Sargas-PJ1

RICOH PJ WUL6280/WXL6280/LU6000/LW6000

Machine Codes: Y095/Y096/Y097/Y098

Field Service Manual

September, 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.

⚠WARNING

- 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.

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

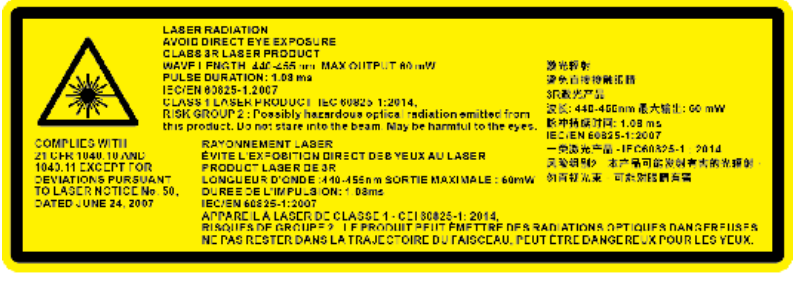
Read through this document in its entirety and understand all warnings and precautions before attempting to operate the projector.

Important Laser Notice

- This product is classified as Class 3R 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.

  IEC 60825-1:2014: CLASS 1 LASER PRODUCT - RISK GROUP 2

- The explanatory label shows all information related to laser power.



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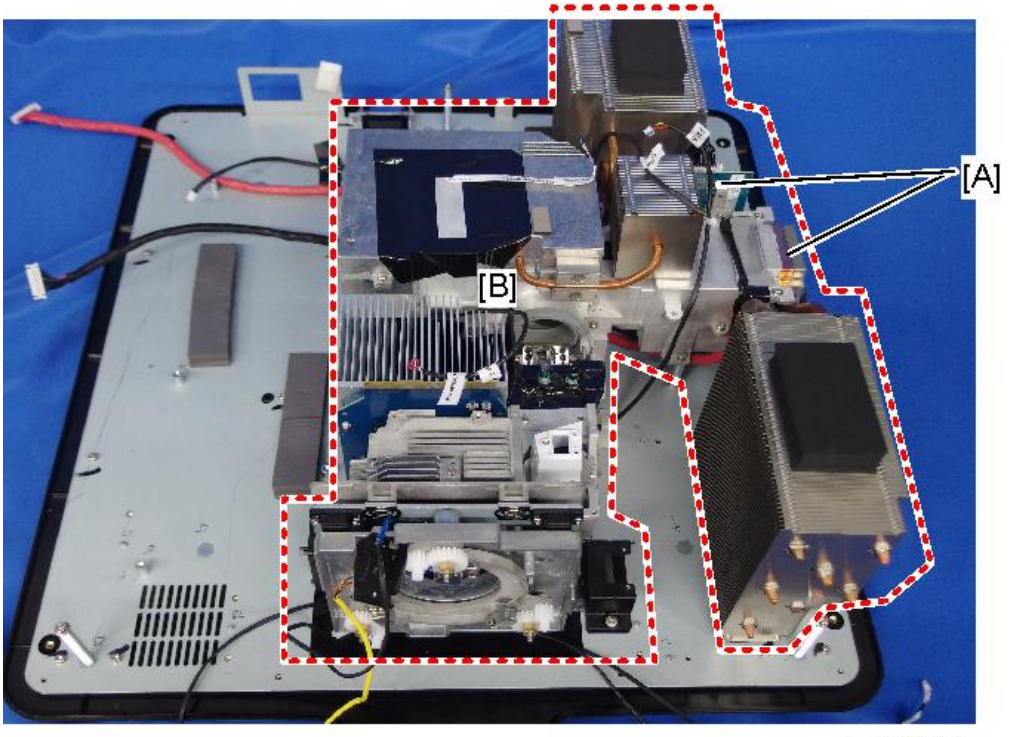
- CLASS 3R LASER PRODUCT-AVOID DIRECT EYE EXPOSURE.
- The laser aperture is from the projection lens, DO NOT LOOK INTO THE LENS.

Y097m0013

- This projector has a built-in Class 4 laser module.
- Unplug the power cord from the outlet with exterior covers open before maintenance operations. However, if you need to turn the main power on with the covers open to do adjustment, never attempt to remove or disassemble the Optical Engine [B] and Laser Banks [A]. Doing so may cause exposure to CLASS 4 laser light.
- If it is necessary to replace the Laser Bank, replace the entire optical engine and base unit.



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- 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.
- Adequate instructions for assembly, operation, and maintenance, including clear warnings concerning precautions to avoid possible exposure to laser and collateral radiation in excess of the accessible emission limits are defined by Class 3R.

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3. Replacement

4. Adjustment

5. Troubleshooting

6. Test & Inspection

7. Firmware Update

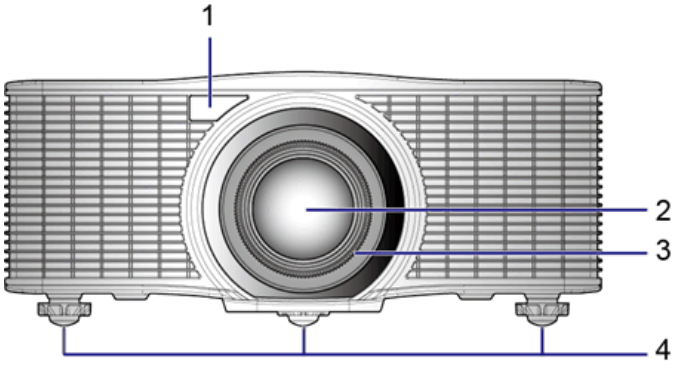
8. Detailed Description

1. Product Information

Overview

Main Unit

Front view



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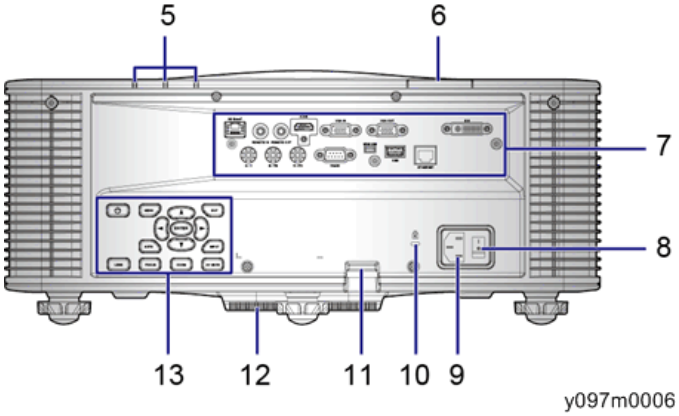
Rear view

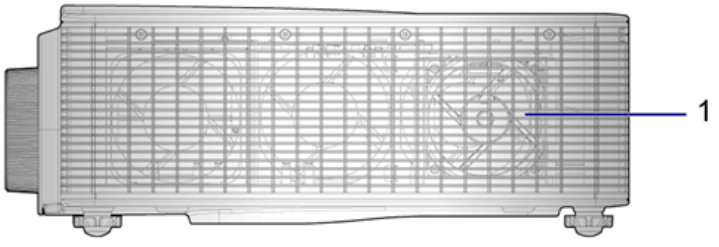


y097m0006

1. Front IR receiver
2. Projection lens
3. Lens ring
4. Adjustable feet
5. LED status indicators
6. Top IR sensor

7. Connector panel
8. Power switch
9. Power connector
10. Kensington lock
11. Security bar
12. Inlet vent
13. Control panel

Right view



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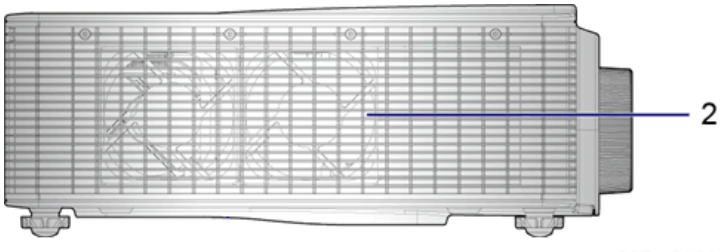
Left view



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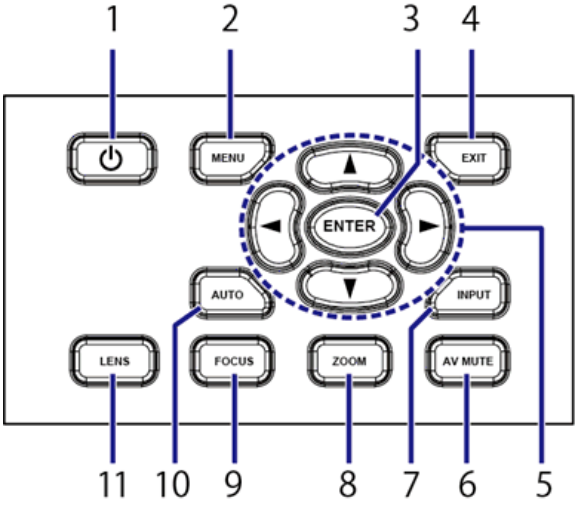
1. Inlet vent
2. Outlet vent

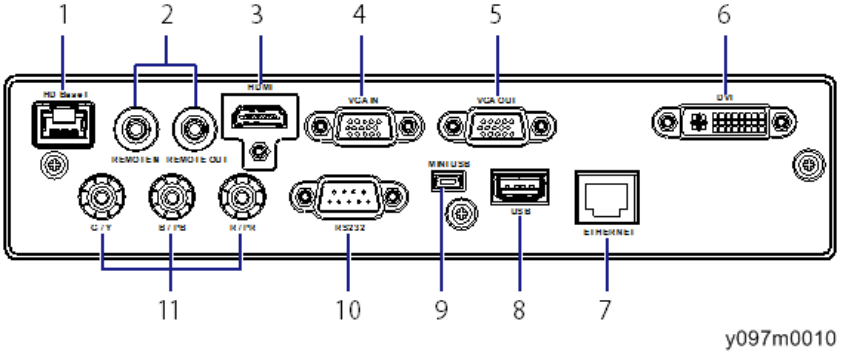
Control Panel



y097m0009

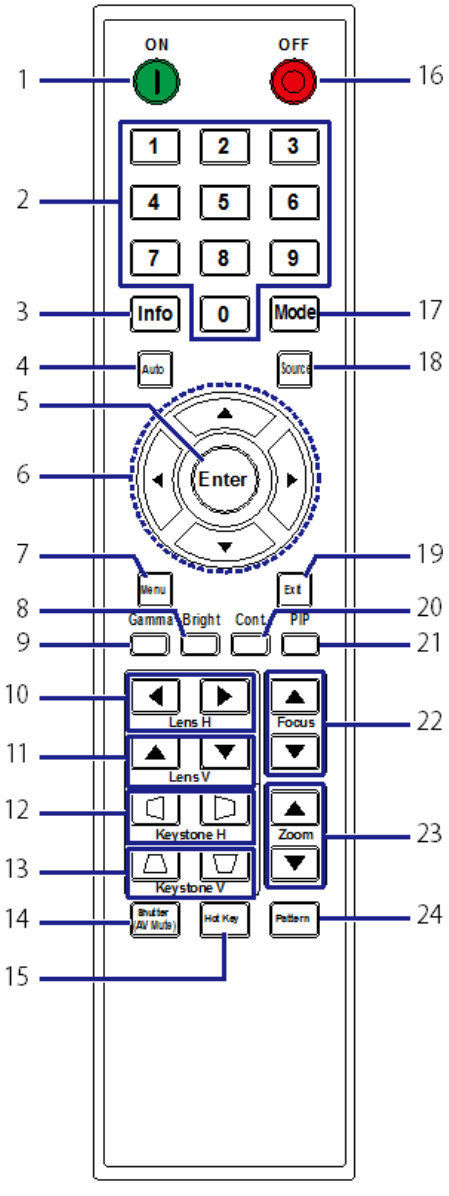
Ind.	Part Name	Description
1	⏻/ Power key	Turns the projector on or off.
2	Menu key	Displays menus.
3	Enter key	Confirms a selection.
4	Exit key	Returns to the previous level, or exits the menu if at the top level.
5	Arrow keys	• Adjusts a setting UP or DOWN. • Navigates within a menu.
6	AV mute key	Displays or blanks the video image.
7	Input key	Selects an input for the main or PIP/PBP image.
8	Zoom key	Adjusts zoom.
9	Focus key	Adjusts focus.
10	Auto key	Automatically optimizes the image.
11	Lens key	Adjusts the lens vertical or horizontal offset setting.

Connection Ports



1. HDBaseT connector
2. Remote In/Out connectors
3. HDMI connector
4. VGA IN connector
5. VGA OUT connector
6. DVI-D connector
7. Ethernet connector
8. USB Type A connector
9. Mini USB connector (for LAN firmware update only)
10. RS232 connector (PC control)
11. Component IN connectors

Remote Control



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Ind.	Part Name	Description
1	Power on	Turns the projector ON.
2	Number key	Enters a number, such as a value for an IP address, etc.

Ind.	Part Name	Description
3	Info	Displays source image information.
4	Auto	Automatically optimizes the image.
5	Enter	• Selects a highlighted menu item. • Changes or accepts a value.
6	Arrow keys	• Adjusts a setting UP or DOWN. • Navigates within a menu.
7	Menu	Displays menus.
8	Bright	Adjusts the amount of light in the image.
9	Gamma	Adjusts mid-range levels.
10	Lens H	Adjusts the position of the image horizontally.
11	Lens V	Adjusts the position of the image vertically.
12	Keystone H	Adjusts the horizontal keystone.
13	Keystone V	Adjusts the vertical keystone.
14	Shutter (AV Mute)	Displays or blanks the video image.
15	Hot Key	Selects your preset keys quickly.
16	OFF	Turns the projector OFF.
17	Mode	Selects the preset display mode.
18	Source	Selects an input for the main or PIP/PBP image.
19	Exit	Returns to the previous level or exits the menus if at the top level.
20	Cont.	Adjusts the difference between dark and light.
21	PIP	Turns PIP/PBP ON/OFF.
22	Focus	Adjusts focus to improve image clarity as desired.
23	Zoom	Adjusts zoom to achieve the desired image size.
24	Pattern	Displays a test pattern.

Specifications

Product Highlights

- WXGA: One panel 0.65”-WXGA projection system, w/ TI DDP4421 solution
- WUXGA: One panel 0.67”-WUXGA projection system, w/ TI DDP4422 solution
- 5,400 ANSI lumens platform for WXGA (Standard) and WUXGA (Standard)
- Power Zoom/Focus and full lens shift
- Supports LAN network control and HDBaseT for video streaming
- Supports Wi-Fi (optional dongle)
- Supports PIP/PBP.
- Supports 360 degrees free orientation operation.

General Specifications

No	Item	Description
1	Technology	“TI” 0.65” XGA DMD, Type A, DC3 / “TI” 0.67” WUXGA DMD, Type A, DC3
2	Dimension (W x D x H)	484 x 525 x 186 mm (without lens, w/o elevators)
3	Weight	• Net weight (w/o lens): 18 kg • Gross Weight (with Type A3 lens): 18.5 kg • Weight with package (w/o lens): 22.5 kg
4	Power supply	Auto-ranging: 100V-240V ± 10%, 50-60Hz • 400W Laser Diode @ Normal operation • 240W Laser Diode @ ECO operation
5	Keystone correction	V: +/- 20 degrees H: +/- 20 degrees OSD adjusting range will be +/-40 steps for H and V.
6	Pincushion/Barrel	OSD adjusting range will be 0-100 steps for H and V.

No	Item	Description
7	Resolution	• Native resolution: WXGA (1200x800) / WUXGA (1920x1200) • Supported Resolution: Up to WUXGA@60Hz (Reduced Blanking) & UXGA@60Hz
8	Power consumption	• Normal Brightness mode: 570W+/-15%@ 110VAC • ECO Brightness mode: 300W+/-10%@ 110VAC • Standby mode (LAN off) < 0.5W (supports ErP < 8W, include Wi-Fi dongle)
9	Throw ratio (WXGA)	• 1.00-1.28 (Replacement Lens Type A2) • 1.28-1.61 (Standard Lens Type A3) • 1.60-3.07 (Replacement Lens Type A4) • 3.04-5.78 (Replacement Lens Type A5) • 0.79-1.00 (Replacement Lens Type A1)
10	LD life	• Normal mode: 20,000 hours standard @3.5W, 50% survival rate
11	Video compatibility	• NTSC: NTSC M 3.58MHz, 4.43MHz • PAL: PAL B/D/G/H/I/M/N, 4.43MHz • SDTV: 480i/p, 576i/p • HDTV: 720p(50/60Hz), 1080i/p(50/60Hz), 1080p 24\25\30\50\60 Hz
12	Brightness (ANSI Lumens)	• Standard: 5,400(WXGA) /5,400(WUXGA) • Minimum: 4,800(WXGA) /4,800(WUXGA)

No	Item	Description	
13	Contrast ratio *1	Full on/ Full off	• Standard: 1,100:1 (WXGA) / 1200:1 (WUXGA) • Minimum: 1000:1 (WXGA) / 1000:1 (WUXGA)
		ANSI	• Standard: 250:1 (WXGA) / 250:1 (WUXGA) • Minimum: 150:1 (WXGA) / 150:1 (WUXGA)
14	Uniformity *2	JBMA Standard (Lens Center)	• Standard: 85% (WXGA) / 85% (WUXGA) • Minimum: 80% (WXGA) / 80% (WUXGA)
		White ANSI Standard (Lens Center)	• Standard: +/-15% (WXGA) / +/-15% (WUXGA) • Minimum: +/-30% (WXGA) / +/-30% (WUXGA)
		Black ANSI Standard (Lens Center)	• Standard: +/-30% (WXGA) / +/-30% (WUXGA) • Minimum: • +/-50% (WXGA) / +/-50% (WUXGA)
15	Filter wheel	• 4 Segment—RYGB, Filter Diameter: 65mm • R98/G90/Y118/B54 • Speed: 7200 Hz	
16	Color Coordinate: Chromaticity (± 0.025)	White: X: 0.3181, Y: 0.3405 Red: X: 0.6347, Y: 0.3598 Green: X: 0.2973, Y: 0.6271 Blue: X: 0.1601, Y: 0.0166	
17	Projection lens	See the section about the Lens (page 22 "Lenses")	

No	Item	Description
18	Temperature	• Operating: 5°C to 40 °C *3 • Storage: -10°C to 60°C
19	Humidity	• Operating: 10 to 85%RH, non-condensing • Storage: 5 to 90%RH, non-condensing
20	Altitude	• Operating: for 0 - 2500 ft, 5 - 40°C for 2500 - 5000 ft, 5 - 35°C for 5000 - 10000 ft, 5 - 30°C

*1 ANSI contrast is verified in bright display mode and normal brightness mode.

Contrast spec is based on standard lens type A3. For other lenses, contrast will be different.

*2 Uniformity is measured in bright display mode, normal brightness mode and lens shift on center.

*3 The temperature displayed in "System Temperature" in "Information" in "OPTION" in the OSD menu indicates the temperature inside the enclosure, so it is not a problem even if it exceeds 40°C (104°F).

Compatible Modes

Input Signal

Signal	Resolution	Refresh rate [Hz]	VGA	Component	HDMI	DVI	HDBaseT
PC	640 x 480	60	O	-	O	O	O
PC	640 x 480	67	O	-	O	O	O
PC	640 x 480	75	O	-	O	O	O
PC	640 x 480	85	O	-	O	O	O
PC	640 x 480	66.6	-	-	O	O	O
PC	720 x 400	60	O	-	O	O	O
PC	800 x 600	60	O	-	O	O	O
PC	800 x 600	72	O	-	O	O	O

Signal	Resolution	Refresh rate [Hz]	VGA	Component	HDMI	DVI	HDBaseT
PC	800 x 600	75	O	-	O	O	O
PC	800 x 600	85	O	-	O	O	O
PC	832 x 624	75	O	-	O	O	O
PC	848 x 480	50	-	-	O	O	O
PC	848 x 480	60	-	-	O	O	O
PC	848 x 480	75	-	-	O	O	O
PC	848 x 480	85	-	-	O	O	O
PC	1024 x 768	60	O	-	O	O	O
PC	1024 x 768	75	O	-	O	O	O
PC	1024 x 768	85	O	-	O	O	O
PC	1152 x 720	50	-	-	O	O	O
PC	1152 x 720	60	-	-	O	O	O
PC	1152 x 720	75	-	-	O	O	O
PC	1152 x 720	85	-	-	O	O	O
PC	1152 x 864	60	O	-	O	O	O
PC	1152 x 864	70	O	-	O	O	O
PC	1152 x 864	75	O	-	O	O	O
PC	1152 x 864	85	O	-	O	O	O
PC	1152 x 870	75	-	-	O	O	O
PC	1280 x 720	50	-	-	O	O	O
PC	1280 x 720	60	O	-	O	O	O
PC	1280 x 720	75	O	-	O	O	O
PC	1280 x 720	85	O	-	O	O	O
PC	1280 x 768	60	O	-	O	O	O

Signal	Resolution	Refresh rate [Hz]	VGA	Component	HDMI	DVI	HDBaseT
PC	1280 x 768	75	O	-	O	O	O
PC	1280 x 768	85	O	-	O	O	O
PC	1280 x 800	50	O	-	O	O	O
PC	1280 x 800	60	O	-	O	O	O
PC	1280 x 800	75	O	-	O	O	O
PC	1280 x 800	85	O	-	O	O	O
PC	1280 x 960	50	-	-	O	O	O
PC	1280 x 960	60	O	-	O	O	O
PC	1280 x 960	75	O	-	O	O	O
PC	1280 x 960	85	O	-	O	O	O
PC	1280 x 1024	50	-	-	O	O	O
PC	1280 x 1024	60	O	-	O	O	O
PC	1280 x 1024	75	O	-	O	O	O
PC	1280 x 1024	85	O	-	O	O	O
PC	1360 x 768	50	-	-	O	O	O
PC	1360 x 768	60	-	-	O	O	O
PC	1360 x 768	75	-	-	O	O	O
PC	1360 x 768	85	-	-	O	O	O
PC	1366 x 768	60	O	-	O	O	O
PC	1400 x 1050	50	-	-	O	O	O
PC	1400 x 1050	60	-	-	O	O	O
PC	1400 x 1050	75	O	-	O	O	O
PC	1440 x 900	60	O	-	O	O	O
PC	1440 x 900	75	-	-	O	O	O

Signal	Resolution	Refresh rate [Hz]	VGA	Component	HDMI	DVI	HDBaseT
PC	1600 x 900	60	-	-	O	O	O
PC	1600 x1200	60	O	-	O	O	O
PC	1680 x1050	60	O	-	O	O	O
PC	1920 x 1080	50	-	-	O	O	O
PC	1920 x 1080	60	O	-	O	O	O
PC	1920 x 1200RB	50	O	-	O	O	O
PC	1920 x 1200RB	60	O	-	O	O	O
SDTV	480i	60	O	O	O	O	O
	576i	50	O	O	O	O	O
EDTV	480p	60	O	O	O	O	O
	576p	50	O	O	O	O	O
HDTV	1080i	25	O	O	O	O	O
	1080i	29	O	O	O	O	O
	1080i	30	O	O	O	O	O
	720p	50	O	O	O	O	O
	720p	59	O	O	O	O	O
	720p	60	O	O	O	O	O
	1080p	23	O	O	O	O	O
	1080p	24	O	O	O	O	O
	1080p	25	O	O	O	O	O
	1080p	29	O	O	O	O	O
	1080p	30	O	O	O	O	O
	1080p	50	O	O	O	O	O
	1080p	59	O	O	O	O	O

Signal	Resolution	Refresh rate [Hz]	VGA	Component	HDMI	DVI	HDBaseT
	1080p	60	O	O	O	O	O

Note

- **"O" expressed support this type of signal and "-" expressed that does not support this type of signal.**
- **"RB" means "reduced blanking".**

PIP/PBP Compatibility

Input Signal	HDMI	VGA	Component	HDBaseT	DVI-D
HDMI	-	-	-	-	O
VGA	-	-	-	-	O
Component	-	-	-	-	O
HDBaseT	-	-	-	-	O
DVI-D	O	O	O	O	-

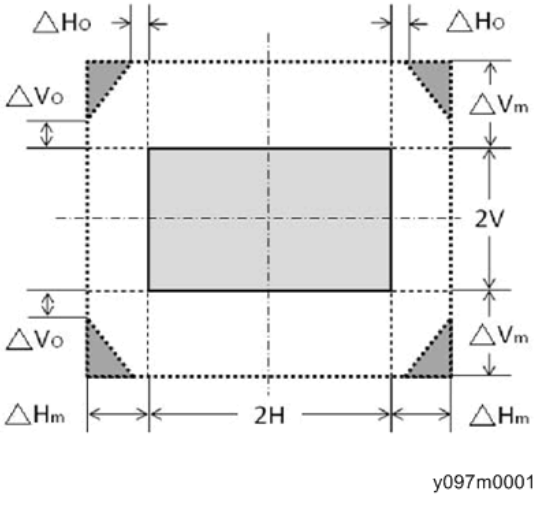
Laser Diode Information

	Description
Type	3.5W
LD life	Normal mode: 20,000 hours standard @3.5W, 50% survival rate
	The above spec is only claimed for table top and ceiling mount.
LD power	Normal mode: 3.5W@2.3A

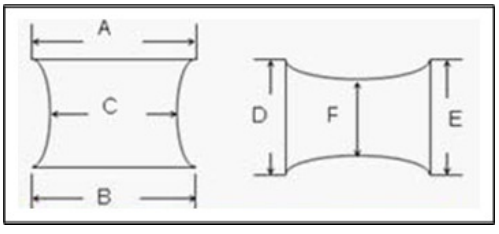
Lenses

WXGA/WUXGA: Type A3 is the standard lens.

