PM-2000A

3D Polarized System

User Manual

October 12th, 2022

Before installing and operating the Espedeo™ PM-2000A 3D Polarized System, please read this User Manual thoroughly

REGULATORY NOTICES

FCC COMPLIANCE STATEMENT

This equipment has been tested and found to comply with the limits for a **Class A** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

This is a **Class A** product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Table of Contents

1. System Introduction

The **Espedeo™ PM-2000A** is a standalone passive 3D Polarized System specially developed for digital cinema projectors. Featuring flexible and easy installation, the system can automatically switch to the corresponding operating position by identifying 2D and 3D signals. Equipped with specified polarized glasses, the PM-2000A is able to present stunning and brilliant 3D images.

1.1. Key Features

- **Easy Installation**

  The system can be installed right in front of digital cinema projector by simply using the bracket delivered along with the system itself.

- **Simple Connection**

  The entire system is simply connected by two connection cables with the digital cinema projector and motorized bracket.

- **2D-3D Switching**

  The polarizer automatically identifies 2D/3D signals. It automatically moves to the front of the lens while playing 3D images and automatically moves to the standby position when playing 2D images or system is idle.

- **Easy Maintenance**

  The polarizer can be cleaned and maintained in an easy and fast manner. In addition, the polarized glasses can be directly replaced if there are any damages of the polarized glass that affect projection quality.

2. System Specifications

Electrical Parameters:

System power consumption		**＜ 12W**
From 3D interface	**Power supply**	**12V DC 1A**
	Synchronization signal input	**3D interface (15pin)**
From Power converter	**Power input**	**100 - 240V AC 60-50Hz**
	Power output	**12V DC 1A (through the synchronization cable)**

Table 1

Optical Properties:

Projector luminance	**Max. 33,000 lumens**
Luminous efficiency	**≥ 30% (for Espedeo™ Supra-5000 Projector)** **16% ± 1% (for other DCI-compliant Projectors)**
Contrast ratio	**＞ 200:1**
Cross-talk rate	**＜ 0.5%**
Response time	**＜ 150μs**
Operating temperature	**0~50°C**
Operating humidity	**≤ 60%**
Maximum screen size	**18m (59ft) width**
Window size	**186 x 104mm**
Optical type	**Circular polarization**
Supported Frame rates	**24fps, 48fps & 60fps per eye**

Table 2

3. Corresponding Requirements for Cinema

Cinema Requirements:

Polarized glasses	**Espedeo™ Polarized 3D glasses**
Silver screen: Luminance Gain factor	**≥ 2.4**

Table 3

Digital Cinema Projector Settings:

Dark time	**650 - 850μs**
Output Reference delay time	**-120μs**

Table 4

4. System Components

The PM-2000A 3D System consists of the following components:

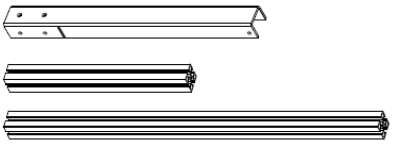
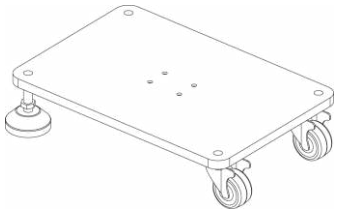
Sr. No.	Part Description		Quantity
①	**Polarizer**		1 PCS.
②	**Adjustable Bracket Extension Kit**		3 PCS.
③	**Motorized Bracket**		1 PCS.
④	**Bracket Support Base**		1 PCS.
⑤	**DB37M/9F synchronization cable (optional with power converter)**		1 PCS.
⑥	**DB9M/9F motor signal cable (between bracket and polarizer)**		1 PCS.
⑦	**DB9F/15M synchronization cable (between projector and polarizer)**		1 PCS.
⑧	**Power converter (optional)**		1 PCS.
⑨	**Power cord (optional with power converter)**		1 PCS.

