## **Furud-PJ1**

RICOH PJ XL4540 (Y0A4) RICOH PJ WXL4540 (Y0A5) RICOH PJ LX3000ST(Y0A6) RICOH PJ LW3000ST(Y0A7)

**Field Service Manual** 

December, 2015

## **Important Safety Notices**

## **Important Safety Notices**

### Prevention of physical injury

- 1. Before disassembling or assembling parts of the main machine and peripherals, make sure that the power cord of the main machine is unplugged.
- 2. The wall outlet should be near the machine and easily accessible.
- 3. If any adjustment or operation check has to be made with exterior covers off or open while the main switch is turned on, keep hands away from electrified or mechanically driven components.



 To prevent a fire or explosion, keep the machine away from flammable liquids, gases, and aerosols.

#### Health safety conditions

This machine, which uses a high voltage power source, can generate ozone gas. High ozone density is harmful to human health. Therefore, the machine must be installed in a well-ventilated room.

### Observance of electrical safety standards

This machine and its peripherals must be serviced by a customer service representative who has completed the training course on those models.

### Safety and Ecological Notes for Disposal

Dispose of replaced parts in accordance with local regulations.

## Laser Safety Information

Read through this document in its entirety and understand all warnings and precautions before attempting to operate the projector.

- Do not turn the main power ON while any of the exterior covers are open.
- Even if the purpose of the adjustment or confirming electrification, do not turn the main power ON holding down the safety interlock switch.
- Unplug the power cord from the outlet with exterior covers open before maintenance operations.
- Any operation or adjustment not specifically instructed by the service manual creates the risk of hazardous laser radiation exposure.
- Do not stare into the beam when the projector is ON. The bright light may result in permanent eye damage.
- When turning on the projector, make sure no one within projection range is looking at the lens.
- Not following the control, adjustment or operation procedure may cause damage by exposure to laser radiation.

## Safety Labels of This Machine

- Do not block the air intake or exhaust. Doing so could cause a fire due to internal overheating. Do
  not place your hands, face, or other objects near the air exhaust, the bottom of the unit. Doing so
  could result in injury and/or damage the object.
- 2. Do not look into the lens while the light source is on. The strong light from the light source may cause damage to your eyesight.
- 3. Do not place anything in front of the lens while the projector is operating. Things placed in front of the lens may overheat and burn or start a fire. If you want to temporarily stop the projected image, use the AV mute on the remote control or the keypad.
- 4. Do not remove any screws. Do not block or cover the vents.
- 5. This product contains substances which are harmful to humans and the environment. Users in the countries where this symbol shown in this section has been specified in national law on collection and treatment of E-waste.
- Complies with 21 CFR 1040.10. and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007



### Laser Notice

- This Product is classified as Class 2 of IEC60825-1:2007 and also complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24,2007. (For USA)
- IEC 60825-1:2014: CLASS 1 LASER PRODUCT RISK GROUP 1. (For EU countries and Japan and China)

## Light source specification

- 3.5W laser diodes x 19
- Wavelength: 440-455nm
- Pulse duration: 1.32ms

## 

• This projector has built-in laser module. Possibly hazardous optical radiation emitted from this product. Do not stare into the beam. May be harmful to the eyes.

## Symbols, Abbreviations and Trademarks

This manual uses several symbols and abbreviations. The meaning of those symbols and abbreviations are as follows:

OP	Screw
S.	Connector

## Trademarks

- DLP is trademarks of Texas Instruments.
- IBM is a trademark or registered trademark of International Business Machines Corporation.
- Macintosh, Mac OS X, iMac, and PowerBook are trademarks of Apple Inc., registered in the U.S. and other countries.
- Microsoft, Windows, Windows Vista, Internet Explorer and PowerPoint are either a registered trademark or trademark of Microsoft Corporation in the United States and/or other countries.
- HDMI, the HDMI Logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.
- Other product and company names mentioned in this user's manual may be the trademarks or registered trademarks of their respective holders.

# TABLE OF CONTENTS

Important Safety Notices	1
Important Safety Notices	
Prevention of physical injury	
Health safety conditions	1
Observance of electrical safety standards	
Safety and Ecological Notes for Disposal	
Laser Safety Information	2
Safety Labels of This Machine	2
Laser Notice	3
Light source specification	3
Symbols, Abbreviations and Trademarks	5
Trademarks	5
1. Product Information	
Overview	
Main Unit	
Control Panel	13
Connection Ports	14
Remote Control	
Specifications	17
Product Highlights	
General Specifications	
Laser Diode Information	
Lens	
Compatible Modes	19
VGA Analog	19
HDMI Digital	
Installation Requirements	
Environment/Power Requirements	
Machine Space Requirements	25
Machine Dimensions	
2. Installation	
Main Machine Installation	
Accessory Check	

Precautions	
Do	
Do not	
3. Replacement	
Special Tools	
Equipment Needed	
Parts List	
Service Parts List	
Part Replacement	
Dust Filters	
Exterior Covers	40
Тор Соvег	
IO Cover	
Front Cover	
Left Cover	
Right Cover	
Keypad Board, Keypad Buttons	
Main Board	
Connection List	51
IO Board, Audio Board	
Fan 1, Fan 2, and Fan 3	
Notes on Installation	
LD Driver Board	
Speaker	
Interlock Switch, PSU	
Front IR Sensor	
Notes on Installation	63
Optical Engine, DMD Fan	
Engine Unit, Filter Wheel, Combiner Unit	65
Power Socket	
Adjustable Foot	
Bottom Cover	70
Required Action after Replacing Parts	72

## 4. Adjustment

Service Mode	73
How to enter the Service Mode	73
Service Mode Settings	74
Adjustment	
Wheel Index Adjustment	76
Changing the LD/Projector Hours	79
Calibration	
ADC Calibration	
Factory Reset	
Factory Reset Procedure (OSD menu)	
Factory Reset Procedure (Service Mode)	
5. Troubleshooting	
LED Indicators	
Troubleshooting	
Test and Inspection	
Test Equipment Needed	
Recommended Test Condition	
VGA Port Test	
Audio Performance Test	93
Video Performance Test	94
HDMI Performance Test	
3D Test (HDMI)	
USB Performance Test	95
Check points	95
6. Firmware Update	
System Firmware Update	
Equipment Needed	97
Firmware Update Procedure	97
DLP composer lite setup procedure	
Get into firmware download mode	
USB driver update procedure	101
Connect the projector to the PC	

Firmware update procedure	
Check system firmware version	
MCU Firmware Update	
Upgrade Procedure	
EDID Update	
EDID Introduction	
Procedure	
Setup Procedure (VGA&HDMI)	
EDID Key-In Procedure	
7. Detailed Description	
Laser	
Characteristics of Laser Light Source Projector	
Classification According to Light Source	121
Optical Mechanism	
Optical Engine Component	
Projection Light	

# **1. Product Information**

Overview				
Main l	Jnit			
5	Image: constrained state stat			
1	Control Panel			
2	Focusing Ring			
3	Ventilation (inlet)			
4	IR Receiver			
5	Ventilation (outlet)			



6	Speaker
7	Power Socket
8	Input / Output Connections
9	Lens

## Control Panel



y0a4m0126

Ind.	Part Name	Description	
1 Power LED Refer to the page 85 "L		Refer to the LED indicator of the projector power status. See page 85 "LED Indicators".	
2	Enter	Confirm your item selection.	
3 Temp LED Refer to the LED indicator of the projector temperature st page 85 "LED Indicators".		Refer to the LED indicator of the projector temperature status. See page 85 "LED Indicators".	
4 Light LED Refer to the LED indicator of the pr page 85 "LED Indicators".		Refer to the LED indicator of the projector light source status. See page 85 "LED Indicators".	
5 Menu Press "MENU" to launch the on-sc exit OSD, press "MENU" again.		Press "MENU" to launch the on-screen display (OSD) menu. To exit OSD, press "MENU" again.	
6	Input	Press "INPUT" to select an input signal.	
7 Four Directional Select Keys Select items or make adjustments to your selection.		Select items or make adjustments to your selection.	

#### 1. Product Information

Ind.	Part Name	Description
8	Power/Standby button (也)	Press the " <sup>(U</sup> )" button on the control panel to turn On/Off the projector.
9	IR Receiver	-

### **Connection Ports**



1. Computer-In/YPbPr Connector

(PC Analog Signal/Component Video Input/HDTV/YPbPr)

- 2. HDMI2 Input Connector
- 3. HDMI1 Input Connector
- 4. Service
- 5. Power Socket
- 6. Kensington<sup>TM</sup> Lock Port
- 7. Microphone Input Connector
- 8. Audio Input 1 Connector (3.5mm mini jack)
- 9. Audio Output Connector (3.5mm mini jack)
- 10. Audio Input 2 (left) Connector
- 11. Audio Input 2 (right) Connector
- 12. Video Input Connector
- 13. PC Control (9-pin DIN Type)
- 14. Monitor-Out Connector

## **Remote Control**



y0a4m0128

Ind.	Part Name	Description	
1	Transmitter	Send signals to the projector.	
2	Picture	Select the preset picture mode.	
3	Input	Select the input source.	
4	AV Mute	Momentarily turn off/on the audio and video.	
5 Four Directional Select Keys Select items or make adjustments to your selectio		Select items or make adjustments to your selection.	
6	Auto Set	Automatically synchronize the projector to the input source.	
7	Volume +/-	Adjust the speaker volume.	

