class 3	Count 0 0 0 0 0 0				-	fransi i Teat	
Window 4 Level BPM Analy Bem Rows Columns Class 0 Class 0 Class 2 Class 3 Class 4	Count 0 0 0 0 0 0 0 0				ŀ	9	
Window 4 Level BPM Analy Bem Rows Columns Class 0 Class 0 Class 1 Class 3 Class 3 Class 4 Class 5–8	Count 0 0 0 0 0 0 0 0 0 0				Ľ	9	
Window 4 Level BPM Analy Bem Rows Columns Cass 0 Cass 1 Cass 2 Cass 3 Cass 3 Cass 4 Cass 5–8 Topological	Count 0 0 0 0 0 0 0 0 0 0	Time	Type	Detais	Ľ		
4 Window 4 Level BPM Anab Bem Rows Calumns Class 0 Class 0 Class 0 Class 3 Class 3 Class 3 Class 4 Class 5-8 month Date 2016-09-02	Count 0 0 0 0 0 0 0 0 0 0 0 0	Tore 112231	Type Settings	Defunits Programacemented for 1018110.100	Ľ	Aliano (* 1446)	
Window 4 Level BPM Analy hem Columns Case 0 Columns Case 1 Case 2 Case 3 Case 4 Case 5-8 Date	Count 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						

<Exposure Index Screen>

#### **Image Functions**

82



#### 1 Image Viewer

- The Calibration, User BPM, Validation, and EI menus include an image viewer that lets you view the acquired images.
- · An image is loaded and displayed when it is acquired or clicked.
- · Information about the image is displayed in the following sections.
  - Image Loaded: Indicates whether an image is loaded in the image area.
    - \* When an image is loaded: Image Loaded.
    - \* When no image is loaded: Image not Loaded.
  - Min: Minimum pixel value within the image area.
  - Max: Maximum pixel value within the image area.
  - Med: Median value of the image.
  - Mean: Mean value of the image.
  - **Std**: Standard deviation value of the image.
  - Bad Pixel Count: Bad pixel count in the image area.
  - 14B = N, 8B = M: Representation of the pixel value at (x,y) in bits.
  - Bad Pixel Count: Bad pixel count in the image area.
  - 100%: Percentage of the image shown in the image area compared to the entire image size.
  - (X x Y): Size of the entire image.

age Loaded Min=0, Max=3312, Med=2721, Mean=2709.358, Std=96.76997, Bad Pixel Count=484

443,1412) 14B=2674 8B=41 100% 3328x2

83

#### 2 Navigator

- The Navigator shows the entire area of the acquired image and indicates the zoomed in/out area.
- The red rectangle in the Navigator indicates the area shown in the Image Viewer.
- Clicking a position in the Navigator moves the red rectangle to the position and displays the area in the Image Viewer.

#### 8 Histogram

- · Histogram of the acquired image is shown here.
- · Window/Level can be adjusted for better image distinction.
- Use the <> buttons or the scroll bars below the Histogram graph to adjust window/level.
- · Click the Reset button to restore the default values.

#### 4 Reference Point

- When you click a position inside the Image Viewer, a reference point is specified, and the coordinates and pixel value of the reference point are shown at the top. You can also move the reference point by entering the X and Y values manually.
  - Since reference point coordinates are numbers, only numeric values can be entered.

#### 6 Bad Pixel Map Analysis

• Displays the results of bad line and bad pixel class analysis based on the Bad Pixel Map after calibration.

### Log

This shows the necessary information about the application execution process that is helpful to the user. It consists of the date, time, type and content, which are saved as a log file.

	User Bl	M Validation				
Navigator	8			The State of	History	Open
					New	-
					Dark Image(s)	Count 0 Acceleration
Histogram	10.000				Bright Image(s)	Count 0
e Window e					Calibration	Gillerin
Level					Offset Remove	Count
BPM Analy						
Baitt	Count					
Rows Columns	0					
Class 0	0				Result	
Class 1	0				in the second se	
Class 2	0					
Cass 3	0					
Class 4 Class 5-8						
and the second		-				
Date		Time	Type	Petals		
2016-09-0			Settings	Ping succeeded to 10.10.10.100		
		11.23.34	Settings	Ping succeeded to 10.10.10.100		
2018-09-0						

# USAGE

### Launching the Program

- Double-click the executable file installed on your PC to launch the calibration software.
- If launching for the first time, the Settings screen appears.

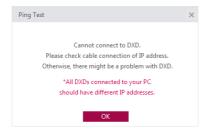
LG DXD Calibration					
DXD	Calibration SW	Firmware Update			About
Connection & File Sav		Detector	Parameters		
DXD Serial Number	12345678	Trigger	Mode	Auto	Manual
DXD IP	10 _ 10	10 100 Sensitiv	ity	10	(1~32)
Timeout	5000 msec. (500	-10000) Ping Trigger	Sensitivity	254	(0 - 256)
Save Location	C:\Users\beuser\De	cuments/LG 0 Window	Time	5 00	mset (2~20)
		Frame	Vidth	3328	
		Frame	feight	2816	
		Repti Press R	eset: to load factory-default	t Detector Parameters.	Reset
Network Options				Save	Cancel
Current Status: Wir	ed Change DXD IP	Windess Setup Power O	ptions		
Installation Info.		Auto Si	tep	011	
Date Format	YYYY/MM/DD	Auto Po	wer-Off	Off	
Current Date	2016/09/01				
		llegister		Save	Cancel
					Exit
o16-09-01	Time Type 16:11:46 Setti				
016-09-01	16:11:49 Setti		to 10.10.10.100 etector successfully		

#### **Checking IP Address and Ping Test**

- A default IP address is entered for the detector.
- If you change the IP address of the detector, enter the new detector IP address in the detector IP field of the calibration tool.
- For instructions on changing the detector IP address, see "Detector and PC(Wired mode)".
- After entering the IP address, set a timeout value and click the Ping button to perform a ping test. A pop-up message
  appears if the ping test is successful.