Table 5

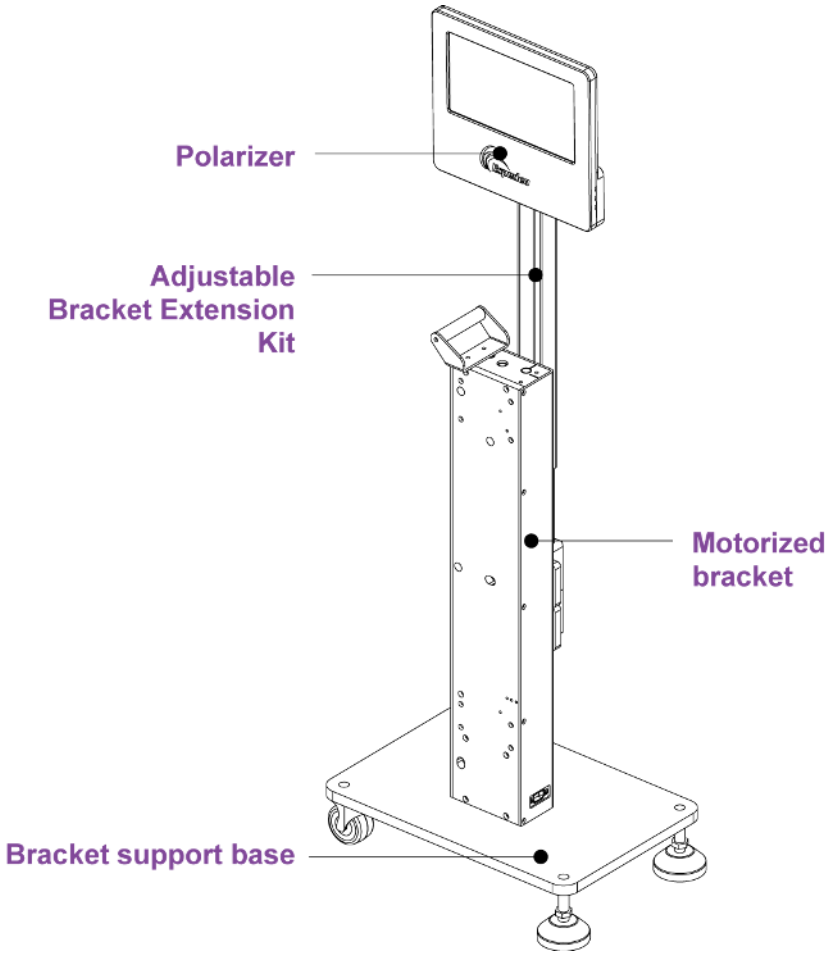


Figure 1: System Components

⚠ **NOTE**

When installing the 3D system, handle the equipment with care to avoid damaging the digital cinema projector lens or the polarizer.

4.1. Polarizer

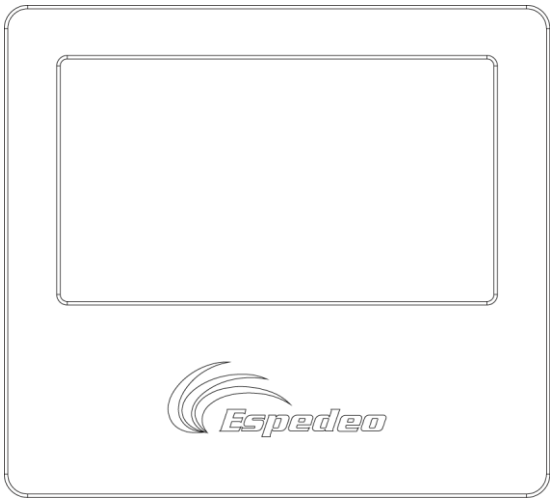


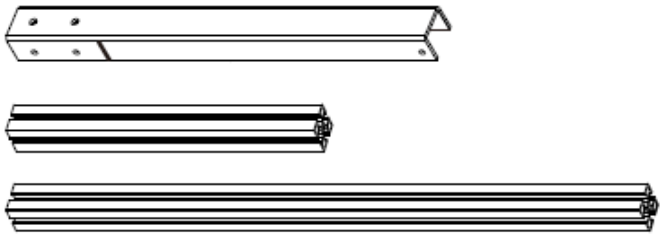
Figure 2: Polarizer

The dimensions of the polarizer are approximately 234 x 211 x 25mm and its weight is about 1.3 kg.

⚠ **NOTE**

The polarizer is a major optical component of the PM-2000A system. Ensure that it is handled it care during system installation.

4.2. Adjustable Bracket Extension Kit



Length: 320mm

Length: 300mm

Length: 650mm

Figure 3: Adjustable Bracket Extension Kit

Adjustable bracket extension kit is used to connect the polarizer with the motorized bracket. It uses a combination of aluminum rods of different lengths for easy height adjustment and makes it compatible with various projector lens height.