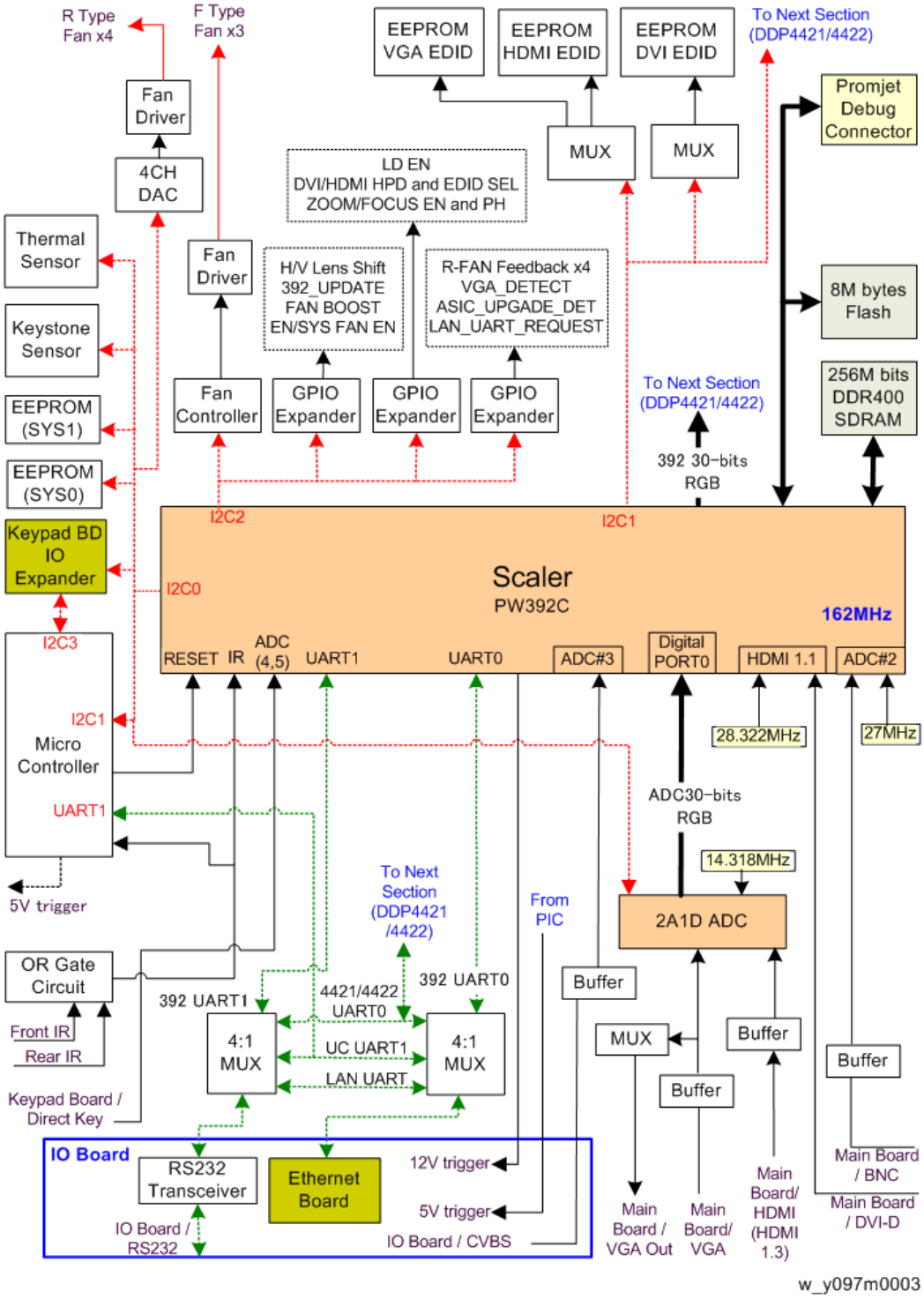
Projection lens	Replacement Lens Type A2	Standard Lens Type A3	Replacement Lens Type A4	Replacement Lens Type A5	Replacement Lens Type A1
Focal length (f)	14.03-17.96	18.07-22.59	22.56-42.87	42.68-80.90	11.11-14.06
F number	2.30-2.57	2.00-2.32	2.30-3.39	2.30-2.74	2.30-2.53
Focus spec (MTF)	67 lp/mm	47 lp/mm	67 lp/mm	67 lp/mm	67 lp/mm
Zoom range (ratio)	1.28X	1.25X	1.9X	1.9X	1.26X
Zoom & focus adjustment	Motorized				
Throw ratio (WXGA)	1.00-1.28	1.28-1.61	1.60-3.07	3.04-5.78	0.79-1.00
Throw distance (WXGA)	1.08~8.27m	1.38~10.40m	1.72~19.84m	3.27~37.35m	0.83~6.45m
Throw ratio (WUXGA)	0.95-1.22	1.22-1.53	1.52-2.92	2.90-5.50	0.75-0.95
Throw distance (WUXGA)	1.02~7.88m	1.31~9.89m	1.64~18.87m	3.12~35.54m	0.81~6.13m
Projection image size	50~300″				

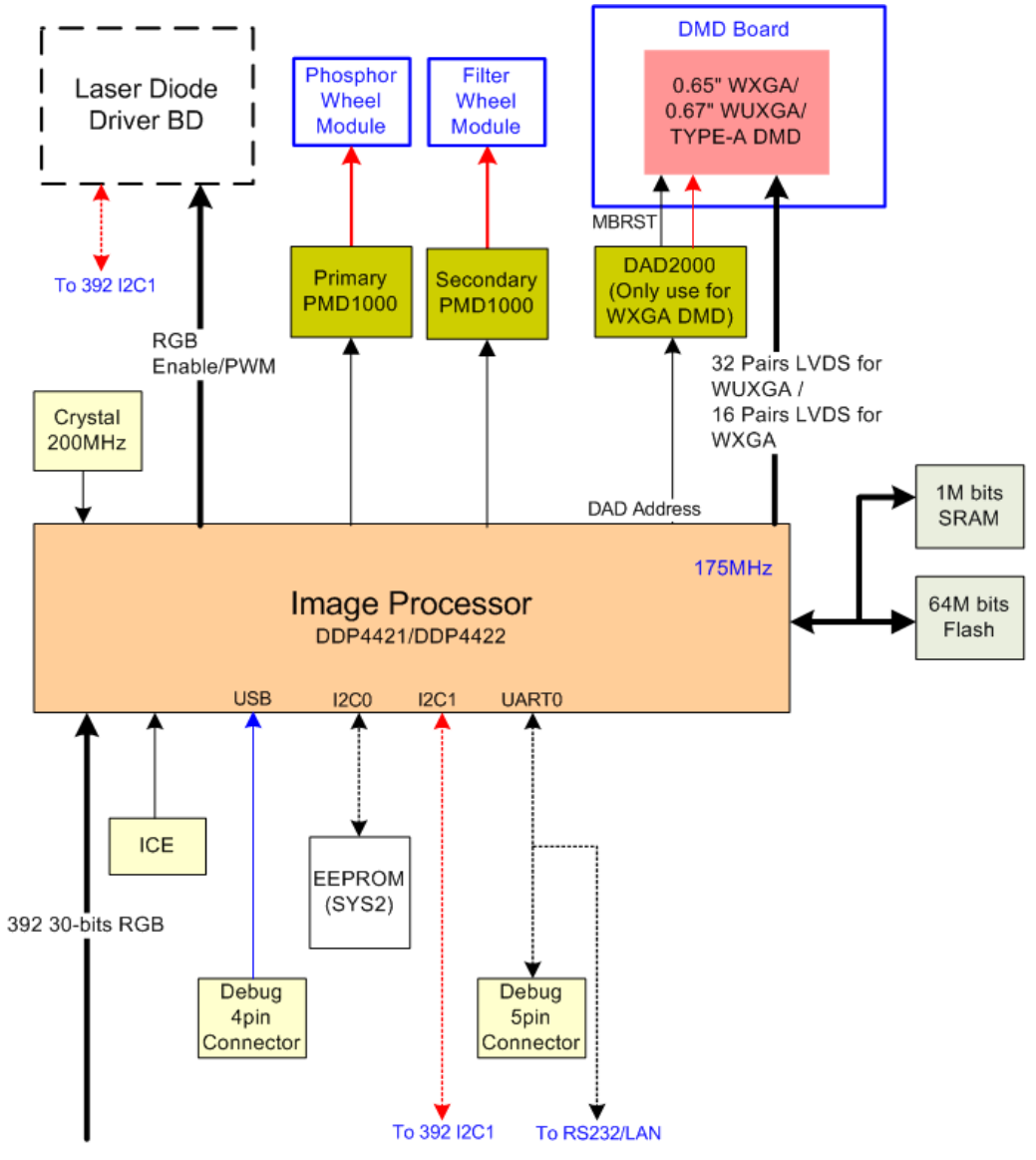
<table>
<tr><th>Projection lens</th><th>Replacement Lens Type A2</th><th>Standard Lens Type A3</th><th>Replacement Lens Type A4</th><th>Replacement Lens Type A5</th><th>Replacement Lens Type A1</th></tr>
<tr><td>Motorized lens shift</td><td colspan="5">WXGA, WUXGA: (Dim corner is larger than 50%)
• Horizontal: +/-30% (standard: tolerance +/-4%) (1/2 screen image)
• Vertical: +/-100% (standard: tolerance +/-4%) (1/2 screen image)
Replacement Lens Type A2/A3/A4/A5
• 0.65” WXGA: H:30%, V:100%
• 0.67” WUXGA: H:30%, V:100%
Replacement Lens Type A1
• 0.65” WXGA: H:15%, V:50%
• 0.67” WUXGA: H:15%, V:50%
 

y097m0001
Lens shift accuracy: 0.5 pixel per step
When the lens is shifted beyond the recommended range for operation, the screen edges may become darker or the images may become out of focus.</td></tr>
<tr><td>Keystone correction</td><td colspan="5">V: +/- 20 degrees</td></tr>
<tr><td>Leakage</td><td colspan="5"><=0.8 Lx @ screen size diagonal 83” outside the active area.</td></tr>
</table>

Projection lens	Replacement Lens Type A2	Standard Lens Type A3	Replacement Lens Type A4	Replacement Lens Type A5	Replacement Lens Type A1
Distortion	<+/- 1.0% @ 100" screen size (all lens shift areas, all optional lenses)  Horizontal distortion = (A-C)/C (up) and (B-C)C (down) Vertical distortion = (D + E - 2F)/2F				
Flare	Flare <=2.5 pixels (Excl. core pixel), @ 100" screen				
Unbalance	<50cm @100" full range for all lenses.				
Image Quality	Follows TI DMD Image Quality Specification IQ-8				

Block Diagram


R Type Fan x4
F Type Fan x3
Fan Driver
4CH DAC
Thermal Sensor
Keystone Sensor
EEPROM (SYS1)
EEPROM (SYS0)
Keypad BD IO Expander
I2C3
I2C1
Micro Controller
UART1
5V trigger
OR Gate Circuit
Front IR
Rear IR
Keypad Board / Direct Key
Fan Driver
Fan Controller
I2C2
I2C0
EEPROM VGA EDID
EEPROM HDMI EDID
EEPROM DVI EDID
MUX
MUX
LD EN
DVI/HDMI HPD and EDID SEL
ZOOM/FOCUS EN and PH
H/V Lens Shift
392_UPDATE
FAN BOOST
EN/SYS FAN EN
R-FAN Feedback x4
VGA_DETECT
ASIC_UPGADE_DET
LAN_UART_REQUEST
GPIO Expander
GPIO Expander
GPIO Expander
To Next Section (DDP4421/4422)
392 30-bits RGB
I2C1
Scaler
PW392C
162MHz
RESET
IR
ADC (4,5)
UART1
UART0
ADC#3
Digital PORT0
HDMI 1.1
ADC#2
To Next Section (DDP4421 /4422)
From PIC
392 UART1
4421/4422 UART0
392 UART0
4:1 MUX
UC UART1
LAN UART
4:1 MUX
IO Board
RS232 Transceiver
Ethernet Board
IO Board / RS232
12V trigger
5V trigger
IO Board / CVBS
Promjet Debug Connector
8M bytes Flash
256M bits DDR400 SDRAM
28.322MHz
27MHz
ADC30-bits RGB
14.318MHz
2A1D ADC
Buffer
MUX
Buffer
Buffer
Buffer
Buffer
Main Board / VGA Out
Main Board/ VGA
Main Board/ HDMI (HDMI 1.3)
Main Board / BNC
Main Board / DVI-D
w_y097m0003


Laser Diode Driver BD
To 392 I2C1
Phosphor Wheel Module
Filter Wheel Module
DMD Board
0.65" WXGA/ 0.67" WUXGA/ TYPE-A DMD
MBRST
Primary PMD1000
Secondary PMD1000
DAD2000 (Only use for WXGA DMD)
RGB Enable/PWM
32 Pairs LVDS for WUXGA / 16 Pairs LVDS for WXGA
Crystal 200MHz
DAD Address
1M bits SRAM
175MHz
Image Processor
DDP4421/DDP4422
64M bits Flash
USB
I2C0
I2C1
UART0
ICE
EEPROM (SYS2)
392 30-bits RGB
Debug 4pin Connector
Debug 5pin Connector
To 392 I2C1
To RS232/LAN

w_y097m0004

2. Installation

Installation Requirements

Environment/Power Requirements

Operating temperature

5ºC to 40ºC / 41°F to 104°F

Note

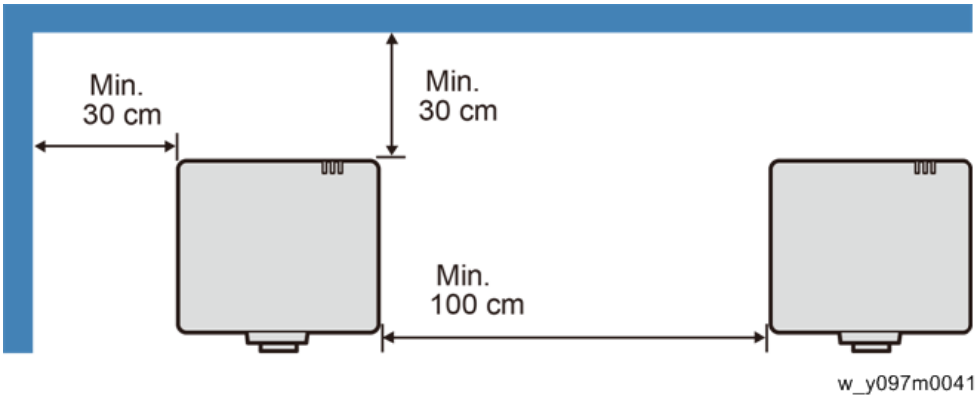
- The temperature displayed in "System Temperature" in "Information" in "OPTION" in the OSD menu indicates the temperature inside the enclosure, so it is not a problem even if it exceeds 40°C (104°F).

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. Leave a space of 100 cm or more between the projectors if they are installed side by side.



Machine Dimensions

484 mm (W) x 525 mm (D) x 186 mm (H) (without lens, elevators)

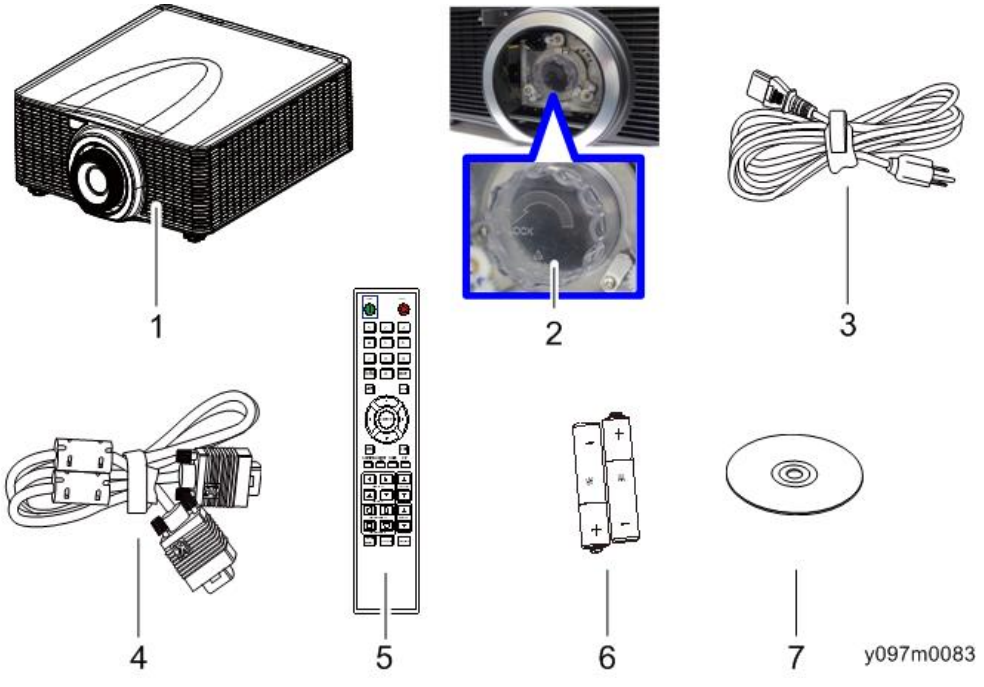
Main Machine Installation

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



No	Description	Q'ty
1	Projector (Lens is not included)	1
2	Lens cover	1
3	Power cord	1
4	VGA cable	1
5	Remote control	1
6	AA (R6) batteries (for remote control)	2

No	Description	Q'ty
7	User Manual (CD-ROM)	1
-	Warranty Card	1

Note

- 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
    - Relative humidity is 10% to 85%

- In areas susceptible to excessive dust and dirt.
- Near any appliance generating a strong magnetic field.
- In direct sunlight.

3. Replacement

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 (page 60 "Optical Engine + Base Unit") or main board (page 48 "LAN Board, Main Board, IO Board").

1. RS-232C cable (cross, 9pin - 9pin)

2. USB cable (Type A to Mini B)

3. Laptop (with terminal emulator software, which is required for collecting error logs and updating 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. Projector

Parts List

Service Parts List

1. Optical engine and base unit.
2. Adjustable foot
3. Top IR sensor
4. Front IR sensor
5. Fan 1
6. Fan 2
7. Fan 3 and sponge
8. Fan 4
9. Fan 5
10. Top cover
11. Rear cover
12. Front cover
13. Left cover
14. Right cover
15. Keypad board
16. Keypad button
17. Interlock switch
18. Main board
19. I/O board
20. LAN board
21. PSU
22. Harness Power SW (AC inlet)
23. Filter wheel and sponge rubber
24. Thermal switch
25. Motor
26. LED indicator board (PCB)
27. Cable tie
28. Light sensor

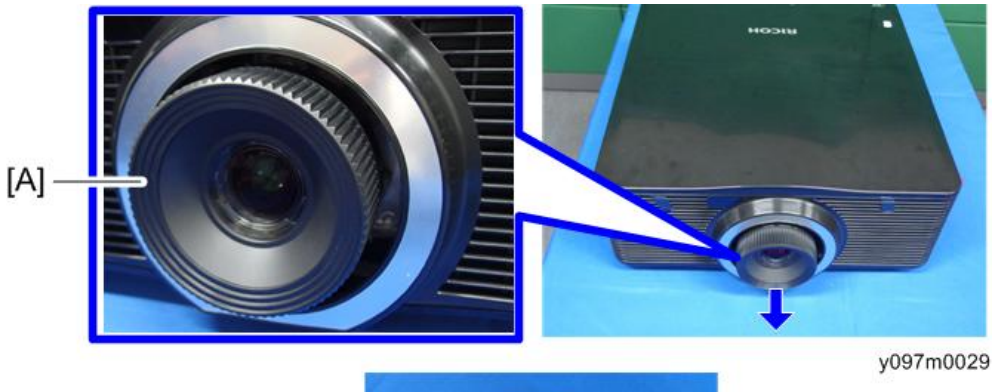
Part Replacement

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.

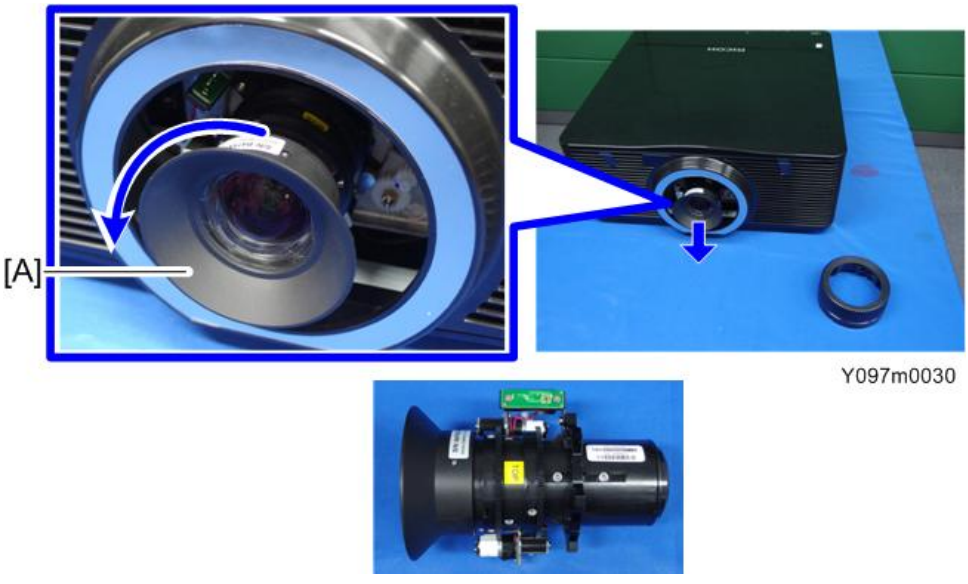
Lens Ring, Projector Lens

1. Pull out the lens ring [A].



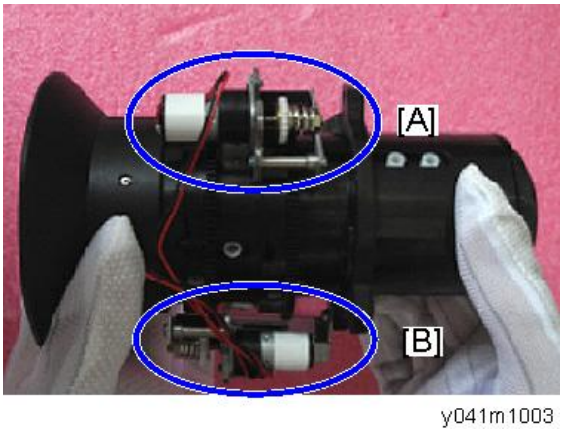
y097m0029

2. **Hold the projector lens [A], and rotate it carefully. Then remove the projector lens carefully.**



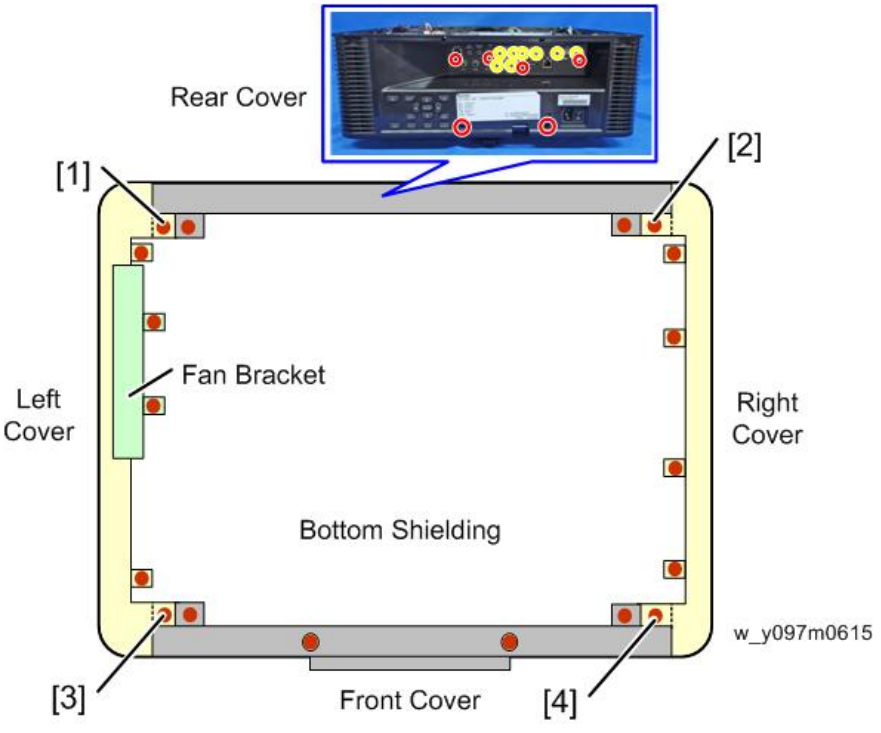
Note

- Be careful not to dirty the glass of the projector lens.
- Be careful not to touch the motor [A] [B] of the projector lens.



Exterior Covers

Location of screws



- Each of Screws [1], [2], [3] and [4] fastens adjoining covers. (For example, Screw [1] fastens the left and rear covers.)
- If a cover is difficult to remove, removing the screws of its adjoining cover will make it easier to remove the cover.

Top Cover

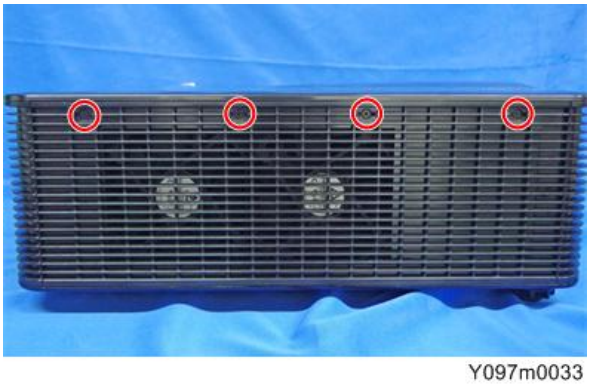
1. **Remove 4 screws on the back cover (x4)**

y097m0031

2. Remove 4 screws on the right cover (x4).

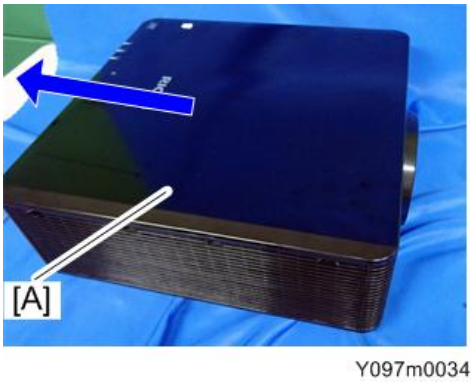
Y097m0032

3. Remove 4 screws on the left cover (x4).



Y097m0033

4. Pull to remove the top cover [A].



Y097m0034

Important

- The flat screw [A] and round screw [B] are used on the top cover.
- Be careful not to insert the wrong screws. Doing so will make it impossible to remove the screws and the top cover.

y097m0604

Rear Cover

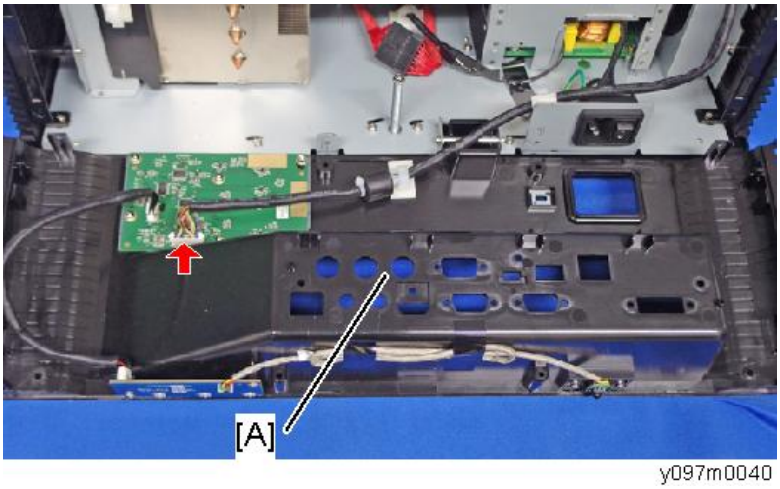
1. Top Cover (page 38 "Top Cover")
2. Remove 4 screws on the upper side (x4).

Y097m0036

3. Remove 6 screws (red circles) and 8 hex screws (yellow circles) on the back side (x14).

y097m0035

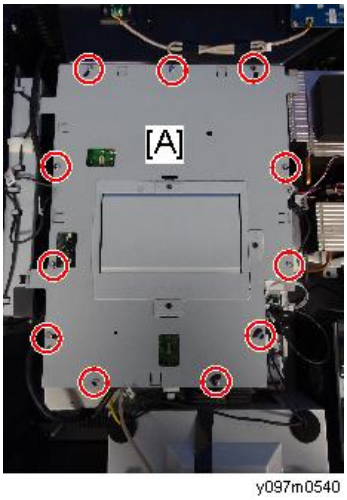
4. Rear Cover [A] (x1).



y097m0040

Front Cover, Front IR Sensor

1. Top Cover (page 38 "Top Cover")
2. Top Shielding [A] (x11)



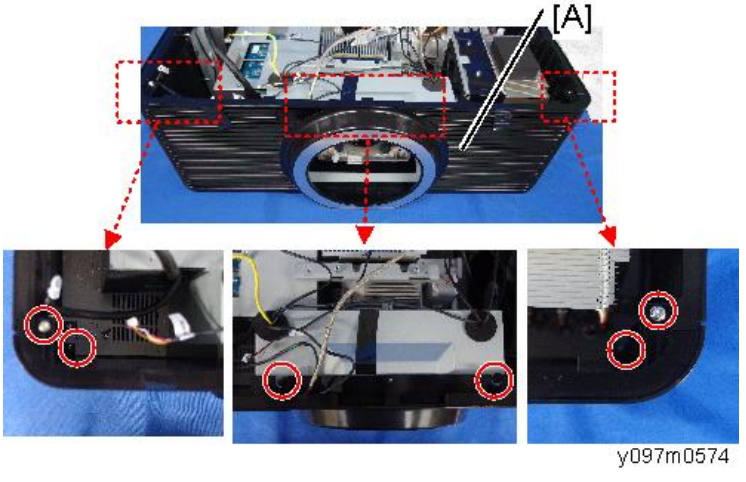
y097m0540

3. Disconnect the front IR sensor connector (x1).

   "IR" is printed on the main board.