Ping Test		×
	Ping succeeded. * DXD Serial Number : 12345678	
	575 Schurrennber - 12545676	
	ОК	

The following pop-up window appears if the ping test is unsuccessful. If the pop-up window appears, check your PC's
network settings, the connection between the detector and PC, the detector status, the Control Box status and the
IP address, then perform the ping test again.



## **Checking Save Location**

While the calibration software is run, the acquired images, logs, result files and factory-default calibration results are saved in the designated location.

You can change the storage path in the Save location.

Click the **Apply** button when a folder is created in the specified path.

- Default: C:\Users\heuser\Documents\LG DXD Calibration
- heuser. User name

Calibration Use	r BPM	Validation EI	
DXD		Calibration SW	Firmware Update
Connection & File S	Save		
DXD Serial Numbe	er		
DXD IP		10 . 10	. 10 . 100
Timeout		<b>5000</b> msec. (50	0~10000) Ping
Save Location		C:\Users\heuser\D	ocuments\LG Open
			Apply

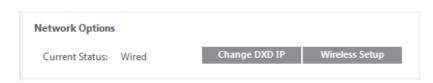
## Apply

After performing the ping test and verifying the save location, click the **Apply** button to perform the following procedures

- 1 Automatically create the necessary folders in the save location designated in the Checking Save Location stage.
- 2 Load from the detector and save the factory-default calibration results.
- 3 Load the detector's settings.

Dark Im-	Automatic creation of	Creation of date/time folder	Avgdark.raw			
ages	the Serial Number folder (Created when Apply is complete)	(created when the Calibration	Gain.raw			
		button is clicked)	Offset.raw			
	Condition: Created if		BPM.raw			
	the same Serial Number folder is not found in the custom folder		El results (A folder is created for the date/time applied at the time of El.)			
			History file			
		Log	Shows logfile including connections + bpm class			
		Image	Bright Images			
			Dark Images			
			User BPM images			
			Validation images			
			El images			
			Raw images			
		Factory calibration	Avgdark.raw			
		(Created when Apply is	Gain.raw			
		complete if the folder or files do not exist or if the files are	Offset.raw			
		abnormally small)	BPM.raw			

4 When **Apply** is successful, the detector's network status is displayed. **Current Status** : Wired Connection. Wireless Connection.



### **NOTE**

• Other menus remain inaccessible until you perform Apply. (Calibration, User BPM, Validation, EI)

## **Checking and Changing Detector Settings**

Upon **Apply**, the current detector settings are loaded on the settings screen below.

LG DXD Calibration					
DXD	Colibration SW	Firmware Updat			About
Connection & File Sav	re		Detector Parameters		
DXD Serial Number	12345678		Trigger Mode	• Auto	Manual
DXD IP	10 1	0 . 10 . 100	Sensitivity	10	(1~32)
Timeout	5000 mse	r. (500–10000) Ping	Trigger Sensitivity	254	(0 - 256)
Save Location	C:\Users\beus	er\Documents\LG	Window Time	5 00	msec (2~20)
			Frame Width	3328	
			Frame Height	2816	
Network Options Current Status: Wa	red Change DXD	NetWorks Schup	Press Reset to load factory-default Detector Parameters		Reset Cancel
Installation Info.			Power Options		
Date Format			Auto Sleep	Off	•
	YYYY/MM/D0	•	Auto Power-Off	Off	
Current Date	2016/09/01	Hegastee	Save		Cancel
					Exit
late 016-09-01 016-09-01	Time 16:11:46 16:11:49	Settings Pi	tails ng succeeded to 10.10.10.00 annected to detector successfully		

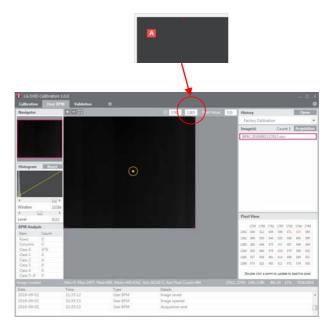
- Detector Parameters are parameters used when obtaining images from the detector.
- · Click the Save button to apply the settings entered.
- · Descriptions of the data are as follows:
  - Trigger Mode : This sets Trigger Mode.
    - \* Auto : Enables the Auto Exposure Detection feature.
    - \* Manual : Disables the Auto Exposure Detection feature.
  - Sensitivity : This is the panel sensitivity.
  - Trigger Sensitivity : This is the threshold at which the detector starts acquiring images.
  - Gain : This is the gain value to be saved in the Detector.
  - Frame Width/Height : This is the detector size.
  - **Window Time** : This sets the time taken to read the values after the x-ray exposure. (An input value of 5 means 500 ms.)
- Descriptions of the buttons are as follows.
  - Save : Applies the changes.
  - **Reset** : Loads the factory default settings.
  - Cancel : Loads the last saved values.

The calibration parameters are updated when the **Calibration** Software tab is clicked.

#### **Calibration Parameters**

These settings are used to perform calibration.

- Descriptions of the data are as follows:
  - Target Gain : Amplification level within algorithms.
    - Pixels with values that exceed the Gain Margin are specified as bad pixels.
  - Offset Margin : Offset margin value used within algorithms.
  - Std Margin : Pixels with values that exceed the Std Margin are specified as bad pixels.
  - Ref Sat Value : Maximum range of values during Image acquisition.
  - **Surr Margin** : In corrected bright images, if the difference between the standard pixel value and surrounding pixel value exceeds the **Surr Margin**, the standard pixel is specified as a bad pixel.
  - **Cut Edge** : This indicates the pixel values to cut off in the top, bottom, left or right directions of the frame. After acquiring an image in **Validation** or **EI**, the border of the image to cut off is indicated as dotted lines in the Image Viewer.



