RICOH

Y011/Y012
Service Training

Soleil-PJ1

Slide 1

Version 1.0

This training course provides service technician training for the Soleil-PJ1 series.

This section provides an overview of the machine, and the options that can be installed.

What Models are there in the Series?

- **Soleil-PJ1a (Y011): PJ WX4130**
  - 2500 lumens, WXGA resolution
- **Soleil-PJ1b (Y012): PJ WX4130N**
  - 2500 lumens, WXGA resolution, network capability
- **These are DLP projectors.**
- **These are 'short-throw' models, for use in a tight space.**
  - 31.7 cm from the wall for 80-inch display
  - 18.8 cm from the wall for 48-inch display
- **The Soleil-PJ1a cannot be used as a network projector.**
  - This model does not work with 'Network Utility', 'Projector Management Utility', or @Remote.

Slide 3

- At the time of writing, this is the only projector on the market that has a minimum throw distance of 28 mm.

Main Specifications

	Soleil-PJ1a	Soleil-PJ1b
Type	DLP	
Brightness	2500lm	
Lamp type	High-pressure mercury lamp (Standard mode: 225 W, Eco mode: 170 W)	
Resolution	WXGA	WXGA
Dimensions (W × D × H)	257 × 144 × 221	
Weight	Less than 3 kg (6.7 lbs)	3 kg (6.7 lbs)
Max. Power Consumption	291W	300W
Speaker	2W x 1	
Wired LAN	No	Yes
Wireless LAN	No	Yes
PJLink	No	Yes
@Remote	No	Yes
USB	Service Use Only	Service Use, PC-Free Presentation Use
HDMI	Yes	

Slide 4

Soleil-PJ1b

- Additional USB port: Users can use this to display JPEG or MPEG2 files without PC or network connection.
- LAN: For use with PJLInk. Users can also use the LAN to project files that are stored on a PC or server on the network. @Remote will also be available.
- To enable projection of a file from a PC over a network, a network utility can be downloaded to the PC or installed from the CD that comes with the projector. No lengthy installation procedure is required.

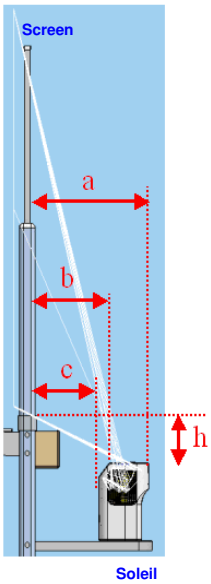
Features

- This product can be installed by users.
- It is designed for table-top use only. Ceiling and wall mounts are not applicable for this product.
- 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.

Slide 5

No additional notes

Projection Distance



	a	b	c	h
48 inch	261mm	188mm	117mm	91mm
60 inch	310mm	235mm	166mm	115mm
80 inch	393mm	317mm	249mm	155mm

a. From the screen to the front of the body
b. From the screen to the optical outlet
c. From the screen to the back of the body
h. From the top face of the body to the bottom of the projected image

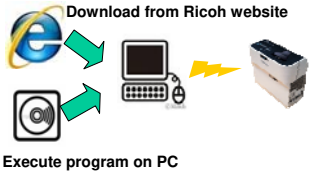
Slide 6

No additional notes

Network Features (Soleil-PJ1b)

❑ Easy network setup

- For network projection, Soleil-PJ1b has an installation-free network utility. Just download the file from the Ricoh website to your PC or execute the program on the attached CD, and you are ready to project images.



Slide 7

No additional notes

Network Features (Soleil-PJ1b)

- **@Remote capability**
  - Remaining Lamp hour information
  - Power and status reporting
- **Projection server function**
  - JPEG files stored on a web server can be projected without a PC. Files can be uploaded onto the web server using the supplied software: JPEG conversion tool type A.

Slide 8

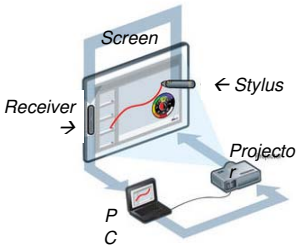
No additional notes

Interactivity with Other Digital Devices

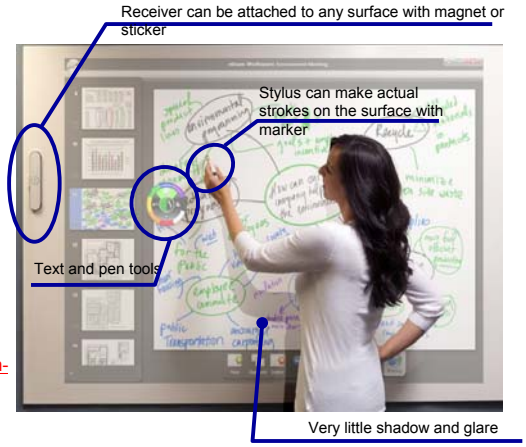
Dual communication via interactive whiteboards

Please note that interactive options will be locally purchased from 3rd party vendors. This is our recommended interactive solution.

eBeam (Luidia Inc.)



http://www.e-beam.com/products/ebeam-edge-projection.html

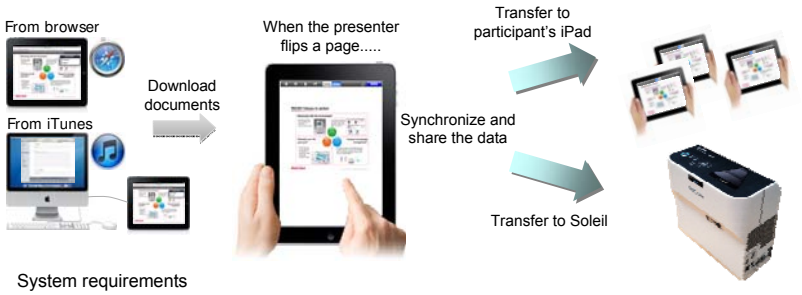


Slide 9

No additional notes

Interactivity with Other Digital Devices
Ricoh TAMAGO Presenter for iPad

Ricoh TAMAGO Presenter was developed as free trial software.