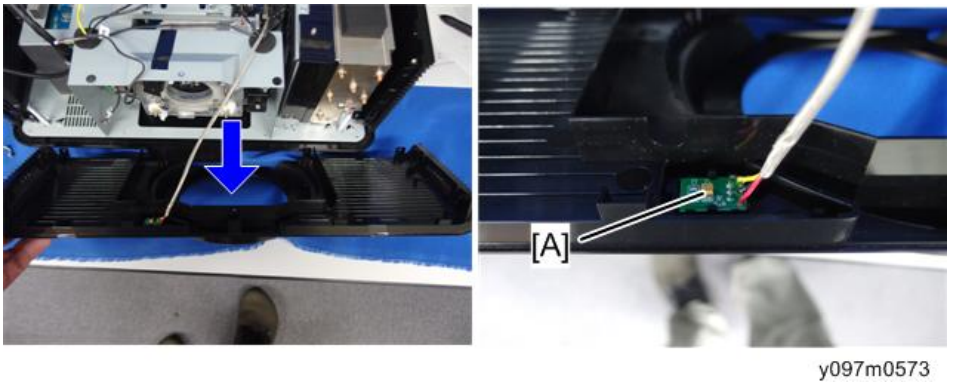
y097m0615

4. Front Cover [A] (x6)

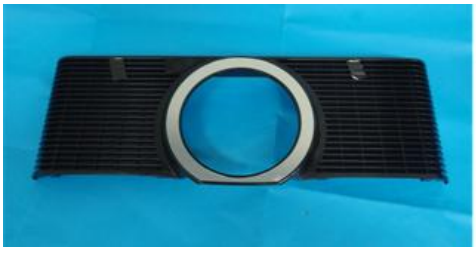


y097m0574

5. Front IR Sensor [A] (2 hooks)



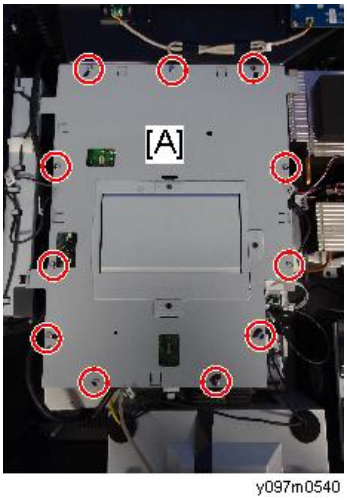
y097m0573



y097m0601

Left Cover

1. Top Cover (page 38 "Top Cover")
2. Top Shielding [A] (x11)



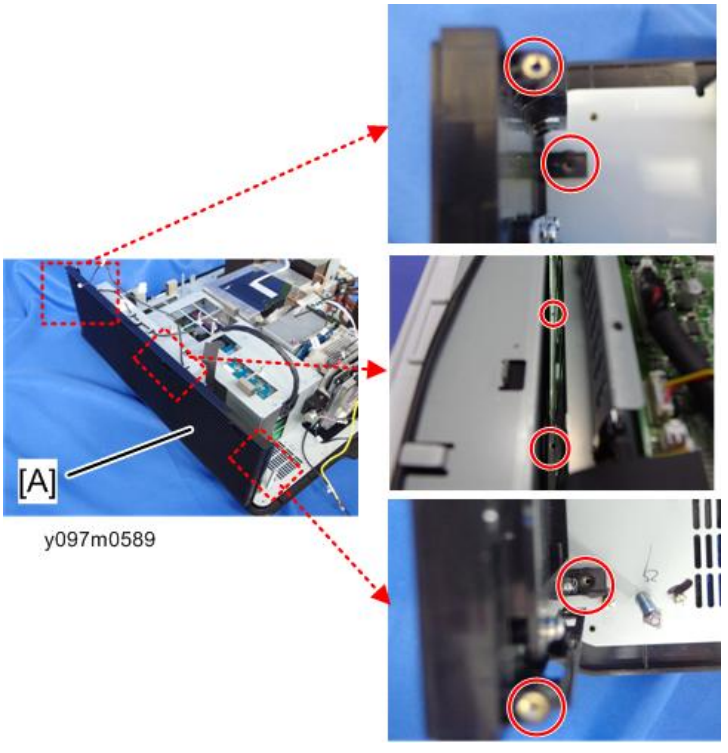
y097m0540

3. Disconnect the fan1, 2 connectors (x2).

"R-Fan1 and R-Fan2" are printed on the main board.

y097m0616

4. Left Cover [A] (x6)



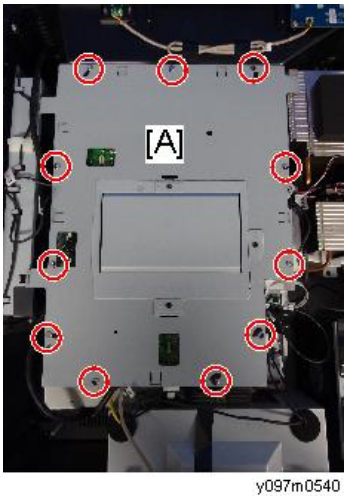
y097m0589

y097m0602

Right Cover

1. Top Cover (page 38 "Top Cover")

1. **Top Shielding [A] (x11)**



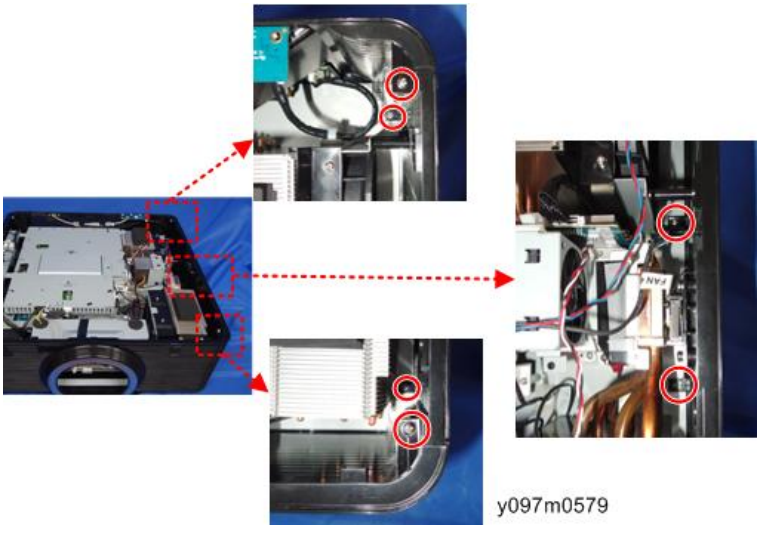
y097m0540

2. **Disconnect the fan 5 connector (x1).**

"F-Fan5" is printed on the main board.

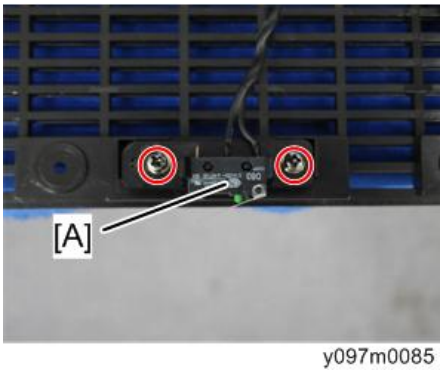
y097m0617

3. **Remove the screws for the right cover (x6).**



y097m0579

4. **Remove the safety interlock switch [A] (x2).**

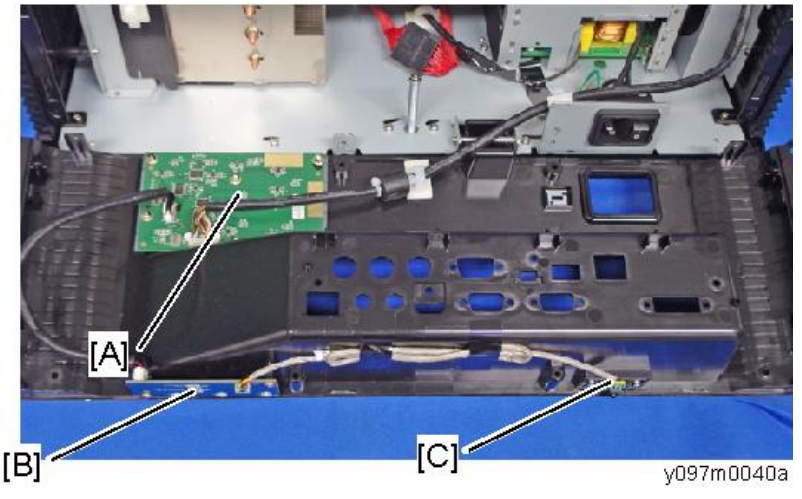


y097m0085

5. **Right Cover [A]**

y097m0580

Keypad Board, Keypad Buttons, Top IR Sensor, LED Indicator Board



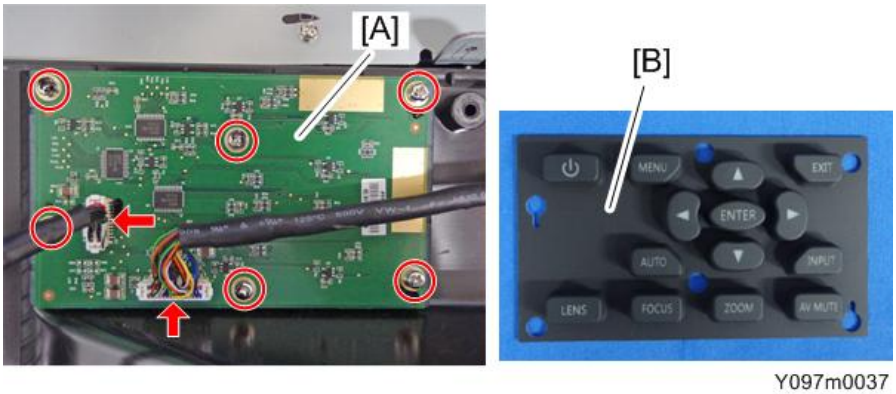
y097m0040a

A: Keypad Board and Keypad Buttons

B: LED indicator Board

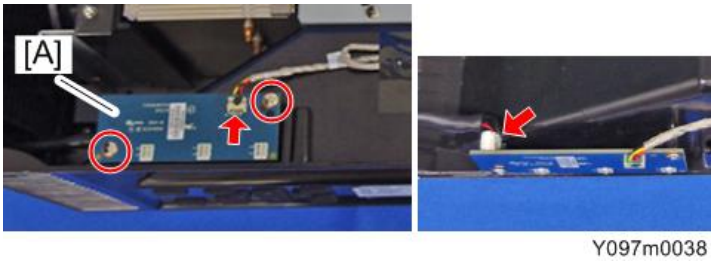
C: Top IR Sensor

1. **Rear Cover (page 40 "Rear Cover")**
2. **Keypad Board [A] and Keypad Buttons [B] (x6, x2)**



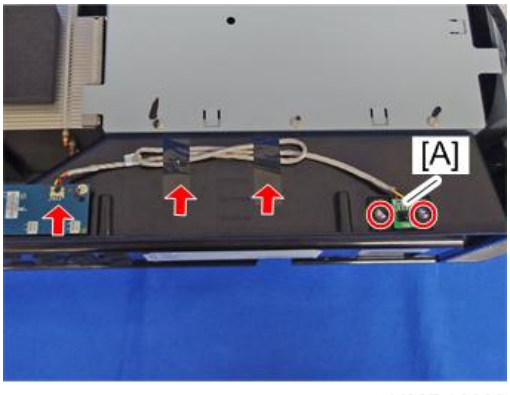
Y097m0037

3. **LED Indicator Board (x2, x2)**



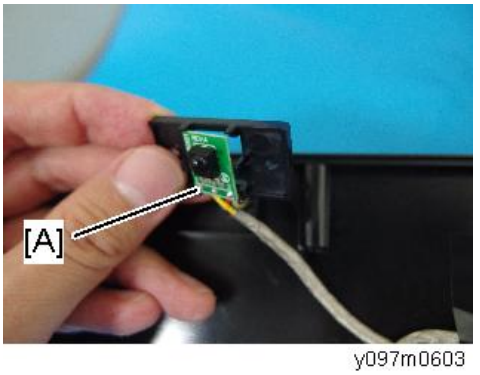
Y097m0038

4. **Top IR sensor with bracket [A] (x2, x1, black seal x2).**



Y097m0039

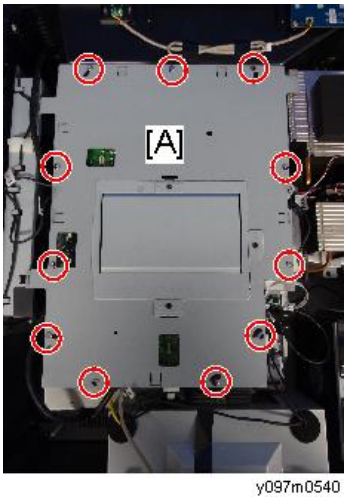
5. Separate the Top IR sensor [A] and the bracket.



y097m0603

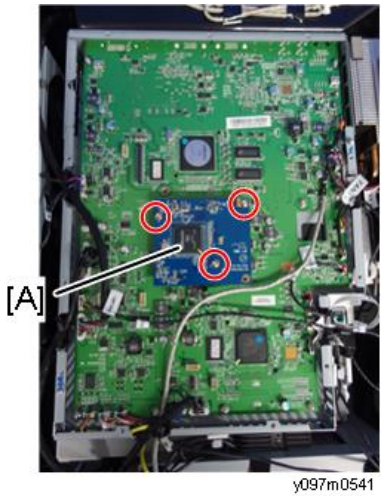
LAN Board, Main Board, IO Board

1. Top Cover (page 38 "Top Cover")
2. Top Shielding [A] (x11)



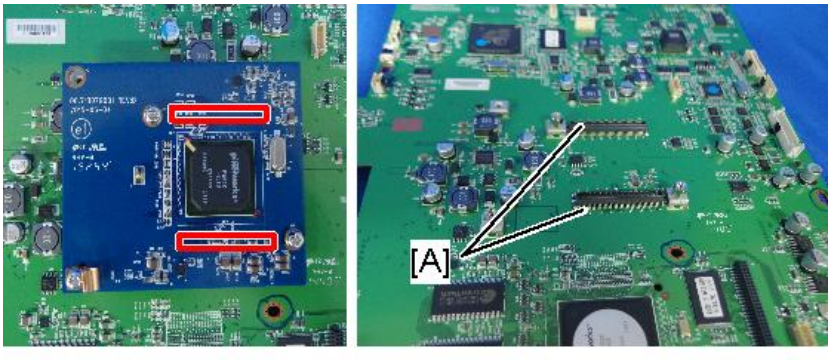
y097m0540

3. **LAN Board [A] (x3, x2)**



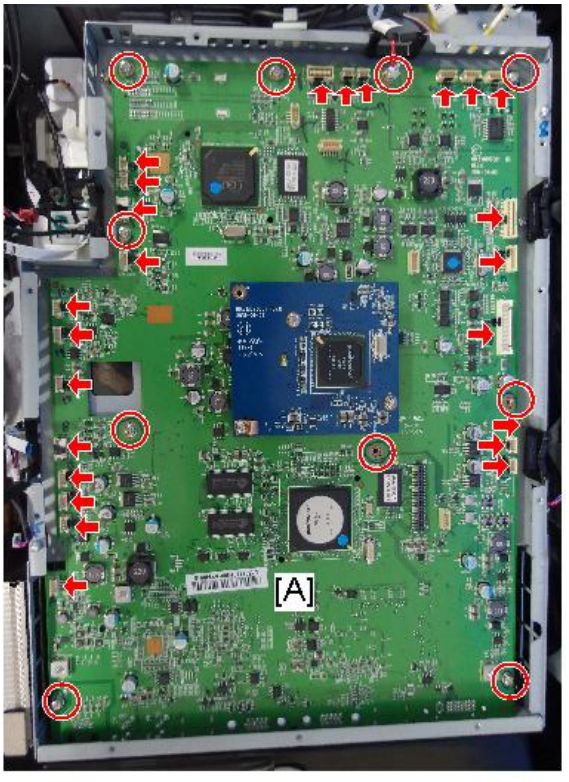
y097m0541

There are 2 connectors [A] at the back side.



y097m0572

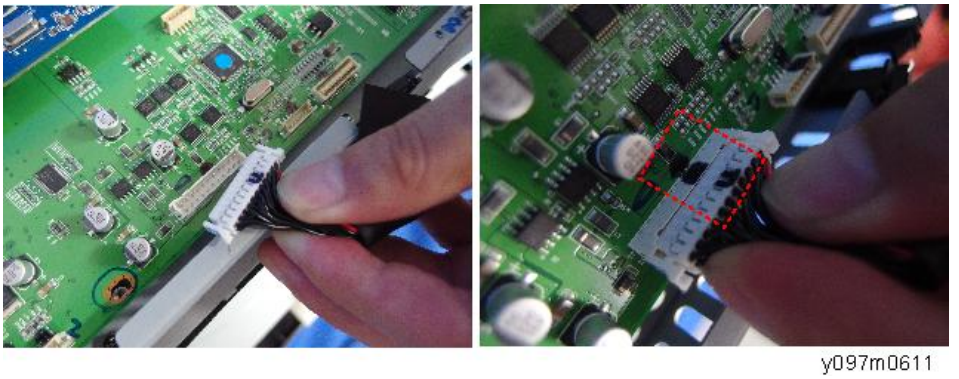
4. **Main Board [A] (x9, all connectors)**



y097m0606

Important

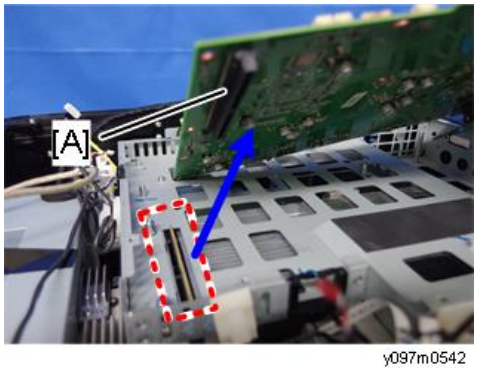
- Each end connector of the harness linking the LVPS and PSU must be connected to the matching board. After disconnecting the harness, if you connect the LVPS end to the PSU, the power will fail to turn on. Mark the connectors and boards as shown in the red frame so as to indicate the matching pairs of connectors and boards.



y097m0611

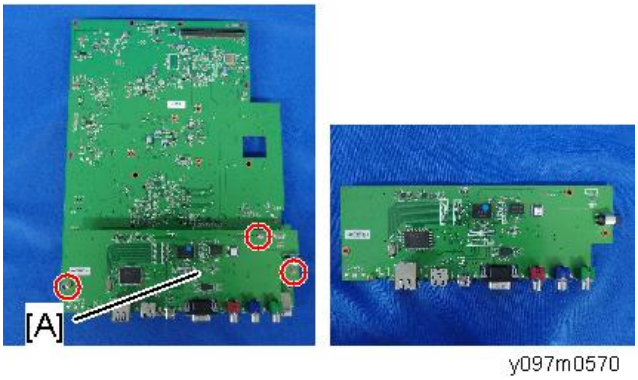
Important

- There is a connector [A] at the back side of the main board. Pull the main board upward, and then remove it.



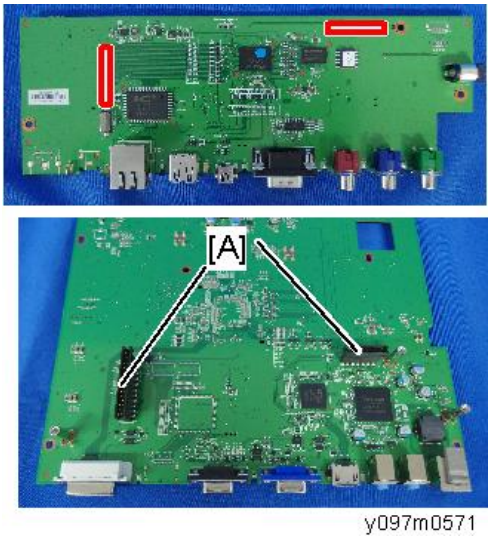
y097m0542

5. Turn the main board upside down, and then remove the IO board [A] (x3, x2).



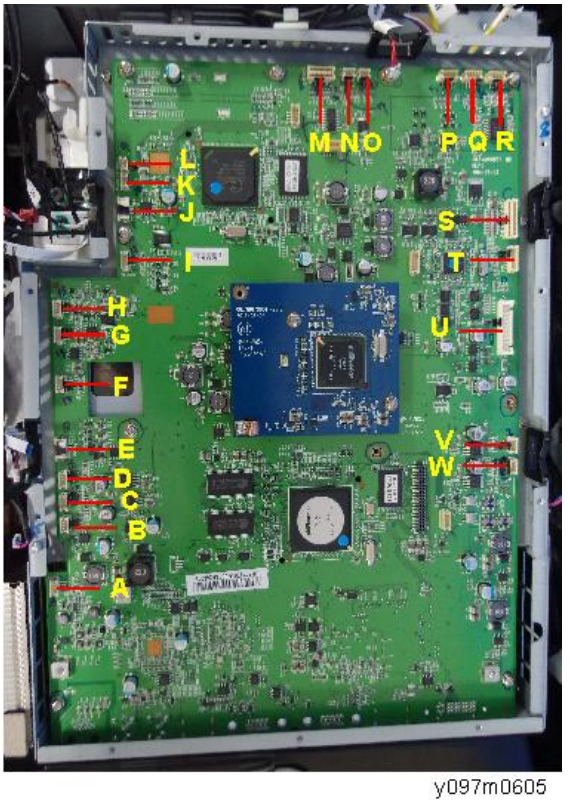
y097m0570

There are 2 connectors [A] at the back side.



y097m0571

Connection List



y097m0605

Item	Name on board	Key feature	Figure
A	Front IR Sensor	Red/Black/Yellow wire, green connector (3 pins)	
B	R-Fan 3	Red/Blue/Black wire, White connector and Black tube (3 pins)	
C	R-Fan 4	Composed of Red/Blue/Black wire, White connector and Black tube (3 pins)	
D	F-Fan 5	Composed of Red/Blue/Black wire, White connector (3 pins)	

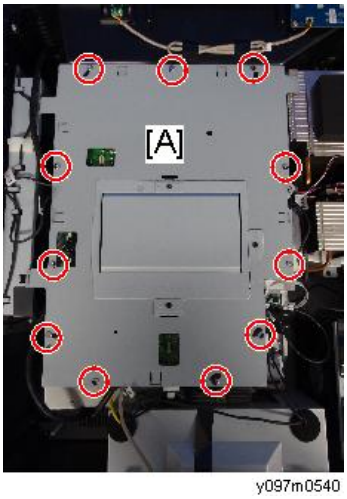
Item	Name on board	Key feature	Figure
E	P/W-Motor	Blue connector and flat cable	
F	F-Fan 6	Composed of Yellow/Red/Black wire, White connector and Black tube (3 pins)	
G	F-Fan 7	Composed of Green/Red/Black wire, White connector and Black tube (3 pins)	
H	P/W Sensor	Composed of White/Red/Black wire, Red connector and Black tube (3 pins)	
I	F/W Sensor	Composed of White/Red/Black wire, Red connector and Black tube (3 pins)	
J	FW Motor	Blue connector and flat cable	
K	H- Sensor-L	Composed of White/White wire, White connector and Black tube (2 pins)	
L	V Sensor-B	Composed of Black/Black wire, White connector and Black tube (2 pins)	
M	Driver DB	20 pins	
N	V Sensor-T	Composed of Blue/Blue wire, White connector and Black tube (2 pins)	
O	H Sensor-R	Composed of Red/Red wire, White connector and Black tube (2 pins)	

Item	Name on board	Key feature	Figure
P	Motor-V	Composed of Red/White/Blue/Yellow wire, White connector (4 pins)	
Q	Motor-H	Composed of Red/White/Blue/Yellow wire, White connector (4 pins)	
R	Zoom	Composed of Brown/Black/Yellow/ Orange wire, White connector and Black tube (4 pins)	
S	Keypad	Black tube (30 pins)	
T	Light Sensor	Composed of Red/Yellow/Black wire, White connector and Black tube (3 pins)	
U	LVPS	22 pins	
V	R-Fan 2	Composed of Red/Blue/Black wire, White connector and Black wire tube (3 pins)	
W	R-Fan 1	Composed of Red/Blue/Black wire, White connector and Black tube (3 pins)	

Vertical Motor, Horizontal Motor

1. Top Cover **(page 38 "Top Cover")**
2. Front Cover **(page 41 "Front Cover, Front IR Sensor")**

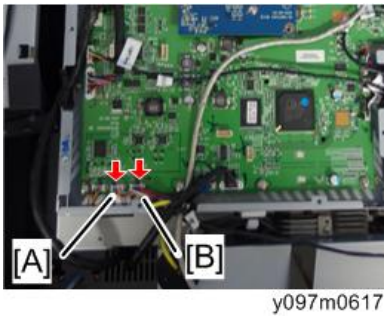
3. **Top shielding [A] (x11)**



y097m0540

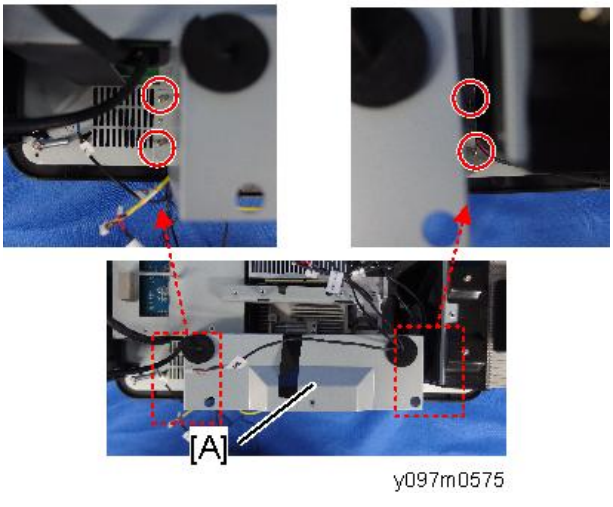
4. **Disconnect the horizontal motor connector [A] and vertical motor connector [B] (x2).**

"Motor-V" and "Motor-H" are printed on the main board.



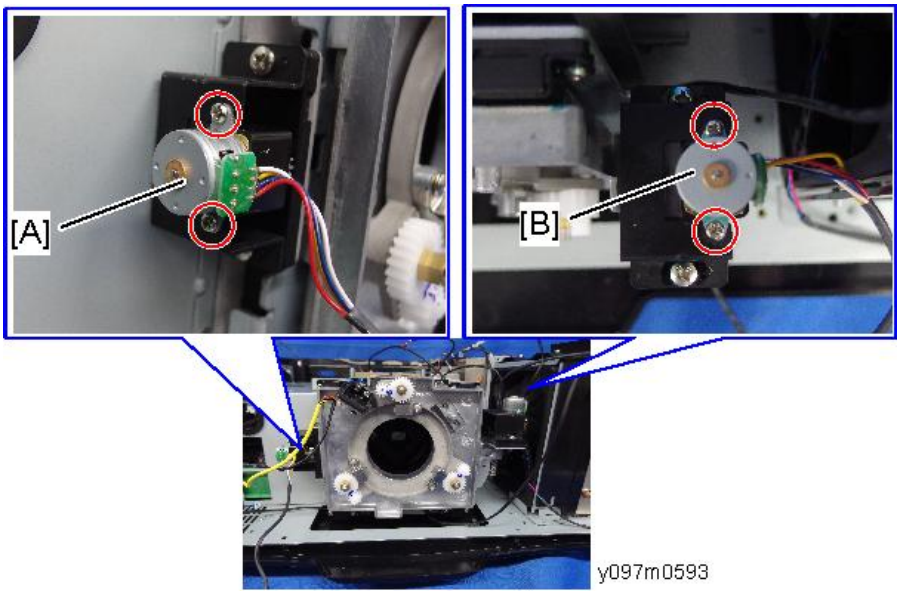
y097m0617

5. **Front Shielding [A]**



y097m0575

6. **Horizontal Motor [A] and Vertical Motor [B]**



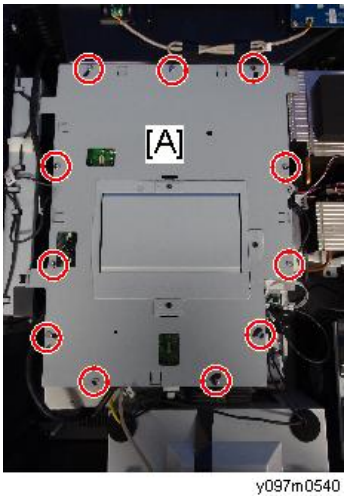
Note

- The horizontal motor and vertical motor are the same part (interchangeable).

Light Sensor

1. Top Cover (page 38 "Top Cover")

2. **Top Shielding [A] (x11)**



y097m0540

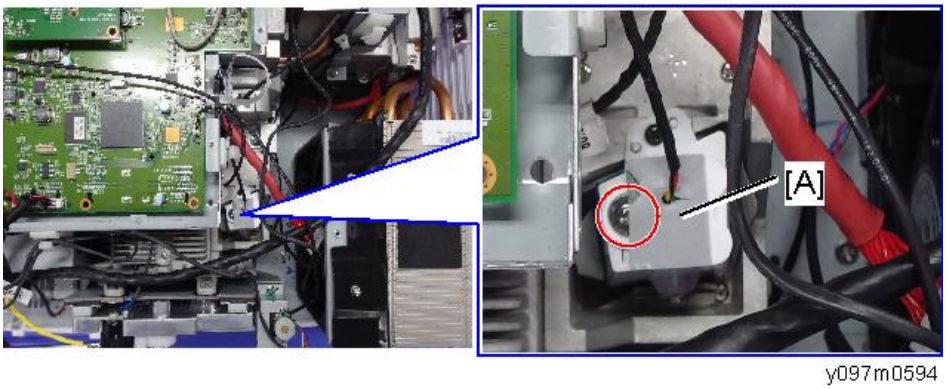
3. **Disconnect the light sensor connector (x1).**

"Light Sensor" is printed on the main board.

y097m0620

4. **Sensor Cover [A] (x1)**

Peel the sponge seal if the screw is covered with the sponge seal.