#### Image Edit

These are Image Viewer settings of the selected tool.

- Rotation : This sets the rotation angle of the image. (0°, 90°, 180°, 270°)
- Flip : Sets how the image shown in the Image Viewer is rotated. (None, Horizontal, Vertical)
- Invert : Inverts the image data shown in the Image Viewer.
- · Click the Save button to apply the settings entered.
- Descriptions of the buttons are as follows.
  - Save : Applies the changes.
  - Reset : Loads the factory default settings.
  - Cancel : Loads the last saved values.
  - **Exit** : Return to the previous screen.

### **NOTE**

• The next stage will not be accessible until you perform Apply.

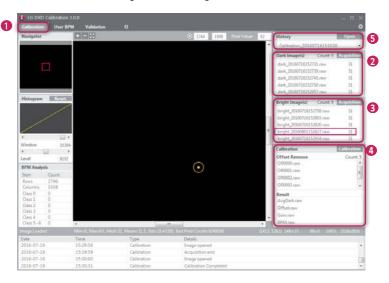
LG DXD Calibration 1.0.	0 Validation El					
DXD	Calibration SW	1	rmware Update			About
Calibration Parameters				Image Edit		
Target Gain		1	(0.0-255.0)	Rotation	D	•
Gain Margin		0.3	(0.0 - 1.0)	Flip	None	
Offset Margin		45	(0~65535)	Invert		
Std Margin		20	(9-65535)			
Ref sat value		13000	(200-65535)			
Surr Margin		25	(0~65535)			
Cut Edge		T 5 (0-1407				
	L 5 (0-1663	B 22 (0-1407	R 5 (0~1663)			
				Press Reset to load factory-default Calib	wation SW Settings.	Reset
					Save	Cancel Exit
	lime Typ 11-23-31 Set	e Lings	Det	ult g succeeded to 10.10.10.100		
2016-09-01	11:23:38 Set	tings	Pin	prucceeded to 10.10.10.100 nected to detector successfully		

## Calibration

After configuring all settings, click the **Calibration** tab to open the Calibration menu.

### 

• This tab cannot be accessed until the settings have been configured.



#### Open Calibration Menu

- Click the **Calibration** menu button to open the menu.

#### 2 Get Dark

The menu is used to acquire dark images necessary for performing calibration.

- When a dark image is acquired, the image count increases and the image file is saved in the Image folder within the location specified in Settings.
- After acquiring an image, the mean value of the image is shown next to the file name.
- After comparing multiple images, you can delete any abnormal images by right-clicking them.
- When deleted, both the list entry and the file are deleted.

- All the images are deleted when calibration ends. For backup, copy the images and paste them into another folder.
- Up to 10 images can be saved.
- Dark Image: An image obtained without generating X-rays.

#### 3 Get Bright

The menu is used to acquire bright images necessary for performing calibration.

- When a bright image is acquired, the image count increases and the image file is saved in the Image folder within the location specified in **Settings**.
- After acquiring an image, the mean value of the image is shown next to the file name.
- After comparing multiple images, you can delete any abnormal images by right-clicking them.
- When deleted, both the list entry and the file are deleted.

### **NOTE**

- All the images are deleted when calibration ends. For backup, copy the images and paste them into another folder.
- · Up to 10 images can be saved.
- Bright Image: An image obtained by generating X-rays without a phantom or any other object on the detector.

#### 4 Calibration

This area is used for calibration.

- · At least four dark images and four bright images are required for calibration.
- Calibration result files are saved in a folder that is created based on the date and time of the calibration.
- · The BPM Analysis is updated when the calibration is complete.

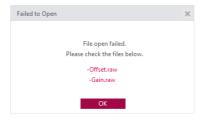
### **NOTE**

- · When calibration is performed more than five times, the oldest results are automatically replaced with new results.
- · For backup, copy the results folder and paste the results into another folder.

#### 6 History

- You can load previous calibration results. Click the **Open** button to load the previous calibration result files.

- Selecting any one of the files also loads other associated files. (Select any one of the Avgdark, Offset, Gain or BPM files, and all the four associated files will be loaded.)
- If there is a problem while loading the files, the following error popup window appears. If the popup window below
  appears, check the file sizes, path, file names and folder access permissions, and then try again.

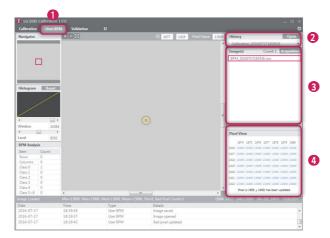


## **User BPM**

The user can manually edit the Bad Pixel Map created during **Calibration** in this menu.

### 

· You can skip the User BPM stage and proceed to Validation.



#### 1 Open User BPM Menu

- Click the User BPM menu button to open the menu.

### 

• The pop-up window below will appear if you open this menu without performing calibration.



#### 2 Check History File

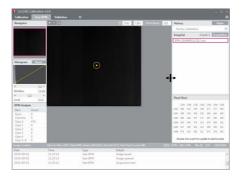
- Check that the History name created during calibration matches the name shown in the current History window.
- The User BPM procedure is performed by applying the selected History.

#### 8 Image Acquisition

- User BPM requires image acquisition as it involves a visual inspection of images with applied calibration results. When the **Acquisition** button is clicked and a bright image is acquired, the name of the image will appear in the image list.

#### 4 Pixel View

- · Check pixel values in Pixel View
  - Pixel values for the center of the Image Viewer are displayed in the Pixel View window.
  - The minimum value, maximum value and pixels estimated as bad pixels are shown as below.
  - \* Minimum value : Indicated as a green number
  - \* Maximum value : Indicated as a red number
  - \* Estimated bad pixels : Indicated with gray background
  - The size of the **Pixel View** window can be adjusted using the **++** icon. The mouse pointer changes to a **++** icon when hovering over the border between the **Pixel View** and Image Viewer.