System requirements

iPad version	**Apple iPad/iPad2 (3G+Wi-Fi model, Wi-Fi model) / OS version: iOS 4.3.4**
Wireless connection	**Wireless LAN (Wi-Fi) IEEE 802.11a/b/g/n *In the same broadband area**
Projector model	**Soleil PJ1b (PJ WX4130N), Regulus (PJ X3241N, PJ WX3231N)**
Connectivity	**Connection with less than 10 units in a meeting is preferable**

Free download from the iTunes store
*You need to install iTunes on your PC before searching for the Ricoh Smart presenter.
Operating instructions → http://www.ricoh.co.jp/software/other/rtp/

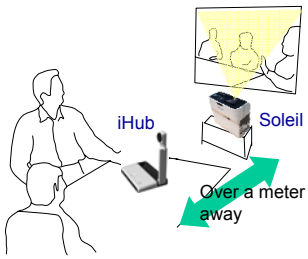
Slide 10

No additional notes

Interactivity with Other Digital Devices

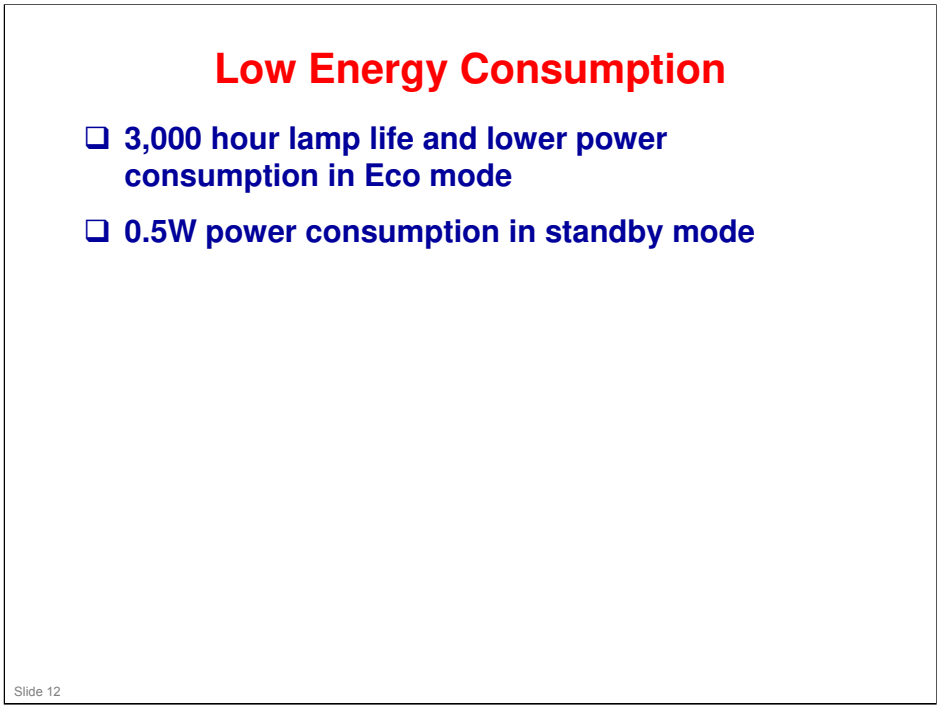
Collaboration with iHub (Unified Communication System)

- Target: Small meetings of 2 – 5 people
- Soleil can be placed over a meter away from iHub, which means no glare affects the video camera on iHub.



Slide 11

No additional notes



- Note that in the service mode menu, Eco Mode is referred to as ‘Low Mode’.

Consumables and Options

- **Replacement lamp (Y209)**
  - Mercury lamp
  - Life: 3000 hours (normal mode), 4000 hours (Eco mode)
    - » The lamp is regarded as having reached its yield when its maximum brightness has decreased to 50% of the original level.
    - » When this occurs, a message to this effect is projected.
- **3D glasses (Y107)**
  - DLP link is a technology that allows DLP projectors to transmit 3D data.
  - DLP link technology sends data seamlessly to the glasses between frames to create a 3D image.

Slide 13

- For more about DLP link: http://www.dlp.com/projector/dlp-innovations/dlp-link.aspx

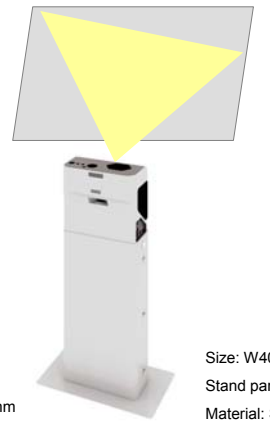
Cabinet and Stand

Please note that these options will be locally procured or purchased from 3rd parties.

■ **Simple cabinet**

Size: W400xD404xH605 – 805mm, Top face: W350xD404mm
Material: Steel, Melamine coating
Elevating (between 200mm) with handle
Soleil can be fixed in the pocket. (W265xD404mm)

■ **Smart stand**



Size: W400xD230xH450mm
Stand part: W261xD148mm
Material: Steel, Powder coating
Supplied with screws x 2

Slide 14

No additional notes

Reliability Information

- **Average monthly projection time: 58.3 hrs/month**
  - 2.65 hrs/day x 22 working days/month
- **Failure Rate**
  - 1st year: 0.00269 cases/unit/month
  - 2nd year: 0.0032 cases/unit/month
  - 3rd year: 0.00406 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

Slide 15

No additional notes

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.
  - If used in Normal Mode only, the alert appears after 3,000 hrs projection time
  - If used in Eco Mode only, the alert appears after 4,000 hrs projection time
  - 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.