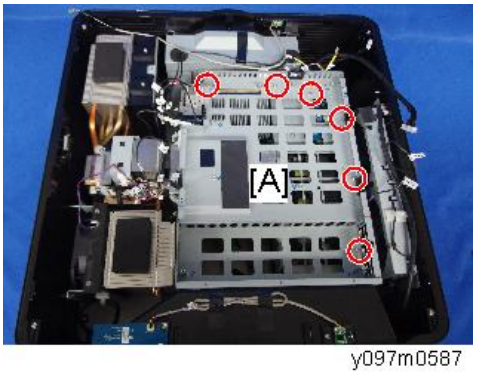
y097m0594

5. Light Sensor [A]

y097m0595

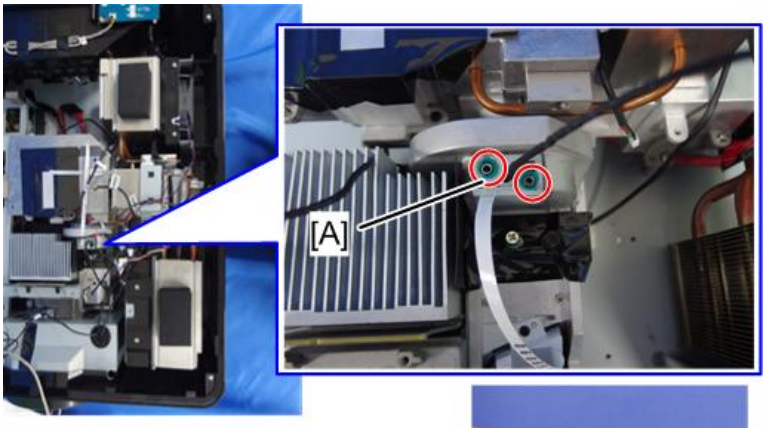
Filter Wheel

1. Top Cover (page 38 "Top Cover")
2. Main Board (page 48 "LAN Board, Main Board, IO Board")
3. Bottom Shielding [A] (☞x6)



y097m0587

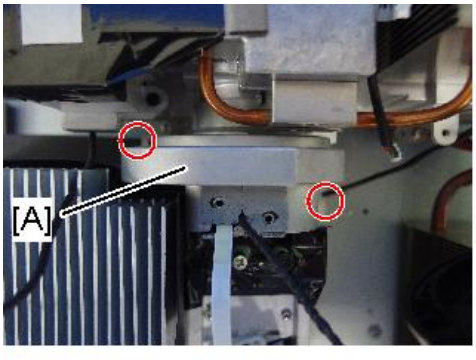
4. **Bracket [A] (x2)**



y097m0597

5. **Filter Wheel Cover with sponge seal [A] (x2)**

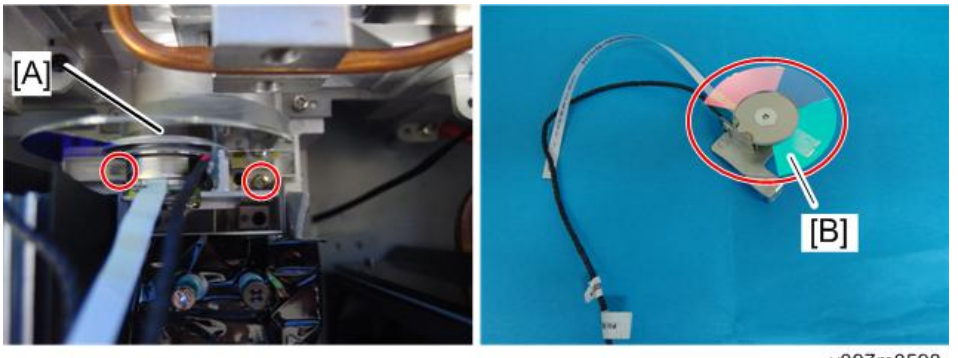
The sponge seal [B] is attached to prevent the entry of dust.



y097m0596

6. **Filter Wheel [A] (x2)**

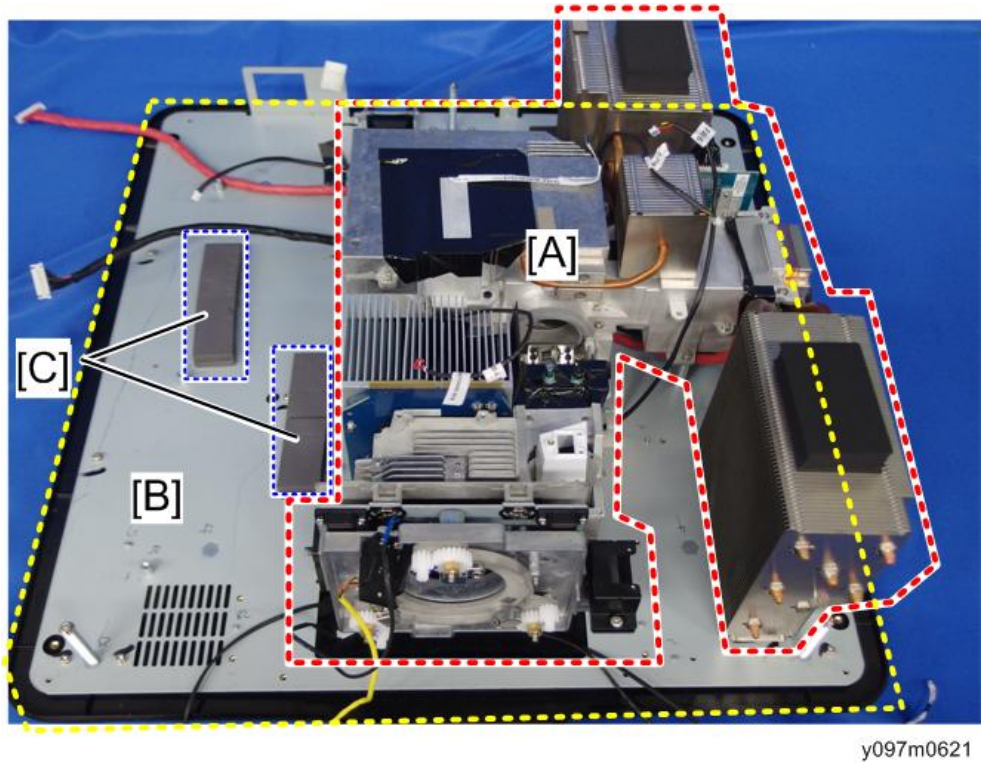
Do not touch the wheel part [B]. Be careful not to bump the wheel against anything when you replace it, because it breaks easily.



y097m0598

Optical Engine + Base Unit

Optical Engine [A], Base Unit [B], and 2 Thermal Pads [C] are integrated and provided as a one-piece unit.

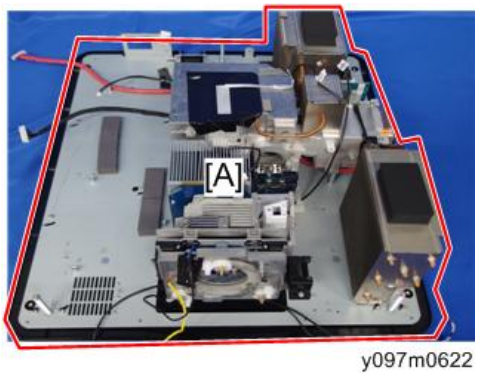


y097m0621

[A]	Optical Engine	Optical Engine components are as follows: • 2 Laser banks • 2 Laser Bank Boards • Optical Engine Board • DMD Board • Phosphor Wheel • Fan 7* *Fan 7 is by the Phosphor Wheel.
[B]	Base Unit	Base Unit components are as follows: • Bottom Shielding • Bottom Cover • Fan 6* *Fan 6 is between the Optical Engine and the Bottom Shielding.
[C]	Thermal Pads	

1. **Exterior Covers (page 37 "Exterior Covers")**
2. **LAN Board, Main Board, IO Board (page 48 "LAN Board, Main Board, IO Board")**
3. **Vertical Motor, Horizontal Motor (page 54 "Vertical Motor, Horizontal Motor")**
4. **Light Sensor (page 56 "Light Sensor")**
5. **Filter Wheel (page 58)**
6. **Thermal Switch (page 73 "Thermal Switch")**
7. **Fan 3 (page 64 "Fan 3")**
8. **Fan 4 (page 65 "Fan 4")**
9. **LD Driver Board, PSU (page 68 "LD Driver Board, PSU, Thermal Pad")**
10. **Harness Power SW (page 74 "Harness Power Switch")**
11. **Adjustable foot (page 75 "Adjustable Feet")**

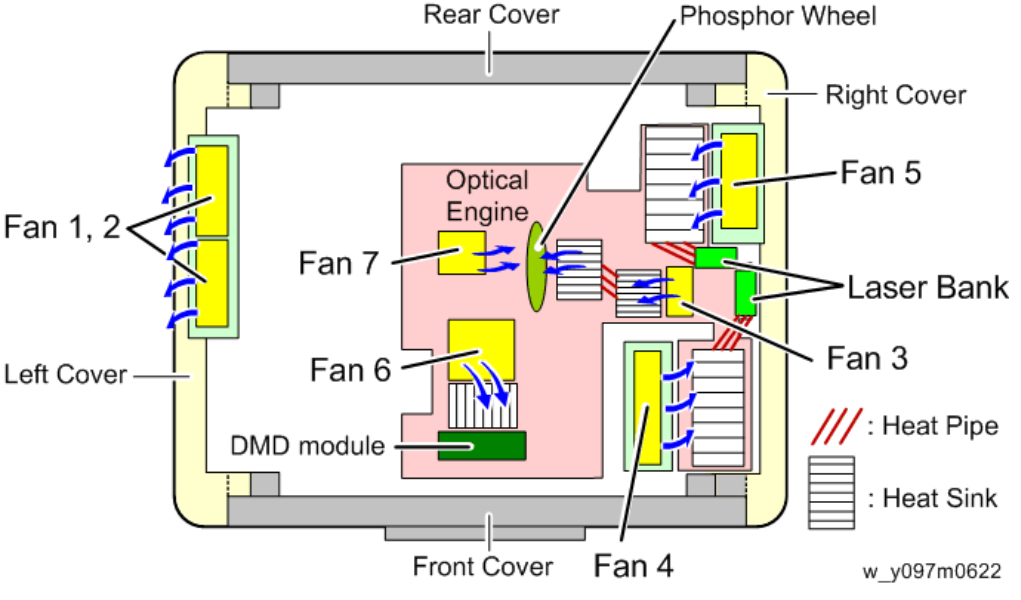
12. Replace the Optical Engine + Base Unit [A].



y097m0622

Fans

Locations of the fans



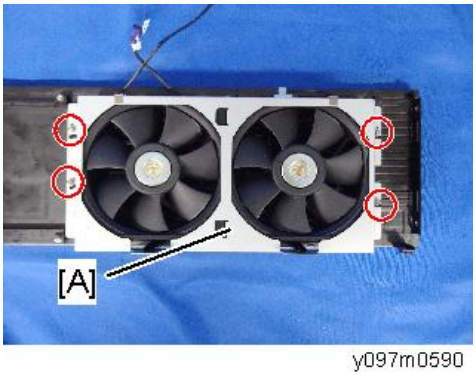
Fan 1, 2	Exhaust fan mounted on the left cover.
Fan 3	Intake fan mounted on the optical engine to cool the phosphor wheel.
Fan 4	Intake fan to cool the laser bank.
Fan 5	Intake fan mounted on the right cover to cool the laser bank.

Fan 6	Intake fan mounted on the bottom shielding, under the optical engine to cool the DMD module.
Fan 7	Blower inside the Optical Engine to cool the phosphor wheel.

Fan 6 and Fan 7 are inside the Optical Engine + Base Unit where the service engineer cannot access. Replace the Optical Engine + Base Unit if Fan 6 and/or Fan 7 must be replaced.

Fan 1, Fan 2

1. **Left Cover (page 43 "Left Cover")**
2. **Fan Bracket [A] (x4)**



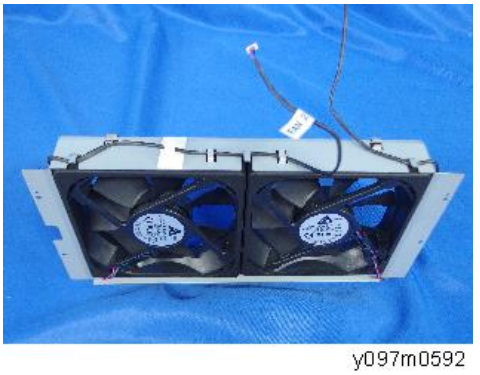
y097m0590

3. **Fan 1, 2 [A] [B]**

y097m0591

Note

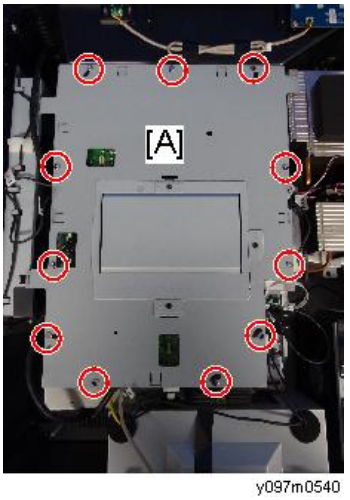
- When attaching the fans, wire the harness as shown:



y097m0592

Fan 3

1. Top Cover (page 38 "Top Cover")
2. Top Shielding [A] (x11)



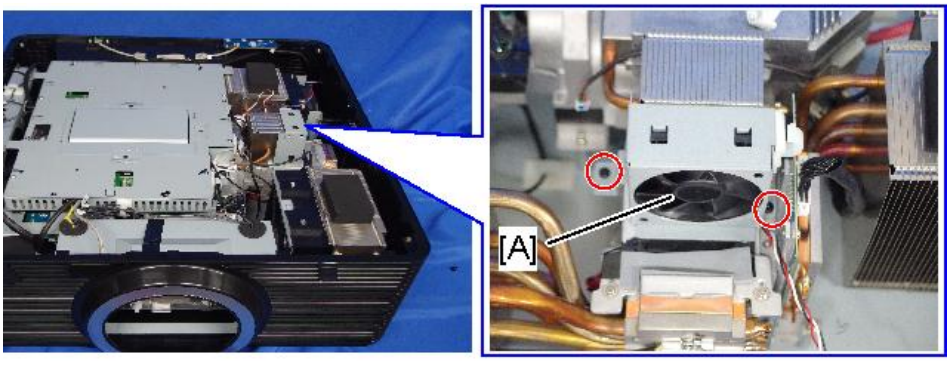
y097m0540

3. Disconnect the fan 3 connector (x1)

"R-Fan 3" is printed on the main board.

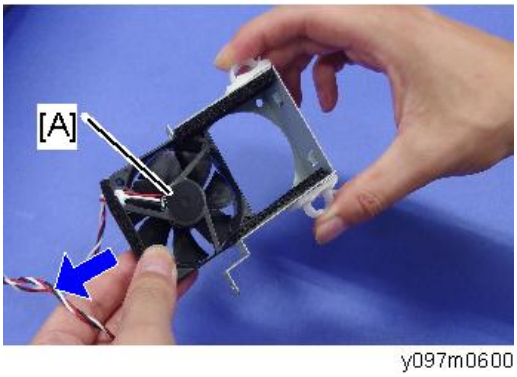
y097m0624

4. **Fan Bracket [A] (x2)**



y097m0599

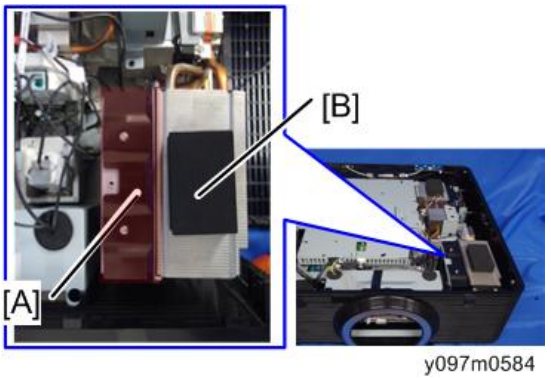
5. **Fan 3 [A]**



y097m0600

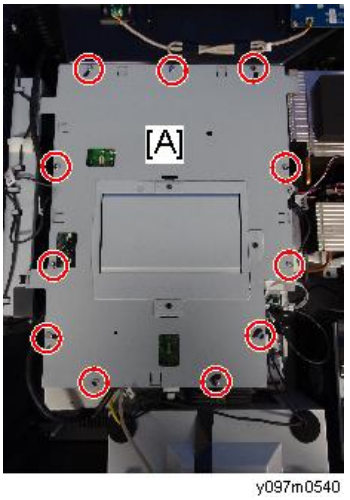
Fan 4

Fan 4 [A] is located next to the heat sink [B].



y097m0584

1. Top Cover (page 38 "Top Cover")
2. Top Shielding [A] (x11)



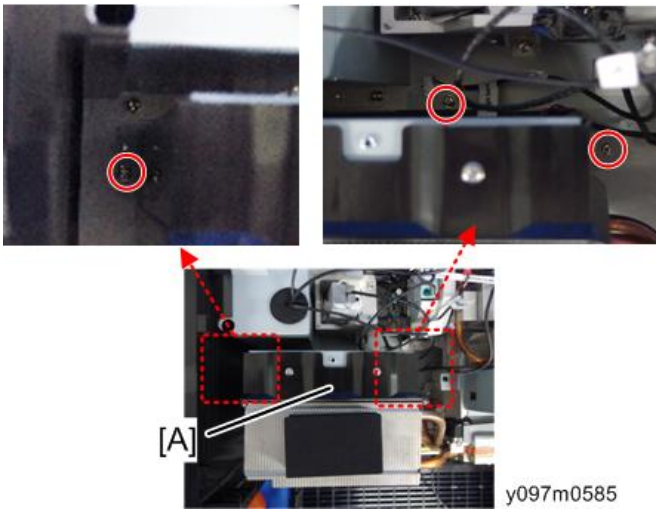
y097m0540

3. Disconnect the fan 4 connector (x1).

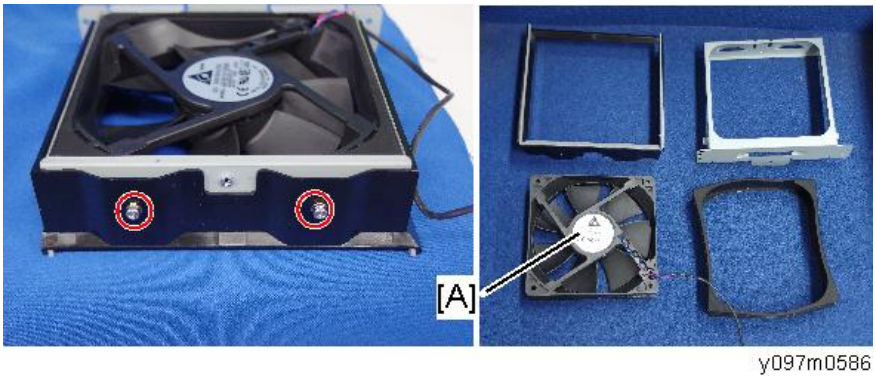
"R-FAN4" on Main Board


y097m0625

4. Fan Bracket [A] (x3)



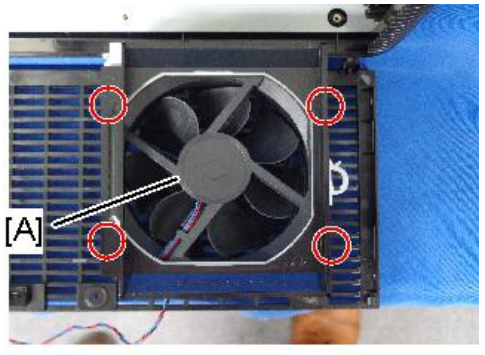
5. Fan 4 [A] (x2)



Fan 5

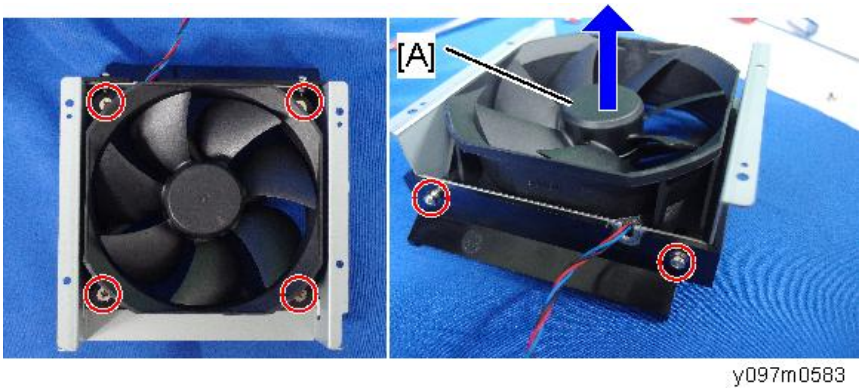
1. Right Cover (page 44 "Right Cover")

2. Fan Bracket [A] (x4)



y097m0581

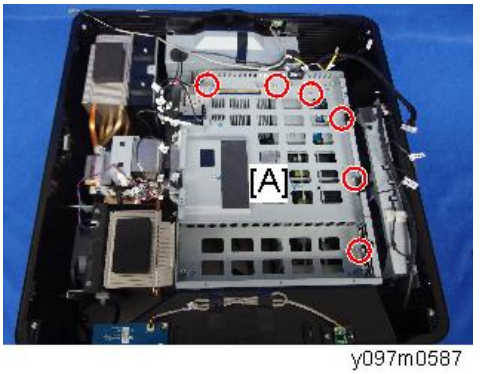
3. Fan 5 [A] (x6)



y097m0583

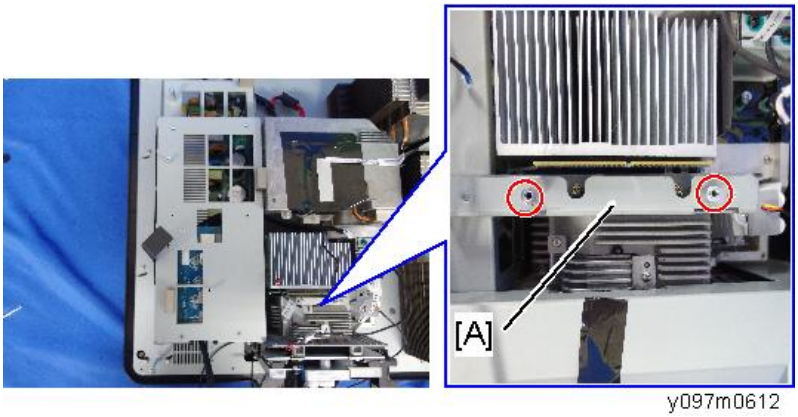
LD Driver Board, PSU, Thermal Pad

1. Bottom Shielding [A] (x6)



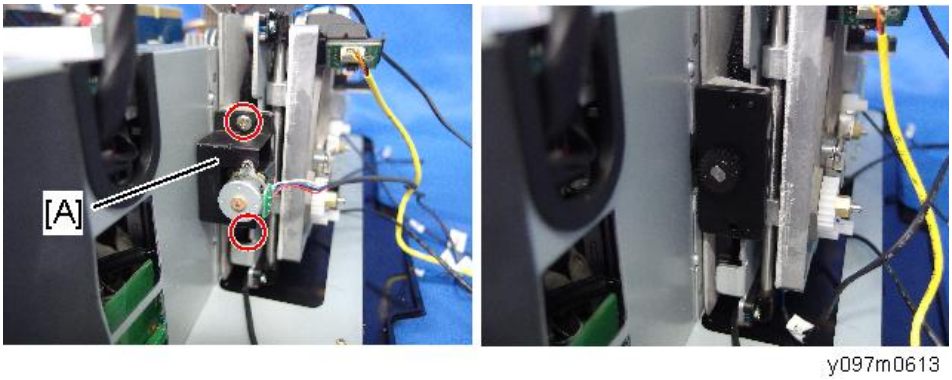
y097m0587

2. Bracket [A] (x6)



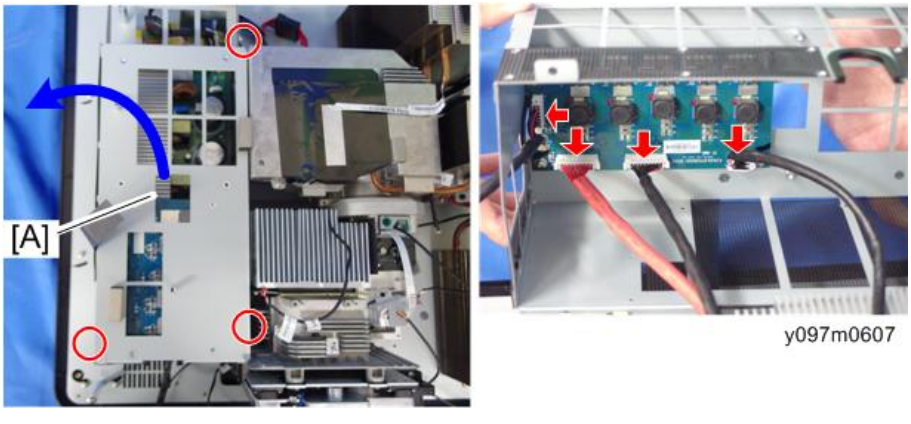
y097m0612

3. Horizontal Motor with bracket [A] (x2)



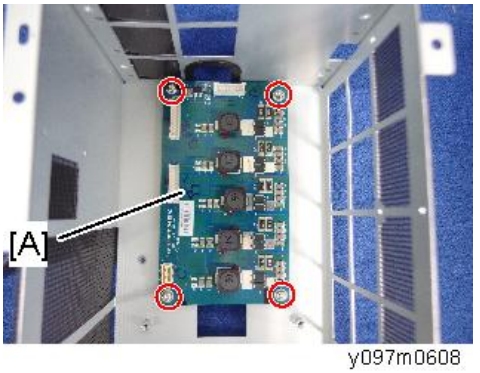
y097m0613

4. LD Driver Board Casing [A] (x3, x4)



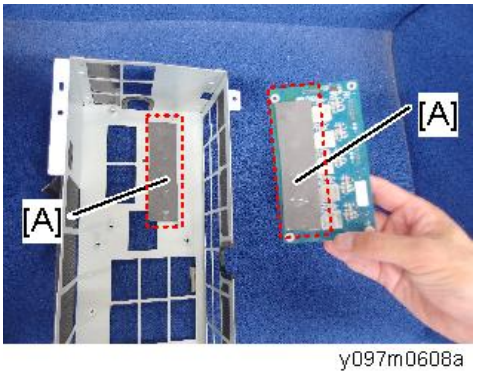
y097m0607

5. **LD Driver Board [A] (x4)**



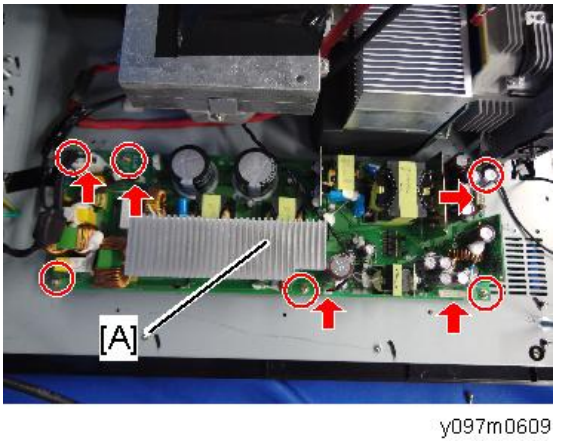
y097m0608

6. **Thermal Pad [A] (2 pads)**



y097m0608a

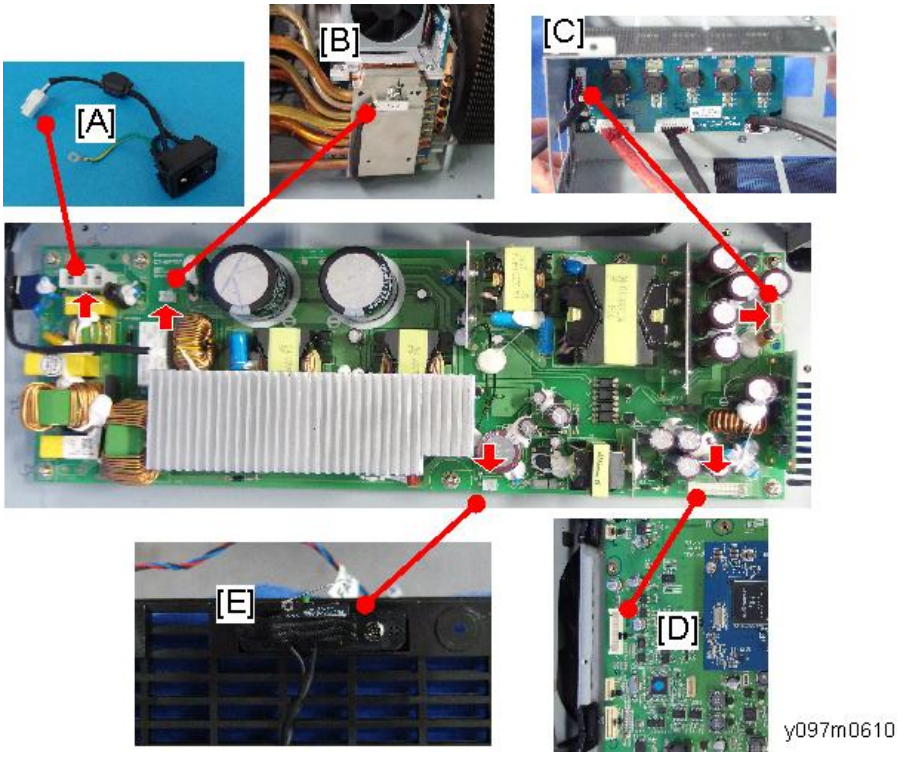
7. **PSU [A] (x6, x5)**



y097m0609

Notes for Installation

Connect the PSU connector properly so as to prevent connection failure or misconnection.