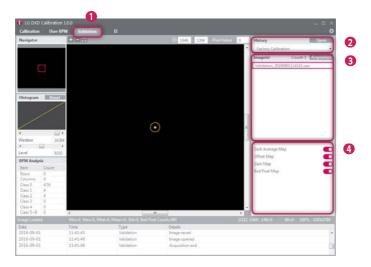


- · Mark additional bad pixels in Pixel View
  - Double-click a pixel in Pixel View to mark it as a bad pixel. Double-click a bad pixel again to unmark it.
  - As you mark bad pixels, the values in Bad Pixel Analysis are updated in real time.
  - Also, pixels marked as bad pixels are replaced with calibrated pixel values.
- Saving Final User BPM
  - The result file is saved when a different menu is opened.
  - When you attempt to exit the current menu and open another menu, a popup window appears asking whether you want to save the data.
  - Select Save to add a calibration history entry and save an updated version of the BPM.raw file.



## Validation

This procedure allows you to perform a visual inspection of the calibration results after completing calibration.

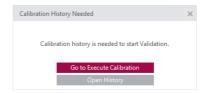


#### Open Validation Menu

- Click the Validation menu button to open the menu.

## 

• The pop-up window below will appear if you open this menu without performing calibration.



#### 2 Check History File

- Please confirm whether the name of the History file created during calibration matches the name displayed in the **History** window.

#### Image Acquisition (Procedure matches that from the User BPM stage)

- When the **Acquisition** button is clicked and a bright image is acquired, the name of the image will appear in the image list.
- Information about the image is displayed below the Image Viewer.

#### 4 Apply/Unapply Calibration Results

- You can apply/unapply calibration results (Dark Average Map, Offset Map, Gain Map, Bad Pixel Map) to the acquired image.
  - C: Apply C: Unapply

- When an image is acquired and loaded for the first time, all results are applied by default.
- If no image has been acquired, the Apply/Unapply button is disabled.

## El (Exposure Index)

98

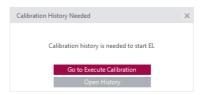
lavigator		+===			0 1646 1394	Porel Value:	0	History		- 1	Open :	1
-								Factory Cal	libration			K
								Image(s)	Cou	nt 1	Acquisition	17
										Dose	Median	
								EI 20160901		1.78	0	
istogram	/			$\odot$								
	16384			$\rightarrow$								J
				)					Measure &	Save		)
vel	16384 Iail + 8192								Measure &	Save	_	)
vel PM Analy em	16384 8192 rsts Count			)					Mrasure &	Save		J
vel 'M Analy em	16384 8192 sta Count 0								Measure &	Save		)
el M Analy ms olumns	16384 8192 sta Count 0 0			)					Measure &	Save		J
rel M Analy mrs olumns ass 0	16384 8192 sts Count 0 0 476			)					Measure &	Save		J
rel 'M Analy em ovrs olumns ass 0 ass 1	16384 8192 sta Count 0 0			)					Measure &	Save		)
vel M Analy ms olumns ass 0 ass 1 ass 2	16384 8192 site Count 0 0 476 4			)					Measure &	Save		J
rel M Anaby mis olumns ass 0 ass 1 ass 2 ass 3	16384 8192 sks Count 0 476 4 4			)					Measure &	Save		J
el M Analy m nors ilumns ass 0 ess 1 ess 2 ess 3 ess 4	16384 8192 Sils Count 0 476 4 4 0								Measure &	Save		J
el M Anaty m humns humns sss 0 ess 1 ess 2 ess 3 sss 4 ess 5 – 8	16384 8192 sils Count 0 0 476 4 4 0 0 0 0	4	110. Mean: 0, Std10, 1	н				100) 148=0	Measure &		293.62789	J
el M Anaty mis ilumns ass 0 ass 1 ass 2 ass 3 ass 4 ass 5 – 8 ajg rock	16384 8192 sils Count 0 0 476 4 4 0 0 0 0	4	110, Means 0, Std::0, D	н				160) 148-9			293/42789	
vel M Analy mis plumns ass 0 ass 1 ass 2 ass 3 ass 4 ass 5–8 violence te	16384 8192 nits Count 0 0 476 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0	a Miniû, Maxiû, Mes		н	454 Details			160) 148-0			291427769	
indow vel PM Anaty em ows olumns lass 0 lass 0 lass 1 lass 2 lass 3 lass 4 lass 5–8 oys 10 lass 5–8 oys 10 lass 0 lass 0 lass 0 lass 1 lass 2 lass 4 lass 5–8 oys 10 lass 0 lass 0 lass 0 lass 0 lass 1 lass 1 lass 2 lass 1 lass 2 lass 4 lass 2 lass 4 lass 5–8 oys 10 lass 0 lass 0 lass 0 lass 1 lass 2 lass 1 lass 2 lass 4 lass 5–8 oys 10 lass 0 lass 0 lass 0 lass 1 lass 1 l	16384 8192 8192 0 0 476 4 4 0 0 0 20 1	۲ Minu0, Mair0, Mee Tirne	1:0, Mean:0, Std:0, D Type	н	. 484			180) 148:0			293.2789	

#### 1 Open El Menu

- Click the EI menu button to open the menu.

## 

• The pop-up window below will appear if you open this menu without performing calibration.



#### 2 Check History File

- Please confirm whether the name of the History file created during calibration matches the name displayed in the History window.

#### Image Acquisition (same as User BPM and Validation)

- When the **Acquisition** button is clicked and a bright image is acquired, the name of the image will appear in the image list.
- Information about the image is displayed below the Image Viewer.