Slide 16

No additional notes

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.**

Slide 17

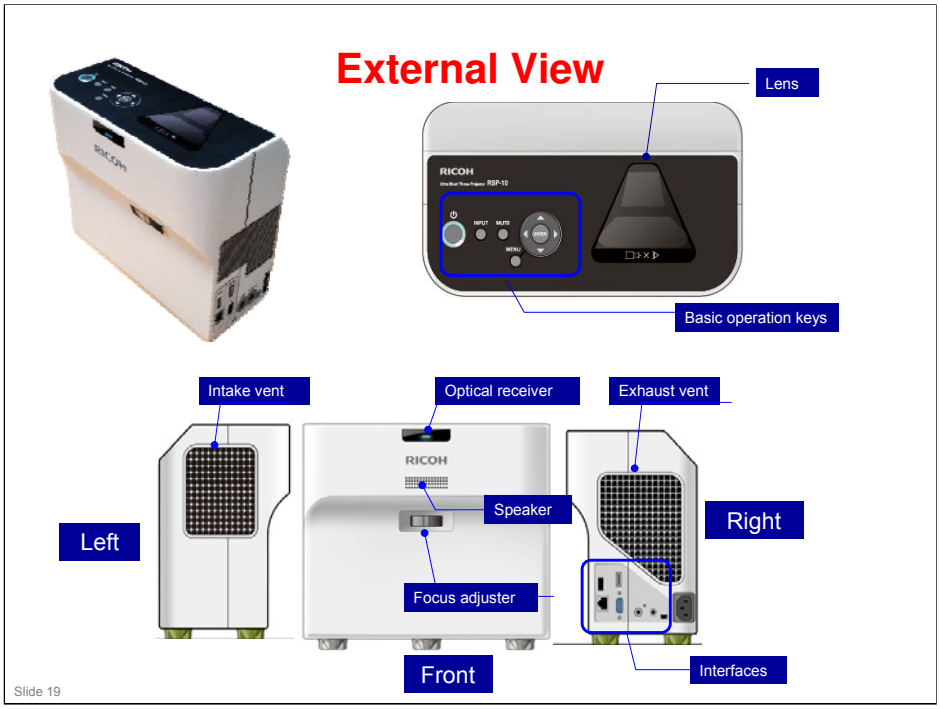
No additional notes

Operation at High Altitude

- In a high-altitude location (higher than 1500 m above sea level) where air is thin, cooling efficiency is reduced so use the projector with [High Altitude Mode] turned [On].

Slide 18

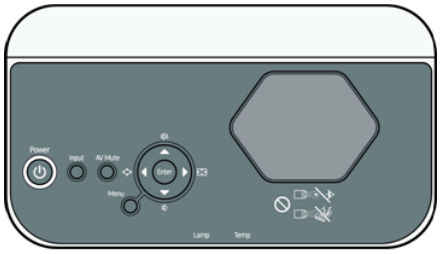
No additional notes



- Optical receiver: For the remote controller

Operation Panel

- The three LEDs are used to show symptoms for troubleshooting.

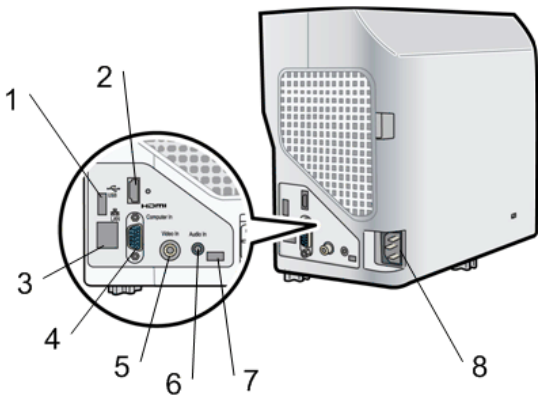


Remote Controller

Slide 20

No additional notes

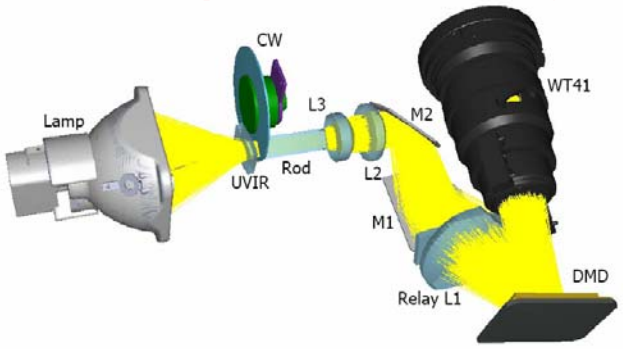
Connection Ports



Slide 21 21

- (1) USB port (Y012 only): For connecting a USB memory device or USB device cable. Accepts JPEG and MPEG2 file formats.
- (2) HDMITM port: For connecting an HDMI (High-Definition Multimedia Interface) cable.
- (3) LAN port (Y012 only): For connecting an Ethernet cable.
- (4) Computer In port (Y/Pb/Pr): For inputting RGB signals from a computer or component image signals (Y/Pb/Pr) from a video player.
- (5) Video In port: For inputting image signals from a video player.
- (6) Audio In port: For inputting audio signals from a computer or video player.
- (7) Control port (USB mini-B): For connecting to a computer. Used when updating the firmware (main board only).
- (8) AC In socket: For connecting the power cord provided with the projector.

Optical Components: DLP Projectors



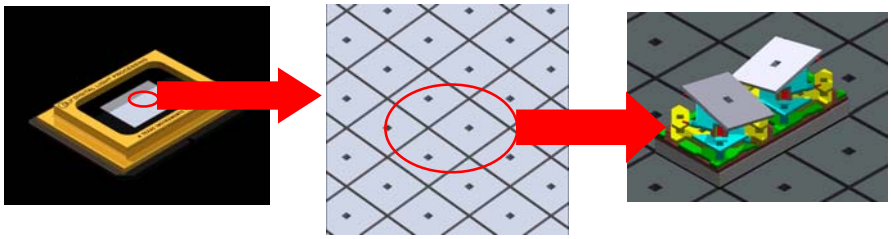
- **The DMD chip is the central part of this type of projector.**
  - In this model, it is called the DLP chip, not the DMD chip.
- **A DMD chip consists of many small pixel-sized mirrors laid out on a semi-conductor chip. Light shone on the DMD chip is reflected by all these tiny mirrors. (For a chip 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.**

Slide 22

- This is a general description. The Soleil-PJ1 does not look exactly like this. See later in this presentation for the components of the Soleil-PJ1.
- Lamp: Light source
- UV-IR Filter: Lets visible light through (wavelengths between 380~780nm) and prevents UV and IR damage to other optical parts.
- CW (Color wheel): The wheel has a red segment, a green segment, and a blue segment. The wheel rotates to provide red, green, and blue light (the color of the output beam changes from red, to green to blue)
- Integrating Rod: Gives the light a uniform luminous flux.
- L3: Condensing lens. Condenses divergent light.
- L2: Condensing lens. Works with L3 to condense divergent light.
- M1: Mirror 1. Changes the light direction.
- M2: Mirror 2. Changes the light direction.
- Relay L1: Condenses and magnifies divergent light before it goes to the DMD.
- DMD Chip: Contains micro mirrors to generate the image
- Projection Lens (WT41 in the diagram): Projects the image onto the screen.

