

YOAS/YOAT/YOAV/YOAY/ YOAZ/YOBO/YOBC Service Training

Mizar-PJ2



What Models are there in the Series?

- Mizar-PJ2 cw (Y0AT / Y0AZ / Y0BC): PJ WX5461 / PJ KW5700 / KW5708
 - 4100 lumens, WXGA resolution
- Mizar-PJ2 cx (Y0AS / Y0AY): PJ X5461 / PJ X5300
 - 4000 lumens, XGA resolution
- Mizar-PJ2 HD (Y0AV / Y0B0): PJ HD5451 / PJ HD5900
 - 3800 lumens, 1080P resolution

• Described in red are China only models.

□ It is upgraded model from Mizar-PJ1

Main Specifications

• Upgrade point

	Mizar – PJ 2		ar – PJ 2	Mizar – PJ1	
	cw	СХ	HD	CW/CX/HD	
СНІР	DLP (D	DP4421)	DLP (DDP4422)	DLP (DDP4421/4422)	
Brightness	4100lm	4000lm	3800lm	4100/4000/3500lm	
Resolution	WXGA	XGA	1080P	XGA/WXGA/1080P	
Contrast		Dynamic eco 10000:1		Dynamic eco 10000:1	
Weight		3.0kg		3.0kg	
Lamp life	3000H/4000H(eco)		4000H(eco)	3000H/4000H(eco)	
Keystone	Vertical & horizontal		& horizontal	vertical	
Zoom	1.36×		36×	1.1x/1.2x	
Lens shift		-99 9	%~ 116%	_	
4 point			\bigcirc	_	
Audio			10W	10W	
Wireless LAN	_		_		
LAN	0		0	0	
HDMI	2 por	ts (only H[OMI2 support MHL)	1 port	
Crestron			0	—	
АМХ			0	—	

Features

- □ This product can be installed by users, except when mounted on a ceiling.
- □ This product is designed for user maintenance. Regular on-site maintenance is not needed.
- There is no display panel, but LEDs show the symptoms for troubleshooting (blinking/lit, number of times the LEDs blink, etc).
- □ A service mode is available.

Low Energy Consumption

- 3,000 hour lamp life in normal mode and 4,000 hour in Eco mode
- □ 0.5W power consumption in standby mode

Consumables and Options

□ Replacement lamp (Y223) *common with Mizar-PJ1

- 260W mercury lamp
- Life: 3,000 hours (normal mode), 4,000 hours (Eco mode)
 - » There may be a 50% decrease in brightness at the end of the lamp's life.

3D glasses (Y107)

 Will also be usable with other DLP-type projector models to be released in the near future.

Reliability Information

□ Average monthly projection time: 58.3 hrs/month

• 2.65 hrs/day x 22 working days/month

Failure Rate

- 1st year: 0.0024 cases/unit/month
- 2nd year: 0.0029 cases/unit/month
- 3rd year: 0.0036 cases/unit/month
- The failure rate of a projector increases with its total power-up time. This is due in part to the failure characteristics of optical engines in projectors.

Lamp Life

- Normal Mode: 3,000 hrs
- Eco Mode: 4,000 hrs

Lamp Near-end/End Alerts

□ There is no near-end alert.

- The lamp end alert occurs when the machine calculates that the life time has expired.
- End alert will appear 30 hours (in Normal mode) before suggested replacement of lamp.
- If the user switches between modes, the machine calculates when to display the alert based on how long the lamp was used in each mode.

Disposal of Broken Lamps

- Projector lamps normally contain mercury vapour.
- These lamps can rupture due to impact or being used longer than their life expectancy.
 - The time that the breakage will occur differs widely for each lamp and its circumstances of use.
- □ These lamps must be disposed of in accordance with local environmental regulations.

External View



- 1. Control panel
- 2. Speaker
- Ventilation (inlet)
- Filter
- 5. Connection ports
- 6. Remote receiver
- 7. Lens cap
- 8. Focus ring

- 9. Zoom lever
- 10. Adjustable feet
- Anti-theft lock hole (Kensington[™] lock)
- 12. Lens Shift
- 13. Lens
- 14. Ventilation (outlet)

Connection Ports



- 1. S-Video In terminal
- 2. Monitor Out terminal
- 3. Computer In terminal
- 4. HDMI 1/MHL terminal
- 5. Service terminal
- 6. AC In socket
- 7. HDMI 2 terminal
- 8. PC-Control terminal
- 9. Audio1 In terminal
- 10. LAN terminal
- 11. Audio Out terminal
- 12. Audio2 In terminal
- 13. Video In terminal



 The interface is subject to model's specifications.