Ind.	Part Name	Description	
8	Magnify +/-	Adjust the part of the image magnification. (Digital Zoom)	
9	Eco	Shift to the "Light Source Power Mode" menu.	
10	Freeze	Pause the screen image. Press again to resume the screen image.	
11     Menu     Press "Menu" to launch the on screen display (OSD the previous menu.		Press "Menu" to launch the on screen display (OSD), or go back to the previous menu.	
12 Enter Select or confirms settings		Select or confirms settings	
13	Keystone	Adjust the image to compensate for distortion caused by tilting the projector.	
14	Aspect Use this function to choose your desired aspect ratio for the scre		
15	Power (Ů)	Press the "Ů" button on the control panel to turn On/Off the projector.	

## **Specifications**

## Product Highlights

Product	Resolution	Chip Set	Lens	LAN
PJ XL4540	1024 x 768 (4:3)	DLP 0.55"	F# 2.8, f = 7.15mm	N/A
PJ WXL4540	1280 x 800 (16:10)	DLP 0.65"	F# 2.7, f = 7.51mm	N/A
PJ LX3000ST	1024 x 768 (4:3)	DLP 0.55"	F# 2.8, f = 7.15mm	N/A
PJ LW3000ST	1280 x 800 (16:10)	DLP 0.65"	F# 2.7, f = 7.51mm	N/A

## **General Specifications**

ltem	Specification		
Consumption Power	210W (ECO mode) / 330W (Full mode)		
Weight	5.5kg(12.2lb)		
Dimensions (WxHxD)	383 x 85 x 308 mm		
	<b>Operational Temperatures:</b> 41° to 104°F (5° to 40°C),		
Environmental	20% to 80% humidity (non-condensing)		
Considerations	Storage Temperatures:		
	-4° to 140°F (-20° to 60°C),		
	20% to 80% humidity (non-condensing)		
Projection System	DLP 0.55" chip (XGA)		
Projection System	DLP 0.65" chip (WXGA)		
Develotion	PJ XL4540/LX3000ST: 1024 x 768pixels (XGA)		
Kesolution	PJ WXL4540/LW3000ST: 1280 x 800pixels (WXGA)		
1	PJ XL4540/LX3000ST: F# 2.8, f = 7.15mm		
Lens	PJ WXL4540/LW3000ST: F# 2.7, f = 7.51mm		
Light Source	3.5W Laser x 19pcs		

ltem		Specification	
Light Source Life	10,000h (Normal Mode) 20,000h (ECO Mode)		
Projection screen size	PJ XL454 PJ WXL4	0/LX3000ST: 56.4 - 100 inch(XGA) 540/LW3000ST: 69.4 - 100 inch (WXGA)	
Projection distance	PJ XL454 PJ WXL4 *Focus re	0/LX3000ST: 75 - 133 cm (XGA) 540/LW3000ST: 78 - 112 cm (WXGA) ange	
Speaker	10W (M	ono)	
Connection terminal	1		
Computer In terminal		Mini D sub 15 pin RGB / Y/PB / PR (dual use)	
Monitor Out terminal		Mini D sub 15 pin	
• HDMI 1/2 In terminal		HDMI type A connector	
• Video In terminal		RCA Jack for Composite Video Input	
• Audio In terminal		Two RCA audio jacks for audio input 3.5 mm diameter mini-jack for COMPUTER	
• Audio In (Microphone)		3.5 mm diameter mini-jack for Microphone Input	
Audio Out terminal		3.5 mm diameter mini-jack	
Computer compatibility		IBM PC Compatible, support HDTV (1080i/p, 720p, 576i/p, 480i/p) include both PC and component inputs	
		• NTSC M(3.58MHz), 4.43MHz	
Video compatibility		• PAL (B, D, G, H, I, M, N), 4.43MHz	
		• SECAM (B, D, G, K, K1, L), 4.25/4.4MHz	
		<ul> <li>HDTV 720p (50/60Hz), 1080i/p (50/60Hz), 1080p (24/25/30/50/60Hz)</li> </ul>	
		• SDTV 480i/p, 576i/p	
Horizontal scan rate		15 KHz to 91.1 KHz	
Vertiacal scan rate		24 Hz to 85 Hz	

ltem	Specification		
Keystone correction		V: +/-10 degrees	

## Laser Diode Information

	Description
Туре	3.5W laser diodes x 19
LD life	Normal mode: 10,000h ECO mode: 20,000h @3.5W, 50% survival rate
Pulse duration	1.08ms

### Lens

	PJ XL4540 PJ LX3000ST	PJ WXL4540 PJ LW3000ST
F-Stop	F/2.8	F/2.7
Focus Length	7.15	7.51
Zoom Range	Fixed	Fixed
Projection Image Size	60" to 100"	70" to 100"
Throw Distance	0.75 to 1.33m	0.779 to 1.127m
Focus Unbalance	<=30cm @77" image size	<=30cm @87" image size

## Compatible Modes

## VGA Analog

a. PC signal

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
	640 x 480	60	31.5
	640 x 480	67	35.0
	640 x 480	72	37.9
VGA	640 x 480	75	37.5
	640 x 480	85	43.3
	640 x 480	120	61.9
IBM	720 x 400	70	31.5
	800 x 600	56	35.1
	800 x 600	60	37.9
	800 x 600	72	48.1
SVGA	800 x 600	75	46.9
	800 x 600	85	53.7
	800 x 600	120	77.4
Apple, MAC II	832 x 624	75	49.1
	1024 x 768	60	48.4
	1024 x 768	70	56.5
XGA	1024 x 768	75	60.0
	1024 x 768	85	68.7
	1024 x 768	120	99.0
Apple, MAC II	1152x870	75	68.7
	1280x1024	60	64.0
SXGA	1280x1024	72	77.0
	1280x1024	75	80.0
	1280 x 960	60	60.0
QuadVGA	1280 x 960	75	75.2

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
SXGA+	1400x1050	60	65.3
UXGA	1600x1200	60	75.0

## b. Extended wide timing

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
WXGA	1280x720	60	44.8
	1280x800	60	49.6
	1366x768	60	47.7
	1440x900	60	59.9
WSXGA+	1680x1050	60	65.3

## c. Component signal

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
480i	720x480 (1440x480)	59.94 (29.97)	15.7
576i	720x576 (1440x576)	50 (25)	15.6
480p	720x480	59.94	31.5
576р	720x576	50	31.3
720p	1280x720	60	45.0
	1280x720	50	37.5
1080i	1920x1080	60 (360)	33.8
	1920x1080	50 (25)	28.1
1080p	1920x1080	23.98/24	27.0
	1920x1080	60	67.5
	1920x1080	50	56.3

## HDMI Digital

## a. PC signal

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
	640 x 480	60	31.5
	640 x 480	67	35.0
	640 x 480	72	37.9
VGA	640 x 480	75	37.5
	640 x 480	85	43.3
	640 x 480	120	61.9
IBM	720 x 400	70	31.5
	800 x 600	56	35.1
	800 x 600	60	37.9
SV/CA	800 x 600	72	48.1
SVGA	800 x 600	75	46.9
	800 x 600	85	53.7
	800 x 600	120	77.4
Apple, MAC II	832 x 624	75	49.1
	1024 x 768	60	48.4
	1024 x 768	70	56.5
XGA	1024 x 768	75	60.0
	1024 x 768	85	68.7
	1024 x 768	120	99.0
Apple, MAC II	1152x870	75	68.7
	1280x1024	60	64.0
SXGA	1280x1024	72	77.0
	1280x1024	75	80.0

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
QuadVGA	1280 x 960	60	60.0
	1280 x 960	75	75.2
SXGA+	1400x1050	60	65.3
UXGA	1600x1200	60	75.0

## b. Extended wide timing

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
WXGA	1280x720	60	44.8
	1280x800	60	49.6
	1366x768	60	47.7
	1440x900	60	59.9
WSXGA+	1680x1050	60	65.3

## c. Video signal

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]	
480p	640x480	59.94/60	31.5	
480i	720x480 (1440x480)	59.94(29.97)	15.7	
576i	720x576 (1440x576)	50(25)	15.6	
480p	720x480	59.94	31.5	
576р	720x576	50	31.3	
720p	1280x720	60	45.0	
	1280x720	50	37.5	
1080i	1920x1080	60 (30)	33.8	
	1920x1080	50 (25)	28.1	

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
1080p	1920x1080	23.98/24	27.0
	1920x1080	60	67.5
	1920x1080	50	56.3

## d. HDMI 1.4a mandatory 3D timing- Video Signal

Mode	Resolution	V. Frequency [Hz]	H. Frequency [Hz]
Frame Packing	720p	50	31.5
	720p	59.94/60	15.7
	1080p	23.98/24	15.6
Side-by-Side(Half)	1080i	50	31.5
	1080i	59.94/60	31.3
Top and Bottom	720p	50	45.0
	720p	59.94/60	37.5
	1080p	23.95/24	33.8

## **Installation Requirements**

## **Environment/Power Requirements**

#### **Operating temperature**

- Storage: -20°C to 60°C / -4°F to 140°F
- Operating: 5°C to 40°C / 41°F to 104°F

#### Altitude

- Storage: 40,000ft
- Operating;
  - 0 to 2,500 ft for  $5^{\circ}$ C to  $40^{\circ}$ C
  - 2,500 to 5,000 ft for  $5\,^{\circ}\text{C}$  to  $35\,^{\circ}\text{C}$
  - 5,000 to 10,000 ft for 5°C to 30°C

#### Humidity

- Storage: 20% to 80%
- Operating: 20% to 80%

#### Power supply

100 to 240VAC ± 10%, 50 to 60Hz (Auto-ranging and power factor correction)

## **Machine Space Requirements**

Do not block projector in/out air vents. Keep 30 cm clearance around vents for air flow.



Side [A] [B]: 30cm Rear [C]: 30cm

## **Machine Dimensions**



w\_y0a4m0129

## **Main Machine Installation**

The user must set this projector up.

#### 🚼 Important 🔵

• About the handling of this machine, follow the contents with reference to Safety Information in the user manual.