#### 4 Enter Dose Value

- Enter an X-ray dose in the dose input field. (Unit: uGy)
- The El value is calculated based on the input value.
- Because the dose value is a number, only numeric values can be entered. Non-number values cannot be entered automatically.

#### 6 Measure & Save

- When you click the **Measure & Save** button after acquiring an image and entering a dose value, the popup notification below appears.

EI saved	×
Conformed and data music	6II
El performed, and data saved success	runy.
ОК	

- The results are saved in the save location specified for El calculation. (Example: C:\Users\heuser\Documents\LG DXD Calibration\Serial Number\Calibration Results Folder (Time and Date) heuser. Username)

- When Measure & Save is repeated, the results file in the folder is updated.
- The following pop-up window appears if the minimum number of images required (three) is not met.

Image Needed	×
At least three or more images are needed to perform EL	

100

When you click the Quit button, the calibration tool quit popup window appears.

In the popup window below, click the Yes button to quit or click the No button to return to the previous screen.

🚯 LG DXD C	alibration 1.0.	) Validation	п				- 0
D		Calibration		mware Update		3	About
Connection	& File Save				Detector Parameters		
DXD Serial	Number	12345678	5		Trigger Mode	Auto	Manual
DXD IP		10	10 . 10	100	Sensitivity	10	(1~32)
Timeout		5000	msec. (500-10000)	Ping	Trigger Sensitivity	254	(0 - 256)
Save Locat	ion	C:\Users\	heuser\Documents\	LG Opente	Window Time	5 00	msec (2~20)
					Frame Width	3328	
					Frame Height	2816	
Network Op		Change	INVERTING AND	nahi na Setup	Press Reset to load factory-default Detector Parameters		Reset Cancel
Current Str	tus: Wired	Cruinge		as senap	Power Options		
Installation I	Info.				Auto Sieep	Off	
Date Form	at	VYYY/M	M/DD		Auto Power-Off	Off	
Current Da	te	2016/09/01		gister	Save		Cancel
							Exit
Date 2016-09-01		ime 6:11:46	Type Settings	Deta	ils succeeded to 10.10.10.100		
2016-09-01	1	6:11:49	Settings	Con	nected to detector successfully		

<Settings: Exit>

End Program		$\times$
	Are you sure you want to quit?	
	Yes No	

<Exit>

## About

When you click the **About** button in Settings, the following popup window appears. It shows the information about the application.

LG DXD Calibration 1.0.0 alibration User BPM	Validation El				
DXD					About
Connection & File Save			Detector Parameters	_	
DXD Serial Number	12345678		Trigger Mode	• Auto	Manual
DXD IP	10 10	10 100	Sensitivity	10	(1~32)
Timeout	5000 msec. (500-	-10000) Ping	Trigger Sensitivity	254	(0 - 256)
Save Location	C:\Users\heuser\Dor	uments/LG 01=0	Window Time	5 00	msec (2~20)
			Frame Width	3328	
			Frame Height	2816	
		APPN	Press Reset' to load factory-default Detector Parameters		Reset
Network Options	Change DXD IP	Wireless Setup	Save		Cancel
Current Status: Wired	Change DAD IP	manual desails	Power Options		
Installation Info.			Auto Sleep	Off	
Date Format	YYYY/MM/DD		Auto Power-Off	Off	
Current Date	2016/09/01	lingister	Save		Canori
	1				Exit
ate Tie			tah	-	EAIT
016-09-01 16	(11:46 Settin (11:49 Settin	gs Pir	ng succeeded to 10.10.10.100		

<Settings: About>



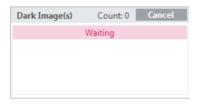
<About>

## **General PopUp**

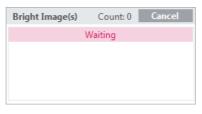
The following are descriptions of the general pop-up windows that may appear when the calibration software is being used.

#### Image Acquisition Cancellation

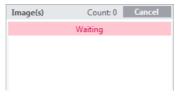
- When the Acquisition button is clicked for image Acquisition, it will be replaced with a Cancel button while the image is being acquired.
- Once image acquisition is complete, the button will revert to an Acquisition button.
- During image acquisition, you can cancel the process by clicking the Cancel button.



<Get Dark Image Cancel Button: Available in Calibration>



<Get Bright Image Cancel Button: Available in Calibration>



<Get Image Cancel Button: Available in User BPM, Validation, EI>

• The popup window below appears when the cancellation is complete.

Acquisition		×
	Cancelled to get image.	
	ОК	

<Get Image Cancel Complete Popup Window>

#### Image Acquisition Failure

• The popup window below appears when image acquisition fails. Check the network and Detector status, then try again.



<Image Acquisition Failure Popup Window>

# SERVICE MANUAL

## **Detector Wired IP Address Setting**

- 1 From the Usage section, perform "Launching the Program", "Checking IP Address and Ping Test", "Checking Save Location" and "Apply".
- 2 Click the Change DXD IP button.

					2	About
DXD	Calibration SW	/ fier	nware Update		-	ADOUT
Connection & File Sa	ve			Detector Parameters		
DXD Serial Number	12345678			Trigger Mode	• Auto	Manual
DXD IP	10	10 . 10	100	Sensitivity	10	(1~32)
Timeout	5000 ms	rec. (500-10000)	Ping	Trigger Sensitivity	254	(0-256)
Save Location	C:\Users\hes	user\Documents\L	G Opente	Window Time	5 0	0 mset (2~20)
				Frame Width	3328	
				Frame Height	2816	
			ŵł	Press Reset' to load factory-default Detector Parameter		Reset
Network Options				Save		Cancel
Current Status: W	ired Change DX	0 IP Wireles	a Setup	V2 1 1940		
				Power Options		
Installation Info.				Auto Sieep	Off	•
Date Format	YYYY/MM/	00	•	Auto Power-Off	Off	
Current Date	2016/09/01					
		lleg	ister	Save		Canorl
						Exit
ste	Time	Туре	Deta			
016-09-01	16:11:46	Settings	Ping	succeeded to 10.10.10.100		

- 3 At the popup window, change the setting and click the **Apply** button.
  - When the **Apply** button is clicked, the system attempts to change the IP address.