 Compatible with MHL version 2.2, the charging current 5V@0.9A.

Operation Panel



1	Four Directional Select Keys	Use \blacktriangle , \bigtriangledown , \checkmark , \checkmark , or \triangleright to select items or make adjustments to your selection.
2	AV Mute	Momentarily turn off/on the audio and video.
3	Power	Refer to the "Power On/Off the Projector" section. (pages 30~31)
4	Temp indicator	Indicate the inside of the projector's temperature status.
5	Power indicator	Indicate the projector's power status.
6	Lamp indicator	Indicate the projector's lamp status.
7	Menu	Press "Menu" to launch the on screen display (OSD), or go back to the previous menu. (See page 39)
8	Enter	Select or confirm settings.

Connection Ports



- 1. S-Video IN
- 2. Computer IN
- 3. HDMI 2
- 4. HDMI 1
- 5. Service port
- 6. PC Control (Dsub 9 pin)
- 7. LAN
- 8. Audio Out
- 9. Audio IN
- 10. Video IN

Optical Components



- □ The DMD chip is the central part of this type of projector.
- □ A DMD chip consists of many small pixel-sized mirrors laid out on a semiconductor chip. Light shone on the DMD chip is reflected by all these tiny mirrors. (For a chip with 1024 x 768 resolution, there are 786,432 small mirrors.)
- □ Light is shone onto the chip through a fast-spinning color wheel (CW in the diagram) that has a red sector, a green sector, and a blue sector.
- □ This light is reflected off the chip and out through a lens onto a screen.

DMD Chip

- R, G, and B signals from the image generating device are sent to the DMD chip, and timed so that the red signal arrives at the same time that the red part of the wheel is in the beam path, and similarly for the green and blue signals.
- The DMD chip generates the R, G, and B images by re-positioning the micromirrors using micromachined hinges to make different pixelated images for each colour (meaning that each micromirror has an ON and an OFF position).
- □ For SVGA resolution, the mirrors are 16-micrometer squares, with a gap of about 0.8 micrometers between each mirror.



Boards

- Main board (MB): Power/signal control and processing
- DMD board (DMD BD): Image signal processing and DMD control
- LVPS (DC-DC): Power supply, passes signals between boards
 - LVPS means Low Voltage Power Supply
- □ Lamp driver (Ballast): Starts the lamp
 - When the lamp is being lit, the voltage is over 10,000V.



Service Training

Basic Points about Service

Slide 17

Swap and Repair

□ This product is intended for 'swap-and-repair'.

If the projector needs repairs, it is taken away from the customer site and a temporary replacement is provided to the customer.

Antistatic Clothing

To protect the components from damage, wear anti-static clothing when you disassemble the machine.

Parts Replacement Hierarchy

This flow chart describes the order in which the parts need to be removed for replacements/ maintenance from the top.

 The higher the level, the lesser the parts, and vice versa.

Entering Service Mode

□ To enter the service mode, press "Power" → "Left" → "Left" → "Menu".

- Note: You can use the remote controller for this.
- For the list of functions in the service mode, see 'System Maintenance (Test & Inspection) - Service Mode - Service Mode Settings' in the service manual.

Status	POV	VER cator	LAMP indicator	TEMP indicator
	(Blue)	(Red)	(Red)	(Red)
Normal Operation				
Standby	Ø	桊	Ø	Ø
Normal (Power ON)	*	Ø	Ø	Ø
Powering up	Flashing (0.5 sec)	Ø	Ø	Ø
Cooling	Ø	Flashing (0.5 sec)	Ø	Ø
Programming	∦	桊	崇	豢
Warning	2.5			
Lamp failed	∦	Ø	誉	Ø
Over Temperature	*	Ø	Ø	豢
Fan Lock	缣	Ø	Ø	Flashing (0.5 sec)

Note

Steady light => ∰ No light => ∅

Parts Replacement

□ After replacing parts, some adjustments may be needed. See the table below.

- This table and the procedures are in the following section of the service manual: Replacement and Adjustment - Electrical Adjustment -Adjustment Points vs Part Replaced
- Whenever you replace a component, check this table to see if you have to do any of these procedures. The text in the Replacement and Adjustments procedures does not always refer to this table.

	Change parts				Software
Action after repair	Optical engine/ Main board assembly	Lamp module	Blower fan	Color wheel	After firmware update
Firmware update	V				V
ADC calibration	V				V
Color wheel index	V			V	
OSD reset		V			V
Re-write lamp usage hours	V				
Fan calibration	V		V		V

Replacing the Lamp

□ To replace the lamp, unplug the power cord and then wait for 60 minutes.