4.3. Motorized Bracket

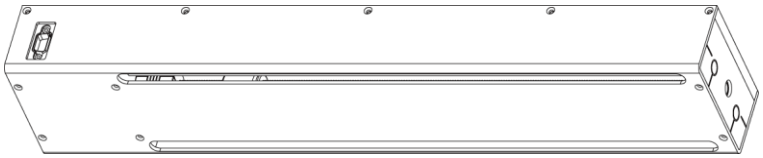


Figure 4: Motorized Bracket

- The motorized bracket is a passive 3D system apparatus for automatic switching between 3D/2D playing.

- Installed on top of the bracket support base, the motorized bracket connects to the polarizer through the DB9M/9F motor signal cable. When the digital cinema projector is playing 3D movie, the polarizer automatically moves upward to the front of the lens to polarize light paths. When the digital cinema projector is playing 2D movie, the polarizer automatically moves downward from the front of the lens.

- The motorized bracket works with the adjustable bracket extension kit to adjust the position of the polarizer.

4.4. Bracket Support Base

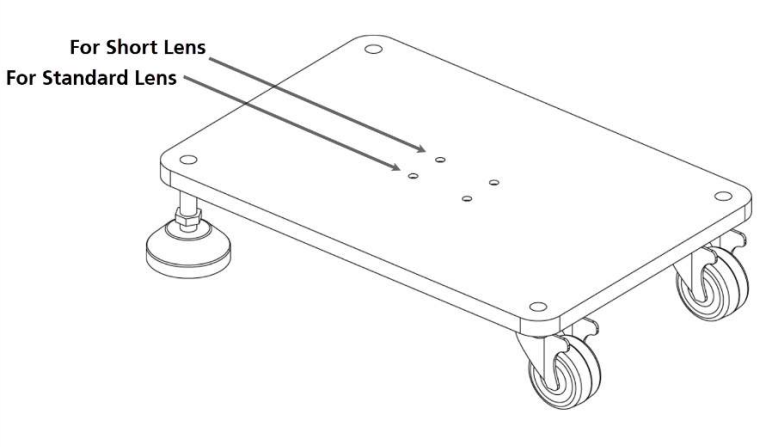


Figure 5: Bracket Support Base

The bracket support base is placed in front of the digital cinema projector which is used to fix the position of motorized bracket. The height of the legs can be adjusted to fit various installations. Moreover, two sets of screw holes are used to fix the bracket for the alternative, as shown in **Figure 5**.

⚠ **NOTE**

Please ensure that the distance between projector lens and the polarizer is within 15cm after the installation.

5. Installation of the 3D System

5.1. Installing the Motorized Bracket

Step ①: Mount the fixing blocks onto the motorized bracket with screws (M4*16mm), as shown in **Figure** 6.

Step ②: Mount the motorized bracket onto the bracket support base with screws (M6*16mm), as shown in
Figure 6.