A: To Power Switch

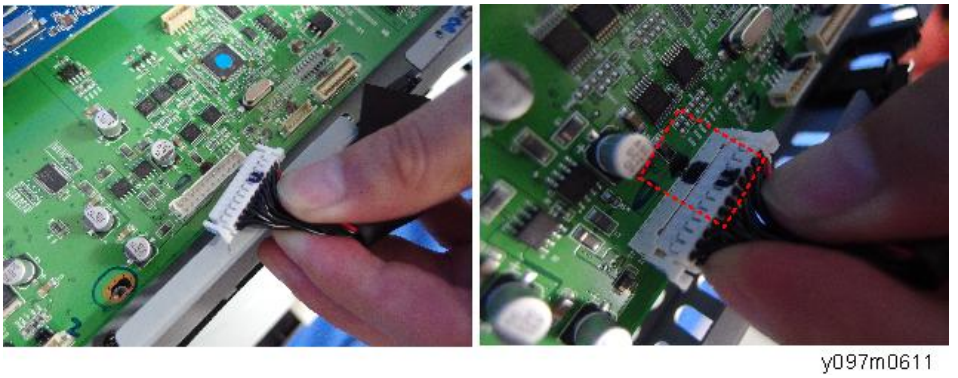
B: To Thermal Switch

C: To LD Driver Board

D: To Main Board "LVPS" connector

E: To Safety Interlock Switch

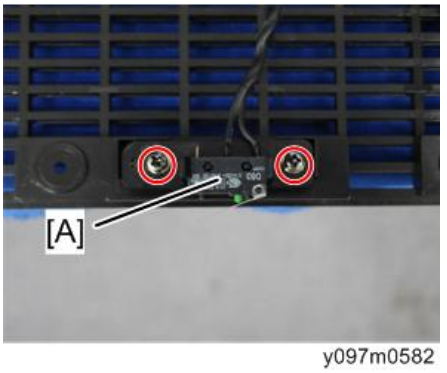
- The interlock switch [E] is attached to the right cover. Since the exterior covers are to be attached at the last step, be careful not to forget to connect the interlock switch connector when replacing the PSU.
- Each end connector of the harness linking the LVPS and PSU must be connected to the matching board. After disconnecting the harness, if you connect its LVPS end to the PSU, the power will fail to turn on. Mark the connectors and boards as shown in the red frame so as to indicate the matching pairs of connectors and boards.



y097m0611

Safety Interlock Switch

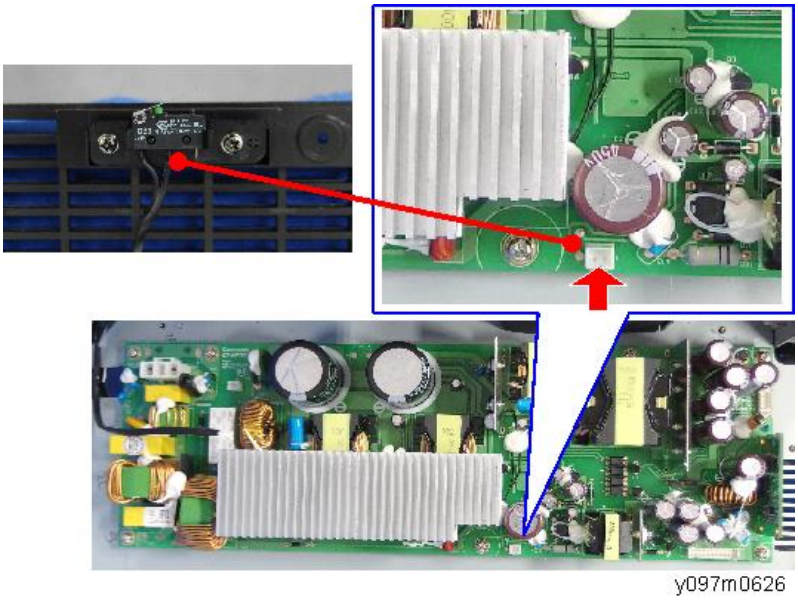
1. Top Cover (page 38 "Top Cover")
2. Right Cover (page 44 "Right Cover")
3. Remove the Safety Interlock Switch [A] (x2).



y097m0582

4. Disconnect the Safety Interlock Switch connector on the PSU.

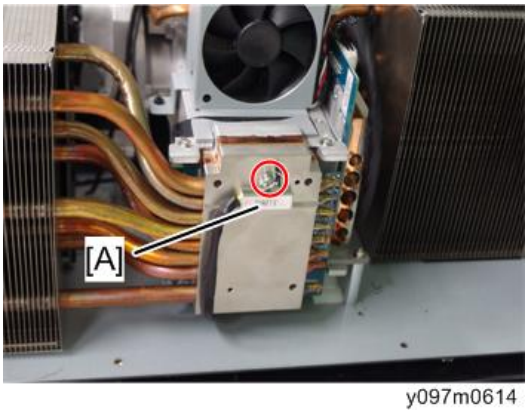
   For how to access the PSU, refer to (page 68 "LD Driver Board, PSU, Thermal Pad")



y097m0626

Thermal Switch

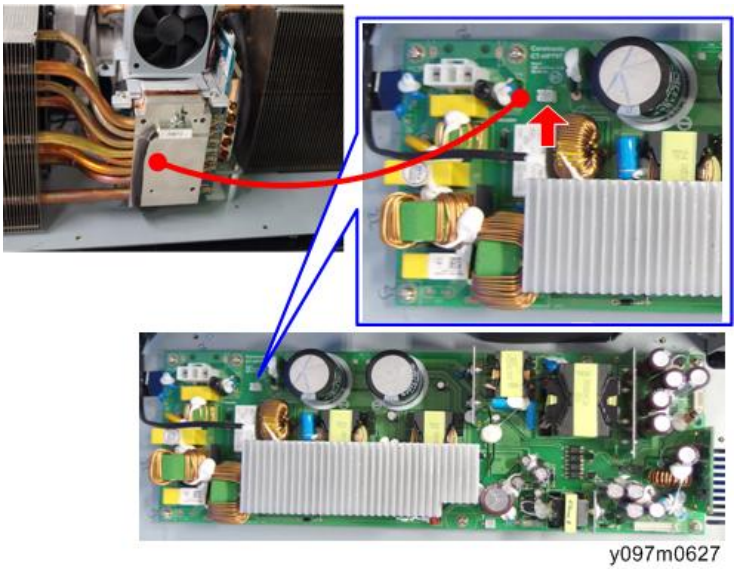
1. Top Cover (page 38 "Top Cover")
2. Right Cover (page 44 "Right Cover")
3. Thermal Switch [A] (x1).



y097m0614

4. **Disconnect the Thermal Switch connector on the PSU.**

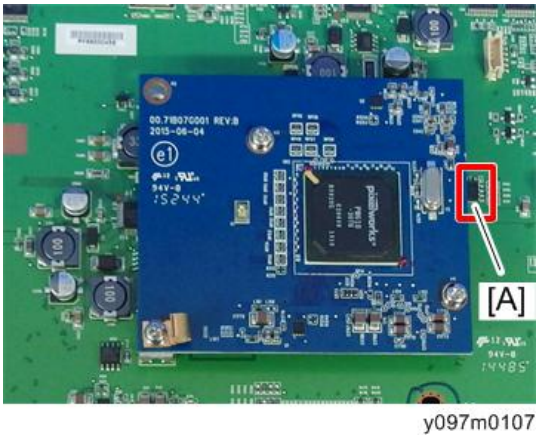
   For how to access the PSU, refer to (page 68 "LD Driver Board, PSU, Thermal Pad")



y097m0627

Note

- The thermal sensor [A] on the main board is not to be replaced.

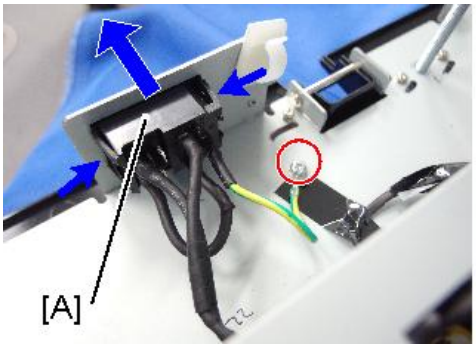


y097m0107

Harness Power Switch

1. Top Cover (page 38 "Top Cover")
2. Rear Cover (page 40 "Rear Cover")
3. Harness Power Switch [A] (x1, x1)

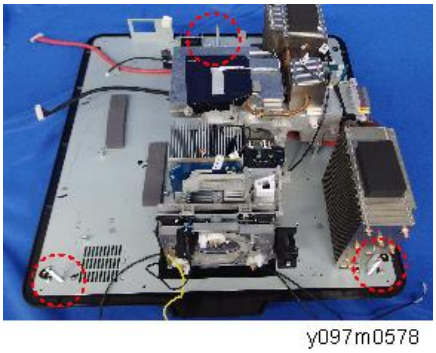
4. The harness is connected to the PSU.



y097m0576

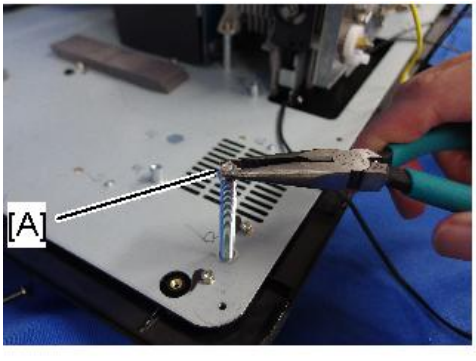
Adjustable Feet

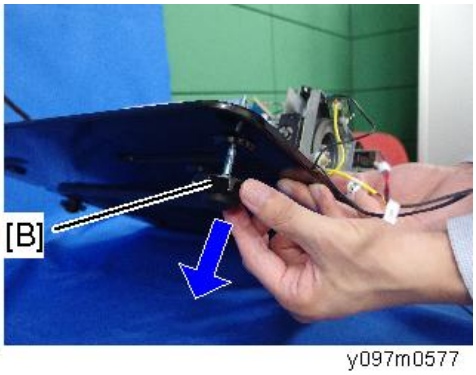
There are three adjustable feet; there are 2 on the front and 1 on the rear.



y097m0578

1. Remove necessary parts to access the adjustable foot that you want to replace.
2. Remove the nut [A].
3. Rotate the adjustable foot counterclockwise and remove it.





y097m0577

4. Adjustment

Required Action after Replacing Parts

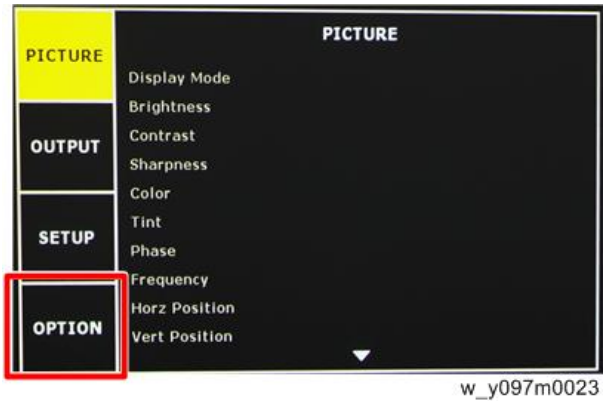
After replacing parts, execute the related items shown in the table below.

Action after repair	Changed parts			Description page
	Main board	Optical Engine + base unit	Filter wheel	
System firmware update	✓			page 127 "PW392/PIC FW Update"
Filter wheel index	✓	✓	✓	page 81 "Adjustment"
Phosphor wheel index	✓	✓		page 81 "Adjustment"
Factory reset	✓			page 103 "Factory Reset"
Lens calibration	✓			page 90 "Calibration"
Light Sensor (ABP) calibration	✓	✓	✓	page 90 "Calibration"
ADC calibration	✓			page 90 "Calibration"
G sensor calibration	✓			page 90 "Calibration"

Service Mode

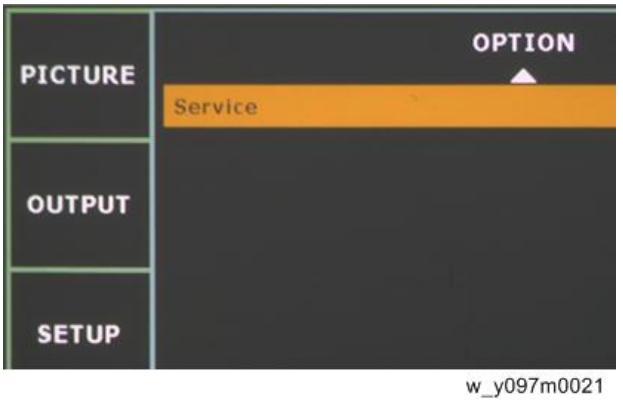
How to enter the Service Mode

1. Turn on the projector.
2. Press the “Menu” key to display the OSD menu.
3. Select “Option” with the [▼] key and press the “Enter” key.



w_y097m0023

4. Select “Service” and press the “Enter” key.



w_y097m0021

5. “Enter Service Code” appears.

w_y097m0065

6. **Press the “Left [1]”, “Down [2]”, “Right [3]”, and “Up [4]” keys sequentially, then press the “Enter” key.**

y097m0064

To switch to the service mode with the remote controller, enter “1590” using the number keys when you enter the service code.

7. **The service mode menu appears.**

w_y097m0024

Note

- To exit from the service mode or return to the previous menu, press the "Exit" key.

Service Mode Settings

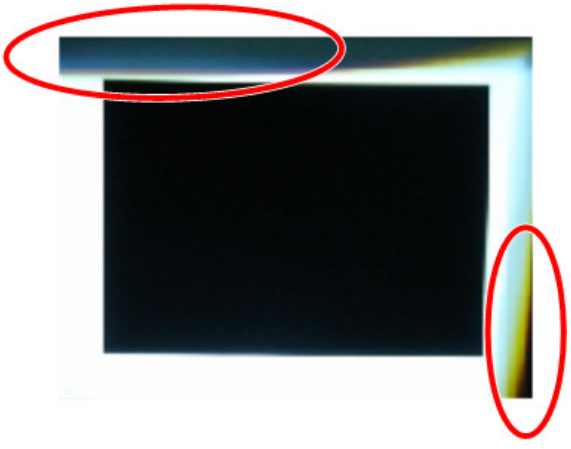
Setting Item	Description
Factory Reset	Use this to reset all the settings in the OSD menu (except for the service mode and network settings).
Filter Wheel Index	Use this to adjust the filter wheel index.
Phosphor Wheel Index	Use this to adjust the phosphor wheel index.

Setting Item	Description
Error Log	Records the times when power for the projector failed to turn on, such as due to excessive temperature, lamp failure or fan lock.
Mode Adjustment	Use this to adjust the projected image position and record the coordinates after adjustment. (Up to 19 coordinates can be recorded.)
Reset Projector Hours	Use this to reset the machine's cumulative operation time.
Light Sensor (ABP) Calibration	During light sensor (ABP) calibration, the color balance of the projected light is adjusted using a sensor in the optical engine.
ADC Calibration	Use this to calibrate the analog-to-digital converter (ADC). Black level adjustment: Adjust the analog black level (0 V) to the digital 0 level. White level adjustment: Adjust the analog white level (0.7 V) to the digital 1,024 level.
G Sensor Calibration	Use this to calibrate the sensor that detects the projector's orientation.

Adjustment

Rod Adjustment

If either of the defects ringed in red appears when projecting an image, perform the adjustment described below.



y0180040

Environment

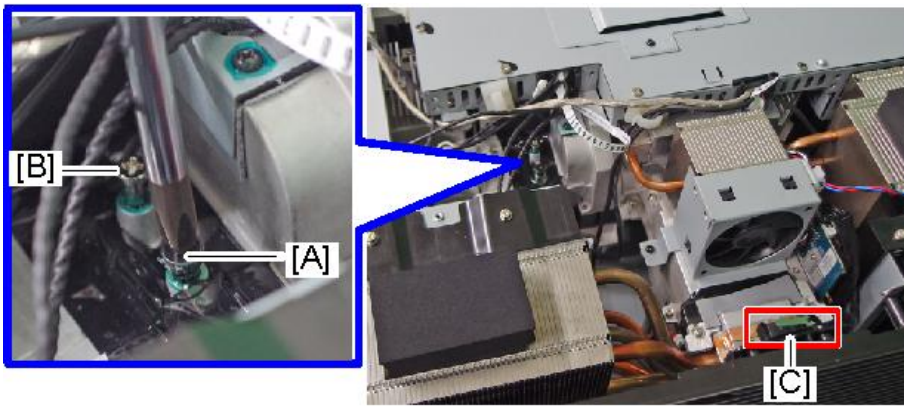
- The size of the screen is 60 inches diagonally.
- This process should be done in a dark environment (under 20 lux).

Procedure

The interlock switch [C] on the cover should be pressed during the adjustment.

1. Display a "white" pattern.
2. Adjust the screws to readjust the image.

   Screw [B] should be adjusted first, and then screw [A]. Adjust until the yellowish or bluish parts disappear.



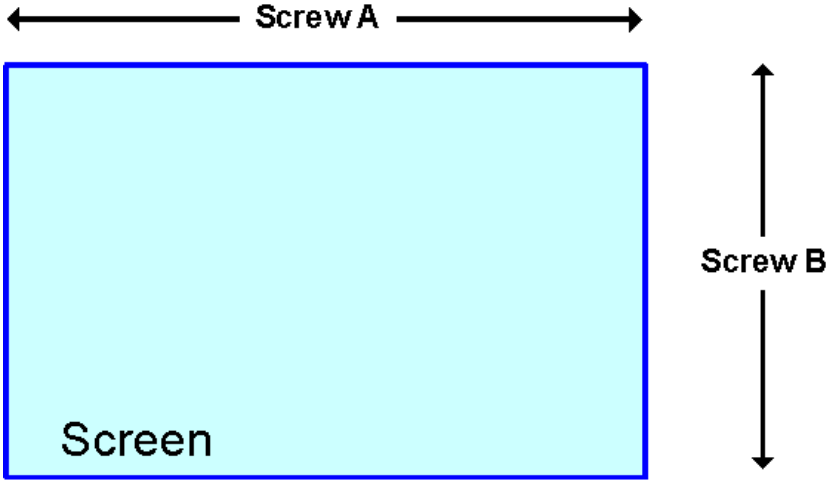
y097m0068

Inspection

There should be no unusual color at the rim of the image when viewed by eye.

Avoid over-adjusting the rod.

- Screw A: Adjusts in the left or right direction.
- Screw B: Adjusts in the up or down direction.

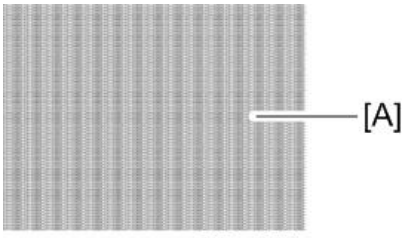


w_y097m0524

Focus Adjustment

Environment

- Test equipment: Video generator
- Test distance: 2.5m
- Test pattern: Full screen [A]



Criteria

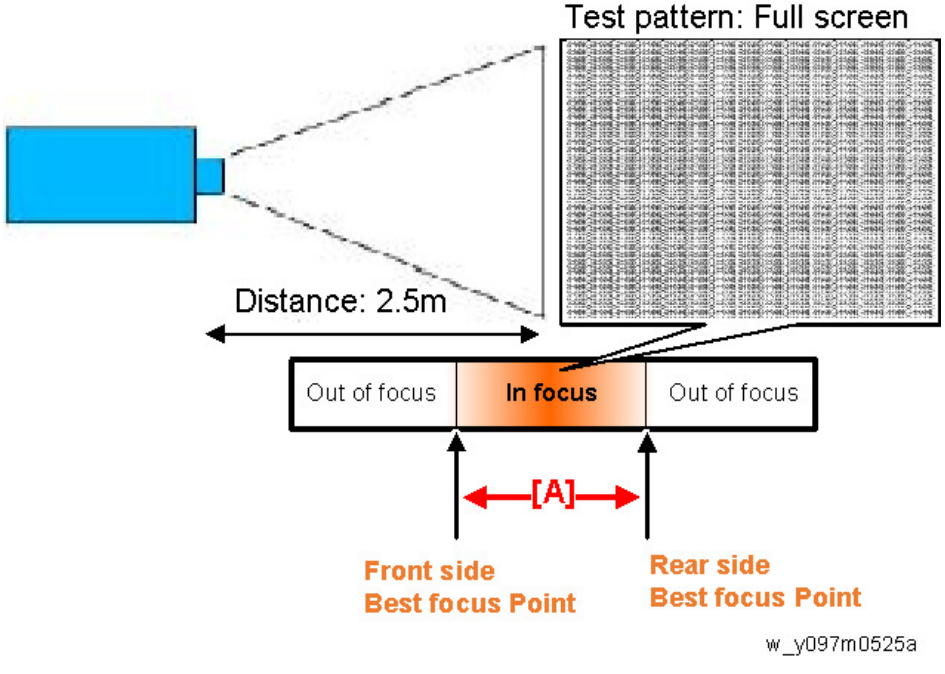
- Unbalance<=50cm

  The focus unbalance of the projected image must be 50 cm or less. If [A] (see below) is over 50 cm, perform focus adjustment according to the following procedure:

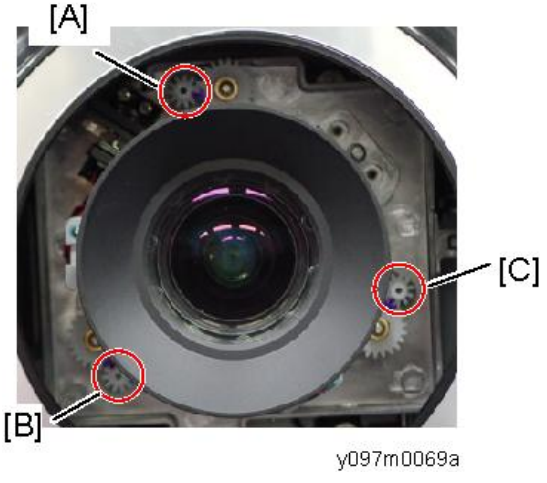
Back focus adjustment

1. **Project the full screen pattern with the lens at the maximum zoom position.**
2. **Measure the distance [A] between the most frontal best focus point and the most rear best focus point along the optical axis direction.**

   Specifically, adjust the focus to the most frontal best focus point and shift the focus by small degrees to the rear side to determine the most rear best focus point.



3. **Check whether the distance is within +/- 3cm of the lens specifications. (Refer to "Unbalance" of page 22 "Lenses")**
    - If not, adjust the screw A, B, and C to bring the distance within specification (every screw must be adjusted by the same amount).



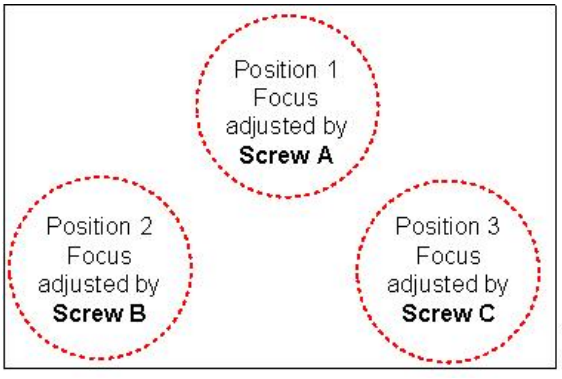
    - If yes, go to "Bore sight adjustment".

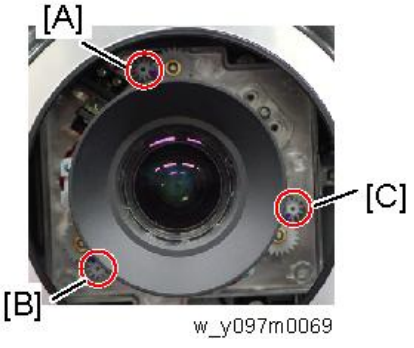
Bore sight adjustment

Perform the procedure below to make the three positions (positions 1, 2, and 3) on the screen match in focus.

1. **Remove the lens ring. (page 36 "Lens Ring, Projector Lens")**
2. **Project a "Full screen" image on the screen.**
3. **Use the focus "Up" or "Down" key to adjust the focus to make position 1 in focus.**
4. **When position 1 is in focus, check position 2. If position 2 is not in focus, use the "Up" or "Down" key to adjust the focus until it is in focus.**
5. **If pressing the "Up" key can focus position 2, adjust setscrew B counterclockwise. If pressing the "Down" key can focus position 2, adjust setscrew B clockwise.**
6. **Refocus position 1 and see if position 2 is also in focus. If not, repeat steps 3 to 6.**
7. **Ensure position 1 is in focus. Then use the "Up" or "Down" key to focus position 3.**
8. **If pressing the "Up" key can focus position 3, adjust setscrew C counterclockwise. If pressing the "Down" key can focus position 3, adjust setscrew C clockwise.**
9. **Refocus position 1 and see if position 3 is also in focus. If not, repeat steps 7 to 8.**
10. **Repeat Steps 3 to 9 until positions 1, 2 and 3 are in focus at the same time.**

11. **Check if the unbalance is within the specification.**
    - Max. gear teeth adjustment is 2 for a single adjustment.
    - The total gear teeth adjustment should be no more than 8.
    - If more than 8, screws A, B, and C should be recovered to the default tooth positions (see 'Checking the Default Gear Position' below) and re-adjusted.

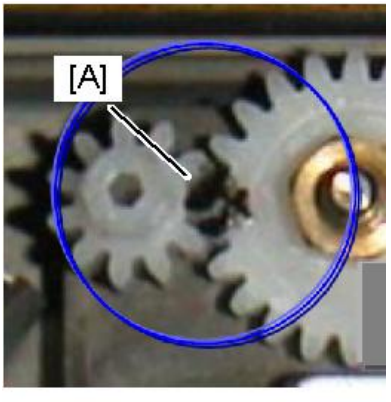




w_y097m0069

Checking the Default Gear Position

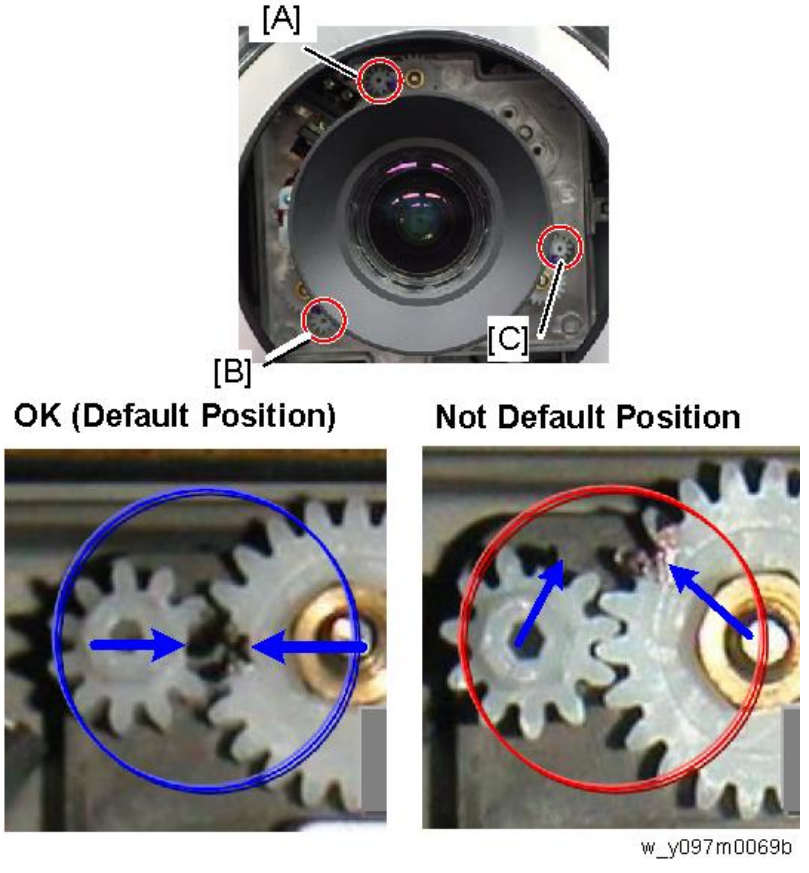
Before the projector shipment, a mark [A] will be made on the gear to show the best match position of each gear set.



y097m0069c

1. **Rotate the screws A, B, and C respectively counterclockwise until it stops.**

2. **Rotate the screws A, B, and C respectively clockwise to align the marks as shown below.**



Phosphor Wheel Index Adjustment

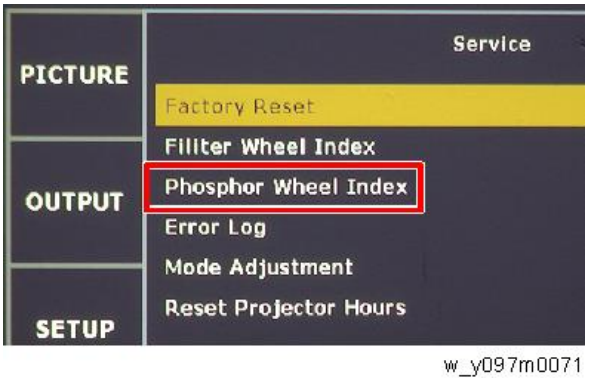
After replacing the main board or optical engine, the Phosphor Wheel Index Adjustment should be done.