Replacing the Main Board

- The main board contains a record of the lamp usage hours.
- If you have to change the main board, make a note of the lamp hours before you remove the board.
- Then use 'Rewrite Lamp Hours' after you install the new board, to store this number in the new board.

Optics Engines

□ These are not the same for each model.

- The lenses are different, for a start.
- Make sure that you have the correct assembly for the model that you are working on.
- □ The optics engine contains the DMD board, DMD chip, lens, and rod.
- □ These cannot be replaced as individual parts.

Replacing the Color Wheel

Avoid touching the glass parts of the color wheel.

Color Wheel Index Adjustment

- **Do this after replacing the color wheel.**
- □ Also, do this adjustment if color appears abnormal after changing the main board.

Rod Adjustment

Adjust if there are yellowish or bluish parts in the image.

OSD Reset

- Select the 3rd button from the top in the main menu
- Then select Reset in the sub menu.
- This returns all adjustments and settings to the factory settings.

Burn-in Test

□ After repairing each unit, a burn-in test is necessary.

- In a burn-in test, the lamp is turned on for a set period of time (such as 50 minutes), then off for another set period of time (such as 10 minutes).
- □ This can be accessed in the service mode.
 - For the procedure, see 'System Maintenance Functional Tests – Burn-in Test' in the service manual.
 - The lamp on and off durations can be set before starting the test.

□ This procedure takes a number of hours to complete, so should not be done at the customer site.

- After a normal repair: 2 hours
- If the cause of the malfunction cannot be detected: 4 hours
- After solving a problem that causes the power to automatically turn off: 6 hours

Service Training

Updating Firmware

Slide 32

Updating the System Firmware - 1

Equipment needed

- Software
 - » DLP Composer Lite 11.2
 - » Firmware (*.img)
 - » 11.2 FlashDeviceParameters
- Hardware
 - » Projector
 - » Power cord
 - » USB Cable mini USB to USB (A)
 - » PC or Laptop

Updating the System Firmware - 2

Preparation

- Install DLP Composer Lite
- Install a USB driver for the DLP device
- Enter the Firmware Update Mode
 - » Hold the "Power" button and plug in the power cord.
 - » After the Power LED lights pink and Lamp/Temp LEDs light red, release the "Power" button.
- Connect the Projector to the PC
 - » Use a mini USB cable

Update the firmware

- Use DLP Composer Lite.
 - » The procedure takes several minutes.
- When "Download completed" appears on the screen:
 - » Unplug the mini USB cable and power cord.
 - » Plug in the power cord, then restart the projector and get into Service mode to check the system firmware version.

Background Information

Types of Projectors

Types of Projectors

□ There are 4 main types.

- CRT projectors: These use three cathode ray tubes (blue, green, and red).
- LCD projectors: These use three LCD filters to create red, green, and blue images.
- DLP projectors: DLP (Digital Light Processing) was developed by Texas Instruments. It uses micro-mirror devices and rotating color wheels
- LCOS projectors: LCOS (liquid crystal on silicon) uses liquid crystals as mirrors, instead of filters

CRT Projectors

- □ These use three cathode ray tubes (blue, green, and red).
- They have better contrast than LCD and DLP projectors.
- They also have good resolution. But they are bulky, heavy, and difficult to adjust.

LCD Projectors

- □ LCD projectors appeared during the early 1990s, and are now the main type of projector.
- Three LCDs receive electrical signals from an imagegenerating device. One receives signals for the red part of the image, one the green, and one the blue. In this way, each LCD holds a pattern of pixels.
- Then, red light is shone through the LCD with the red part of the image, and green and blue light are used for the other two LCDs.
- □ After passing through the LCD filters, the three beams are combined and projected.
- □ LCD projectors give bright, high-resolution output, and they are easy to adjust. They are also cheap.

- □ The DLP chip is the central part of this type of projector.
- □ A DLP chip consists of many small pixel-sized mirrors laid out on a semiconductor chip. Light shone on the DLP chip is reflected by all these tiny mirrors. (For a chip with 1024 x 768 resolution, there are 786,432 small mirrors.)
- □ Light is shone onto the chip through a fast-spinning wheel that has a red sector, a green sector, and a blue sector. This light is reflected off the chip and out through a lens onto a screen.

DLP Projectors (2)

- R, G, and B signals from the image generating device are sent to the DLP chip, and timed so that the red signal arrives at the same time that the red part of the wheel is in the beam path, and similarly for the green and blue signals.
- The DLP chip generates the R, G, and B images by re-positioning the micromirrors using micromachined hinges to make different pixelated images for each colour (meaning that each micromirror has an ON and an OFF position).
- The mirrors can switch over every 15 microseconds, so moving images can be projected.
- □ For SVGA resolution, the mirrors are 16-micrometer squares, with a gap of about 0.8 micrometers between each mirror. Below, we can see the size of the mirrors compared to a grain of table salt.