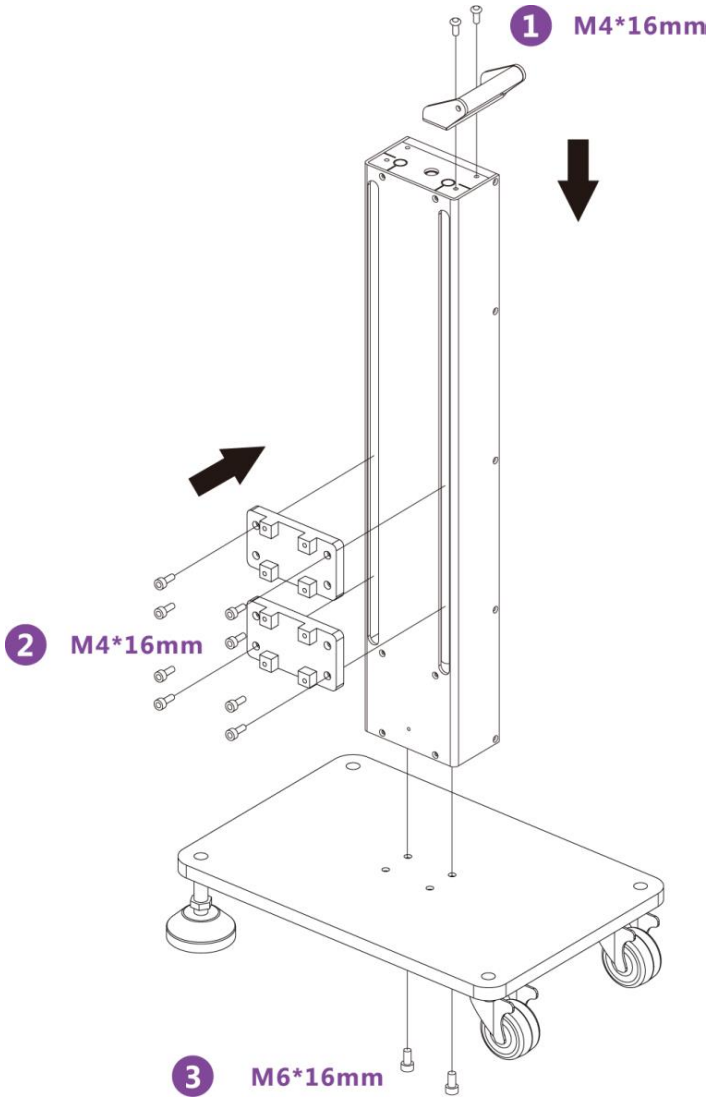


Figure 6: Installing the Motorized Bracket

5.2. Installing the Polarizer

Step ①: Fix the polarizer onto the top of the adjustable bracket extension kit with screws (M4*16mm), as shown in **Figure 7**.

Step ②: Fix the adjustable connecting trough of the adjustable bracket extension kit with screws (M6*16mm) from the left and right sides, as shown in **Figure 7**.