## **Accessory Check**



y0a4m0130

No	Description	Q'ty
1	Projector (Lens is included)	1
2	Remote control (with Battery)	1
3	Power cord	1
4	VGA cable	1

No	Description	Q'ty
5	User Manual (CD-ROM)	1
-	Warranty Card	1
-	Read This First (Paper)	1

#### Vote

• Due to different applications in each country, some regions may have different accessories.

### Precautions

Please follow all warnings, precautions and maintenance as recommended in this manual.

## **WARNING**

- Do not stare into the beam when the projector is ON. The bright light may result in permanent eye damage.
- To reduce the risk of fire or electric shock, do not expose this projector to rain or moisture.
- When switching the projector OFF, please ensure the cooling cycle has been completed before disconnecting power. Allow 60 seconds for the projector to cool down.
- Do not use the lens cap when the projector is in operation.
- Do not look into or point the laser pointer on your remote control into your or someone's eyes. Laser pointers can cause permanent damage to eyesight.
- Do not transport the projector with any lens installed.

#### Do

- Turn OFF and unplug the power plug from the AC outlet before cleaning the product.
- Use a soft dry cloth with mild detergent to clean the display housing.
- Disconnect the power plug from AC outlet if the product is not being used for a long period of time.

#### Do not

- Block the slots and openings on the unit provided for ventilation.
- Use abrasive cleaners, waxes or solvents to clean the unit.
- Use under the following conditions:
  - In extremely hot, cold or humid environments.

- Ensure that the ambient room temperature is within 5°C to 40°C (41°F to 104°F).
- Relative humidity is 20% to 80%
- In areas susceptible to excessive dust and dirt.
- Near any appliance generating a strong magnetic field.
- In direct sunlight.

2. Installation

З

# **Special Tools**

Make sure that engineers are equipped with the following tools, which will be necessary in order to update the firmware, and to perform adjustments that are necessary after replacing the optical engine and other service parts. For details about what engineers should do, see page 72 "Required Action after Replacing Parts ".

- 1. PC or Laptop (with terminal emulator software, which is required for collecting error logs and updating firmware)
- 2. RS-232C cable (cross, 9pin 9pin)
- 3. USB cable (Type A to Mini B)
- 4. DLP composer Lite software (will delivery with firmware)
- 5. nuMicro ISP Programming Tool (will delivery with firmware)

## **Equipment Needed**

- 1. Screw bit (+): 105
- 2. Screw bit (+): 107
- 3. Screw bit (-): 107
- 4. Hex sleeves 5 mm
- 5. Needle-nose pliers
- 6. Tweezers
- 7. Projector



## **Parts List**

## Service Parts List

No.	ltems	lmage	Reference
1	Optical Engine (with Focus Lever)		page 63
2	Engine Unit		page 65
3	Filter Wheel		page 65
4	Combiner Unit		page 65
5	Sheet for Heat Sink		page 53

No.	ltems	Image	Reference
6	Sheet for PSU		page 57
7	Bottom Cover		page 70
8	Top Cover (with Sponge)		page 41
9	IO Cover		page 44
10	Left Cover		page 46
11	Right Cover		page 46
12	Large Dust Filter Holder		page 39
13	Large Dust Filter		page 39
14	Small Dust Filter Holder		page 39
No.	ltems	Image	Reference
-----	---------------------------	-----------------	-----------
15	Small Dust Filter		page 39
16	Adjustable Foot		page 69
17	Fan 1, 2 and 3		page 53
18	DMD Fan		page 63
19	Rubber Vibration Isolator		page 53
20	Interlock Switch		page 57
21	Interlock Switch Holder	<u>eti-11-3</u>	page 57

No	. Items	Image	Reference
22	Front IR Sensor		page 62
23	Speaker (with Rubber)		page 57
24	Front Cover		page 45
25	PSU		page 57
26	Harness (PSU to Main Board)		page 57
27	Harness (Laser Bank to LD Driver Board)		page 63
28	Power Socket		page 67
29	LD Driver Board		page 56

Г

No.	ltems	Image	Reference
30	Harness (LD Driver Board to Main Board)		page 56
31	Keypad Board		page 47
32	Keypad		page 47
33	Keypad (Enter)	Enter	page 47
34	IO Board		page 52
35	Audio Board		page 52
36	Harness (PSU to LD Driver Board)		page 57

#### 3. Replacement

No.	ltems	lmage	Reference
37	Harness (Main Board To IO Board)		page 52
38	FFC (Main Board to Key Pad Board)		page 47
39	Main Board		page 48

# **Part Replacement**

#### 🔁 Important

- The laser safety level is class II. Appropriate laser safety eyewear must be worn if practicable while removing the top cover to do adjustment procedures.
- Do not turn the main power ON while any of the exterior covers are open.
- Even if the purpose of the adjustment or confirming electrification, do not turn the main power ON holding down the safety interlock switch.

## **Dust Filters**

#### Vote

• When the usage hour of Dust Filter reaches the threshold, the following message appears in the screen;



y0a4m0131

 Check and specify the filter counter in following item; OSD menu > [Option] > [Filter Remind (Hour)].



1. Remove the Small Dust Filter Holder [A] and Large Dust Filter Holder [B].

2. Pull out the filter [A] and [B] from the holders.



## **Exterior Covers**

Location of screws



## Top Cover

1. Remove 8 screws on left and right side ( x8).



2. Remove 3 screws on the IO cover (🕅 x3).



3. Turn the projector upside down, then remove screw (🕅 x1).



y0a4m0005



4. Open the top cover [A], and then disconnect the FFC ( $\Im$ x1).

5. Top Cover [A]





• There are five hooks on upper of front cover. Be careful not to break the books when removing the front cover.



## IO Cover

- 1. Top Cover (page 41)
- 2. Remove screw on the upper side (🕅 x1).



y0a4m0011

3. Remove 5 screws (yellow circles) and 6 hex screws (red circles) on the back side ( x11), and then remove the IO cover [A].



Hex screws x6, Round screws x5

w\_y0a4m0012



## Front Cover

- 1. Top Cover (page 41)
- 2. Remove 3 screws on Front Cover [A] ( x3)



3. Interlock Switch holder [A] (@x2), and IR Sensor [B] (2 hooks)





y0a4m0047

#### Left Cover

- 1. Top Cover (page 41)
- 2. Left Cover [A] (🕅 x4)



y0a4m0043

## **Right Cover**

1. Top Cover (page 41)

З

2. Right Cover [A] (🕮: flat screws x 3)



#### y0a4m0044

## Keypad Board, Keypad Buttons

- 1. Top Cover (page 41)
- 2. Keypad Board [A] (@x4)



3. Separate keypad module into Keypad Board [A] and Keypad buttons [B].



y0a4m0009

4. Remove the FFC [A] from Main Board to Keypad Board (🌮 x1).



## Main Board

- 1. Top Cover (page 41)
- 2. IO Cover (page 44)
- 3. Top Shielding [A] ( x8)



y0a4m0014

Make sure not to forget to peel off the black sheet [A] before removing the top shielding.



y0a4m0015

4. IO Shielding [A] (🕅 x3)



5. Main Board [A] with bracket (@x4, all connectors)





6. There is a connector [A] at the back side of the main board. Pull the main board upward, and then disconnect it (🐨 x1).



y0a4m0019

7. Separate the bracket [A] and Main Board [B] (@x2).



y0a4m0110

З

## **Connection List**



y0a4m0020

ltem	Name on board	Key feature	Figure
A	None (to PSU)	Black wire tube (16 pin)	
В	P/W INDEX (to Photo Sensor for Filter Wheel)	Compose of Red/Black/ White Wire(3 pin)	
С	F/W (to Filter Wheel)	FFC cable	AWM 20861 1056
D	P/W INDEX (to Photo Sensor for Phosphor Wheel)	Compose of Red/Black/ White Wire(3 pin)	
E	P/W (to Phosphor Wheel)	FFC cable	WM 20861 105
F	F IR (to IR Sensor)	Compose of Red/Black/ White Wire(3 pin)	

Item	Name on board	Key feature	Figure
G	SPK (to Speaker)	Compose of Red/Black Wire(2 pin)	
Н	LD IF (To LD Driver Board)	FFC cable	
I	DMD FAN	Compose of Red/Blue/ Black Wire (3 pin)	
J	Sys FAN	Compose of Red/Yellow/ Black Wire(3 pin)	

## IO Board, Audio Board

The IO Board and Audio Board are attached on Main Board.



[A]: Main Board [B]: Audio Board [C]: IO Board

1. Separate IO Board and Audio Board from Main Board (🕅 x2, 🖙 x2).



- 2. Audio Board [A] (@x2)
- 3. IO Board [B] (@x2)



y0a4m0111

## Fan 1, Fan 2, and Fan 3

1. Top Cover (page 41)

2. Disconnect the "SYS FAN1, 2 and 3" Connector on Main Board (🌮 x3).



3. Peel off the black sheet for heat sink [A].



y0a4m0041

4. Remove the Fan 1, Fan 2 and Fan 3.





### 5. Rubber Vibration Isolator [A]

y0a4m0112

#### Notes on Installation

• Attach the fans so that the marking comes to the position shown in the following figure.



y0a4m0113

• Attach the Rubber Vibration Isolator [A] to the bottom cover guide as shown in the following figure.