Environment

- Test equipment: Video generator
- Test signal: 1920 x 1200@60Hz, 1280 x 800@60Hz
- Test pattern: 64 gray RGBW

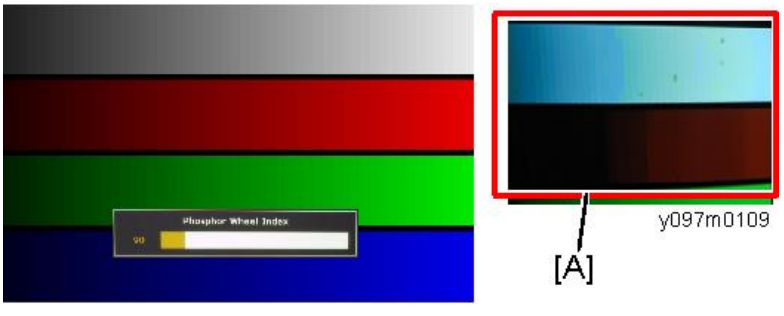
y097m0528

1. Get into Service mode. (page 78 "How to enter the Service Mode")
2. Select [Phosphor Wheel Index].



w_y097m0071

3. Using the [Left] or [Right] key, adjust the R/G/B and gray gradations until they are even.



y097m0109

[A]: Not good

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.
- Blue level should not have unusual color or heavy lines.

Filter Wheel Index Adjustment

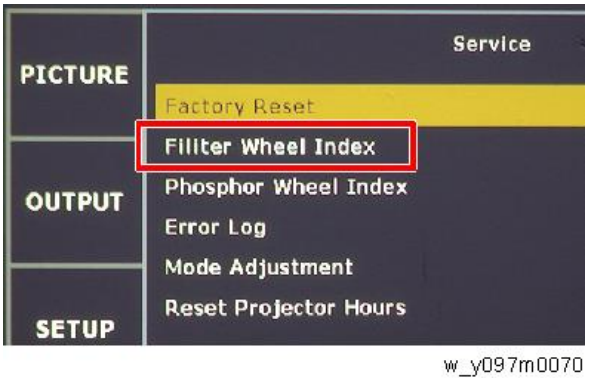
After replacing the main board, optical engine, or filter wheel, the Filter Wheel Index Adjustment should be done.

Environment

- Test equipment: Video generator
- Test signal 1920 x 1200@60Hz, 1280 x 800@60Hz
- Test Pattern: 256 gray RGBW

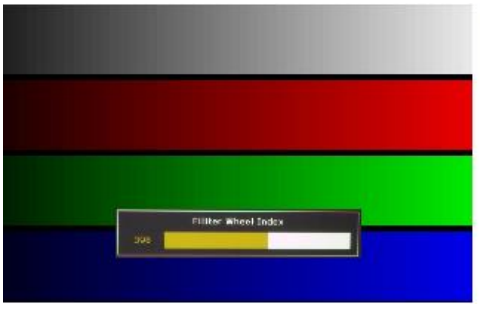
y097m0528

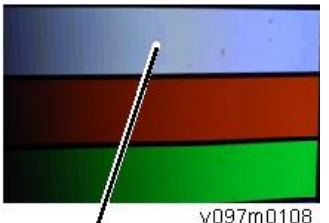
1. Get into the Service mode. **(page 78 "How to enter the Service Mode")**
2. Select [Filter Wheel Index].



w_y097m0070

3. Using the [Left] or [Right] key, adjust the gray gradations until they are even.





y097m0108

[A]: Not good

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.
- Gray level should not have unusual color or heavy lines.

Calibration

Lens Calibration

After replacing the main board, Lens Calibration must be done.

If you execute lens calibration, the lens is returned to the home position using a stepping motor.

Since alignment error occurs after the machine has been used for some time, lens calibration must be done to return the lens to the reference position and reset the internal positional information.

This can be done by users too.

1. **Put the projector on a horizontal surface.**
2. **Press the "Menu" key to enter the OSD menu.**
3. **Select "SETUP" -> "Lens Function" -> Lens Calibration.**

w_y097m0073

4. **Select "Yes", and then press "Enter".**

Light Sensor (ABP) Calibration

After replacing the main board, optical engine, or filter wheel, Light Sensor (ABP) Calibration must be done.

During light sensor (ABP) calibration, the color balance of the projected light is adjusted using a sensor in the optical engine.

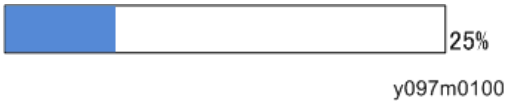
The laser light source separately creates RGB (and other) light beams. This function is used to adjust the light emission balance.

The change in the white balance due to deterioration over time varies between each color. Therefore, color balance adjustment is required periodically.

1. **Put the projector on a horizontal surface.**
2. **Get into service mode. (page 78 "How to enter the Service Mode")**
3. **Select "Light Sensor (ABP) Calibration".**

4. **Press the "Enter" key.**

   Light sensor (ABP) calibration starts. During the calibration, a progress bar appears. The calibration is complete once the progress bar has reached 100%.



y097m0100

ADC Calibration

After replacing the main boar, this calibration must be done.

VGA and Component signals require ADC calibration.

VGA RGB Calibration

Environment

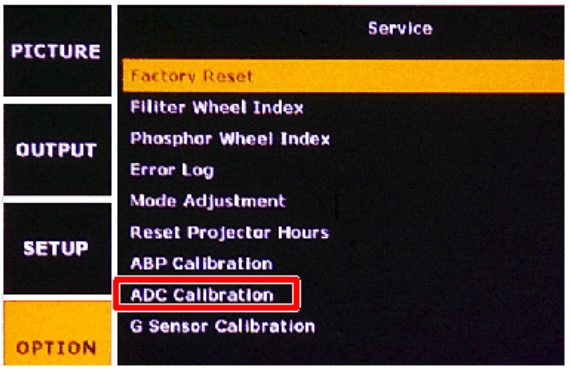
- Test equipment: Video generator
- Test signal: 800 x 600 @72Hz
- Test pattern: Grays 16

y097m0102

- Input the signal from the VGA IN port

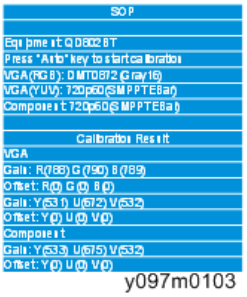
1. **Connect the video source and wait for the screen display.**
2. **Get into service mode. (page 78 "How to enter the Service Mode")**

3. Select "ADC Calibration", and then press the “Enter” key.



y097m0101

4. SOP will show up on screen.



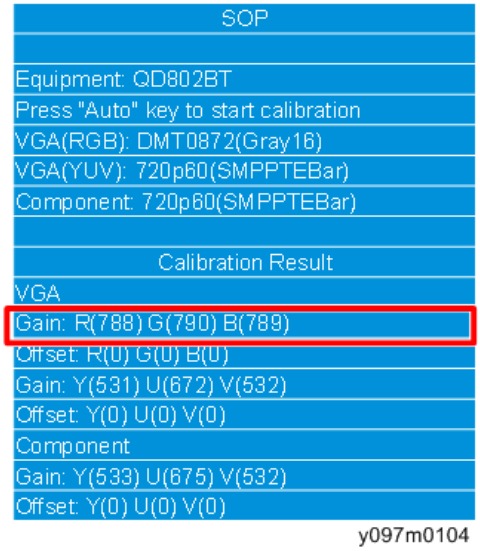
y097m0103

5. Press the “Auto” key, and the process will start.

   The screen will flash during calibration processing.

6. After the process is done, press the “Enter” key to refresh the SOP.

7. **Check the calibration result (red frame).**



y097m0104

8. **Compare the results with the default values.**

   Default Values: R:802, G:802, B:802

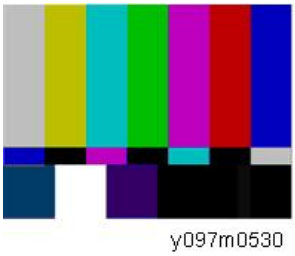
   If the result are the same as the default values, the calibration has failed.

   When the calibration failed, check the video source and redo the ADC calibration.

VGA YUV Calibration

Environment

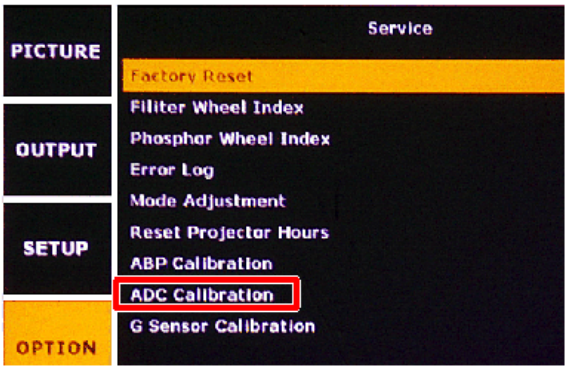
- Test equipment: Video generator
- Test signal: 720p 60Hz
- Test pattern: SMTE pattern


y097m0530

- Input the signal from the VGA IN port

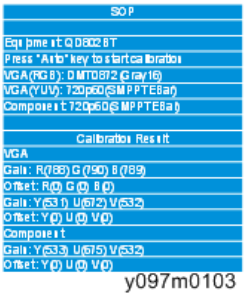
1. **Get into the service mode. (page 78 "How to enter the Service Mode")**

2. Select "ADC Calibration", then press the “Enter” key.



y097m0101

3. SOP will show up on screen.



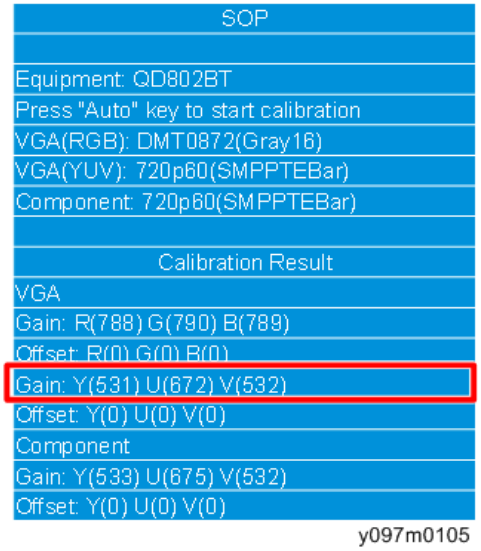
y097m0103

4. Press the “Auto” key, and the process will start.

   The screen will change color during calibration processing.

5. After the process is done, press the “Enter” key to refresh the SOP.

6. **Check the calibration result (red frame).**



y097m0105

7. **Compare the results with the default values.**

   Default Values: R:712, G:690, B:708

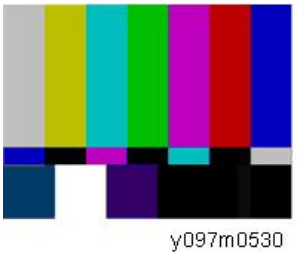
   If the results are the same as the default values, the calibration has failed.

   When the calibration failed, check the video source and redo the ADC calibration.

Component YUV Calibration

Environment

- Test equipment: Video generator
- Test signal: 720p 60Hz
- Test pattern: SMPTE BAR

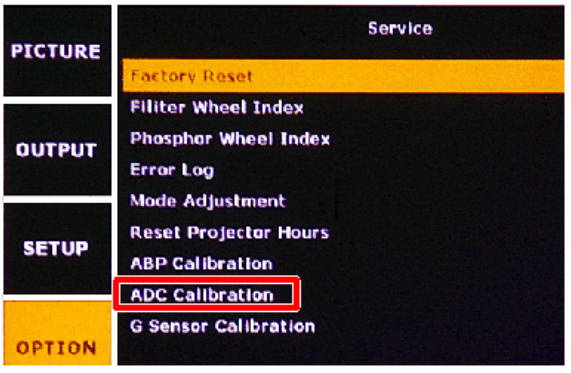


y097m0530

- Input the signal from the Component IN port

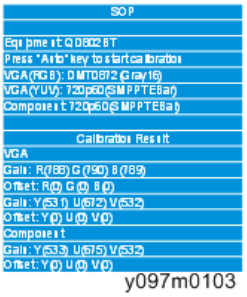
1. **Get into service mode. (page 78 "How to enter the Service Mode")**

2. **Select "ADC Calibration", then press the “Enter” key.**



y097m0101

3. **SOP will show up on screen.**



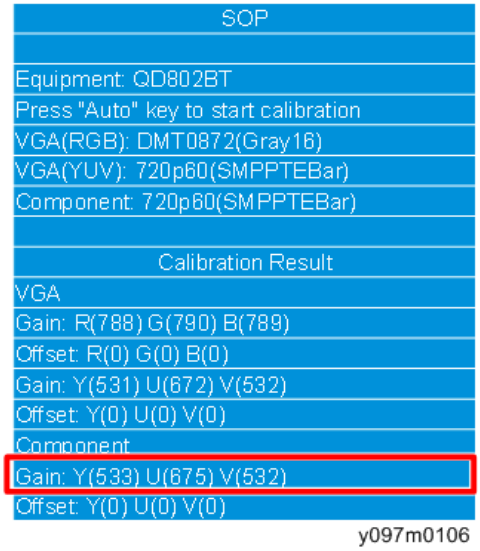
y097m0103

4. **Press the “Auto” key, and the process will start.**

   The screen will change color during calibration processing.

5. **After the process is done, press the “Enter” key to refresh the SOP.**

6. **Check the calibration result (red frame).**



y097m0106

7. **Compare the results with the default values.**

   Default Values: R:720, G:1022, B:708

   If the result are the same as the default values, the calibration has failed.

   When the calibration failed, check the video source and redo the ADC calibration.

G Sensor Calibration

After replacing the main board, this calibration must be done.

1. **Put the projector on a horizontal surface.**
2. **Get into service mode. (page 78 "How to enter the Service Mode")**
3. **Select "G Sensor Calibration", and then press the "Enter" key.**

y097m0110

When the calibration has finished, a message appears.

Re-write Serial Number

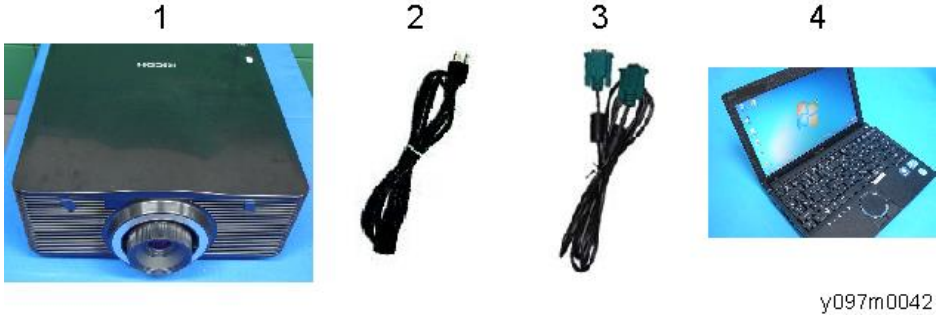
Equipment Needed

Software

Re-write Serial Number tool

Hardware

1. Projector
2. Power cord
3. Female to female RS232 cable (cross, 9pin - 9pin)
4. Laptop

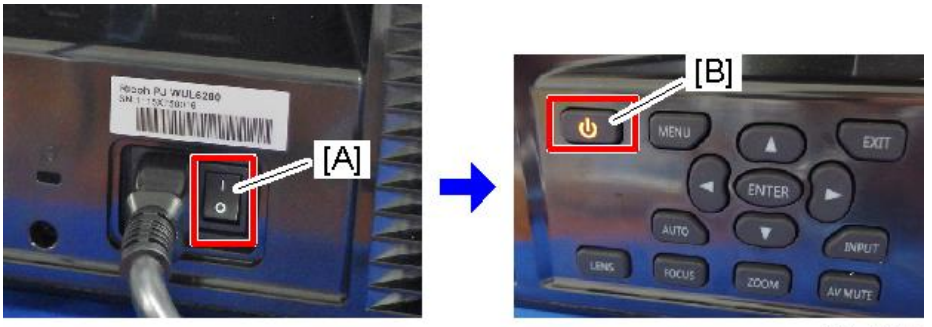


Re-write Serial Number

Connection and projector setting

1. **Connect the projector and PC with the RS232 cable.**

2. Turn ON the "Power Switch" [A], then press the "Power" key [B] to turn ON the projector.



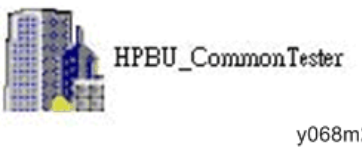
y097m0076

3. Press the “Menu” key to enter the OSD menu.
4. Select “SETUP” -> “Communications” -> “Serial Port Baud Rate” -> “115200”.

w_y097m0050

Re-write serial number

1. Double click the Re-write Serial Number tool file (XXXX Tester for re-write SN.exe).
2. Execute "HPBU_Common Tester".

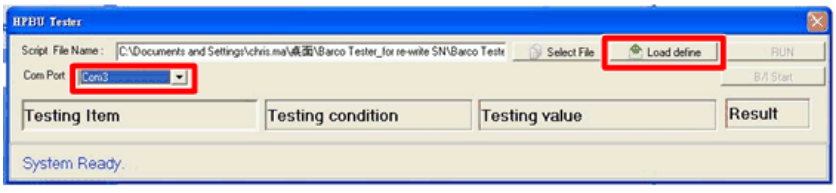


y068m2010

Note

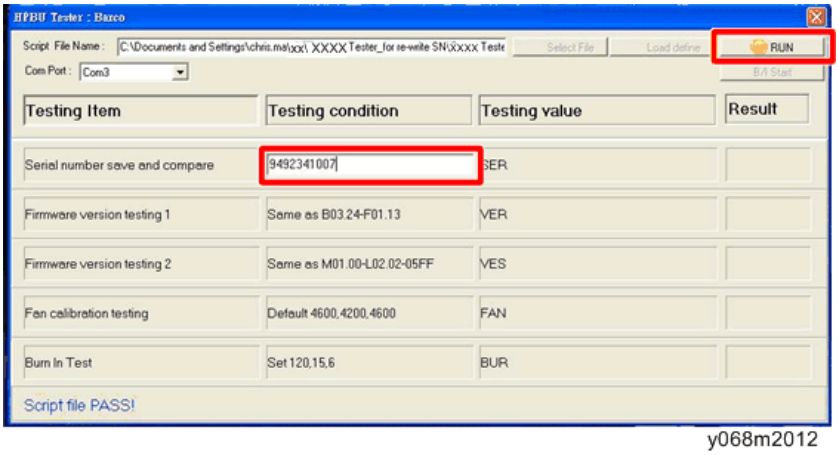
- Ensure that the projector baud rate is "115200".

3. **Choose the com port which you are using.**



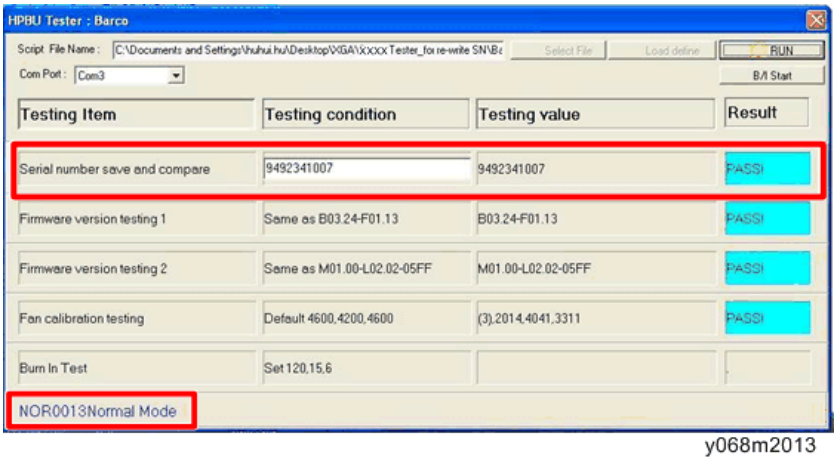
y068m2011

4. **Enter the serial number (for example "9492341007), and then Click "RUN" to re-write the Serial Number.**



y068m2012

The "Pass" and "Normal Mode" messages will be shown in the window.

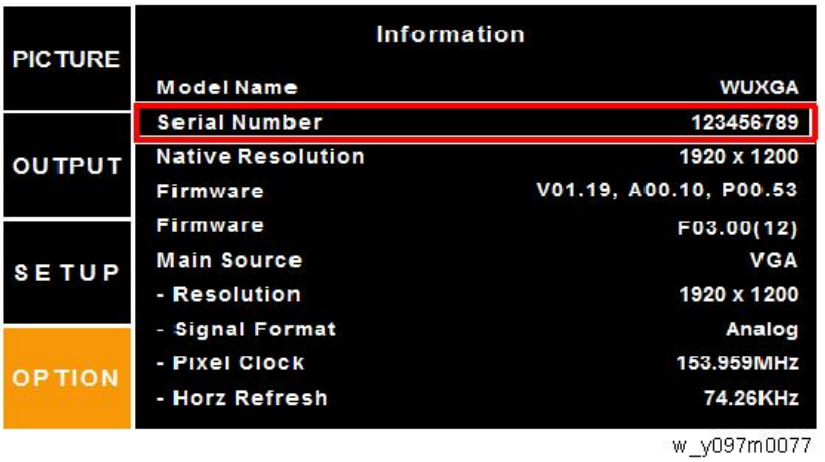


y068m2013

Check Serial Number (SN)

1. **Press the "Menu" key to enter the OSD menu.**

2. Select OPTION -> Information.
3. Check the serial number.



w_y097m0077

Factory Reset

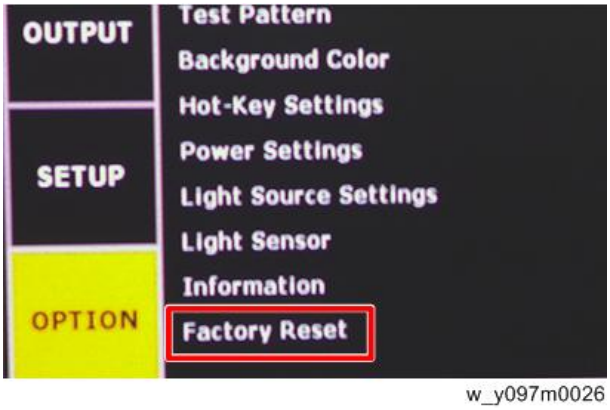
Factory Reset allows you to erase all OSD menu settings and restore the default setting (except the service mode and network settings).

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.

Factory Reset Procedure (1)

1. **Press the "Menu" key to enter the OSD menu.**
2. **Select "Option" -> "Factory Reset".**



w_y097m0026

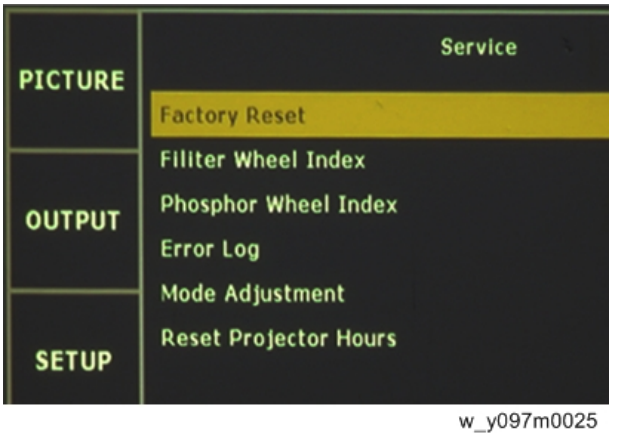
3. **Select "Yes", and then press the "Enter" key.**

w_y097m0078

Factory Reset Procedure (2)

1. **Get into service mode. (page 78 "How to enter the Service Mode")**

2. Select "Factory Reset".



w_y097m0025

3. Select “Yes”, and then press the “Enter” key.

w_y097m0078

5. Troubleshooting

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.

Problem	Solutions
No power	• Plug the power cord of the projector into the AC outlet. • See if the POWER indicator lights red. • Wait 10~20 seconds after the projector is turned off when turning the projector back on. The projector can be turned on after the POWER indicator turns red.
Image is out of focus.	• Adjust the focus of the projector. • Provide the proper distance between the projector and the projection screen. • Check the projection lens to see if it needs cleaning. • Moving the projector from a cool to a warm place may result in condensation on the projection lens. In this case, leave the projector off and wait until the condensation evaporates.
No image	• Check the connection between your computer or video equipment and the projector. • See if the input signal is correctly output from your computer. Some laptop computers may need to change the setting for monitor output when connecting to a projector. See your computer's instruction manual for the setting. • It takes about 20 seconds to display an image after turning on the projector. • See if the selected system is compatible with your computer or video equipment. • Select the correct input source once again through menu operation. • Make sure the temperature is not out of the specified Operating Temperature range of 41 °F to 104 °F (5 °C to 40°C).

Problem	Solutions
Image is reversed Left/ Right.	Check the installation orientation of the projector.
Image is reversed Top/ Bottom.	Check the input signal.
Some displays are not seen during the operation.	Check the input signal.
PIN code dialog box appears at start-up.	A PIN code lock is set. Input a PIN code (1234 or numbers you have set).
Remote Control does not work.	• Check the batteries. • Make sure there is no obstruction between the projector and the remote controller. • Make sure you are not too far from the projector when using the remote controller. Maximum operating range is 32.8′ (5m). • Make sure the ID code of the remote controller conforms with the projector. For details, see the User's manual.

LED Indicators

y097m0027

LED Type	LED Status	Projector State
LIGHT	Off	Laser diode is off
	Solid Orange	Laser diode lifetime is over.
	Solid Green	Laser diode is on and operating correctly
	Flashing Red	When the projector has lost over 60% of initial luminance
STATUS	Off	AC power is off (without AC plug in)
	Off	AC has been applied, and the projector is in standby mode NOTE: The Status LED is off, but the LED on the power key will indicate Standby Mode *1.
	Solid Green	The projector is powered up and operating normally
	Flashing Green	The projector is communicating
	Flashing Orange	The projector is in cool down mode or startup mode
	Flashing (alternating) Green/Orange	The projector is in the flash update state
	Solid Red	The temperature is too high
	Flashing Red	Fan failure

LED Type	LED Status	Projector State
AV MUTE	Solid Green	Light is on – an image is displayed
	Solid Orange	Light is on – the image is blank

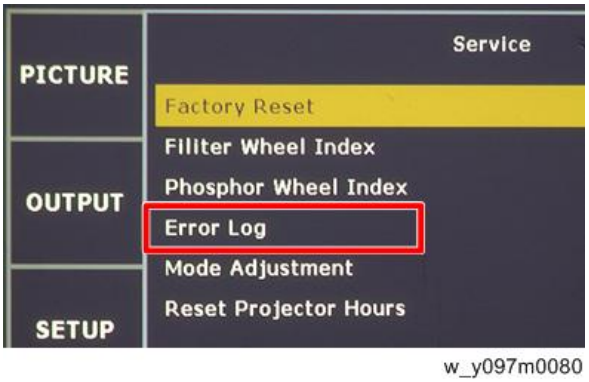
*1 Standby mode

y097m0028

Error Log Troubleshooting

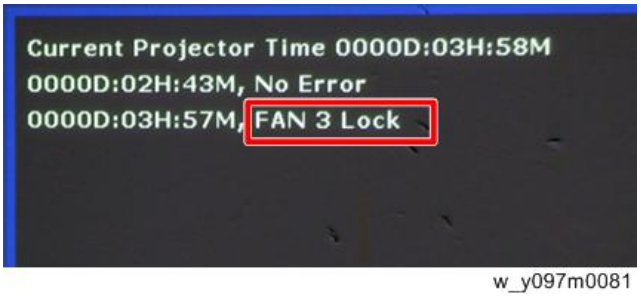
Checking the Error Log (Service Mode Menu)

1. Get into Service mode. **(page 78 "How to enter the Service Mode")**
2. Select [Error Log].



w_y097m0080

3. Check the error log information.



w_y097m0081

Error Codes/Messages and Actions

Code	Messages	Description	Actions
0	No Error	No Error recorded	None
1	Lamp Ignite Fail	Laser failed to ignite	Check laser banks, and replace Optical Engine + base unit if necessary
5	Format Board Power On Fail	Main board failed to power on and projector auto shutdown	Replace main board.
6	Color Wheel Unexpected Stop	Filter wheel unexpected stop and projector auto shutdown	Check filter wheel, and replace it if necessary.