Change DXD IP	×
Enter a new IP address.	
10 10 10	
*Apply this change will restart the DXD.	
Apply	

- 4 Check the result and restart the detector.
  - The following popup windows appear, depending on the successful and failed.



<Popup Window for Successful Configuration>

- Once the new IP address is applied, restart the detector so that the new setting takes effect.
- Restart the detector automatically using the program.
- Because the detector is disconnected when restarting, perform the Connection & File Save process again.

## Wireless AP configuration

To have the Detector connect wirelessly to an AP, the AP information must be saved in the Detector in advance. Once the AP information is transferred and saved in the Detector, the Detector attempts to connect to the AP. The saved AP information can be viewed in the Web Monitoring feature.

- 1 From the Usage section, perform "Launching the Program", "Checking IP Address and Ping Test", "Checking Save Location" and "Apply".
- 2 After checking that wireless settings are enabled on the PC, click the Wireless Setup button.

LG DXD Calibration Calibration User BP					- = > (
DXD	Calibration SW	Firmware Update			About
Connection & File Save			Detector Parameters		
DXD Serial Number	12345678		Trigger Mode	• Auto	Manual
DXD IP	10 10	. 10 . 100	Sensitivity	10	(1~32)
Timeout	5000 msec. (5	00-10000) Ping	Trigger Sensitivity	254	(0 - 256)
Save Location	C:\Users\beuser\E	Rocuments/LG	Window-Time	5 00	mset (2~20)
			Frame Width	3328	
			Frame Height	2816	
		AitoN	Press Reset' to load factory-default Detector Parameters		Reset
Network Options Current Status: Win	change DXD IP	Wireless Setup	Save		Cancel
Current status: wan	co county county		Power Options		
Installation Info.			Auto Sleep	Off	
Date Format	YYYY/MM/DD		Auto Power-Off	Off	
Current Date	2016/09/01				
		Register	Save		Cancel
					Exit
Date 2016-09-01	Time Typ 16:11:46 Set		els a succeeded to 10.10.10.100		
2016-09-01			nected to detector successfully		

- If a pop-up appears, enter your SSID and password, then click Apply.

Wireless Setup		×
SSID:	-	
Password:		
	Show	
	Apply	

## 

SSID can be appear garbled or as question marks or boxes and others because of encording or compatibility.

#### 3 Check results.

- The following popup windows appear, depending on the result.

Wireless Setup	×
Connect annual da Minulana Datura	
Cannot complete Wireless Setup.	
Please try again.	
ОК	

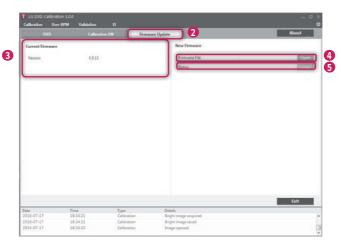
<Popup Window for Successful Configuration>

<Popup Window for Failed Configuration>

## **Detector Firmware Update**

This menu allows you to check the firmware version of the detector or update the firmware.

- 1 From the Usage section, perform "Launching the Program", "Checking IP Address and Ping Test", "Checking Save Location" and "Apply".
- 2 Select the Firmware Update tab.



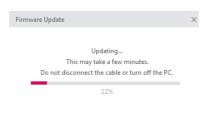
- 3 Check the current firmware version.
  - The current firmware version of the detector is shown here when the PC is connected to the detector.
- 4 Select a firmware file to update.
  - Click the **Open** button to open a file browser window. When you select a file to update, the system validates the file.
  - If the file is correct, the file name appears in the Firmware File section.
  - If the file is invalid, the following popup window appears.

Firmware Update	×
Could not load the Firmware file. Check the file and try again.	
ОК	

<Popup Window for File Loading Failure>

#### 5 Perform the update.

- Select a file, then click the Update button to start the **Update** process.
- The progress status is shown in the Status field.



<File Updating Popup Window>

## 

- Do not remove the power cable until the update is complete. The update may not be successful if the power is disconnected during the update process.
- 6 Check results.
  - When the update is complete, the result is shown in a popup window.

Firmware Up		
	Firmware update success	
	ОК	

Firmware U	Jpdate	>
	Firmware update failed.	
	ОК	

<File Update Successful Popup Window>

<File Update Failed Popup Window>

## Storage of installation date

The date of the first calibration can be saved in the detector.

- 1 From the Usage section, perform "Launching the Program", "Checking IP Address and Ping Test", "Checking Save Location" and "Apply".
- 2 Select the **Settings** > **DXD** tab.
- 3 Check the installation date and select a date format.

		- YYYY: Year
YYYY/MM/DD	•	- MM: Month
YYYY/MM/DD		- DD: Day
MM/DD/YYYY		
DD/MM/YYYY		
	YYYY/MM/DD MM/DD/YYYY	YYYY/MM/DD MM/DD/YYYY

## 

· The date is displayed based on the OS information.

Installation Info.		>
This setting cannot Are you really sure y		
Yes	No	

4 Click the **Register** button to open a pop-up window. The installation date can be checked through the Web Monitoring feature.

- Be careful, as this information is saved only once per detector and cannot be edited later.
- 5 Select the **Yes** button in the pop-up window to save the information in the detector. Once the information is saved, the **Register** button will be disabled.