З

y0a4m0113

## LD Driver Board

- 1. Top Cover (page 41)
- 2. Bracket [A] (@x5)



y0a4m0035

3. LD Driver Board [A] ( x3)



w\_y0a4m0036

## Speaker

- 1. Top Cover (page 41)
- 2. Remove the ground wire screw and disconnect "SPK" connector on Main Board.!
  - ([A]: Speaker)



y0a4m0038

3. Speaker [A]



y0a4m0039

## Interlock Switch, PSU

- 1. Top Cover (page 41)
- 2. Front Cover (page 45)
- 3. LD Driver Board (page 56)

4. Bracket for PSU [A] (@x4)



y0a4m0048

5. Disconnect the Interlock Switch connector [A] on the PSU ( $\mathbf{SFx1}$ ).



y0a4m0049

6. Remove the Interlock Switch [A]



y0a4m0050

7. Remove the black tape [A] of Interlock Switch.





8. Separate the Interlock Switch [A] and Holder [B] (2 hooks).



9. PSU [A] (🛱 x4, 🖾 x1)

3 hex screws, 1 round screw





• When removing the PSU, put the sheet [A] out of the way so that the parts on the PSU board are not caught by the sheet.



y0a4m0118

• Be careful not to scratch the lens [A] surface.



y0a4m0122

10. 2 harnesses (🎯 x2)



11. Sheet for PSU [A]



y0a4m0054

## Front IR Sensor

The connector [A] is too large to pass through between PSU [B] and harness guide. So first you have to remove PSU.



y0a4m0117

- 1. Top Cover (page 41)
- 2. Disconnect the "F IR" connector on Main Board ( $\mathbf{Fx1}$ ).



y0a4m0120

- 3. Front Cover (page 45)
- 4. LD Driver Board (page 56)
- 5. PSU (page 57)

З



6. Peel the sheet [A] off, and then remove the Front IR Sensor [B].

#### Notes on Installation

Attach the harness to guide (three red circles as shown) on bottom cover.



y0a4m0121

## Optical Engine, DMD Fan

Optical Engine [A] is comprised of the following parts:

1. Engine Unit

Lens Module, DMD Module (DMD Chip, DMD Board)

2. Combiner Unit

Heat Sink, Heat Pipe, Laser Bank (Laser Diode, Laser Bank Board), Phosphor Wheel

3. Filter Wheel



y0a4m0055

- 1. IO Cover (page 44 "IO Cover")
- 2. Main Board, IO Board, Audio Board (page 48, page 52)
- 3. Optical Engine [A] (@x6, @x2)



4. Sponge seal [A]



y0a4m0058

5. DMD Fan with bracket [A] (🕅 x2)



y0a4m0059

6. Separate the DMD Fan [A] and Bracket [B].



y0a4m0060

## Engine Unit, Filter Wheel, Combiner Unit

1. Optical Engine [A] (page 63)

2. Filter Wheel Cover [B] ( x2).



y0a4m0190



3. Filter Wheel [A] (🕅 x2).





y0a4m0192



4. Separate the Combiner Unit [A] and Engine Module [B].

#### y0a4m0193

З

#### Notes on Attaching the Filter Wheel

After attaching the cover, pull out the FFC until the black line appears. If the FFC is loose inside the cover, it might come into contact with the filter wheel, causing an error.



#### **Power Socket**

- 1. Exterior Covers (page 40)
- 2. Main Board (page 48)
- 3. IO Board, Audio Board (page 52)
- 4. Fan 1, 2, and 3 (page 53)
- 5. LD Driver Board (page 56)
- 6. PSU (page 57)
- 7. Optical Engine (page 63)
- 8. DMD Fan (page 63)

9. Bottom Shielding [A] (🕅 x8)



10. Socket with bracket [A] (🕅 x2)





11. Remove the harness from the 2 hooks as shown;

12. Separate bracket [A] and Power Socket [B].



## Adjustable Foot

There are three adjustable feet; there are 1 on the front and 2 on the rear.

1. Rotate the adjustable foot [A] counterclockwise and remove it.

No nut attached on the bolt so turn the Adjustable foot counterclockwise and remove it.



З

#### y0a4m0065

### **Bottom Cover**

Remove the all units on Bottom Cover.

Refer to the procedures of the relevant service parts. (page 31 "Replacement")

- 2. Adjustable Foot (page 69)
- 3. Cover for an Opening Area of Bottom Surface [A] (🕅 x2)



y0a4m0066

4. Rubber for an Opening Area of Bottom Surface [A].



y0a4m0067
5. Theft Protection Hook [A] (🕅 x2)



y0a4m0068

6. Remove the Suspension Bracket [A] (🕸 x2)



# **Required Action after Replacing Parts**

After replacing parts, execute the related items shown in the table below.

	Changed parts				
Action after repair	Main Board	Combiner Unit	Filter Wheel	Engine Unit	Reference
Firmware Update*1	~				page 97
Wheel Index Adjustment	~	~	$\checkmark$	$\checkmark$	page 76
Factory Reset	~				page 82
EDID	~				page 112
Re-write LD Hours Usage	~	~			page 79
ADC Calibration	~				page 80

\*1 After Firmware update, ADC Calibration should be done.

# 4. Adjustment

## Service Mode

#### How to enter the Service Mode

- 1. Turn on the projector.
- 2. Press the [Power [1]] key, and then, press the [Left [2]], [Right [3]], and [Menu [4]] keys sequentially to enter the service mode.



y0a4m0132

You can enter the service mode by using the remote controller.

The service mode menu appears.

MCU A02		VGA-1 ADC Calibration		
RICOH Generic Z02 < Aug 20 2015 >		VGA-2 ADC Calibration		
LD Hour-Full	7	SNID Read		153500
LD Hour-ECO	2	Thermal Detect	Disable	
Operating Hour		Debug Message	On	
Over Temp		Fan Menu		
	U	LD Menu		
	5	LD Calibration		
LD Fail	0	Wheel Index		
	12	Factory Reset		
Test Pattern	1	Internal Bus Log		
Burn in Test	1	Exit		

y0a4m0133

### Service Mode Settings

Setting Items	Descriptions
Over Temp	Use this to display the high temperature error.
Fan Lock	Use this to display the details of fan error, such as fan name error occurred and fan speed.
LD Fail	Use this to display the details of LD error, and reset/change the LD counter in each power mode.
Test Pattern	Use this to select the test pattern for each inspection, or adjustment.
Burn In Test	DFU*1
VGA-1 ADC Calibration	Use this to execute the ADC calibration of <b>VGA-IN1(Source</b> from VGA-IN1) Port.
VGA-2 ADC Calibration	Use this to execute the ADC calibration of <b>VGA-IN2(Source</b> from VGA-IN2) Port.
SNID Read	Display the <b>S</b> erial <b>N</b> umber <b>ID</b> entification (SNID)
Thermal Detect	Disable/ Enable DFU * 1
Debug Message	On/Off DFU*1
Fan Menu	Display the fan status such as fan speed, voltage, and temperature.
Laser Operation Mode	Normal/Eco This is the same function as "Laser Power Mode" on OSD menu. Use this to switch the power mode when getting the fan parameter in each mode. On/Off
Simulate Temperature on/off	DFU*1
LD Menu	Use this to display the status of Laser Diode.

Setting Items	Descriptions	
Red PWM	DFU*1	
Green PWM	DFU*1	
Blue PWM	DFU*1	
Yellow PWM	DFU*1	
LD (1to3) Enable	DFU*1	
LD Demo Mode	DFU*1	
LD Calibration		
CALIBRATION	Use this to execute the LD calibration.	
CALIBRATION Reset	Use this to reset the value of calibration data.	
CALIBRATION DATA	Use this to display the detailed value of LD calibration.	
Wheel Index		
DISPLAY MODE	Use this to select the display mode for wheel index adjustment. • BRIGHT • PRESENTATION	
	• MOVIE • sRGB	
	• DEBUG	
P-Wheel Index	Phosphor Wheel Index Adjustment	
F-Wheel Index	Filter wheel index Adjustment	
Factory Reset	Yes/No Use this to reset all the settings in the OSD menu (except for the service mode).	
Internal Bus Log	Use this to display Internal Bus Log.	
Exit	Go back to user mode.	

\* 1 DFU: Design/ Factory Use only

# Adjustment

### Wheel Index Adjustment

After replacing the main board, combiner unit, filter wheel, or engine unit, the Wheel Index Adjustment should be done.

#### Environment

• Test pattern: Full Color Pattern [A], 64 gray RGBW [B]



y0a4m0136

- 1. Connect the projector to PC with HDMI or VGA cable, and then, turn ON the main power.
- 2. Enter the Service mode. (page 73)

3. Select [Wheel Index], and then press [Enter] key.



4. Select the display mode, and then, using the [Left] or [Right] key, adjust the R/G/B and gray gradations until they are correct and satisfactory.

 Wheel Index Calibration Menu

 DISPLAYMODE
 PRESENTATION

 P-Wheel Index
 609

 F-Wheel Index
 258

 Return to Service Menu
 ✓

Both "P-Wheel Index" and "F-Index" are well adjusted.



#### Inspection item

- Check if each color level is correct.
- Color saturation

#### Criteria

- Screen appears satisfactory. There should be no unusual conditions, such as lines on the screen.
- Color levels should be sufficient and satisfactory.
  - [A]: Not good (there is a line on red bar)
  - [B]: Good (Adjusted image)

4



y0a4m0136

# Changing the LD/Projector Hours

After replacing the main board, or combiner unit, you must rewrite the LD/projector operation hours. Write down the LD/projector operation hours before the replacement and put back the same value after replacing.

- 1. Enter the Service mode. (page 73)
- 2. Select [LD Fail], and then press [Enter] key.



- 3. Select the setting item that you want to change hours.
  - Full: Usage time when "Laser Power Mode" is set to "Normal".
  - ECO: Usage time when "Laser Power Mode" is set to "ECO".
  - Bright: Usage time when "Color Mode" is set to "Bright".
  - Operating Hour: Total hours of projector operation.