Code	Messages	Description	Actions
7	Over Temperature	System over temperature and projector auto shutdown	Check intake vent
8	FAN 1 Lock	Fan 1 failure and projector auto shutdown	Check fan 1 and replace it if necessary.
9	FAN 2 Lock	Fan 2 failure and projector auto shutdown	Check fan 2 and replace it if necessary.
10	FAN 3 Lock	Fan 3 failure and projector auto shutdown	Check fan 3 and replace it if necessary.
11	FAN 4 Lock	Fan 4 failure and projector auto shutdown	Check fan 4 and replace it if necessary.
12	FAN 5 Lock	Fan 5 failure and projector auto shutdown	Check fan 5 and replace it if necessary.
26	LD lower than 60%	Filter wheel or Optical Engine is defective	Replace Filter wheel or Optical Engine + base unit
28	LD NTC (1) Over Temperature	Laser bank 1 over temperature and projector auto shutdown	Check fans or intake vent. Replace fans if necessary.
30	LD NTC (2) Over Temperature	Laser bank 2 over temperature and projector auto shutdown	Check fans or intake vent. Replace fans if necessary.
31	High Ambient Temperature	High ambient temperature and projector auto dim to protect laser	Check fans or intake vent. Replace fans if necessary.
32	Portrait mode shut down	Not supported portrait mode	Change the projector orientation.

Checking the Error Log (Using RS232)

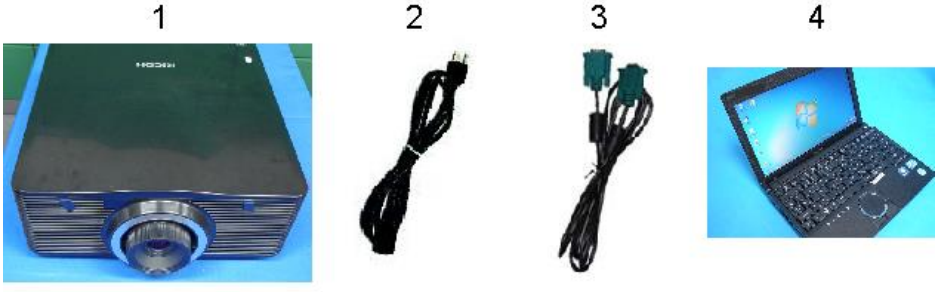
Equipment Needed

Software

- Terminal emulation software (such as Tera Term) which can support serial port connections.

Hardware

1. Projector
2. Power cord
3. Female-to-female RS232 cable (cross, 9pin - 9pin)
4. Laptop



y097m0042

Procedure

1. **Connect the projector and the PC with the RS232 cable.**

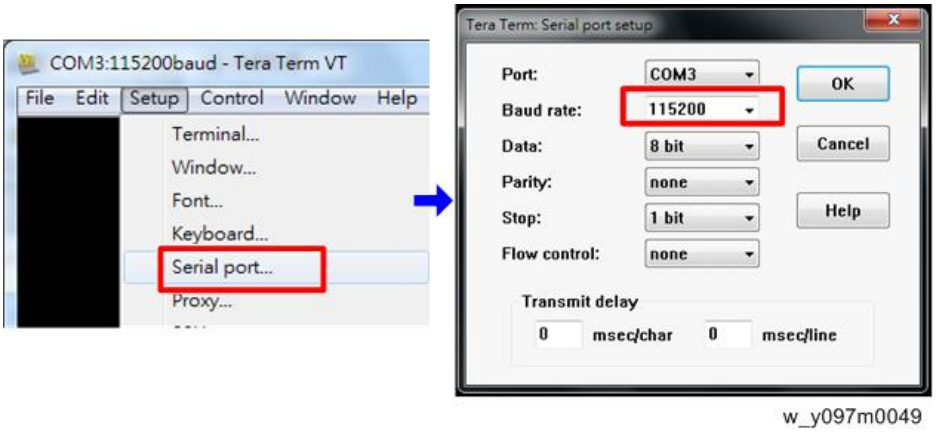
y097m0043

2. **Power on the projector.**
3. **Press the "Menu" key to enter the OSD menu.**

4. **Select "SETUP" -> "Communications" -> "Serial Port Baud Rate" -> "115200".**

w_y097m0050

5. **Start the terminal emulation software.**
6. **Set the baud rate to 115200 with the terminal emulation software.**



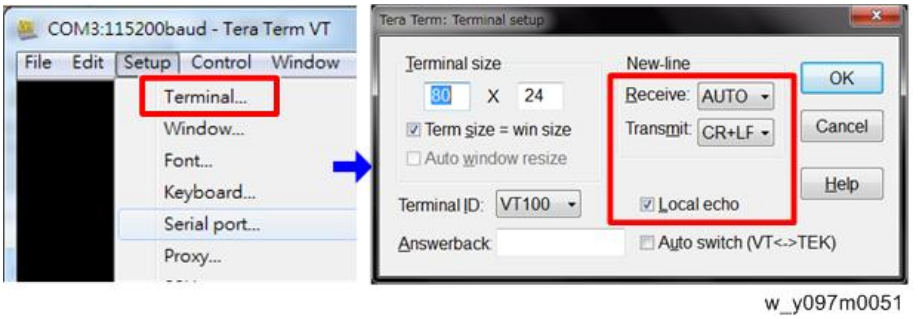
w_y097m0049

7. **Set the following terminal settings.**

   Receive: AUTO

   Transmit: CR+LF

   Local echo: Enable



w_y097m0051

8. **With the terminal emulation software, enter "[elog?]" to see the error log.**

9. **Check the error log information.**

   For descriptions of the error codes, see Checking the Error Log (Service Mode Menu). (page 109 "Checking the Error Log (Service Mode Menu)")

6. Test & Inspection

Test Equipment and Conditions

Test Equipment Needed

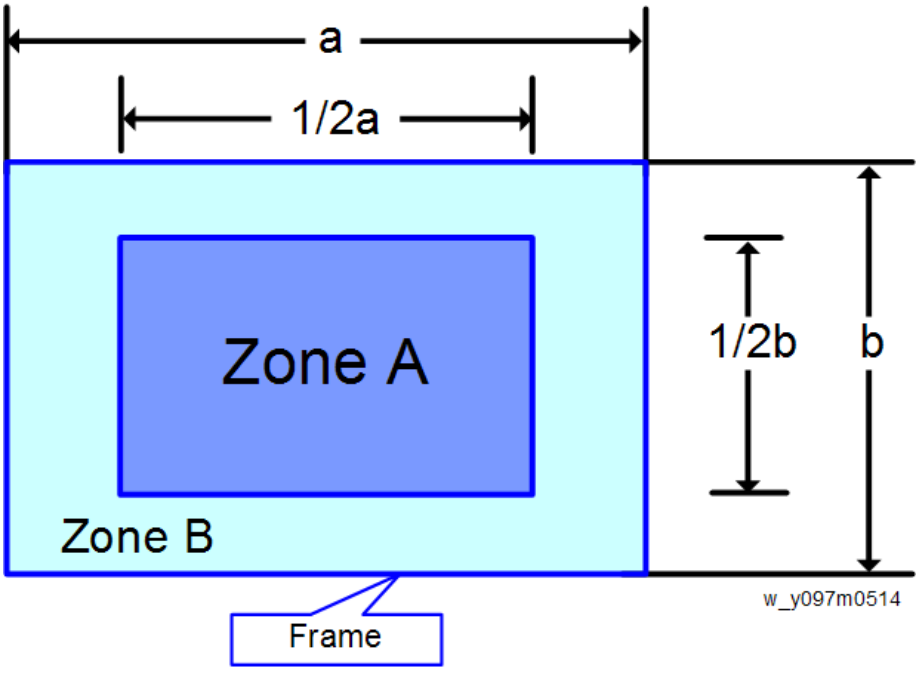
- PC
- DVD player with multi-system, equipped with "Component" and "HDMI".
- HDTV source (480P, 720P, 1080P)*

  * You can also use a computer with an HDMI port.

Recommended Test Condition

- Ambient brightness: Dark room less than 2 lux.
- Screen size: 60 inches diagonal.

Zone Definition



- Zone A: The blue area in the center of the image
- Zone B: The outside of the image

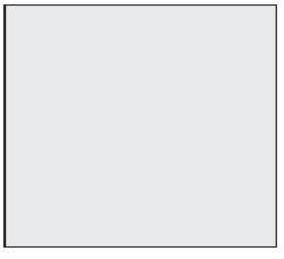
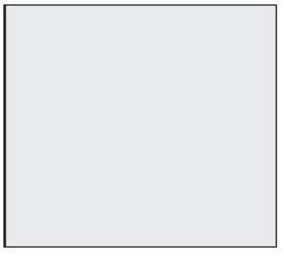
- Definition, Active area = Zone A + Zone B

Pixel Specifications and Criteria

A stands for “Zone A”.

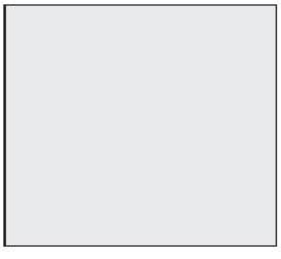
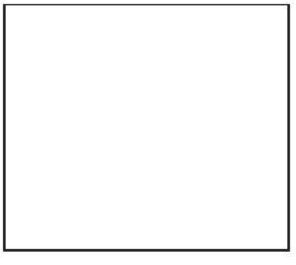
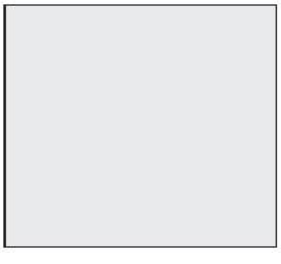
B stands for “Zone B”.

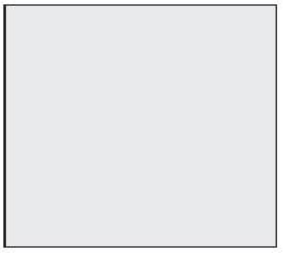
For WXGA

Order	Symptom	Pattern	Criteria
1	Bright pixels (dots)	Gray 10 	A+B=0
2	Dark pixels (dots)	Blue 60 	A=0 B≤7
3	Bright blemishes	Gray 10 	A=0 B≤4 (diameter≤1)
4	Dark blemishes	Blue 60	A=0 B≤4 (diameter≤1)

Order	Symptom	Pattern	Criteria
5	Bright dots in the frame	Gray 30	=0
6	Unstable pixels	Any pattern	A+B=0
7	Adjacent dark pixels	Any pattern	A+B=0

For WUXGA

Order	Symptom	Pattern	Criteria
1	Bright pixels (dots)	Gray 10 	A+B=0
2	Dark pixels (dots)	White 	A=0 B≤2
3	Bright blemishes	Gray 10 	A=0 B≤4 (diameter≤1)

Order	Symptom	Pattern	Criteria
4	Dark blemishes	Blue 60 	A=0 B≤4 (diameter≤1)
5	Bright dots in the frame	Gray 10 	≤ 1
6	Unstable pixels	Any pattern	A+B=0
7	Adjacent dark pixels	Any pattern	A+B=0

Test Inspection Procedure

Function Inspection

General

All OSD functions must be checked for functionality. When the OSD menu is displayed, there shall be no visible peaking, ringing, streaking, or smearing artifacts on the screen.

Factory Default

The factory settings (with appropriate centering, size, geometry distortion, etc.) must be displayed when “Factory Reset” is selected. (page 103 "Factory Reset")

Display Size

All preset modes must expand to full screen size using OSD Horizontal and Vertical Size controls.

Acoustics

High-pitched sound from the cooling fan and filter wheel is unacceptable.

Check points

Check item	Check point
Text & Pattern	Missing letters & pattern or blurry prints are unacceptable.
Exterior	Dirt, scratches, water ripples and uneven color are unacceptable.
Focus and Zoom	Focus and Zoom functions work well.
Logo	Missing logo, missing prints and blurred prints are unacceptable
Screw	All screws should be fixed and of the right type.
Adjustable foot	Working correctly
Plastic Parts	Plastic parts must not be broken or damaged.
Safety or warning label	All safety and warning labels should be visible, including all contents.
Connector	All interface connectors should be complete and working.

Network Test

Connection Test

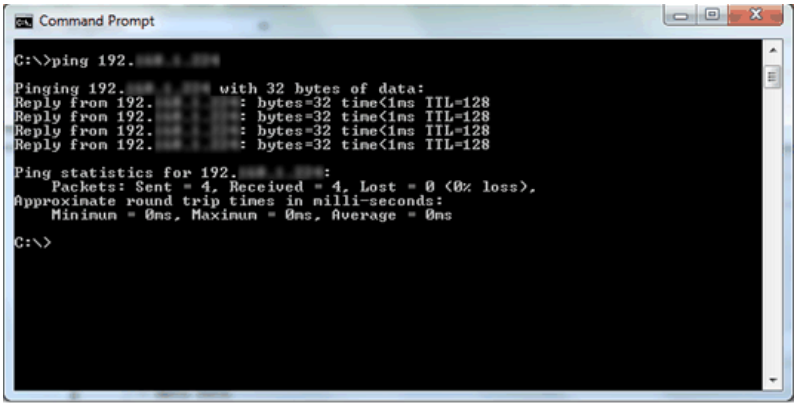
1. **Connect one end of the LAN cable to the LAN connector on the projector and the other end to the network.**
2. **Connect the computer to the network.**

   For how to connect the client PC to the projector, see page 121 "Connecting the Projector & Checking the LAN Setting", page 122 "PC Network Setting", and page 123 "Proxy Setting".
3. **Open the Windows Command Prompt.**
4. **Enter the ping command as follows, and then press the Enter key to execute it.**

   ping xxx.xxx.xxx.xxx

   The "xxx" fields represent the projector's IP address.

   Example: ping 192.168.0.100



w_y041m0090

5. **Check the communication result.**

If communication succeeds

The message "Reply from xxx.xxx.xxx.xxx: bytes=xxx time=xxms TTL=xxx" appears. (The "xxx" fields vary according to the operating environment.)

If communication fails

The message "Request timed out." or "Destination Host Unreachable." appears. If this happens, check the following:

- Check whether the projector's LAN cable is connected properly.

- Press the projector's Menu key and select "SETUP" and then "Communications" in the OSD menu to check whether the network settings have been configured correctly.

Controlling the Machine with a Web Browser

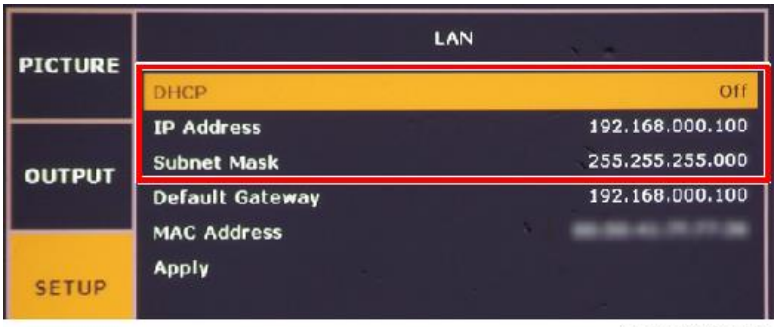
1. **Connect the PC and the Projector with a LAN cable.**
2. **Open a Web browser and visit "http:// 192.168.0.100".**
3. **The web control display appears.**

- [A] Power: Turn off the projector.
- [B] Source List: Choose the input signal.
- [C] Tools: Configure the network and password settings.
- [D] Info: Display the projector information.
- [E] ReSync: Re-sync the input signal.
- [F] Mute: Display or blank the video image.
- [G] Freeze/Contrast/Brightness/Color: You can adjust each of these settings.

Connecting the Projector & Checking the LAN Setting

1. **Plug the LAN cable into the projector.**
2. **Turn ON the projector, then press the "Menu" key to access the OSD menu.**
3. **Select SETUP -> Communications -> LAN.**

4. Make sure that “DHCP” is “Off”.

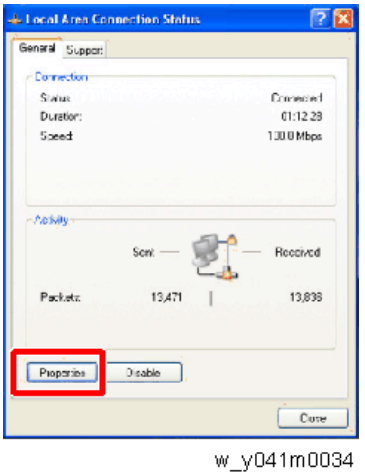


w_y097m0066

5. Write down the IP address and subnet mask: 192.168.0.100 and 255.255.255.0, in this example.

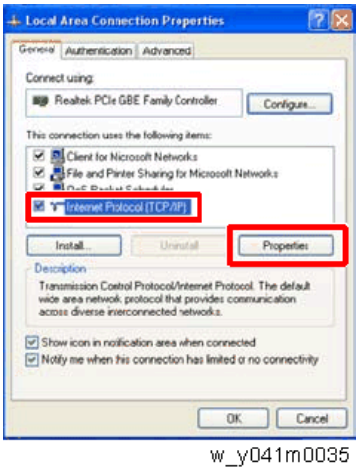
PC Network Setting

1. Double click “Local area connection”, then choose “Properties”.



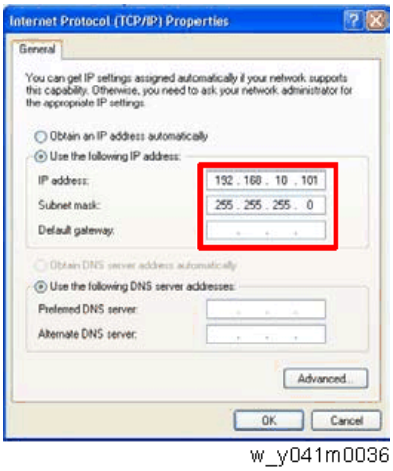
w_y041m0034

2. **Select “Internet protocol (TCP/IP)”, and then click “Properties”.**



w_y041m0035

3. **Modify the IP address to 192.168.0.101, and modify the subnet mask to 255.255.255.0.**



w_y041m0036

The subnet mask of the PC must be the same as the projector. The HOST ID or IP address (192.168.0.XXX) of the PC must be different from the projector IP address written down earlier.

4. **Click "OK".**
5. **Click "Close" to quit the setting screen.**

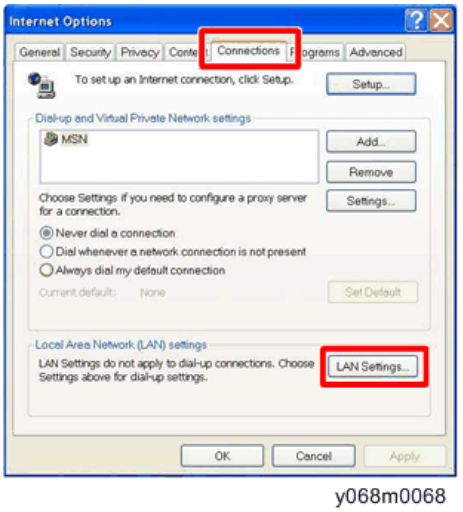
Proxy Setting

This section uses “Internet Explorer” as an example.

1. Execute “Internet Explorer”, and then choose “Tools -> Internet Options".

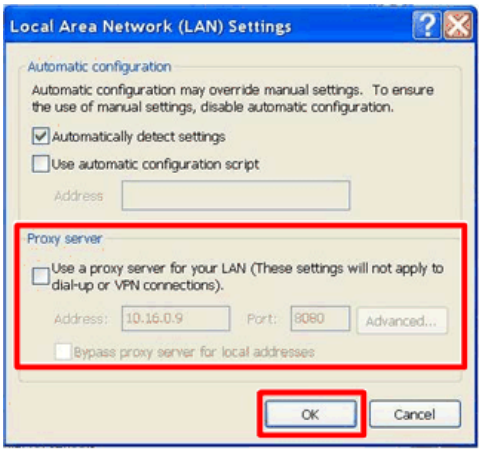
w_y041m0067

2. Select "Connections “, and then click “LAN Settings...".



y068m0068

3. Cancel selection of the proxy server as shown below, and then click "OK".



y068m0069

7. Firmware Update

PW392/PIC FW Update

PW392 is the main firmware for the projector. PIC is for Microcontroller firmware.

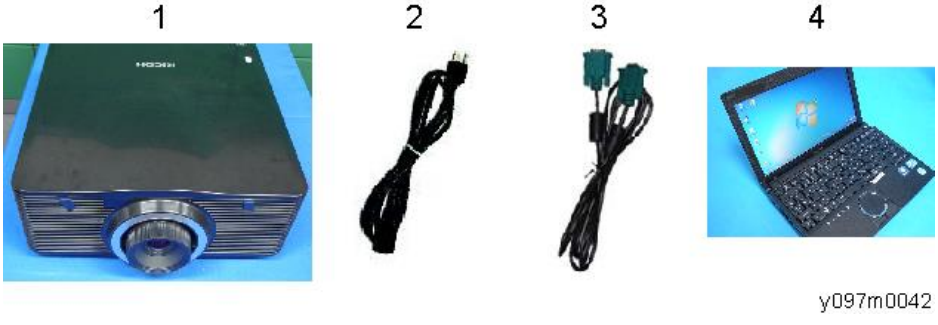
Equipment Needed

Software

1. Firmware (FW) update file
2. Terminal emulation software (such as Tera Term) which can support serial port connections.

Hardware

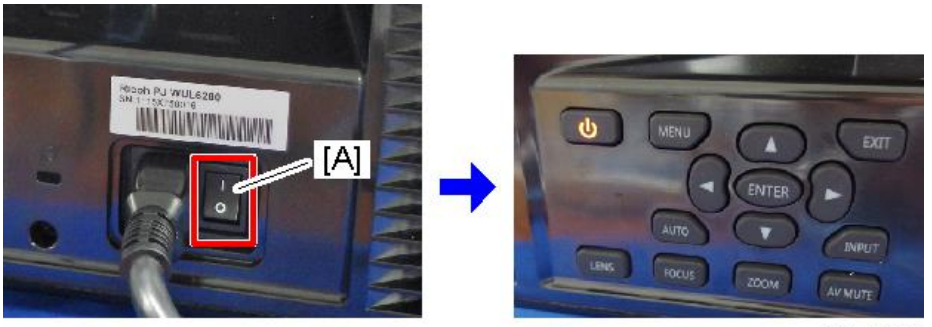
1. Projector
2. Power cord
3. Female to female RS232 cable (cross, 9pin - 9pin)
4. PC



Firmware Update Procedure

PIC is in included in PW392. So update PW392 firmware first, then update PIC firmware.

1. **Turn ON the "Power Switch" [A], and let the projector get into standby mode.**



y097m0044

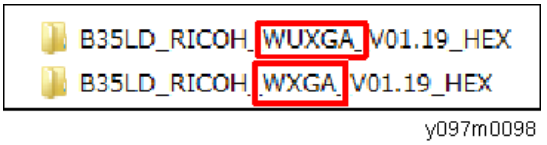
2. **Connect the projector and PC with the RS232 cable.**

y097m0043

3. **Unzip the firmware update file, and then open the folder corresponding to the projector to be updated.**

   WUL6280/LU6000: WUXGA

   WXL6280/LW6000: WXGA

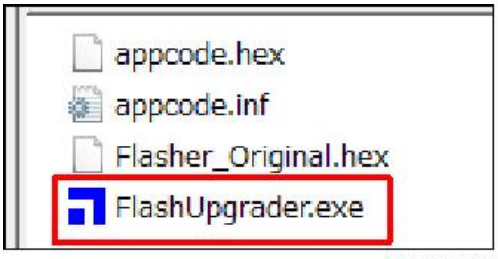


y097m0098

Note

- If you select the wrong folder and execute firmware update, the projector will fail to project images correctly. If this happens, repeat the procedure from Step 3.