DLP Chip

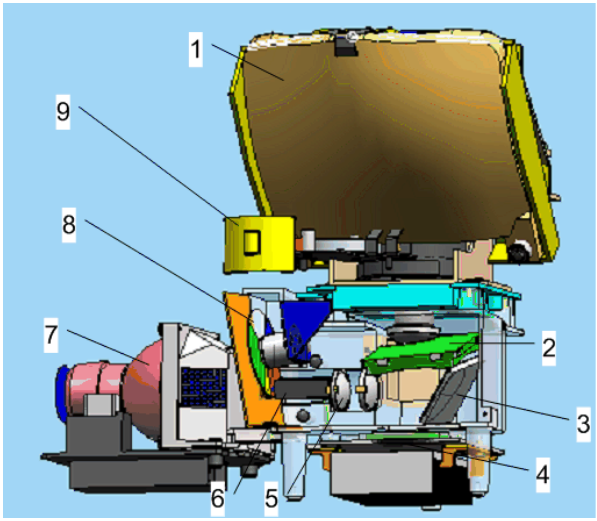
- R, G, and B signals from the image generating device are sent to the DLP chip, and timed so that the red signal arrives at the same time that the red part of the wheel is in the beam path, and similarly for the green and blue signals.
- The DLP chip generates the R, G, and B images by re-positioning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



Slide 23

- The mirrors can switch over every 15 microseconds, so moving images can be projected.

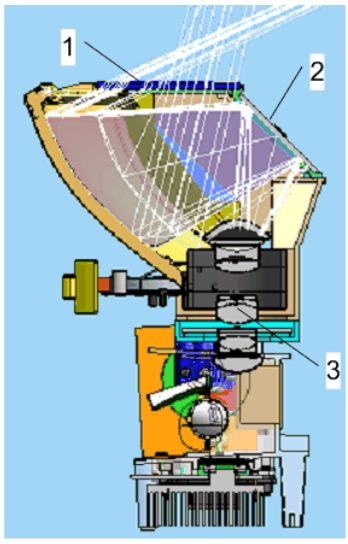
Optical Components of this Series



Slide 24

1. **Free-form surface mirror: Allows this to be an ultra short throw projector**
2. **Concave Mirror**
3. **Cylinder Mirror**
4. **DMD (Digital Micro-mirror Device)**
5. **Relay lens**
6. **Light Pipe (also known as the Rod)**
7. **Mercury Lamp**
8. **Color Wheel**
9. **Focus Lever**

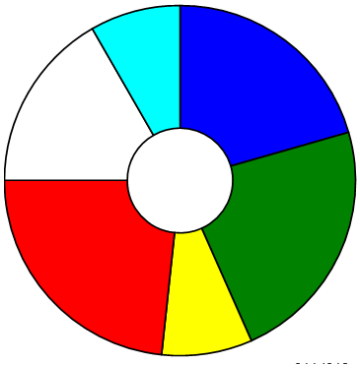
Optical Components of this Series



Slide 25

1. Dust Shield Glass
2. Mirror
3. Projection Lens

Color Wheel

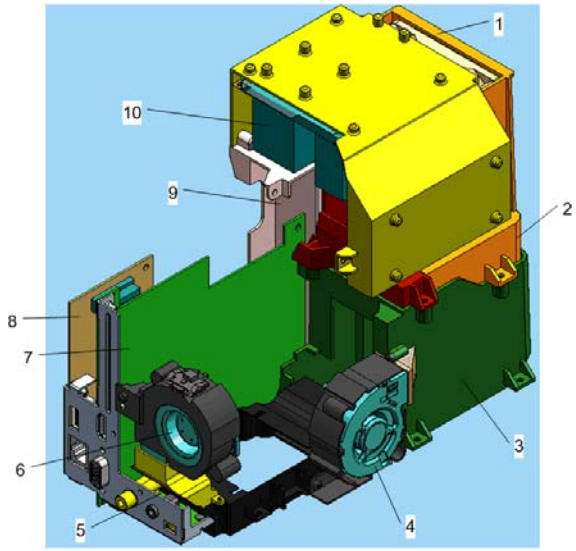


- In this series, the color wheel has cyan, yellow, and white sectors in addition to the usual red, green, and blue.

Slide 26

No additional notes

Component Layout

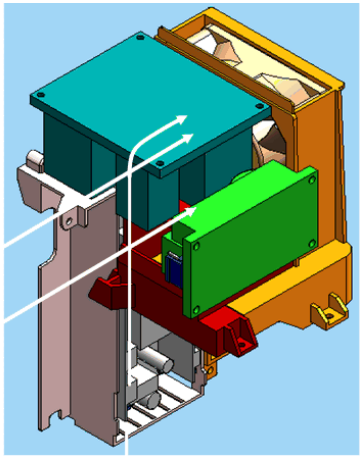


Slide 27

1. Exhaust fan
2. Exhaust duct
3. Lamp housing
4. Lamp fan
5. Interface board
6. Intake fan (for cooling the DMD)
7. Main board
8. Network board (Y012 only)
9. Lamp ballast
10. PSU

Air Flow

PSU and Lamp Ballast

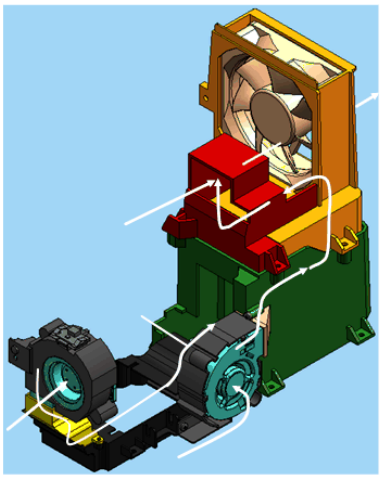


- The lamp ballast is cooled by the air taken in from the bottom of the projector.
- The PSU is cooled by the air taken in from the intake fan and used to cool the main board.