- 4. Change the LD Hour by using [Left] or [Right] key.
  - "Left" key: Decrease LD/projector hours.
  - "Right" key: Increase LD/projector hours.

# Calibration

### **ADC** Calibration

After replacing the main board, ADC Calibration must be done. Also, after firmware update, this should be done, too.

VGA and Component signals require ADC calibration.

#### Environment

- Test equipment: PC support HDTV resolution
- Test signal:

1024x768@60Hz (For RICOH PJXL4540/LX3000ST)

1280x800@60Hz (For RICOH PJ WXL4540/LW3000ST)

• Test pattern: 94%White(up) / 6% Black (down)



y0a4m0148

- Calibration pattern should be in full screen mode.
- Input the signal from the VGA port
- 1. Connect VGA1-in port [A].



2. Enter the service mode. (page 73)

3. Select "VGA-1 ADC Calibration" to perform the calibration.

When calibration is completed, "OK" appears on the screen.



4. Connect VGA2-in port [A].



Y0a4m0149a

5. Select "VGA-2 ADC Calibration"

When calibration is completed, "OK" appears on the screen.

#### Criteria

If there is noise on the screen, the product is considered as failure product.

There should be no unusual conditions, such as lines on the screen.

Check if the projection is same as PC monitor displayed.

### **Factory Reset**

Factory Reset allows you to erase all OSD menu settings and restore the default setting (except the service mode).

There are two ways to do Factory Reset. Either way, the settings to be reset are the same.

After replacing the main board, Factory Reset must be done.

Also, after testing or checking the projector, OSD menu settings must be reset to factory default.

#### Factory Reset Procedure (OSD menu)

- 1. Press the [Menu] key to enter the OSD menu.
- 2. Select [Setting] -> [Reset].

	Setting	
<b>•</b> •••	🕤 🌍 Langua <u>c</u> e	English
	🔣 Menu Location	
	😰 Closed Caption	Off
	📟 VGA Out (Standby)	orr
ė.	🐨 VGA-2 (Function)	Input
1.11	Test Pattern	Off
4.9	🗲 Reset	<b>→</b>
		v0a4m015

3. Select "Yes", and then press the [Enter] key.

#### Factory Reset Procedure (Service Mode)

1. Enter the service mode. (page 73)

2. Select [Factory Reset], and then press the [Enter] key.



3. Select [Yes], and then press the [Enter] key.



y0a4m0152

4. Adjustment

# **LED Indicators**



Message	Power LED	TEMP LED	LIGHT LED
	(Red or Blue)	(Red)	(Red)
Standby (Input power cord)	濛 (Red)	-	-
Normal (Power on)	⊯́ (Blue)	-	-
Powering up (Warming up)	Flashing Red (1.Osec.)	-	-
Power off (Cooling Down)	Flashing Red (0.5sec.)	-	-
Error (Over temp. On Event)	-	پ	-
Error (Over temp. On Standby)	-	*	-

Message	Power LED	TEMP LED	LIGHT LED
	(Red or Blue)	(Red)	(Red)
Error (Light source failed On Event)	-	-	*
Error (Light source failed On Standby)	-	-	*
Frror (Fan failed On Event)	-	Flashing	_
		3sec.	
Error (Ean failed On Standby)	-	Flashing	
		3sec.	-
Error (Filter Wheel fail / Striking Light source Fail	-	Flashing	-
On Event)		0.5sec.	
Error (Filter Wheel fail / Striking Light source Fail		Flashing	-
On Standby)	-	0.5sec.	

5

₩: Light

-: No light

# Troubleshooting

First, check the items below.

- Make sure you have connected the projector properly to the peripheral equipment.
- Make sure all equipment is connected to an AC outlet and the power is turned on.
- If the projector does not project an image while being operated with a computer, restart the computer.

No.	Symptom	Solution procedure	
		<ol> <li>Ensure the Power Cord and AC Power Outlet are securely connected.</li> </ol>	
1		2. Make sure that Keypad Board is not defective.	
I INO Fower	Thorower	<ol> <li>Ensure all connectors are securely connected and are not broken.</li> </ol>	
		4. Make sure that PSU is not defective.	
		1. Ensure the projector is under Operation temperature.	
		2. Check LED status.	
		If Temp LED Flash Red: 3 sec.	
	Auto Shut Down	Check the Fan.	
2		Check the Main Board.	
		If Temp LED lit Red	
		Clean the dust and replace Filter Module.	
		Check the Fan.	
		Check the Main Board.	

No.	Symptom	Solution procedure	
3	No Light On	<ol> <li>Ensure all connectors are securely connected and are not broken.</li> <li>Check LED status.         If Temp LED lit Red, Lamp LED lit Red         <ul> <li>Check the Interlock Switch.</li> <li>If Temp LED flashing Red: 0.5 sec.</li> <li>Check the Filter Wheel Module.</li> <li>Check the Filter Wheel Module.</li> <li>Check the Photo Sensor Board.</li> <li>Check the Combiner Module.</li> <li>Check the ID Driver Board.</li> </ul> </li> <li>Check the LD Driver Board.</li> <li>Check the Combiner Module.</li> <li>Check the Main Board.</li> <li>Check the Main Board.</li> </ol>	
4	No Image	<ol> <li>Ensure the Signal Cable and Source device is work properly.</li> <li>Ensure all connectors are securely connected and are not broken.</li> <li>Check the Main Board.</li> <li>Check the Combiner Module.</li> <li>Check the Optical Engine.</li> </ol>	
5	Mechanical Noise	<ol> <li>Check the Fan.</li> <li>Check the Filter Wheel Module.</li> <li>Check the Combiner Module.</li> </ol>	
6	Line Bar/Line Defect	Check the Main Board.	
7	Image Flicker	<ol> <li>Do "Reset" under "Settings" of the OSD Menu.</li> <li>Ensure that the signal cables and source are work as well.</li> <li>Execute LD Calibration.</li> <li>Check the Main Board.</li> <li>Check the Photo Sensor Board and Filter Wheel Module.</li> <li>Check the Combiner Module.</li> </ol>	

No.	Symptom	Solution procedure
8	Color Unusual	<ol> <li>Do "Reset" under "Settings" of the OSD Menu.</li> <li>Execute LD Calibration.</li> <li>Adjust Wheel Index.</li> <li>Check the Main Board.</li> <li>Check the Filter Wheel Module.</li> <li>Check the Combiner Module.</li> </ol>
9	Poor Uniformity/ Shadow	<ol> <li>Ensure the projection screen without dirt.</li> <li>Ensure the projection lens is clean.</li> <li>Ensure the Brightness is within spec.</li> <li>Check the Optical Engine.</li> <li>Check the Photo Sensor and Filter Wheel</li> </ol>
10	Dead Pixel/Dust (Out of spec.)	<ol> <li>Ensure the projection screen without dirt.</li> <li>Ensure the projection lens is clean</li> <li>Check the Optical Engine.</li> </ol>
11	Garbage Image	<ol> <li>Ensure that the signal cables and source work as well.</li> <li>Check Main Board.</li> </ol>
12	Remote Controller/Control Panel Failed	<ul> <li>Remote Control <ol> <li>Check the Battery.</li> <li>Check the Remote Controller.</li> <li>Check the Remote Controller.</li> <li>Check the IR Sensor Board.</li> <li>Check the Main Board.</li> </ol> </li> <li>Control Panel <ol> <li>Check the FFC cable.</li> <li>Check the Keypad module.</li> <li>Check the Main Board.</li> </ol> </li> </ul>
13	Function Unusual	<ol> <li>Do "Reset" under "Settings" of the OSD Menu.</li> <li>Check the Main Board.</li> </ol>

No.	Symptom	Solution procedure
14	Audio Unusual	<ol> <li>Ensure that the signal cables and source are work as well.</li> <li>Ensure the projector is not in "Mute" mode.</li> <li>Check the Main Board.</li> <li>Check the Speaker.</li> </ol>
15	3D Image Unusual	<ol> <li>Ensure the using 3D glasses is good.</li> <li>Ensure the signal source is 3D format.</li> <li>Ensure the 3D function of projector OSD is on and 3D sync invert is on.</li> <li>Check the Main Board.</li> </ol>

### **Test and Inspection**

#### **Test Equipment Needed**

- PC support HDTV resolution.
- Blue-ray DVD player supports "S-Video", "3D source files", "HDMI", and "Video".

### **Recommended Test Condition**

- Ambient brightness: Dark room less than 2 lux.
- Product must be warmed up for 3 minutes.
- Screen size:
  - 77" diagonal for PJ LPJ XL4540 and PJ LX3000ST
  - 87.2" diagonal for PJ WXL4540 and PJ LW3000ST

#### **Zone Definition**



- Zone A: The blue area in the center of the image
- Zone B: The outside of the image
- Definition, Active area = Zone A + Zone B

### VGA Port Test

Pixel Specifications and Criteria

A stands for "Zone A".

B stands for "Zone B".