4. **Double click the "FlashUpgrader.exe".**



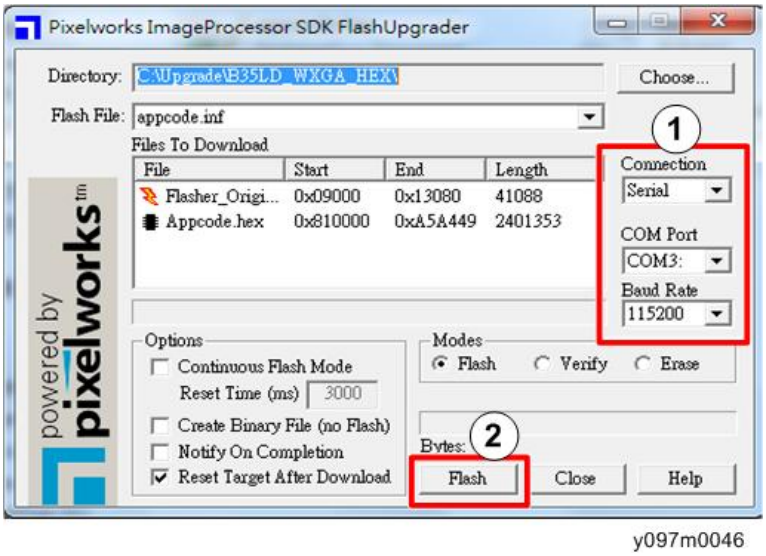
y097m0045

5. **Set as follows:**

   Connection: Serial

   COM port: According to the serial port setting of the PC

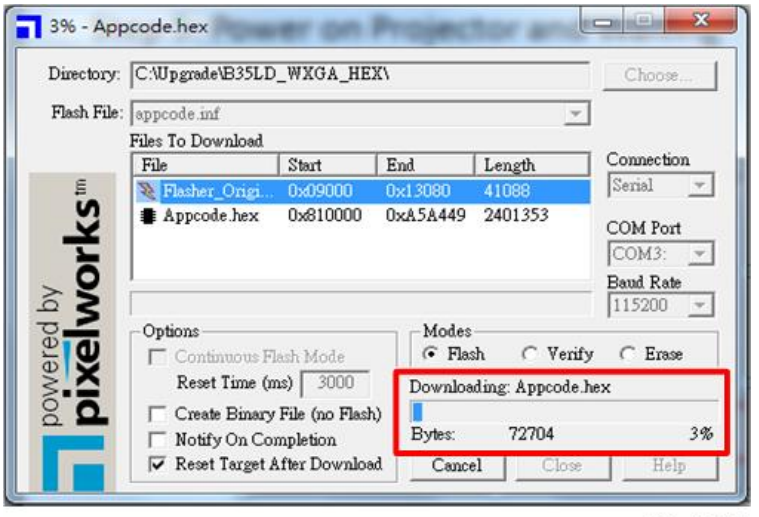
   Baud Rate: 115200



y097m0046

6. **Click "Flash".**
7. **Turn on the projector, and the PW392 firmware update runs automatically.**

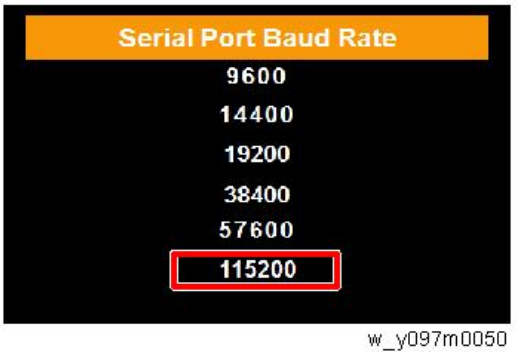
   Wait about 8 minutes.



y097m0047

8. **After updating has finished, the projector automatically reboots itself.**
9. **Select the language on the projector.**

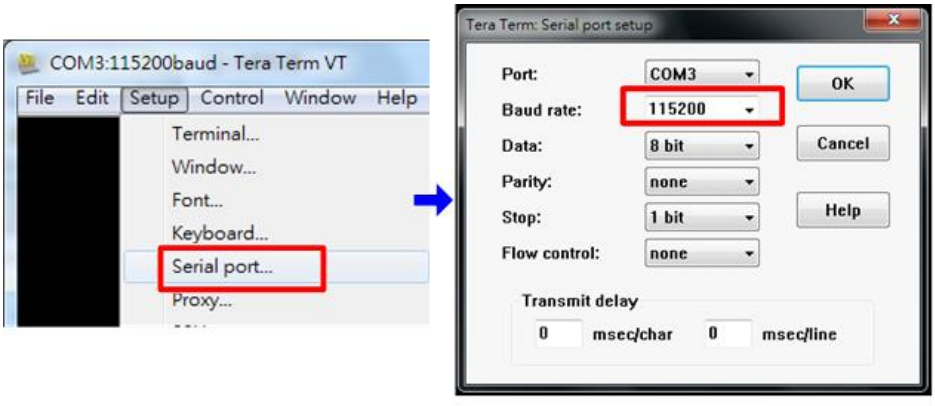
   The PW392 FW update is completed. Continue to the PIC FW update.
10. **Press the "Menu" key to enter the OSD menu.**
11. **Select "SETUP" -> "Communications" -> "Serial Port Baud Rate" -> "115200".**



w_y097m0050

12. **Start the terminal emulation software.**

13. Set the baud rate to 115200 with the terminal emulation software.



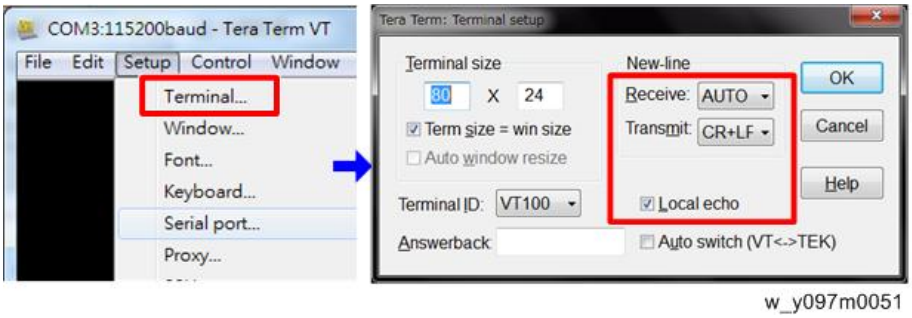
w_y097m0049

14. Set the following terminal settings.

Receive: AUTO

Transmit: CR+LF

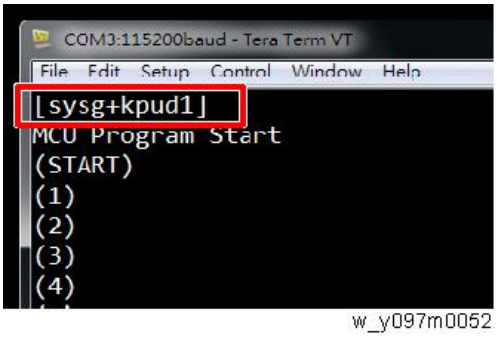
Local echo: Enable



w_y097m0051

15. With the terminal emulation software, enter "[sysg+kpud1]" to trigger the PIC FW updating process.

The projector powers off by itself, and then starts the updating process.



w_y097m0052

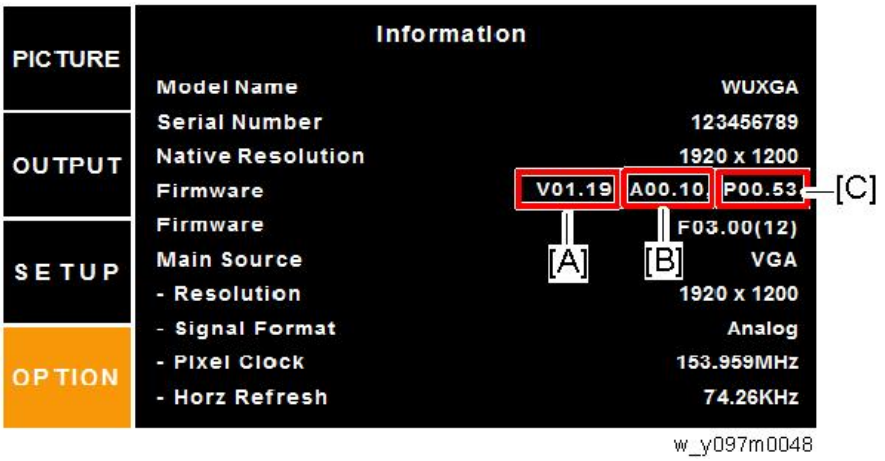
16. When the process is completed, "(END)" appears.

y097m0053

17. Power on the projector. The PIC FW update is completed.

Check the PW392 and PIC FW Version

1. Press the "Menu" key to enter the OSD menu.
2. Select "Option" -> "Information".
3. Check the PW392 and PIC firmware versions.



w_y097m0048

[A]: PW392 firmware version

[B]: PIC firmware version

[C]: LAN firmware version

LAN Firmware Update

PWC808 is the firmware of the LAN function.

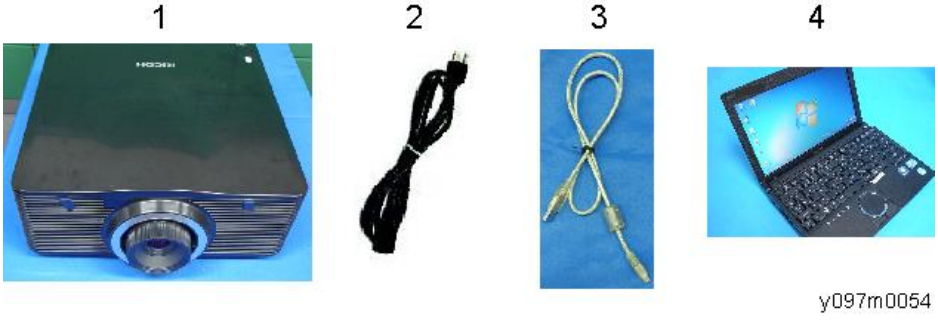
Equipment Needed

Software

- LAN firmware update file

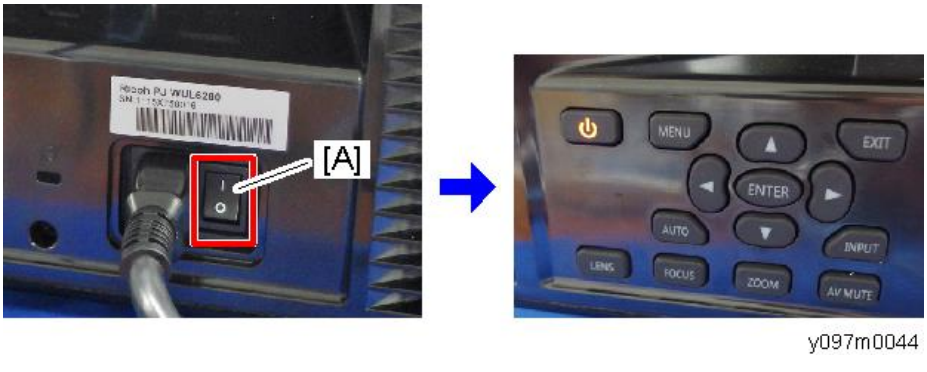
Hardware

1. Projector
2. Power cord
3. USB cable (Type A to Mini B)
4. Laptop



LAN FW Update Procedure

1. **Unzip the LAN FW update file.**
2. **Turn ON the "Power Switch" [A], and let the projector get into standby mode.**



3. **Press the [Up] and [Power] keys for 6 seconds.**

y097m0056

4. **Release the keys when you see that the LED is flashing.**

y097m0057

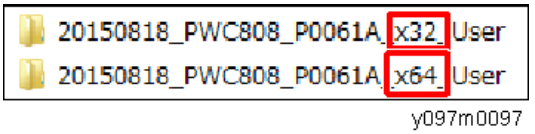
5. **Connect the USB cable between the PC and the projector**
6. **The USB driver will be installed on the PC.**

y097m0058

7. **Open the LAN firmware update program folder.**

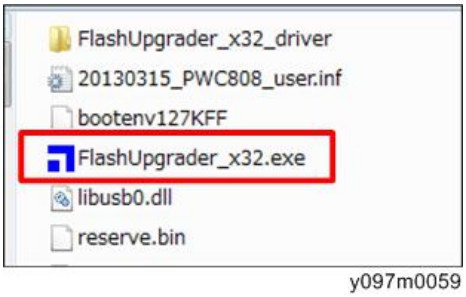
   Select “x32” if the computer’s operating system is 32-bit or “x64” if it is 64-bit.

   (The folder names may differ from those shown below.)



y097m0097

8. **Double click “FlashUpgrader_xXX.exe”.**



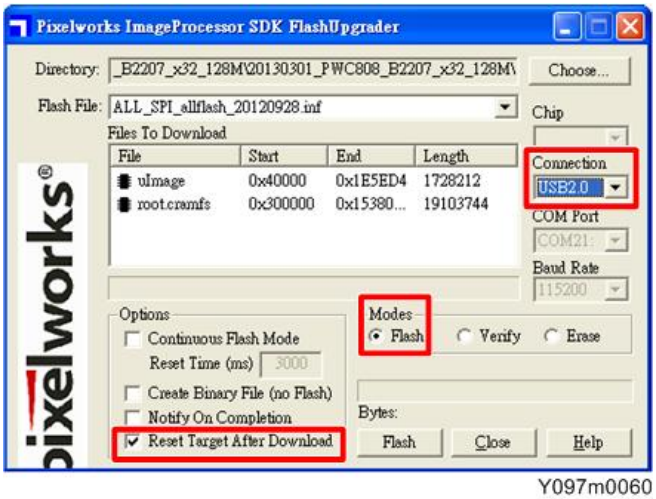
y097m0059

9. **Set as follows:**

Connection: USB2.0

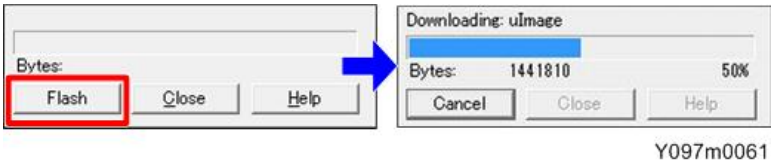
Modes: Flash

Options: Reset Target After Download



Y097m0060

10. **Click “Flash” to start updating.**



Y097m0061

11. **When the process is completed, “programming completed” appears.**

Y097m0062

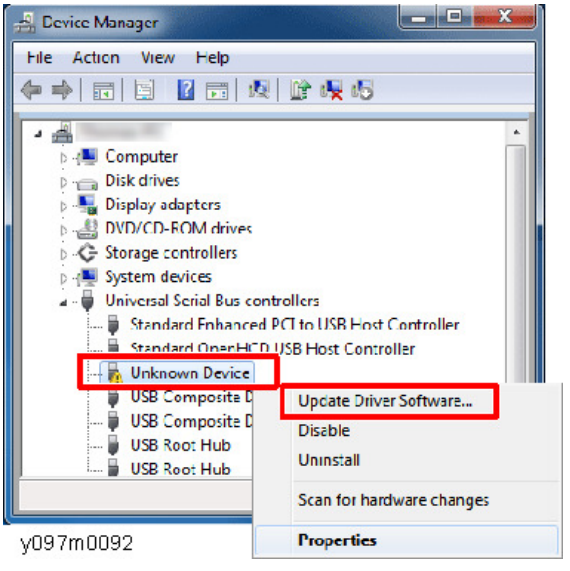
12. Press the "Power" key to turn on the projector, and the LAN FW update is completed.

If LAN firmware does not start

If updating does not start, the USB driver may not have been installed correctly.

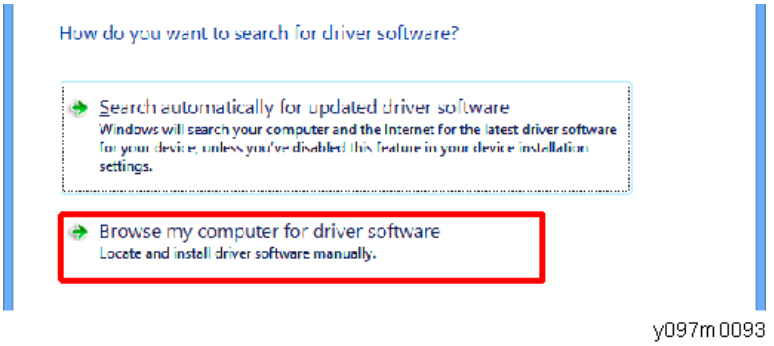
Follow the steps below to re-install the USB driver.

1. Open the computer's Device Manager screen.
2. Right click on "Unknown Device", then click "Update Driver Software...".



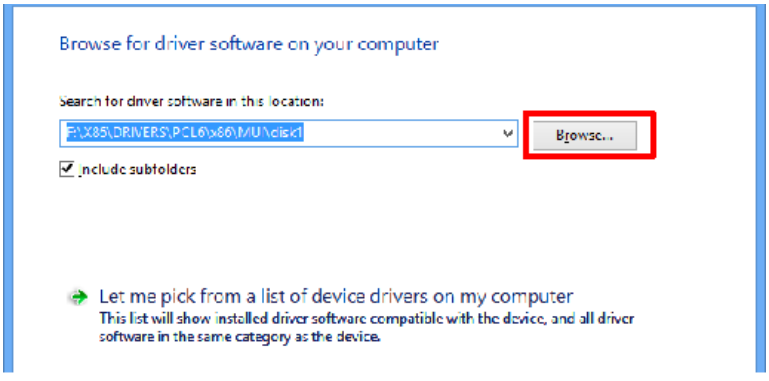
y097m0092

3. Click "Browse my computer for driver software".



y097m0093

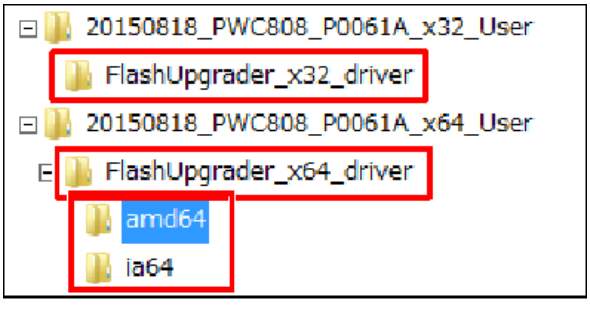
4. Click "Browse...".



y097m0094

5. Select "FlashUpgrader_xXX_driver" in the LAN FW update program folder, and then click [OK].

   For the driver, select "x32" if the computer's operating system is 32-bit or "x64" if it is 64-bit.



y097m0096

   There are two types of 64-bit driver: "amd64" and "ia64". Normally, select "amd64". (It also includes Intel x64.)

   Select "ia64" if the computer's processor is an Itanium.

6. Click [Next].

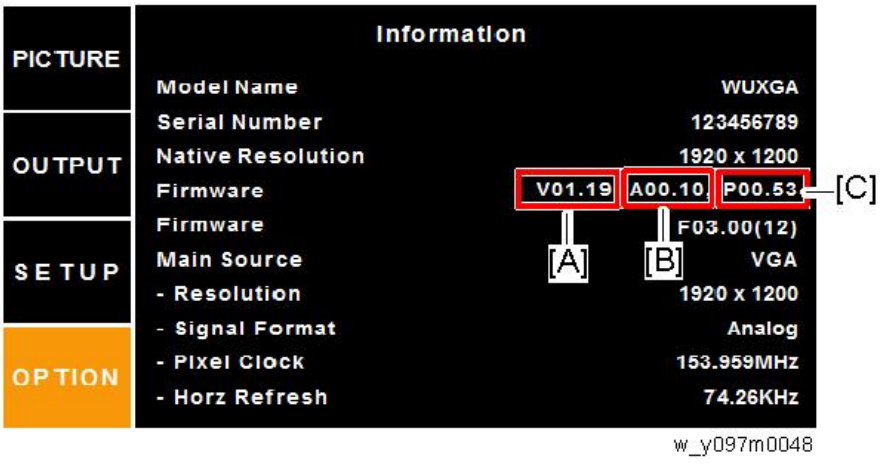
   The driver is installed.

7. After the driver installation is complete, repeat the LAN firmware update procedure from the beginning.

Check the LAN FW Version

1. **Press the "Menu" key to enter the OSD menu.**
2. **Select "Option" -> "Information".**

3. **Check the LAN firmware version.**



[A]: PW392 firmware version

[B]: PIC firmware version

[C]: LAN firmware version

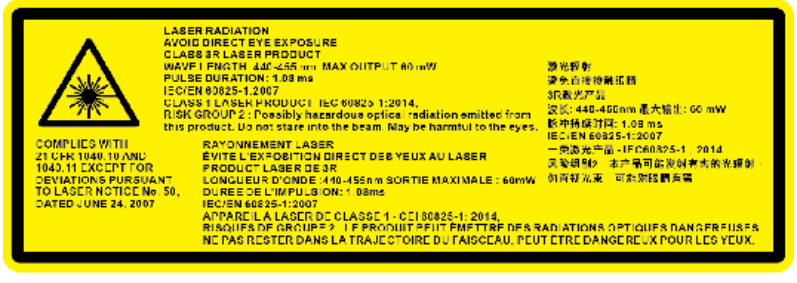
8. Detailed Description

Laser

Labelling

⚠CAUTION

- To disassemble the product, turn the power off and unplug it beforehand.



Y097m0012

- CLASS 3R LASER PRODUCT-AVOID DIRECT EYE EXPOSURE.
- The laser aperture is from the projection lens, DO NOT LOOK INTO THE LENS.

Y097m0013

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.

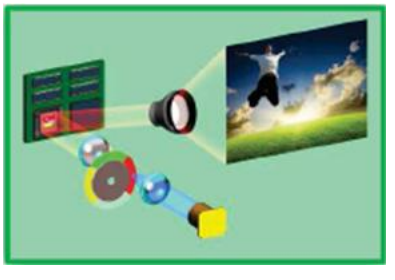
Disadvantages and Challenges

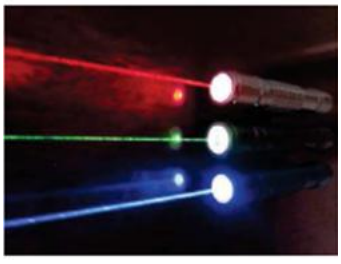
1. Laser light source is expensive.
2. Compliance with laws and regulations in different countries. Class definition of laser equipment. Compliance with Ricoh regulations.
3. Ensuring safety and education of service representatives

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		• Instant on • Long lifetime • Maintenance-free • Increased color gamut • Compact projector size
2. Laser / LED Hybrid		• Instant on • Long lifetime • Maintenance free • Brightsync and very high color rates • LED Etendue* will limit brightness 2000-3500L
3. Laser + Phosphor		• Instant on • Long lifetime • Scalability from low to high brightness • Higher efficiency • Smaller Etendue* • Maintenance-free

Light Source/ Light Collection Method	image	Characteristic
4. Pure Laser		• Instant on • Long lifetime • Maintenance free • Smallest Etendue* • Smaller optics • High laser costs

* 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.

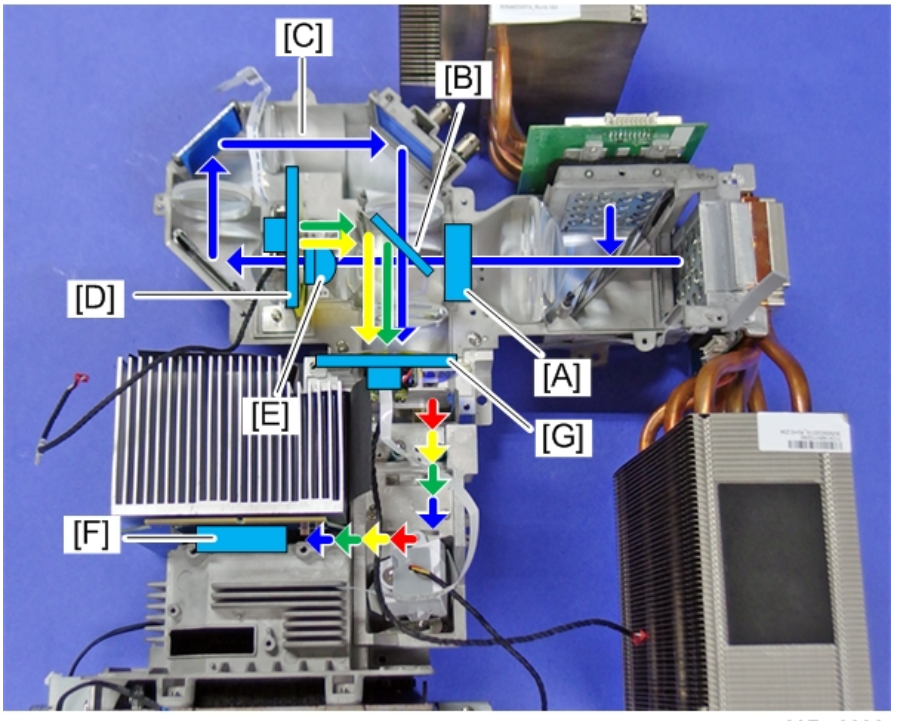
The phosphor wheel [D] creates green and yellow lights from the blue light. The green and yellow lights reflected by the blue dichroic mirror [B].

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.



y097m0090

A: Afocal lens

B: Dichroic mirror

C: Blue wraparound path

D: Phosphor wheel

E: Collimator

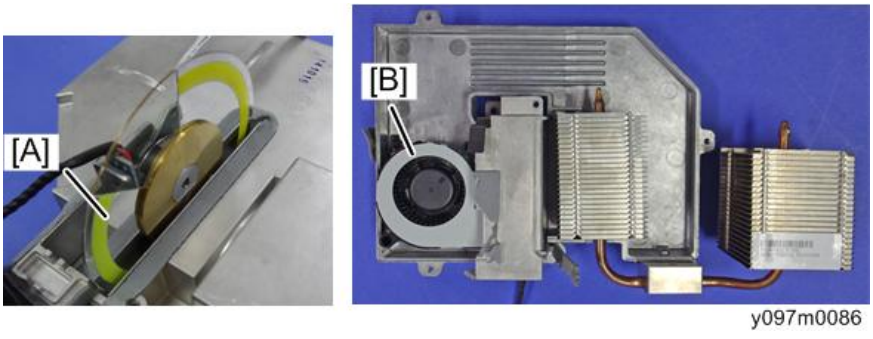
G: Filter wheel

F: DMD

Phosphor wheel

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

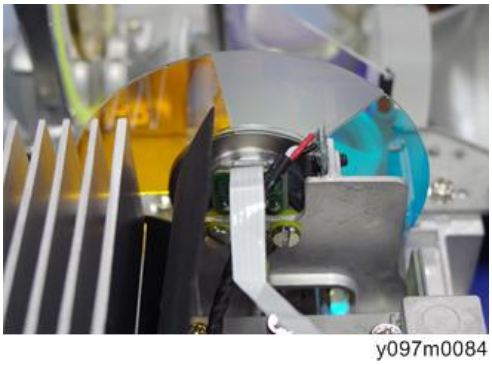
Since the phosphor wheel is prone to heat up, the device is equipped with a cooling fan [B] on its top.



y097m0086

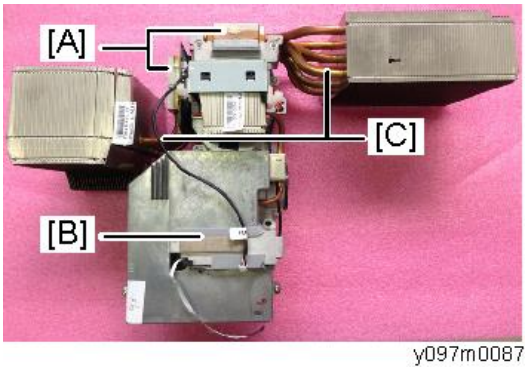
Filter wheel

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).


y097m0084

Combiner module

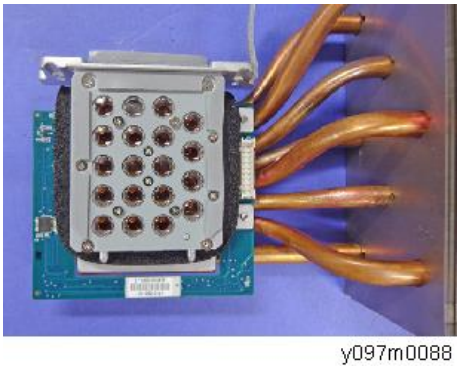
Combiner module is comprised of 2 laser banks [A], 1 phosphor wheel [B], and 2 heat pipes [C] for cooling the laser diodes.



y097m0087

Laser bank

Each laser bank is comprised of 19 laser diodes (5, 5, 5, and 4) and is cooled by the heat pipe.

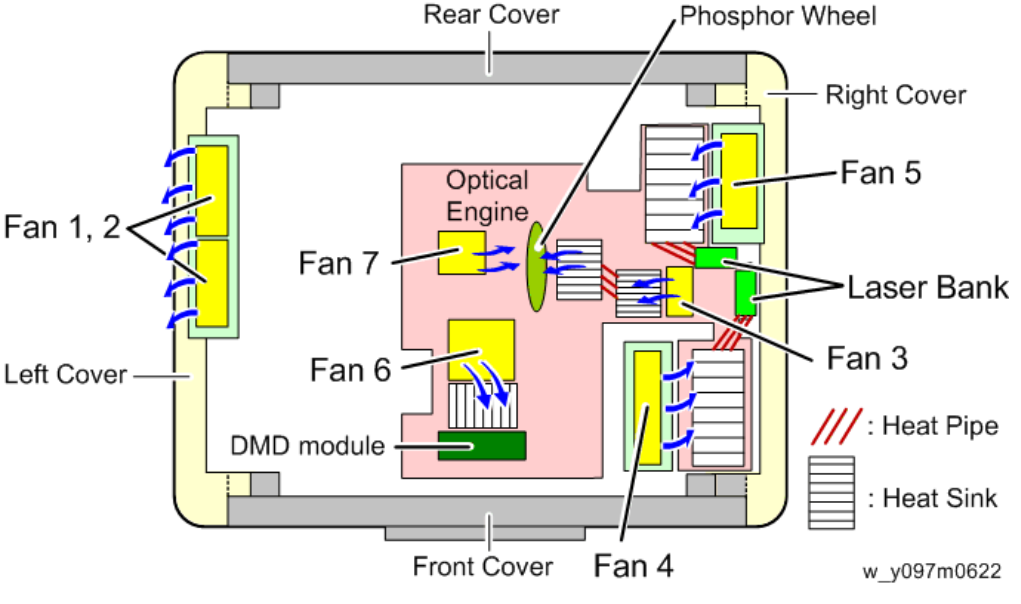


y097m0088

y097m0089

Cooling System

Location of fans



Fan 1, 2	Exhaust fan mounted on the left cover.
Fan 3	Intake fan mounted on the optical engine to cool the phosphor wheel.
Fan 4	Intake fan to cool the laser bank.
Fan 5	Intake fan mounted on the right cover to cool the laser bank.
Fan 6*	Intake fan mounted on the bottom shielding, under the optical engine to cool the DMD module.
Fan 7*	Blower Inside of the Optical Engine to cool the phosphor wheel.

* Fan 6 and Fan7 are located at the inside the Optical Engine + Base Unit where the service engineer cannot access. Replace the Optical Engine + Base Unit if Fan 6 and/or Fan 7 are required to replace.

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.

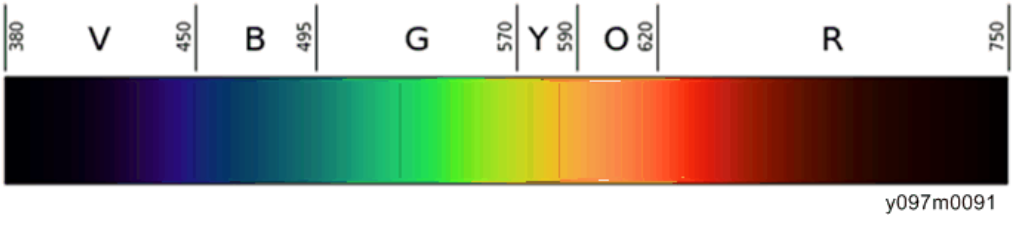
* What's coherence?
Coherence refers to the characteristic of waves, indicating the degree of interference (clarity of the interference fringes). Natural light and lamp light have diverse light wavelength and direction of radiation. Thus, they have low coherence.

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