LCOS Projectors

- In LCoS, a liquid crystal cover is applied to the surface of a semiconductor chip that has a highly reflective coating. There are one of these assemblies for red, green, and blue.
- The RGB images are sent to these semiconductors, and beams of light are reflected off these and recombined before being projected to the screen.
- LCD projectors give bright, highresolution/high-contrast output, and they are easy to adjust. But they are adversely affected by dust and vibrations.
- The layout of the machine is similar to the LCD projector, except that LCoS plates are used instead of LCD plates.

Background Information

Polarization

What is Polarization?

- Polarization refers to the orientation of the electric field.
- It is convenient to think in terms of up-down (vertical), and left-right (horizontal).
- If the polarization is at an angle, then this polarization can be thought of as having up-down and left-right components.

Polarizing Filter

- In a polarizing filter, the arrangement of the molecules allows (for example) the up-down component to pass through, but not the left-right component.
 - Think of a rope passing through a picket fence (with vertical slits).
 - If you vibrate the rope in a horizontal direction, the fence will block the vibrations.
 - If you vibrate the rope in a vertical direction, the vibrations in the rope will pass thought the gaps in the fence.

S- and P- Polarization

- If the electrical field is polarized parallel to the plane of incidence (in other words, horizontal), it is said to be ppolarized.
- □ If the field is polarized perpendicularly to the plane of incidence (vertical), it is said to be s-polarized.

Polarization by Reflection

- Reflection off certain non-metallic substances can polarize light.
- □ If the angle is correct (different for each mineral, depends on the arrangement of molecules in the mineral), the reflected light will be completely s-polarized.
 - The refracted light will be at least partially p-polarized.

Background Information

Terms and Definitions

Aspect Ratio

 This is the ratio of the horizontal to vertical dimensions of the screen. For a normal television, the aspect vratio is 4:3. For HDTV, it is 16:9. For SXGA, it is 5:4.

Resolution

- This is expressed as the number of dots across the image versus the number of dots down the image. the larger the number, the higher the resolution.
- Here are the resolutions of some common video graphic standards.
 - » VGA (Video Graphic Array): 40 x 480
 - » SVGA (Super VGA): 800 x 600
 - » XGA (Extended Graphic Array): 1024 x 768
 - » WXGA (Wide VGA): 1280 x 800
 - » SXGA (Super XGA): 1280 x 1024
 - » UXGA (Ultra XGA): 1600 x 1200

Dichroic Mirror

- A dichroic mirror reflects light of a certain frequency range and allows all other light to pass through.
- LCD projectors contain two of these mirrors, to split the light up into three beams.

Polarized Light

- Light waves oscillate in the same way as sound waves.
- If the waves oscillate in one plane only, the light is said to be polarized.
- Light reflected by a polarizing screen is polarized, and is brighter than light reflected from a non-polarizing screen.

Residual Image

- When an image on a display changes, a residual image of the previous image can remain for some time.
- In serious cases, it can last for more than 1 minute.
- LCD panels normally do not have this problem.

□ Air Filter

- Air is drawn into the projector to cool its internal components. The air filter prevents dust from being pulled into the projector with this air. If the filter becomes dirty, air cannot pass through properly, and it will become hot inside the projector.
- Every 100 hours, a message will appear, asking the user to clean the air filter.
- Do not operate the projector without the filter.
- The message will appear the first time the user switches the power on after the 100-hour limit has been reached. The message will stay on-screen for 30 seconds, or until the user operates the projector.

Brightness and Focus of Outer Parts of the Projected Image

 Generally, when an image is projected, there are differences between the center of the image and the outer parts. The center is typically brighter than the outer parts. The focus can be better or worse at the center than at the edges.

Suspension from the Ceiling

- This machine can be suspended from the ceiling, if the required metal supports are fitted.
- These metal supports are not supplied with the projector.

Changing the Lamp

- The first time that the power is turned on after the lamp has been used for 3000 hours, a message is displayed for the user.
- The message disappears if you press the center part of the circular 'arrow' button.
- The hours of lamp use are calculated as follows: Lamp use time + Normal mode usage time - Eco mode usage time.