Active area = Zone A + Zone B

#### For PJ WXL4540 / PJ LW3000ST

Order	Symptom	Pattern	Criteria
1	Dark Blemish	Blue 60	<ol> <li>≤ 4 visible dark blemishes are allowed in the active area (Zone A + Zone B).</li> <li>No blemish will be &gt; 1.5" (3.81cm) long/diameter.</li> </ol>
2	Light Blemish	Gray 10	<ol> <li>≤ 4 visible light blemishes are allowed in the active area (Zone A + Zone B).</li> <li>No blemish will be &gt; 1.5" (3.81cm) long/diameter.</li> </ol>
3	Eyecatchers/ Border Artifacts	Black	The eyecatcher and lines are allowed
4	Projected Images	<ol> <li>Any screen</li> <li>Gray 10</li> <li>Any screen</li> <li>Gray 10</li> <li>Gray 10</li> <li>White</li> <li>Any screen</li> <li>Black or White</li> </ol>	<ol> <li>No adjacent pixels</li> <li>No bright pixels in Active Area</li> <li>No unstable pixels in Active Area</li> <li>≤ 1 bright pixel</li> <li>≤ 6 dark pixels in the Active Area</li> <li>No DMD window aperture shadowing on the Active Area</li> <li>Blemishes are allowed</li> </ol>

Order	Symptom	Pattern	Criteria
1	Dark Blemish	Blue 60	<ol> <li>≤ 4 visible dark blemishes are allowed in the active area (Zone A + Zone B).</li> <li>No blemish will be &gt; 1.5" (3.81cm) long/diameter.</li> </ol>
2	Light Blemish	Gray 10	<ol> <li>≤ 4 visible light blemishes are allowed in the active area (Zone A + Zone B).</li> <li>No blemish will be &gt; 1.5" (3.81cm) long/diameter.</li> </ol>
3	Eyecatchers/ Border Artifacts	Black	The eyecatcher and lines are allowed
4	Projected Images	<ol> <li>Any screen</li> <li>Gray 10</li> <li>Any screen</li> <li>Gray 10</li> <li>Gray 10</li> <li>White</li> <li>Any screen</li> <li>Black or White</li> </ol>	<ol> <li>No adjacent pixels</li> <li>No bright pixels in Active Area</li> <li>No unstable pixels in Active Area</li> <li>≤ 1 bright pixel</li> <li>≤ 4 dark pixels in the Active Area</li> <li>No DMD window aperture shadowing on the Active Area</li> <li>Blemishes are allowed</li> </ol>

#### For PJ XL4540 / PJ LX3000ST

### **Audio Performance Test**

- Test equipment: DVD Player
- Test signal: CVBS
- 1. Plug the audio cable into Audio-IN port
- 2. Adjust the volume from "0"to "8"by using the remote controller.

3. Check the sound from speaker.

#### Criteria

Check whether "Volume" is working properly.

#### Video Performance Test

- Test equipment: DVD player
- Test signal: Video



y0a4m0155

#### Criteria

Check any unsatisfactory color, line distortion or any noise on the screen.

Check the sound from speaker.

#### **HDMI** Performance Test

- Test equipment: DVD Player with HDMI output
- Test signal: 720p, 1080p, 1080i

#### Criteria

Ensure the image is well performed.

Check whether "mute" is working properly.

#### 3D Test (HDMI)

- Test equipment: Blue-Ray DVD player & 3D format CD&3D glasses (144Hz)
- Test signal: 1080p@24Hz

#### Criteria

The image should not appear noise, flicker shadow, shocking, and unsatisfactory color.

#### **USB** Performance Test

- Test equipment: USB Memory with video files
- 1. Plug USB memory into USB port, and then search multimedia.
- 2. Select "USB Disk" on OSD menu, and then click "Video" to test.

#### Criteria

Check whether sound and video is satisfactory.

### Check points

Check item	Check point
Firmware version	All firmware version must be the latest version.
Exterior covers	The exterior covers are not broken.
Logo	Missing logo, missing prints and blurry prints are unacceptable.
Zoom in/out	The function should work smoothly.
Keypad	All keypad buttons must operate smoothly.

5. Troubleshooting

# 6. Firmware Update

## System Firmware Update

#### **Equipment Needed**

#### Software

- DLP Composer Lite
- Firmware (\*.img)
- HD26FlashDeviceParameters

Note

 Download "DLP Composer Lite" and "HD26FlashDeviceParameters" from website that provides the relevant tools for maintenance.

#### Hardware

- 1. Projector
- 2. Power cord
- 3. USB Cable mini USB to USB (A)
- 4. PC / Laptop

### Firmware Update Procedure

#### DLP composer lite setup procedure

1. Execute "DLP Composer Lite v\*\* Setup" Program.



2. Click "Next".



w\_y042m0051

3. Read "License Agreement", and then choose "I accept and agree to be bound by all the terms and conditions of this License Agreement" and click "Next".



w\_y042m0052

4. Click "Next".



w\_y042m0053

5. Click "Next".



w\_y042m0054

6. Click "Next".



w\_y042m0055

The program is executing "installing" status.



w\_y042m0056

7. Click "Finish".



w\_y042m0057

#### Get into firmware download mode

Set up the following procedure.

1. While holding down the "Enter" key, then plug in the power cord.

2. After the Power LED lights pink, and the Lamp and Temp LEDs light red, then release the "Enter" key as shown in the photo below.



y0a4m0162

#### USB driver update procedure

1. Execute "Install DLP Device Drivers" in the start menu.



w\_y042m1059

2. Select "Jungo WinDriver (WinVista/Win7)", then click "install".



w\_y042m1060



• If OS is 64bit, select "Microsoft WinUSB".





3. Click "Next".



4. Click "Finish".



#### Connect the projector to the PC

- 1. Enter the firmware download mode. (page 100)
- Connect the Projector and PC with a mini USB cable. The Found New Hardware Wizard appears.
- 3. Select "No, not this time", then click "Next".



y0200036

4. Select "Install the software automatically (Recommended)", then click "Next".



y0200037

5. Click "Finish".



#### Firmware update procedure

1. Execute the "DLP Composer<sup>TM</sup> Lite \*\*" file.



2. Select the file "V1FlashDeviceParameters".

3. Put "V1FlashDeviceParameters" file into the folder where you setup "DLP Composer Lite \*\*".



4. Click "Edit" and "Preferences".

- 10	P Compo	eer(TW) Lite						÷ 5.
rm	10	Window 1988						
1.	Liver.		D					
	114		4					
n	Capy .	Opi+C.						
H	Para							
	-		1					
Ľ	There is	-						
-			- 61					
2	anh I							
			C feel fast	· Direct Dated	2144	Annual (1994)	In the X or offer	60
	electer	Contant of	w.r. 1	the first had been				
ç,	rcest 7	vojector fi	lest					
h	árda Det	rol Flash Loader						
-								14.01

w\_y042m0065

5. Click "Communications" and select "USB" then click "OK".



6. Choose "Flash Loader" and click "Browse" to search the firmware file (\*.img) and click "Open".

Alexenter Control Peak Loader Peak Loader Peak Loader Peak Loader Peak Integri Peak Orgenised Statistics of updates charged sectors] Orgenised Integri Peak Into Control (Summer Controls of refer rang) Orgenised Integri Peak Into Control (Summer Controls of refer rang) Sectors Flow Vertices of the Summer Control (Summer Control (Summer Controls of refer rang) Vertices of the Summer Control (Summer Con
Destage #F1200m_minate00_2500_cbetring_m_L

w\_y042m0067
7. Select the item "Skip Boot Loader Area" and select "64KB" then click "Reset Bus" to erase the flash memory.



y058m0068

- 8. If the firmware is ready, click "Start Download" to execute the firmware update.
- 9. Click "Yes" to erase the flash memory. .



w\_y042m0069

It takes about several minutes, the firmware update process is finished, "Download completed" will appear on the screen.



w\_y042m0070

10. Unplug the USB cable and power cord.

## Check system firmware version

- 1. Re-plug in the power cord, and then restart the projector.
- 2. Get into the Service Mode. (page 73)
- 3. Check the system firmware version [A].



## **MCU Firmware Update**

## Upgrade Procedure

#### **Equipment Needed**

- NuMicro ISP Programming Tool
- Firmware (\*.isp)
- Projector
- Power cord
- Female to female RS232 Cable
- PC or Laptop
- 1. Plug in the power cord, connect the projector to PC with RS232 cable.
- 2. Execute the "NuvoISP.exe" firmware upgrade tool from "NuMicro ISP Programming Tool" folder.



#### y0a4m0165

3. Select the COM port which you are using, then click the "Connect"

NuMiero ISP	Programmin	g Tool V1.44			
About					
UVO	Ton		and the second		-
Connection typ	e		Connection check		
⊙ COM	COMI	~	Connect	Disconnected	
P					
	RAM: N/A	APROM: N/A De	ataFlash: N/A	F/W Ver: N	4
Lord File		-			_
400.044	Fie name:	Er(New Folder (	4)/ISF_RS2321		
- MPROFIL	File size:		Checksum:		
	Fie name:	EilMew Folder (	MISE BSZGZ		_

4. Click the "File", and then select "Load Project".

and the second se
Y

- 5. Select the firmware file, and then click "open".
- 6. Click"Start".



7. After the "PASS" appeared, close the window.

Tile debe																	
APROM Da	taRash																
00000000	40 07	00 20	49 03	00 0	0 69	01	00	00	€B	01	00	CO		6 I.		<b>k</b>	1
00000010	D0 00	00 00	CO 01	0 00 0	00 00	00	00	00	CO	00	00	00	4	6. S. S. S.			12
02000000	00 00	00 00	CO 03	0 00 0	0 00	00	00	00	CD.	01	00	CO	2				
00000000	00 00	00 00	CO 03	00 0	0 67	01	00	00	71	01	oc	CO	2				
0000040	73 01	00 00	BB Z	8 UC C	0 D9	13	00	UU	es.	1.6	0U	00	4	s			
0000050	73 01	00 00	63 13	00 0	0 71	22	00	00	73	2.2	00	CO.	3	e	. q"	51	
00000060	73 01	00 00	23 23	9 00 0	0 37	29	00	00	A7	29	00	0.0		· · · · · · · · · · · · · · · · · · ·	. 13	1.1.1.	
00000070	5D 02	00 00	E9 03	00.0	0 73	01	00	00	78	01	00	CO	1				
00000000	70 01	00 00	73 03	L 00 0	0 07	19	00	00	73	01	00	C0	÷	\$		5	
Proceano							_						-		D		9
● AFR CM	C	DH-FI-	1	OAPR	очн	alaF	ash	C	Fra		JI	Ξ	]0	uni gʻ	PI	400	
14 ×																	
								-							E	N. 9/1	-
															8	2.4.0	

y0a4m0170

8. Check if the MCU firmware [A] is updated on Service Mode.



y0a4m0171

6

# **EDID Update**

### **EDID Introduction**

Extended Display Identification Data is a VESA standard data format that contains basic information about a display device and its capabilities, including vendor information, maximum image size, color characteristics, factory pre-set timings, frequency range limits, and character strings for the monitor name and serial number.