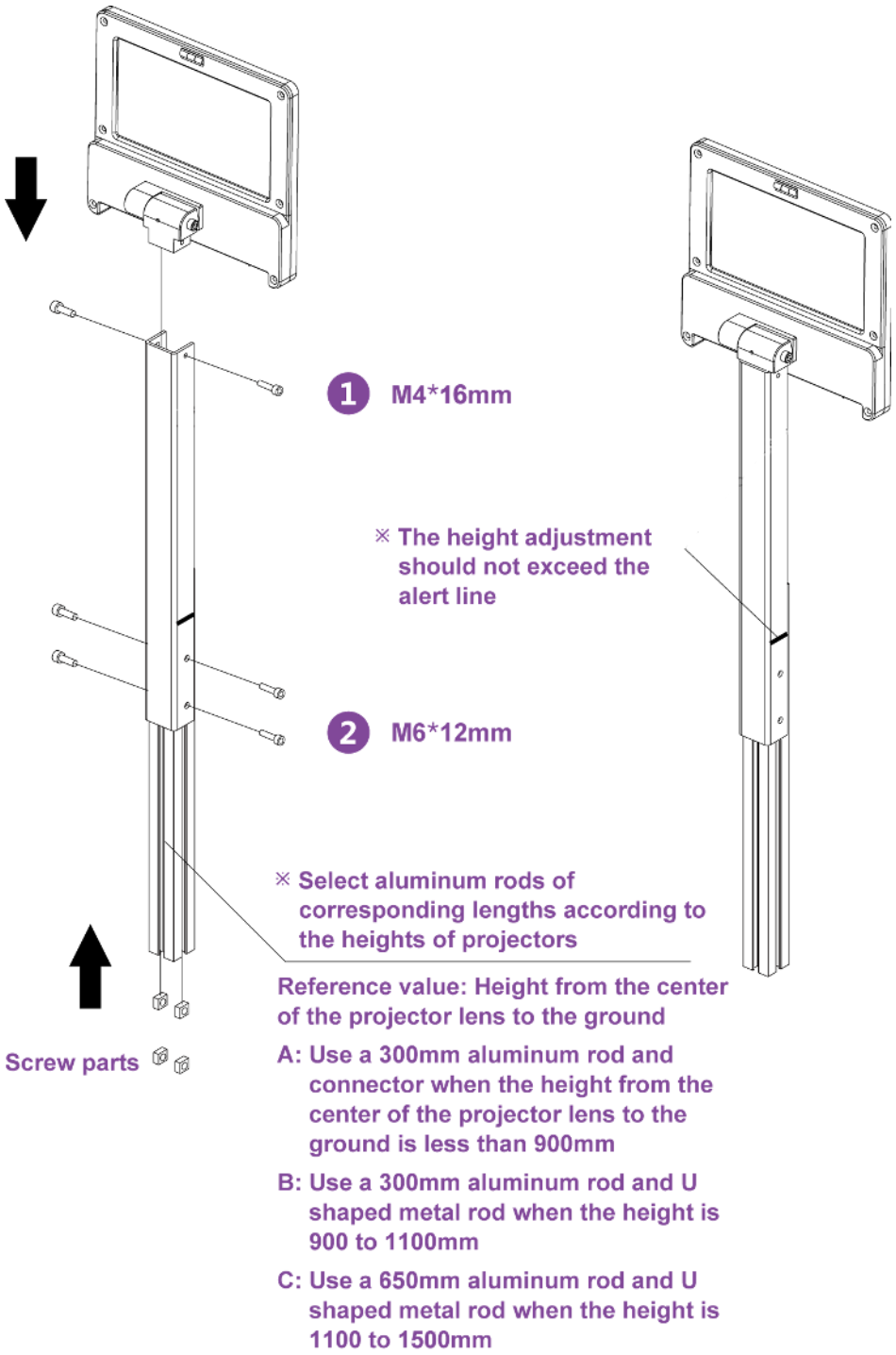


Figure 7: Installing the Polarizer

5.3. Installing the Adjustable Bracket Extension Kit

Fix the adjustable bracket extension kit with the polarizer installed onto the motorized bracket with a clamping block, as shown in **Figure 8**.