Slide 28

No additional notes

Air Flow
Lamp and DMD

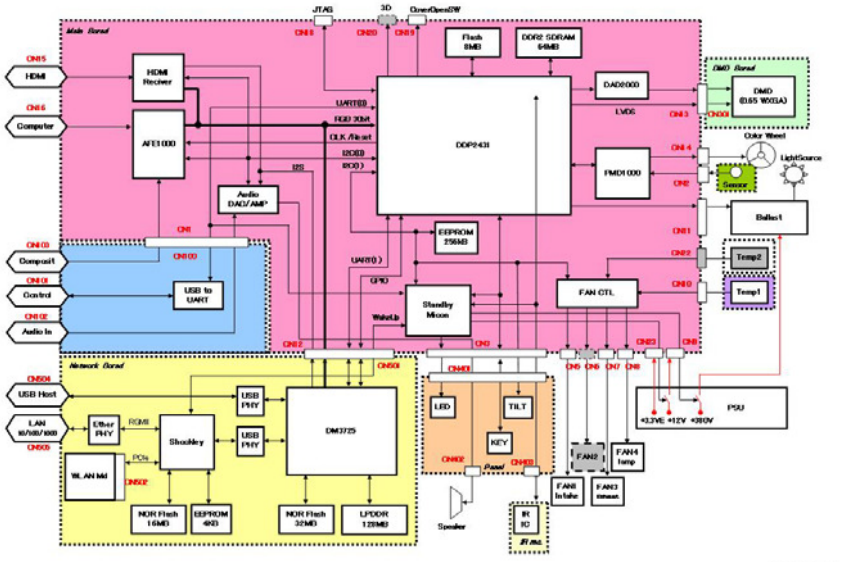


- The air for cooling the DMD and the air for cooling the lamp are mixed in the lamp housing.

Slide 29

No additional notes

System Block Diagram



- Network board: Y012 only

Boards

- **Main board (MB): Power/signal control and processing**
- **DMD board (DMD BD): Image signal processing and DMD control**
- **Lamp driver (Ballast): Starts the lamp**
  - When the lamp is being lit, the voltage is over 10,000V.

Slide 31

No additional notes

This section explains the basic points about servicing the machine.

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.

Slide 33

No additional notes

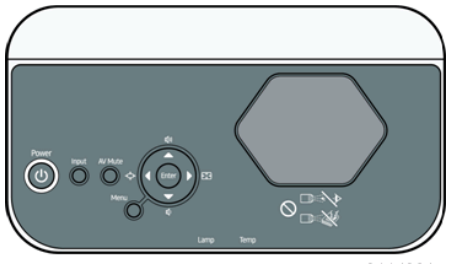
Antistatic Clothing

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

Slide 34

No additional notes

Entering Service Mode



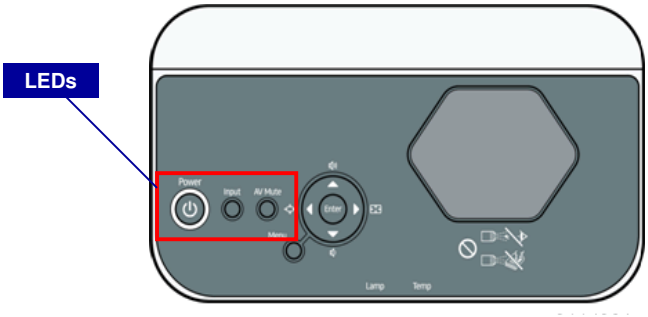
- **Hold down “Enter" and "Menu" simultaneously for 2 seconds.**
- **Then press the left button, then the down button, then the up button.**
- **Then press and hold the [Enter] button on the projector for longer than 2 seconds.**
- **When the projector enters the Service Mode, the buzzer beeps for 3 seconds.**
  - If it doesn’t beep, repeat from the beginning.
- **The projector remains in this mode until you disconnect the power cord.**

Slide 35

Service Mode features

- Service status display
- Keystone calibration
- Sub contrast adjustment
- Color wheel index delay adjustment
- Fan control
- Test pattern projection

LED Display



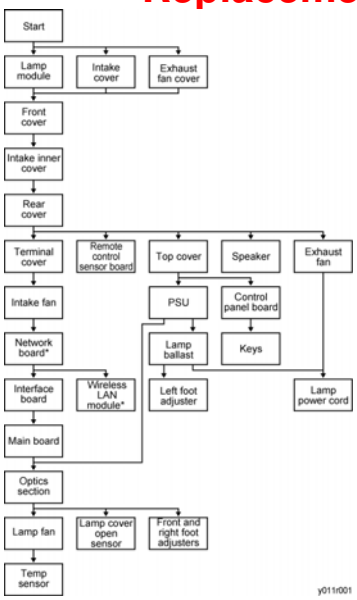
- **The status of the three LEDs on the front panel indicate the machine's condition.**
  - See the table 'LED Display' in the Troubleshooting section of the service manual.

Slide 36

No additional notes

- This section shows the main points about replacing parts, and how to calibrate the machine after installing new parts.

Replacement Flow Chart



- **This shows which parts must be removed to access the various components of the machine.**

Slide 38

- See the service manual for details of the procedures. The next few slides will cover the main points.

Adjustments Required after Replacement

	Keystone	Sub Contrast	Color Wheel Index Delay
Main Board	Yes	Yes	Yes
Operation Panel Board	Yes	No	No
Optical Engine	Yes	No	Yes

- The above table shows which adjustments are needed after replacing the Main Board or Optics Engine.
- The adjustments are in the service manual.

Slide 39

Keystone

- When you project an image onto a surface at an angle (because the projector is not quite centered on the screen), the image will be larger at the top than at the bottom (in the case when the projector is on a table pointing up at the screen).
- Modern projectors correct for this digitally, but calibration is needed.

Sub-contrast

- Inputs from both computer interfaces must be calibrated.

VCOM, Gamma, Shading

- These require the DPJ Adjustment Tool.