DXD	Colbratic					About
Connection & File Sa	ve			Detector Parameters		
DXD Serial Number	123456	78		Trigger Mode	Auto	Manual
DXD IP	10	. 10 . 10	100	Sensitivity	10	(1-32)
Timeout	5000	msec. (500-10000)	Ping	Trigger Sensitivity	254	(0 - 256)
Save Location	C:\User	s\heuser\Documents\l	G Open	Window Time	5 00	msec (2~20)
				Frame Width	3328	
				Frame Height	2816	
Network Options			rshi	Press Reset to load factory-default Detector Par		Reset
Current Status: Wi	red Own	ge DXD IP Winde	ss Setup	Power Options	_	
Installation Info.				Auto Sleep	Off	3
Date Format	10002	MM/DD	•	Auto Power-Off	Off	
Current Date	2016/09		pister	5	ve	Canori
ste	Time	Туре	Deta			Exit
016-09-01	16:11:46	Settings	Pine	succeeded to 10.10.10.100		

## **Power Options Setting**

This menu allows you to save the Power Options of detector.

- 1 From the Usage section, perform "Launching the Program", "Checking IP Address and Ping Test", "Checking Save Location" and "Apply".
- 2 Select the Settings > DXD tab.
- 3 Select the options of Auto Sleep and Auto Power-Off.
- 4 Click the Save button to save the options on Detector.

- Calibration Software only saves the options.
- · Detector enters the the Power Mode when there is no communication during the setting times.
- The Detector does not enter the Power Mode while the Calibration Softwere runs(from the "Apply" to exit) because the Calibration Software checks the Detector's status Periodically.
- · This feature is only enabled wireless models

DXD					About
Connection & File Save			Detector Parameters	_	
DXD Serial Number	12345678		Trigger Mode	• Auto	Manual
DXD IP	10 . 10 .	10 100	Sensitivity	10	(1~32)
Timeout	5000 msec. (500-1)	0000) Ping	Trigger Sensitivity	254	(0-256)
Save Location	C:\Users\beuser\Docur	ments/LG 0.000	Window Time	5 00	0 msec (2~20)
			Frame Width	3328	
			Frame Height	2816	
		Faste	Press Reset: to load factory-default Detector Parameters		Reset
Network Options Current Status: Wired	Change DXD IP	Wireless Selup	Save		Cancel
Installation Info.		_	Power Options Auto Sieco	Off	
Date Format	YYYY/MM/DD		Auto Power-Off	Off	
Current Date	2016/09/01		Auto Power Cit	- Un	
Current Date	2010/02/01	Register	Save		Cancel
					Exit
ste Time 016-09-01 16:1	Type 1-46 Settings	Deti	als a succeeded to 10.10.10.100		

## Web monitoring

This feature displays the detector's release date, installation date, software version and other internally managed information in a web browser.

### Internal Information

Category	Content	Description
Product	Software version	Currently installed detector firmware version
information	Product release date	Product manufacture date
	Product installation date	<ul> <li>Installation date as registered by the installer</li> </ul>
	Model number	Product model number
	Serial No.	Product serial information
Network	Connection status	Network connection mode (wired/wireless)
	IP	Detector's IP address
	SSID of the wireless AP connected to the detector	ID of the wireless AP connected
	Detector netmask	
	Detector gateway	
	MAC address of the currently connected network	Product MAC information
Battery	Status	Battery level, charging status notification, Auto Sleep , Auto Power off
ETC	Bright image count	Number of times images were acquired by generating X-Rays
	Dark image count	Number of times images were acquired without generating X-Rays

## Web monitoring

- 1 Establish a wired/wireless connection between the detector and the PC.
  - Refer to the "Detector and PC(Wireless mode)" or "Detector and PC(Wireless mode)" sections for instructions.
- 2  $\,$  Enter the IP address in the address input of the detector PC web browser.
- 3 The default IP address: 10.10.10.100 enter the page as below appears.

Count
ount

# MAINTENANCE

## Cleaning

• Make sure to turn the detector off and remove the battery before cleaning.

## Inspection

- Check the detector regularly to ensure that it operates stably and properly. If a problem occurs, please contact the manufacture.
- Use the checklist below as a reference for checking the product.

Checklist	Inspector	Cycle
Is the cable damaged?	User	Daily
Is the plug or are the connectors loose or damaged?	User	Daily
Is the detector scratched or cracked on the surface?	User	Daily
Is the LED power working properly?	User	Daily
Is the battery charging properly?	User	Daily
Scheduled calibration	Vendor	3 to 6 months
Performance inspection	Vendor	Yearly

# TROUBLESHOOTING

Problems that occur while using the detector can be solved by using the information on this page. If problems persist, please contact the manufacturer.

Problem	Action
The product does not turn on.	Check that the power cord is properly connected.
	<ul> <li>After disconnecting and reconnecting the power cord, press the power button on the product.</li> </ul>
The product was suddenly turned	<ul> <li>Check that the power cable is properly connected.</li> </ul>
off during use.	<ul> <li>After turning the product on again, check the detector battery status using the battery LED. If flashing in orange, it means that the battery is low. Please charge before use.</li> </ul>
The Control Box Ready/Exposure	<ul> <li>Check the power cable connection of the control box.</li> </ul>
LED flashes in orange.	<ul> <li>Check that the control box is properly connected to the generator or the detector.</li> </ul>
The PC and the detector are not	<ul> <li>Check the power supply. If on, check the following:</li> </ul>
connected.	<ul> <li>Check that the connection is made as instructed in the manual. Try connecting again.</li> </ul>
	<ul> <li>Perform the Ping Test in Settings &gt; Connection &amp; Save Location section of Calibration Software to check your connection. You can also check your connection by entering the IP address in the address bar of the Browser window and checking whether the page is properly loaded.</li> </ul>
	Check whether the network IP address of your PC is using the same IP address     as the detector.
	<ul> <li>In some cases, especially Win 8 OS, it might be problem in connection because of firewall rule that blocks all incoming ICMP packets. Please refet to next page, "Solution for firewall block".</li> </ul>
There is a problem with acquired	Check whether the detector surface is soiled.
images.	<ul> <li>Images acquired immediately after turning the detector on may be incorrect due to instability of the panel. Open the Calibration menu of the Calibration Software. Acquire some dark images first or wait a while before proceeding.</li> </ul>
	<ul> <li>If the images continue to be unstable, perform Calibration, apply the results, then continue.</li> </ul>

# SOLUTION FOR FIREWALL BLOCK

If Calibration Software connection doesn't work for firewall in Windows 8, refer to instructions as below.