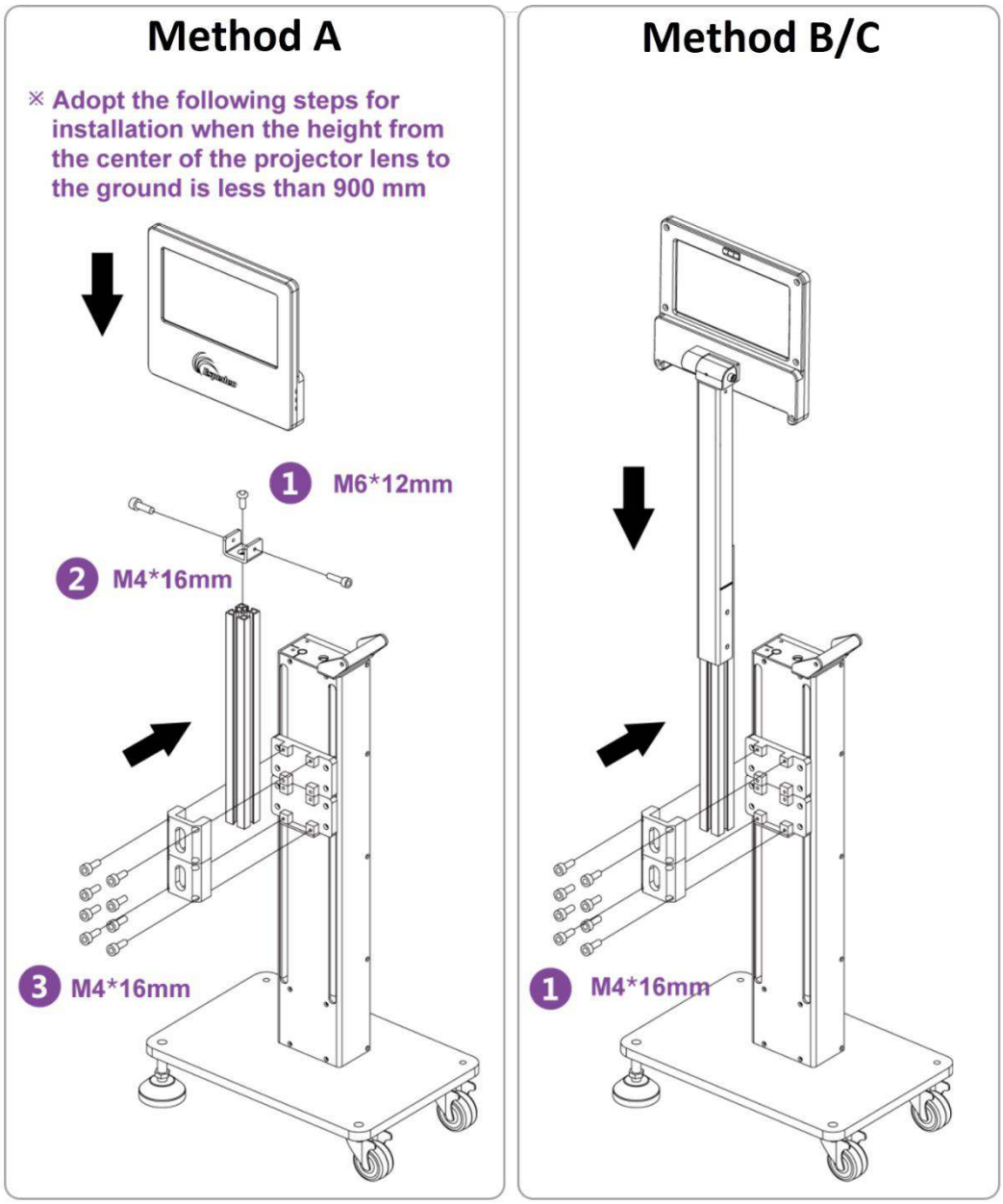


Figure 8: Installing the Adjustable Bracket Extension Kit

5.4. Cable Connections for Passive 3D System

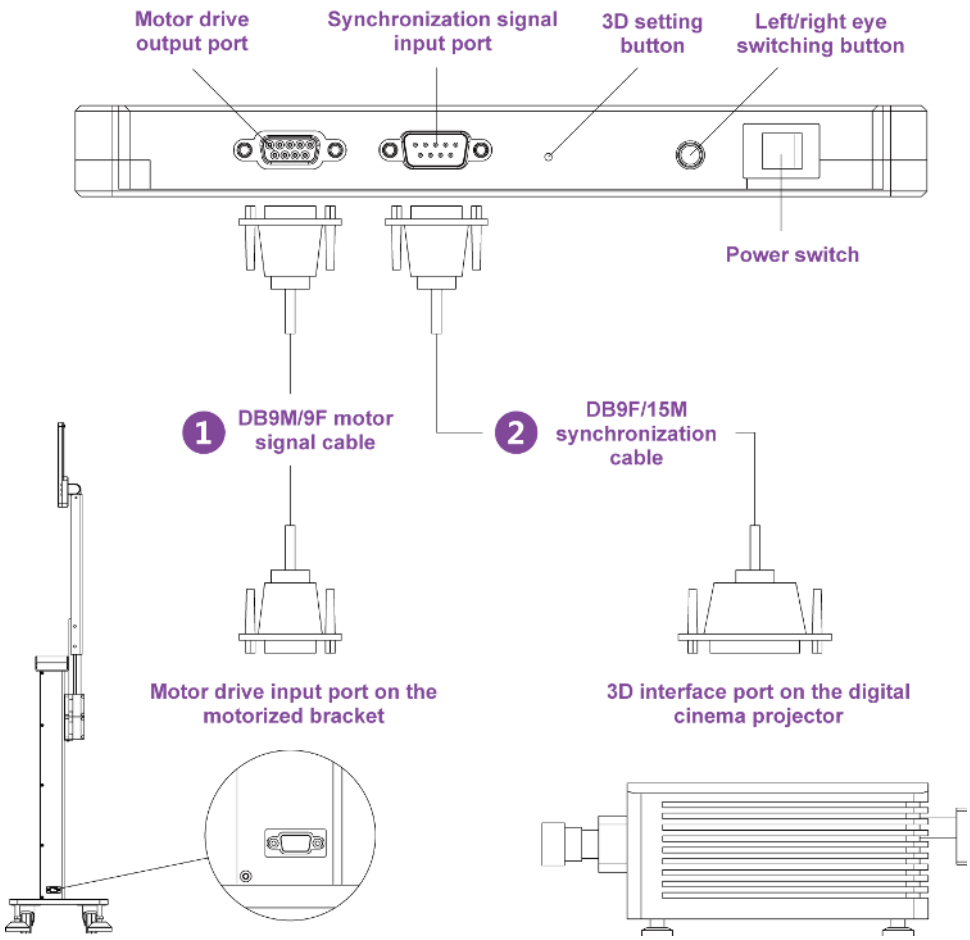


Figure 9: Cable connections of the Passive 3D System

Connect the synchronization cable:
Connect the 15-pin end of the DB9F/15M synchronization cable to the 3D interface synchronization signal output port on the digital cinema projector, and connect the 9-pin end to the synchronization signal input port on the polarizer.