Replacing the Lamp

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

Slide 40

No additional notes

Replacing the Main Board

- **You must enter the current value of color wheel index delay after installing the new board.**
  - Make a note of the current value by displaying the Service status.
  - How to view the service status: After the projector has entered the service mode, press the [AV Mute] and up buttons simultaneously
- **Also you must do keystone calibration and sub-contrast adjustment.**
- **These procedures are all explained in the following section of the service manual:**
  - Replacement and Adjustment - Electrical Adjustment - Projector Setup

Slide 41

No additional notes

Replacing the Optics Engine

- **After replacing the optics section, the input the value of color wheel index delay that is specific to the new unit.**
  - The value is printed on the label attached to the unit.
  - You must input the last three digits on the label.
  - Make a note of these before you install the new optics engine.
- **When handling the optics engine, hold the metal parts shown in the figure.**
- **When installing the optics engine, make sure the cables are not trapped under the leg of the optics engine.**

Slide 42

No additional notes

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.**

Slide 43

No additional notes

Replacing the Color Wheel

- Avoid touching the glass parts of the color wheel.

Slide 44

No additional notes

Equipment Required for the Adjustments

- Personal computer (Windows PC, using Windows 98SE, ME, 2000, or XP)
- Cables: RGB Cable and Control (USB-A to Mini-B) Cable
- Protractor: Used to measure angles for the Keystone Calibration

Slide 45

No additional notes

Before you Start the Adjustments

- **Copy the current settings data to EEPROM: Press the [Up], [Down], [Left] and [Right] buttons simultaneously.**
- **Enter service mode.**
  - See the service manual for the procedure.
- **The buzzer beeps for 3 seconds if you enter service mode successfully.**
- **To exit service mode, disconnect the power cord.**

Slide 46

- The EEPROM is a backup area to hold the old settings if the adjustments do not go well.

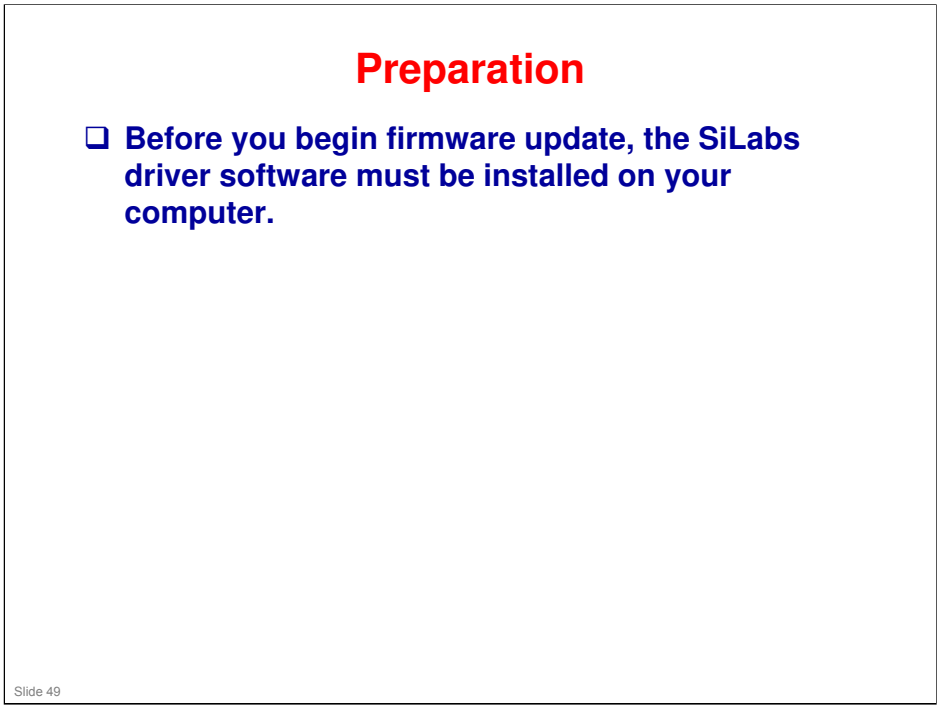
Adjustments

- **Do the necessary adjustments as described in the service manual.**
  - Keystone Calibration
  - Sub Contrast
  - Color Wheel Index Delay

Slide 47

No additional notes

This section explains the basic points about updating the firmware.



- See the service manual for details.

Procedure

- ❑ Unplug the projector power cord.
- ❑ Connect a USB cable to the control port, and to your computer.
- ❑ While holding down the Input and Mute buttons, plug in the power cord.
- ❑ Start DLP_FlashLoader on your computer.
- ❑ Click [browse…] and select the firmware data (*.img file).
- ❑ Click [Start Download].
- ❑ When update is complete, the projector beeps for 3 seconds.

Slide 50

❑ See the service manual for details.

Alternative Procedure for Y012 Only

- Copy the firmware data onto a USB memory device.
- Check the power cord of the projector is disconnected.
- Connect the USB memory device to the projector.
- While holding down the [Power] and [Input] buttons, plug in the power cord.
- After checking the firmware data, the projector starts writing the firmware.
  - When the writing process starts, the power button, the lamp indicator and the temperature indicator flash sequentially.
- When the update is successfully completed, the [Power] button lights up blue and the lamp and temperature indicators light up red and the projector restarts in normal mode.

Slide 51

No additional notes

- For basic troubleshooting procedures, see the service manual.

LED Display

- **The combination of LED indicators show if a problem has occurred.**
  - These are the Power, Input, and AV Mute indicators.

Slide 53

No additional notes

Symptom

- The Troubleshooting section of the service manual contains some notes on symptom troubleshooting.

Slide 54

No additional notes

Background Information

Types of Projectors

Slide 55

- This section briefly explains the various projector technologies on the market.

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

Slide 56

No additional notes

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.

Slide 57

No additional notes

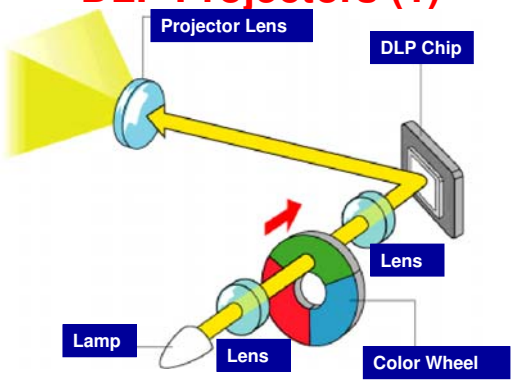
LCD Projectors

- LCD projectors appeared during the early 1990s, and are now the main type of projector.
- Three LCDs receive electrical signals from an image-generating 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.