Lux, Lumen, Candela

- The brightness of a lamp is generally measured in lumens, and ambient brightness and light reflected from a screen is generally expressed in lux.
- Lumen
 - » This ANSI unit is used to measure the amount of light emitted from a light source. In the ANSI procedure for measuring the brightness of a source, the light is directed onto a screen. The area of the screen is divided by 9, and the brightness at the center of each of these is measured. The average of these is taken to be the brightness of the source in lumens.
- Lux (lx)
 - This is a measure of the intensity of illumination. It can be expressed as lumens/square meter.
 - » Outside on a sunny day, the intensity is 15,000 to 20,000 lux.
 - » Inside a room with electric light, it is 1,500 lux.
 - » In a room lit by candlelight, it is 2 lux.
- Candela
 - » This is often used for projectors with a built-in light source, such as a television. It is normally expressed as candelas per square meter. The candela is a measure of the strength of a light source, and cd/m2 expresses its brightness.
 - » $cd/m2 = (lumens x screen gain)/(screen area m2 x \pi)$
 - » Screen gain: Brightness increases with screen size.

Uneven colour

• This term is used when the contrast and color of the image is not constant. There are many possible causes for this.

Gradation

 Between white and black, there are shades of grey. The number of levels between white and black are called gradations. The higher the number of gradations, the greater effect on the image, but if the contrast is not high, this effect is cancelled.

Color Separation

 A computer video signal is separated into a black-and-white signal and a colour signal. In a projector, it is separated into three colors (red, green, blue). The condition of the components that separate the light will have an effect on the quality of the image.

Contrast

 In general, this is the ratio between the bright and dark parts of an image. A high contrast gives a clear image. A projector with an internal light source is unaffected by external light sources gives a high contrast image that is clear.

□ Jitter, Flickering

- Jitter is noise in the image that is mainly caused by temporary fluctuations in the movement of rotating components, such as the motors that drive the heads in a VCR unit. The effects can be seen on vertical lines in the image.
- Flickering of the image also can occur.

Image Adjustments

- If the projected image is flickering or blurred, in the wrong position, and so on, the horizontal position, vertical position, and synchronization can be adjusted.
 - » Flickering is often caused by inaccurate synchronization of the image data signal to the LCD panel.
- The image settings (reverse, ceiling) depend on how the projector is set up.
- The following settings from the image adjustment menu can be used to adjust the projected image.
 - Contrast (weak/strong), brightness (dim/bright), colour strength for red green and blue, image quality (soft/sharp).

Gamma correction

- This adjusts the signal level to get the correct VT response characteristics (V: input voltage, T: amount of transmitted light).
- □ Trapezoidal image correction (Keystone correction)
 - Depending on the angle of projection, the projected image will be distorted into a trapezoidal shape, instead of a rectangular shape.
 - The projector contains a sensor that detects the angle of projection in 15-degree increments, and the image is automatically corrected. This is known as Keystone Correction.

Projection Distance

 This is the distance from the projection lens to the screen. For a larger screen, the distance becomes longer (the distance is directly proportional to the screen size).

Galaxie Screen Gain

- A measure of how brightly a screen displays an image.
- The higher the screen gain, the brighter the screen.

Relation between Screen Gain and Brightness

- Generally, the larger the screen, the darker it is. If you choose a screen with a higher gain, the brightness is preserved to some extent.
- Also, choose a screen to suit the room. In a long room, use a high luminance screen. In a wide room, a high viewing angle screen.

	White screen for OHP projection	High viewing angle screen	High luminance screen
Viewing angle (horizontally)	1 (wide)	2	3
Brightness	3 (dark)	2	1
Price	1 (cheap)	2	3
Screen gain	3 (low)	2	1

□ Ad hoc mode and Infrastructure mode

- There are two ways to connect to a PC using W-LAN.
- Ad hoc mode is used to connect to a PC without using a W-LAN access point.
- Infrastructure mode is used to connect to a PC through a W-LAN access point. In this mode, connection to the internet is possible, so security is provided by means of MAC address filtering.

□ JPEG Joint Photographic Experts Group

 This is a compression technology to facilitate the storage and transmission of still colour images. The data is reduced in a manner that is not visible to the eye, but a compression of 1/100 is achieved.

MPEG Motion Picture Experts Group

- This is a compression technology to facilitate the storage and transmission of moving colour images. There is more data than in a still image, so compression is important for efficient storage and transmission.
- Depending on the degree of compression, there are MPEG-1, MPEG-2, and MPEG-4 standards.
- MPEG-2 gives better results than MPEG-1, but a dedicated circuit is required for playing the image.

Throw Ratio

□ Throw Ratio = PD/SW

Projection Lens Offset

□ Offset = [(A+B)/B]x100% =[(a+b)/b]x100%

RICOH