Connect the motor signal cable:
Connect one end of the DB9M/9F motor signal cable to the motor drive output port on the polarizer, and connect the other end to the motor drive input port on the motorized bracket, as shown in **Figure 9**.

5.4.1. Alternative Power Connection when 3D Interface is not available from Projector (with power converter and GPIO control signal)

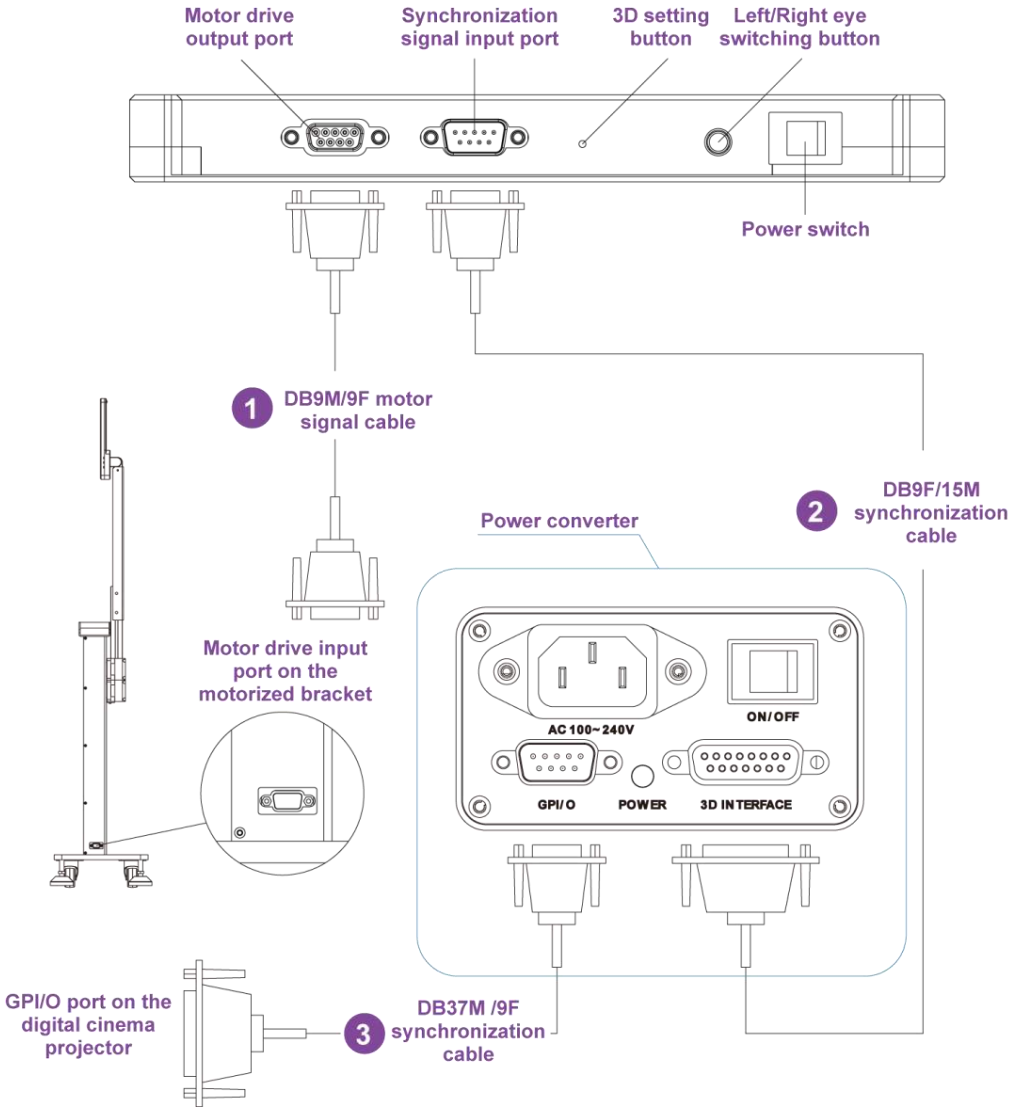


Figure 10: Alternative power connection when 3D Interface is not available from projector (with power converter and GPIO control signal)

Alternative power connection when 3D Interface is not available from projector:
You can connect to the passive 3D system through connecting to GPIO port on digital cinema projector with signal converter, as shown in **Figure 10**.