Slide 58

No additional notes

DLP Projectors (1)



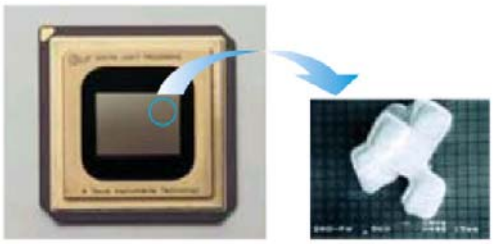
- The DLP chip is the central part of this type of projector.
- A DLP chip consists of many small pixel-sized mirrors laid out on a semi-conductor chip. Light shone on the DLP chip is reflected by all these tiny mirrors. (For a chip with 1024 x 768 resolution, there are 786,432 small mirrors.)
- Light 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.

Slide 59

- DLP (Digital Light Processing) was developed by Texas Instruments in 1987.
- The DLP chip is also known as a Digital Micromirror Device (DMD).
- DLP technology uses light reflection, which leads to a brighter image than a light-transmission type of device such as an LCD projector.

DLP Projectors (2)

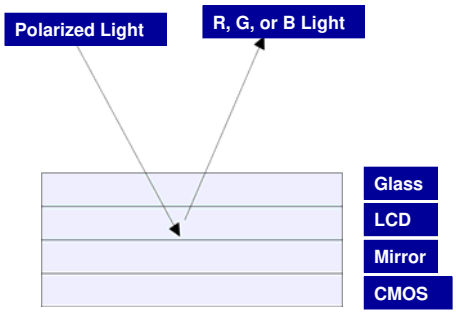
- R, G, and B signals from the image generating device are sent to the DLP chip, and timed so that the red signal arrives at the same time that the red part of the wheel is in the beam path, and similarly for the green and blue signals.
- The DLP chip generates the R, G, and B images by re-positioning 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.



Slide 60

No additional notes

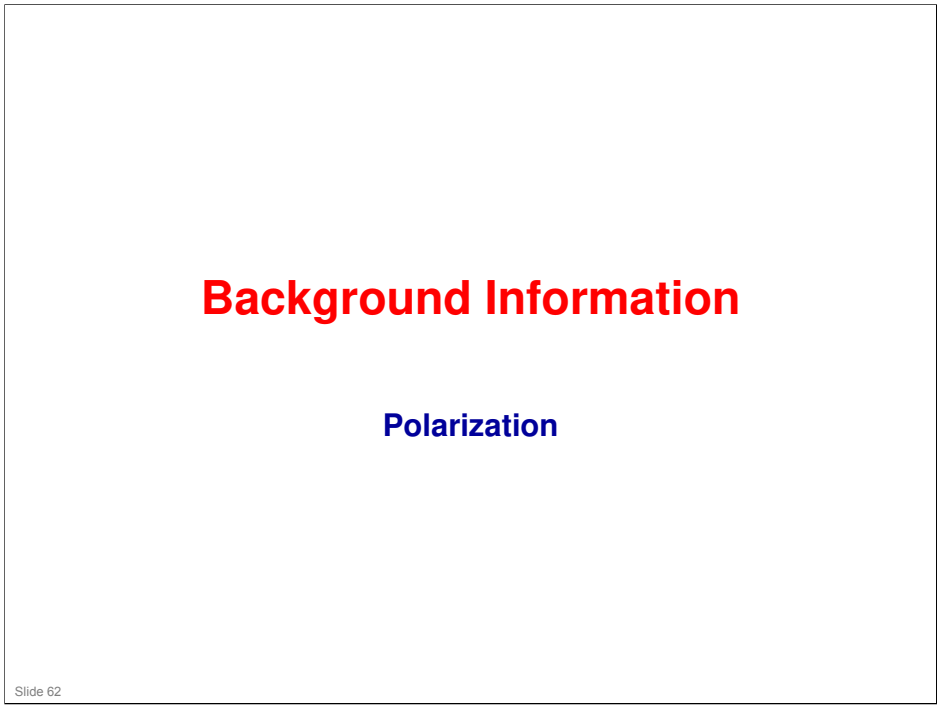
LCOS Projectors



- 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, high-resolution/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.

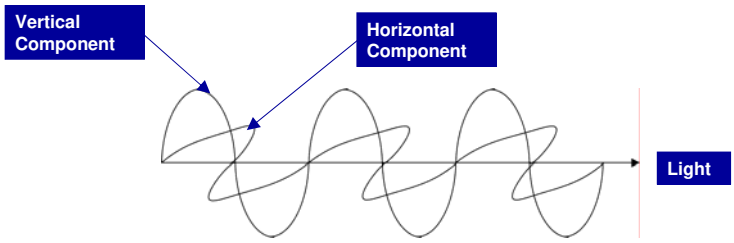
Slide 61

- LCOS: Liquid Crystal on Silicon
- The diagram shows a simplified cross section of an LCoS panel.



No additional notes

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.

Slide 63

No additional notes

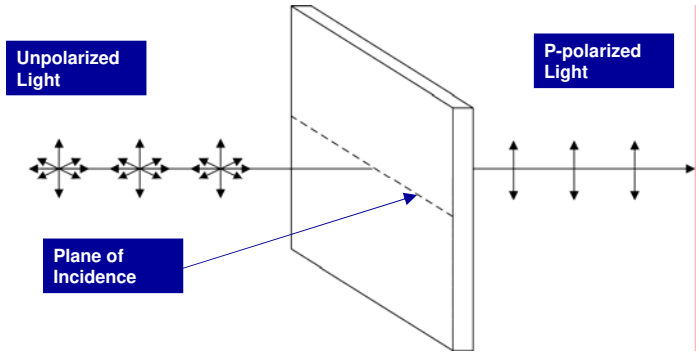
Polarizing Filter

- **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.