1 Enter into control panel and click on the System and Security link

#### Adjust your computer's settings

Back up your data

Find and fix problems

System and Security Review your computer's status

Network and Internet

Hardware and Sound

View devices and printers

Add devices and printers

View network status and tasks

Choose homegroup and sharing options

View by: Category -



User Accounts and Family Safety Add or remove user accounts Set up parental controls for any user



Appearance and Personalization Change the theme Change desktop background Adjust screen resolution



Change keyboards or other input methods Ease of Access

Clock, Language, and Region



Let Windows suggest settings Optimize visual display

Change display language

2 Select the Windows Firewall link.

Programs

Uninstall a program



#### Action Center

Review your computer's status and resolve issues | 🚱 Change User Account Control settings | Troubleshoot common computer problems | Restore your computer to an earlier time



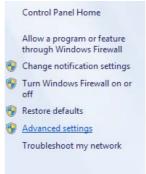
#### Windows Firewall

Check firewall status Allow a program through Windows Firewall



#### System

3 Click on the Advanced settings link situated in the pane on the left hand side.



4 Choose **Inbound rules** in Windows Firewall with Advanced Security. Scroll and find **File and Printer Sharing** rule to enable.

File     Action     View     Help       Image: Second s				
Pindows Firewall with Advance	Inbound Rules			
Cutbound Rules	Name	Group	Profile	
Connection Security Rules	🕑 BitBox	BitBox	All	
Monitoring	BranchCache Content Retrieval (HTTP-In)	BranchCache - Content Retr	All	
	BranchCache Hosted Cache Server (HTT	BranchCache - Hosted Cach	All	
	BranchCache Peer Discovery (WSD-In)	BranchCache - Peer Discove	All	
	Connect to a Network Projector (TCP-In)	Connect to a Network Proje	Domain	

### 5 Click Enable Rule.

File and Printer Sharing (Echo Request - ICMPv4-In)		Private, Public
File and Printer Sharing (Echo Request - ICMPv4-In)	Enable Rule	Domain
File and Printer Sharing (Echo Request - ICMPv6-In)	Cut	Domain
File and Printer Sharing (Echo Request - ICMPv6-In)	Сору	Private, Public
Check its status and try to connect detector again.  General File and Printer Sharing (Echo Request - ICMPv4-In)	File and Printer Sharing	Private, Public
, , ,	File and Printer Sharing File and Printer Sharing	Private, Public Domain
File and Printer Sharing (Echo Request - ICMPv4-In)		

# SUPPLEMENT. WIRELESS AP SET UP INSTRUCTION (MODEL : Cisco Linksys EA9200)

- 1 Connect the LAN Cable from the Ethernet port on the PC to the Ethernet port on the AP.
- 2 Launch your web browser and enter linksyssmartwifi.com or http://192.168.1.1 in the Address bar then press **Enter**

(IP number address for the 1st access is 192.168.1.1. However, IP number address for accessing will be 10.10.10.1 after changing 10.10.10.1)



Enter into Connectivity > Local Network. Click Edit to change IP address to 10.10.10.1.

Connectivity					
view and change router settings					
Basic Tinternet Settings Local Network	Advanced Routing Administration				
Router Details	DHCP Server	bed			
Host name: Linksys03345	Start IP address:	10.10	. 10	. 2	
IP address 10.10.10.1	Maximum number of users:	50	1	10 253	
Subnet mask: 255.255.255.0	IP address range:	10 10 10 10	10 2 10 51	to	
	Client lease time:	1440	м	nutes	
	State ONS 1	0	0	0	
	State DNS 2.	0	0 0	0	
	State DNS 3:	0	0 0	0	
	WINS.	0	0	0	

(You should click **Apply** button to apply current setting)

Help Linksys03345 🚽 Sign Out 👻 LINKSYS' Smart Wi-Fi Wireless View and change router settings . Wreless MAC Filtering Wi-Fi Protected Setup 6 GHz band steering
 6 GHz band steering 0 0# Smart Connect: Network name: LGEDXD Network: ON Broadcast \$SID: Channel: Y Igedxd2000 Yes Auto Password: Channel width: Y WPA2 Personal ¥ N Mixed Auto °o LGEDXD 5-GH2, + 5-GH2; Network not Network: ON Ð Broadcast \$\$ID: laedxd2000 Yes Channel: Auto -Network mode: Auto WPA2 Personal Channel width: Auto Security mode 0 Øk Cancel Apply

(You should click **Apply** button to apply current setting)

For more information, please visit the web site as below.

http://www.linksys.com/sg/support-product?pid=01t80000003efNkAAI



To obtain the source code under GPL, LGPL, MPL, and other open source licenses, that is contained in this product, please visit *http://opensource.lge.com*.

In addition to the source code, all referred license terms, warranty disclaimers and copyright notices are available for download.

LG Electronics will also provide open source code to you on CD-ROM for a charge covering the cost of performing such distribution (such as the cost of media, shipping, and handling) upon email request to *opensource@lge.com*. This offer is valid for three (3) years from the date on which you purchased the product.

Model \_\_\_\_ Serial No.



 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B

???????



 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B
 B

???????