The information is stored in the display and is used to communicate with the system through a Display Data Channel (DDC), which sites between the display device and the PC graphics adapter. The system uses this information for configuration purposes, so the monitor and system can work together.

If a display device has digital input ports, like DVI or HDMI, but without EDID in its Main Board, the display device will show no image while the input source is digital signal.

#### **Equipment Needed**

- EDID Program
- EDID File (\*.ini)
- Projector
- Power Cord for Projector
- VGA Cable
- HDMI to DVI cable
- Generic Fixture Board for EDID Key-in
- RS-232 9 Pin Cable
- Power Adapter (Output DC 12V)
- Display Monitor
- PC



## Procedure

## Setup Procedure (VGA&HDMI)

- 1. Connect all ports.
  - 1. Connect P1 of Fixture Board [A] to COM Port of PC/Laptop with RS232 cable.
  - 2. Connect P3&P4 of Fixture Board to VGA-in port of projector with VGA cable.
  - 3. Connect P5 of Fixture Board to HDMI1 port of projector with HDMI to DVI cable.
  - 4. Plug power adapter to JP1 of Fixture Board.





#### VGA x2 HDMI

## EDID Key-In Procedure

- 1. Execute EDID Program.
  - (1) Click "EDID" to execute EDID program.



- 2. Process
  - (1) Select the COM Port which you are using.
  - (2) Click "Model".
  - (3) Select the source file (\*.ini).
  - (4) Click "Open".

140 Enput C Dar code auto 1	aad @ Panus]	-EDED values Analog Vilues	
Barcodo Hanf.Code Hoit Hn.	(2)		
EDID Informations Serial	Read		
Heek Vear	Hotel	Digital Lalues	
Product	Jukin (3) Reday		
1)	I vin Shrendt In (I 人名克本	(4)	
irt DHI Kasalije	Hennes 0.0000,200 Filosoftype Pitting 10 Pitting 10	BICST_2664_A02 ki Open II) Elanca	
			4

y0a4m0177

- (5) Enter the Serial Number next to "Unit No.".
- (6) In "Write Source Select", select "VGA1" and "HDMI1".
- (7) Click "Program".

								•	
langal	EDIE value Analog Va	1085							
Legaty     (5)     Read	00         01         02         0           08         FF         FF         6         1           14         19         01         0         1         1           19         16         6.3         2         1	F FF FF 5 8E 00 5 CF 80 5 0 09 40 10 00 00 11 88 34 1 88 34 3 31 30	FF 80 80 78 45 70 64 19 80 18 32 39 20 28 53 54	08 02 3E R0 EA 89 61 76 00 40 00 00 NA 20 DA 20 DA 20	RH         RH           16         62           E7         A0           81         FD           41         40           04         FF           28         26           29         20	00 57 45 26 58 88 88 28	00 45 01 40 54 8F 59 61 80 18 41 37 FB 40 80 40 20 40	00 28 59 88 80 32 FC E2	
Program Smitr1 Fxit Texet	Digital U D0 01 02 Bu FF FF F 1H 19 07 19 4F 63	alues 15 du 05 15 FF FF 15 SV 00 25 CF 80	36 87 FF 85 30 78 81 70	able1 08 03 3E 00 EH 09 45 70 00 00	20 00 19 93 67 00 61 70 61 70	8 AD 5 / 5 81 9 26	00 01 91 91 54 85 FC 45 20 11	23 59 88	^
© Analog ← Digital 〒 Trans	36 HR HR H 56 25 32 3 78 0F 5E 5 56 56 58 5 52 60 20 5 16 15 16 18 HR 38 3	AN A	40 15 22 25 20 26 52 51 42 80 47 80 48 85	NB AF DA 20 20 20 DA 20 84 H5 83 H1 41 11	24 Fi 24 21 24 21 24 21 24 21 24 21 24 21 25 21 25 21	NR NB NB NB NB NB NB NB NB NB NB NB NB NB	A-1 51 FD 81 DB 81 28 91 11 12 HC 81 H1 11	1 37 1 37 1 48 1 37 1 48 1 37 1 38 1 37 1 38 1 37 1 37 1 37 1 37 1 37 1 37 1 37 1 37	×
SCAN									
	Legary Read Program	Image: Second	EDIT values  Anating Values  A	Bit is a lue:         Bit is a lue:           Bit is a lue:         Bit is a lue: <t< td=""><td>Control         Control         <t< td=""><td>Control         Coll estude:           Analogy Galaxies         Analogy Galaxies           Image: Coll and the state of the state of</td><td>Control         Control         <t< td=""><td>Bool III 0010000         E011 0010000           Bool III 00100000         Bool III 0010000         Bool III 0010000         Bool III 0010000         Bool III 00100000         Bool III 00100000         Bool III 0010000000         Bool III 0010000000000000000000000000000000</td><td>Nonice         Table         Table           Company         ED11 volues         Statuty Values           Company         ED12 volues         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values</td></t<></td></t<></td></t<>	Control         Control <t< td=""><td>Control         Coll estude:           Analogy Galaxies         Analogy Galaxies           Image: Coll and the state of the state of</td><td>Control         Control         <t< td=""><td>Bool III 0010000         E011 0010000           Bool III 00100000         Bool III 0010000         Bool III 0010000         Bool III 0010000         Bool III 00100000         Bool III 00100000         Bool III 0010000000         Bool III 0010000000000000000000000000000000</td><td>Nonice         Table         Table           Company         ED11 volues         Statuty Values           Company         ED12 volues         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values</td></t<></td></t<>	Control         Coll estude:           Analogy Galaxies         Analogy Galaxies           Image: Coll and the state of	Control         Control <t< td=""><td>Bool III 0010000         E011 0010000           Bool III 00100000         Bool III 0010000         Bool III 0010000         Bool III 0010000         Bool III 00100000         Bool III 00100000         Bool III 0010000000         Bool III 0010000000000000000000000000000000</td><td>Nonice         Table         Table           Company         ED11 volues         Statuty Values           Company         ED12 volues         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values</td></t<>	Bool III 0010000         E011 0010000           Bool III 00100000         Bool III 0010000         Bool III 0010000         Bool III 0010000         Bool III 00100000         Bool III 00100000         Bool III 0010000000         Bool III 0010000000000000000000000000000000	Nonice         Table         Table           Company         ED11 volues         Statuty Values           Company         ED12 volues         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values           Company         ED12 volues         Table Status Values         Table Status Values         Table Status Values         Table Status Values

(8) Click "OK".



(9) Click "OK".

INE Enput	lanual	EDI	o val	ues Iatu											
Barcade Hanf.Code Unit Ho. M780526AMAAAMtu2	e tegedy	H8 1 H8 1 1A 1 10 1 31 0 30 0	1 10 1 11 1 11 1 11 1 11 1 11 1 11 1 11	83 11 81 2F 80 00 36	HA B HE H 69 A 00 0	6 80 8 68 8 65 8 65 8 65 8 65 8 65 8 65 8 65	H7 HH 78 70 19 18 39	38 11 1 A 61 61 60 60 60	10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1	A 48 A 48 7 AA 1 FC 1 00 0 FF A 88	AD 57 45 26 58	H3 54 59 80 41 63	252 HF 61 18 37 263	18 118 271 59 88 98 98	
EDID Informations Serial 429	Read	78 0	IF 5E IA 58	11 88	00 0 31 3	A 28 8 58	20 54	20 20	20 2	0 20	08 20	88	84 84	FC E2	
Veek 26 Year 2H15 Nodel ZE3145T		kese cta	nge the	e cabile	bo VG	1	T 107	able	en 100 a	· HI	HC.	00	86	16	2
Product UIII 4318 Write Suarce Selvet 17 Bian 17 Homes 17 Bian 17 Bian 17 Bian 18 Bian 19 Bian	(9) Read item © Analog © Digital E Trans	61 30 56 78 88 82 14	× 20 81 20 00 25 32 20 55 20 55 20 55 16 58 20 55 16 48 38	94 94 36 11 33 71 1F 28	81 8 00 0 30 3 88 8 31 3 4F 0 23 0 28 0	FF 08 31 8 64 9 08 4 32 8 53 1 02 9 07 8 60	00 78 76 19 18 39 28 59 29 54 03 07	3E EA 45 24 24 24 24 84 83 81	80 1 89 E 70 6 48 9 20 9 20 9 21 2 21 2 21 2 05 9 01 9 11 2	0 03 7 06 1 70 1 70 1 40 9 FF 0 00 8 20 8 20 8 20 8 20 8 20 9 00 2 /8	00 57 81 20 80 80 80 80 80 80 80 80 80 80 80 80 80	01 54 FC 38 FD 88 FD 88	00 8F 45 18 87 00 81 12 81 12 10	07 28 59 80 37 32 FC 40 18 84	
rert Conti Mexcage								41							
[	RUN														

y0a4m0179

(10) Click "OK".