Slide 64

No additional notes

S- and P- Polarization

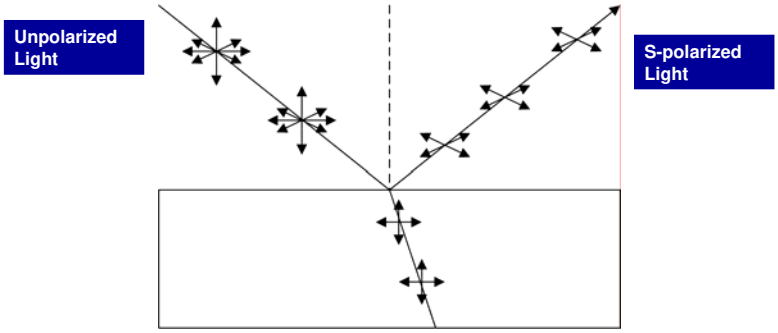


- If the electrical field is polarized parallel to the plane of incidence (in other words, horizontal), it is said to be p-polarized.
- If the field is polarized perpendicularly to the plane of incidence (vertical), it is said to be s-polarized.

Slide 65

- This diagram shows the case of a p-polarizing filter.

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.

Slide 66

No additional notes

Background Information

Terms and Definitions

Slide 67

- Some details in this section may not apply to this model.

Terms and Definitions - 1

- **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

Slide 68

No additional notes

Terms and Definitions - 2

- **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.

Slide 69

No additional notes

Terms and Definitions - 3

- **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.

Slide 70

No additional notes

Terms and Definitions - 4

- **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.

Slide 71

- Eco mode is the lower brightness mode that can be selected by the user. It is not an Energy Star function.

Terms and Definitions - 5

- **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 π)
    - » Screen gain: Brightness increases with screen size.

Slide 72

- Example of conversion between lumen, lux, candela
  - 1. From lumen (lm) to lux (lx)

    For a 40-inch screen with a 4:3 aspect ratio, the area is about 0.5 m2.

    For 1000 ANSI lumens, the amount in lux is: =1000/0.5, = 2000 lux
  - 2. From lumen (lm) to candelas (cd/m2)

    For a 40-inch projector with a screen gain of 2 (double that of an OHP projector screen), cd/m2 is:

    (1000x2)/(0.5×3.14) = 2000/1.57 = 1274 cd/m2

Terms and Definitions - 6

- **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.

Slide 73

No additional notes

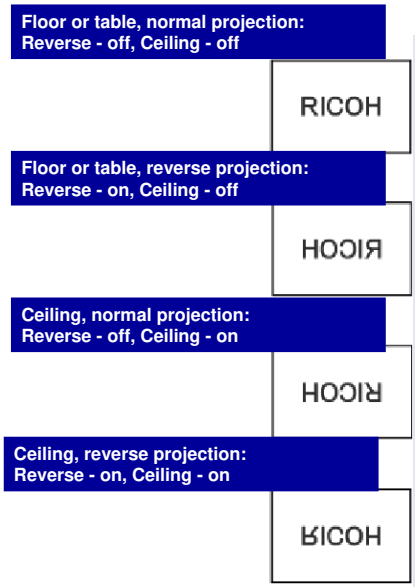
Terms and Definitions - 7

- **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.

Slide 74

No additional notes

Terms and Definitions - 8



- **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).

Slide 75

- Reverse, ceiling: These are in the customer settings menu.

Terms and Definitions - 9

- **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).

Slide 76

No additional notes

Terms and Definitions - 10

- **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

Slide 77

Screen Size Conversion Table

- Screen size (inches) is measured diagonally across the screen from top left to bottom right.

	4:3		16:9			4:3		16:9	
Size (in)	L (mm)	W (mm)	L (mm)	W (mm)	Size (in)	L (mm)	W (mm)	L (mm)	W (mm)
30	457	610	374	664	170	2591	3454	2116	3757
40	610	813	498	885	180	2743	3648	2240	3978
50	762	1016	623	1107	190	2896	3861	2365	4199
60	914	1219	747	1328	200	3048	4064	2489	4420
70	1067	1422	871	1547	210	3200	4267	2614	4641
80	1219	1626	996	1768	220	3353	4470	2738	4862
90	1372	1829	1120	1989	230	3505	4674	2863	5083
100	1524	2032	1245	2210	240	3658	4877	2987	5304
110	1676	2235	1369	2431	250	3810	5080	3112	5525
120	1829	2438	1494	2652	260	3962	5283	3236	5745
130	1981	2642	1618	2873	270	4115	5486	3360	5966
140	2134	2845	1742	3094	280	4267	5690	3485	6187
150	2286	3048	1867	3315	290	4420	5893	3609	6408
160	2438	3251	1991	3536	300	4572	6096	3734	6629

Terms and Definitions - 11

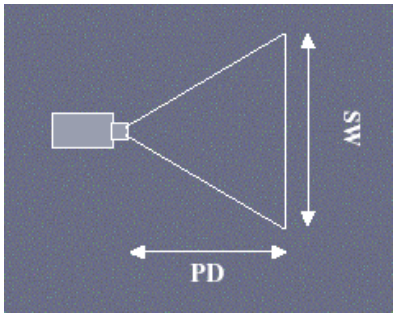
- **Ad hoc mode and Infrastructure mode**
  - There are two ways to connect to a PC using W-LAN.
  - Ad hoc mode is used to connect to a PC without using a W-LAN access point.
  - Infrastructure mode is used to connect to a PC through a W-LAN access point. In this mode, connection to the internet is 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.

Slide 78

No additional notes

Throw Ratio

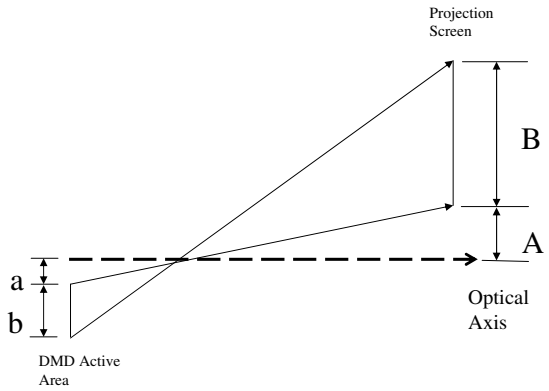
- Throw Ratio = PD/SW



Slide 79

No additional notes

Projection Lens Offset



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

Slide 80

No additional notes

No additional notes