1HI Input far code auto isas	-EDID values Analog Values
Barcode Nanf.Cnde FLegat Naif Mn. N705268668000429	PR         Other Model         Add Stress Add S
EDID Informations Hee Serial 020 Prom Heek 26 Prom Vear 2015 Hedel 2221EST	
Product NTH R318 (10 Nrite Source Select 7 SGA1 7 HONE2 6 Ad	OK         F 40 32 80 10 83 40 81 40 10 23           19         M 43 27 67 40 37 46 40 87 66 40 75 56 40 72 33           19         M 43 27 67 40 37 46 40 87 66 40 75 56 40 72 33           110         M 43 27 67 40 37 16 70 40 76 70 40 76 70 40 77 70 40 77 70 40 76 70 40 77 70 40 77 70 40 77 70 40 77 70 40 77 70 40 77 70 40 77 70 40 70 40 77 70 40 70 40 77 70 40 70 40 77 70 40 70 40 77 70 40 70 70 40 70 40 70 70 40 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 40 70 70 70 40 70 70 70 70 70 70 70 70 70 70 70 70 70
P NDR2 P NDR1 Urt DN1	The CA CH 21 20 21 20 52 CH 20 20 20 20 20 20 20 20 20 20 20 20 20
Analog read: RU	N

(11) Connect P5 of Fixture Board to HDMI port 2 of projector with HDMI to DVI cable, and then click "OK".

Please change the cable to HDMI2

4F 63 2F CF 80 31 70

OK

19

4. 13

54

ń

y0a4m0182

-

04 78



(11)

3. When the EDID program is completed, a message "OK" will appear on the screen.

		pagarear ourges			
Hodel ZX818ST	Fxit	08 01 82 93 64 0	5 06 97 08 09	OR OB OC OD CE OF	-
Product 0TM 0310	Recet	00 FF FF FF FF FF F	F FF 00 3E 80 9 06 78 En 89	10 03 AD 01 00 00 E7 06 57 54 BF 23	
Write Source Select ⊽ UCn1	Bead item © Analog ⊂ Digital □ Trans	17 4F 03 2F CF 8 61 50 81 00 81 8 55 08 06 00 60 0 55 35 32 06 00 60 68 54 58 00 01 6 62 63 20 71 4F 0 14 15 16 1F 23 0	0         31         76         45         76           0         64         15         00         40           0         00         16         00         00           4         32         35         64         28           4         32         35         64         28           8         53         54         64         28           8         53         54         64         28           16         28         80         84         86           17         82         83         84         85           16         28         83         84         86           17         82         83         84         85	01 7C 81 FC 45 52 41 00 26 30 18 88 00 FF 00 41 37 30 00 66 00 FF 68 32 20 20 20 90 FF 68 32 20 20 20 20 60 FF 68 7C 20 20 20 20 61 FF 68 06 67 16 11 12 13 00 00 76 03 6C 00	
Purl		110 00 38 28 20 0		22 78 10 61 10 66	~
COH1					
Massage Finish/Standby	OK				
	1				_

y0a4m0183

4. Read EDID "VGA" information.

т нин аррисатов

In the Read, select "Analog" and "Trans", and then click "Read".

EDID information will show the result.

INI Input C Bar made suto load @	Honval	EDID values	
Harcode Hanf.Code Unit Ho.	<b>F</b> Leyary	HI         HI         R2         R2         H3         H3         R4           BH         FF         FF </th <th>NY         NX         NX&lt;</th>	NY         NX         NX<
EDID Informations Serial 420 Week 26	Head Program	78 0F 5E 11 00 00 20 2 00 50 50 33 31 30 53 5	20 21 20 20 20 90 00 00 10 FC 54 00 20 20 20 20 20 00 E2
Year 2815 Hodel 2X3185T Product 0TH 0310	Nodel Exit Reset	Eigital Values	Table1 -
Urite Source Select ☞ UGA1 ☞ HON12 ☞ UGA2 ☞ HDME1	-Read iten		
rort IOM1	 		
Hessage Finish/Standby	OK		

y0a4m0184

5. Read EDID "HDMI" information.

In the Read, select "Digital" and "Trans", and then click "Read". EDID information will show the result.

C Dar code auto load F	Manual	-EDID values Analog Values
Darcode Hanf.Code Unit No.	T Legacy	
EDID Informations Serial 429 Veek 26 Vear 2015 Hodel 2016 51 Product 0114 6010 Urite Source Select 7 Hoat 12 Ho112	Read Program Hudel Exit Reset	Digital Ualues           00 81 82 83 84 85 84 67 88 82 94 80 86 80 60 60 60 7           00 FF FF FF FF FF FF 60 32 80 10 83 00 01 80 80           10 0 FF FF FF FF FF FF 60 32 80 10 83 00 01 80 80           10 0 FF FF FF FF FF FF 60 32 68 80 10 83 00 10 85 00 10 85 00 10 83 00 10 85 00 10 85 00 10 85 00 10 85 00 10 85 00 10 85 00 10 85 00 10 80 00 10 80 00 10 80 00 10 80 10 80 10 80 00 10 80 10 80 10 80 10 10 10 10 10 10 10 10 10 10 10 10 10
₩ USA2 ₩ HDM11	r Digital IZ Trans	5 6 3 5 2 3 6 30 6 30 6 31 2 3 9 6 3 2 8 9 8 6 8 9 7 6 6 3 2 7 8 7 5 7 1 10 7 6 7 1 10 7 8 3 7 3 7 3 7 2 7 3 7 3 7 3 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7
CONT	•	
Hessage Finish/Standby	ок	

y0a4m0185

6

6. Firmware Update

## Laser

## **Characteristics of Laser Light Source Projector**

#### **Advantages**

- 1. Laser light source has a long working lifetime of 20,000 hours or longer, minimizing the need to replace the light source.
- 2. The projection start-up time is shorter than the lamp light source.
- 3. Unlike the existing lamp, the laser light source does not contain mercury and is eco-friendly.

#### **Disadvantages and Challenges**

- 1. Laser light source is expensive.
- 2. Compliance with laws and regulations in different countries. Class definition of laser equipment. Compliance with Ricoh regulations.
- 3. Ensuring safety and education of service representatives

## **Classification According to Light Source**

According to the light source light collection method, laser projectors can be classified to the following 4 categories:

The machine applies the "3. Laser Diode + Phosphor" method. Using the phosphor wheel, it creates the other required colors (yellow, red, and green) from the blue laser light source.

Light Source/ Light Collection Method	image	Characteristic
1.LED		<ul> <li>Instant on</li> <li>Long lifetime</li> <li>Maintenance-free</li> <li>Increased color gamut</li> <li>Compact projector size</li> </ul>

Light Source/ Light Collection Method	image	Characteristic
2. Laser / LED Hybrid		<ul> <li>Instant on</li> <li>Long lifetime</li> <li>Maintenance free</li> <li>Brightsync and very high color rates</li> <li>LED Etendue* will limit brightness 2000-3500L</li> </ul>
3. Laser + Phosphor		<ul> <li>Instant on</li> <li>Long lifetime</li> <li>Scalability from low to high brightness</li> <li>Higher efficiency</li> <li>Smaller Etendue*</li> <li>Maintenance-free</li> </ul>
4. Pure Laser		<ul> <li>Instant on</li> <li>Long lifetime</li> <li>Maintenance free</li> <li>Smallest Etendue*</li> <li>Smaller optics</li> <li>High laser costs</li> </ul>

\* This is the amount of light collected into the display device (such as a DMD or LCD). The smaller the value is, the smaller size you can achieve.

## **Optical Mechanism**

The blue laser light from the laser diode passes through the afocal lens\*[A] and the blue dichroic mirror [B]. Using the collimator [E], the laser irradiation position on the phosphor wheel is adjusted for convergence.

The phosphor wheel [D] creates green and yellow lights from the blue light. The green and yellow lights reflected by the blue dichroic mirror [B].

The blue light passes without modification. To use the blue light as is, there is the blue wraparound path [C].

The filter wheel [G] creates the red light from the yellow light.

Red, yellow, green, and blue lights reach the DMD [F].

\*Afocal lens, without convergence, transmits light signal to a distant point as a parallel light.



y0a4m0156

- A: Afocal lens
- B: Dichroic mirror
- C: Blue wraparound path
- D: Phosphor wheel
- E: Collimator
- F: DMD
- G: Filter wheel

## **Optical Engine Component**

Optical engine con is comprised of Combiner Module and DMD/Lens Module.

7

#### **Combiner Module**

Combiner module is comprised of the heat sink [A], heat pipe [B], laser bank [C], filter wheel [D], and phosphor wheel [E].



#### Phosphor wheel

The phosphor wheel [A] is divided into 3 segments comprised of the blue transparency, yellow phosphor, and green phosphor.

([B]: Dichroic mirror, [C]: Collimator)



y0a4m0156

### Filter wheel

The filter wheel is located in front of the light tunnel.

It is divided into 4 segments comprised of green, blue (diffuser), red, and yellow (transparent).



y0a4m0158

#### Laser bank

Each laser bank is comprised of 24 laser diodes (4, 5, 5, 5 and 4) and is cooled by the heat pipe.



y0a4m0160

## **Projection Light**

Blue laser light turns into a diffused light in its optical path and then its coherence is lowered as it passes through the filter wheel and other parts, so the projection light is not dangerous.

#### \* What's coherence?

Coherence refers to the characteristic of waves, indicating the degree of interference (clarity of the interference fringes). Natural light and lamp light have diverse light wavelength and direction of radiation. Thus, they have low coherence.

On the other hand, laser has the same light wave length and direction of radiation. Thus, it has high coherence.

## Light

This picture shows the relationship between the visible light and wave length in units of nanometer.

### Wavelength



- The light energy (E) can be calculated by the formula E=a (constant)/wavelength, and the shorter the wavelength, the higher the energy.
- The red laser light is used for the CD/DVD laser light source and optical receivers.
- Blue laser light is used for the Blu-ray Disc laser light source and optical receivers.

MEMO

MEMO