Switch on the power supply and check the signal LEDs:
After connecting the cables, turn on the power switch of the polarizer. Activate the digital cinema projector for 3D movie playback and check the signal LEDs on the polarizer.

5.5. LED indicators of Passive 3D System

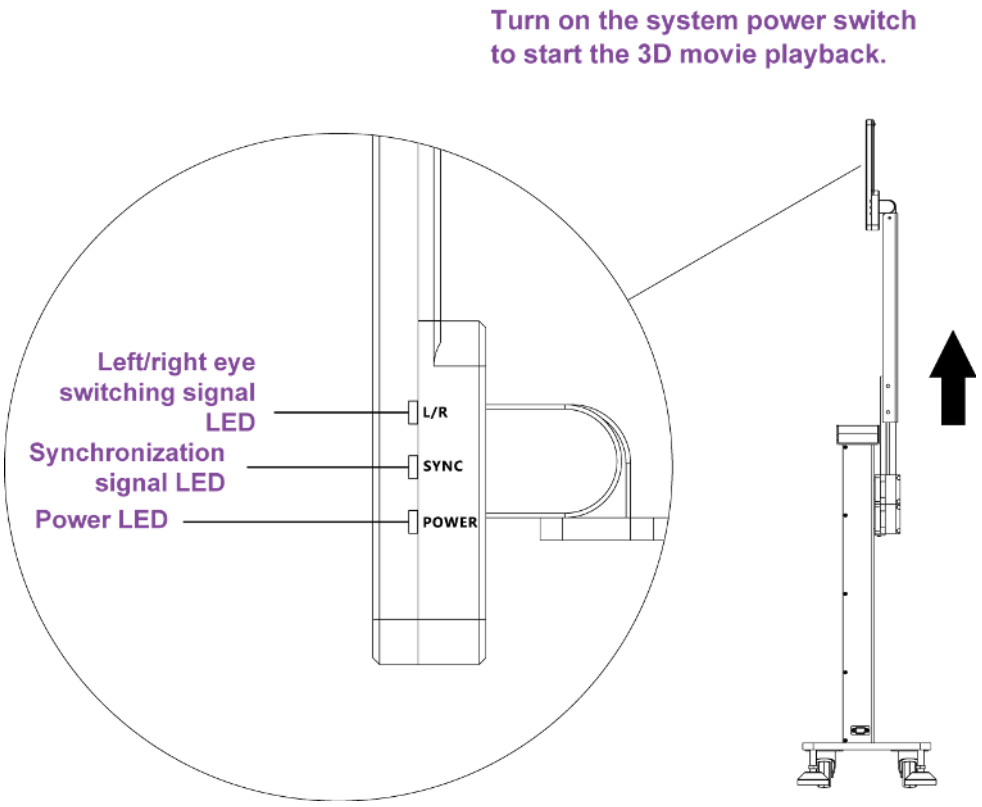


Figure 11: LED Indicators on the Polarizer

POWER (Power LED):

Turn ON the power switch of the polarizer for power supply.

- If the power LED is ON in green color; it indicates that the power supply has been connected.
- If the power LED is OFF; check whether the signal cables are properly connected and whether the digital cinema projector has been powered on.

SYNC (Synchronization signal LED):

- If the Sync LED is ON in green color; it indicates that 3D signals are detected and a 3D movie can be normally played.
- If the Sync LED is OFF; it indicates that no 3D signals are detected. In this case, check whether the synchronization cable is properly connected and whether the digital cinema projector is properly set.

L/R (Left/Right eye switching signal LED):

In case the audiences feel the depth of field is inverted inside 3D image objects; for example, which makes the background seem to be in the front and front objects are at the back, this is because the light phase of polarizer and 3D glass is inverted. Then we can press the L/R switch to toggle the Left/Right eye signal for correction.

5.6. Adjusting the operating position of the Polarizer for 3D Playback

During a 3D movie playback, the polarizer automatically moves to the default/pre-set operating position. The 3D operating position of the polarizer can be achieved by choosing aluminum rods of suitable lengths and adjusting the height of the rod, as shown in **Figure 12**.

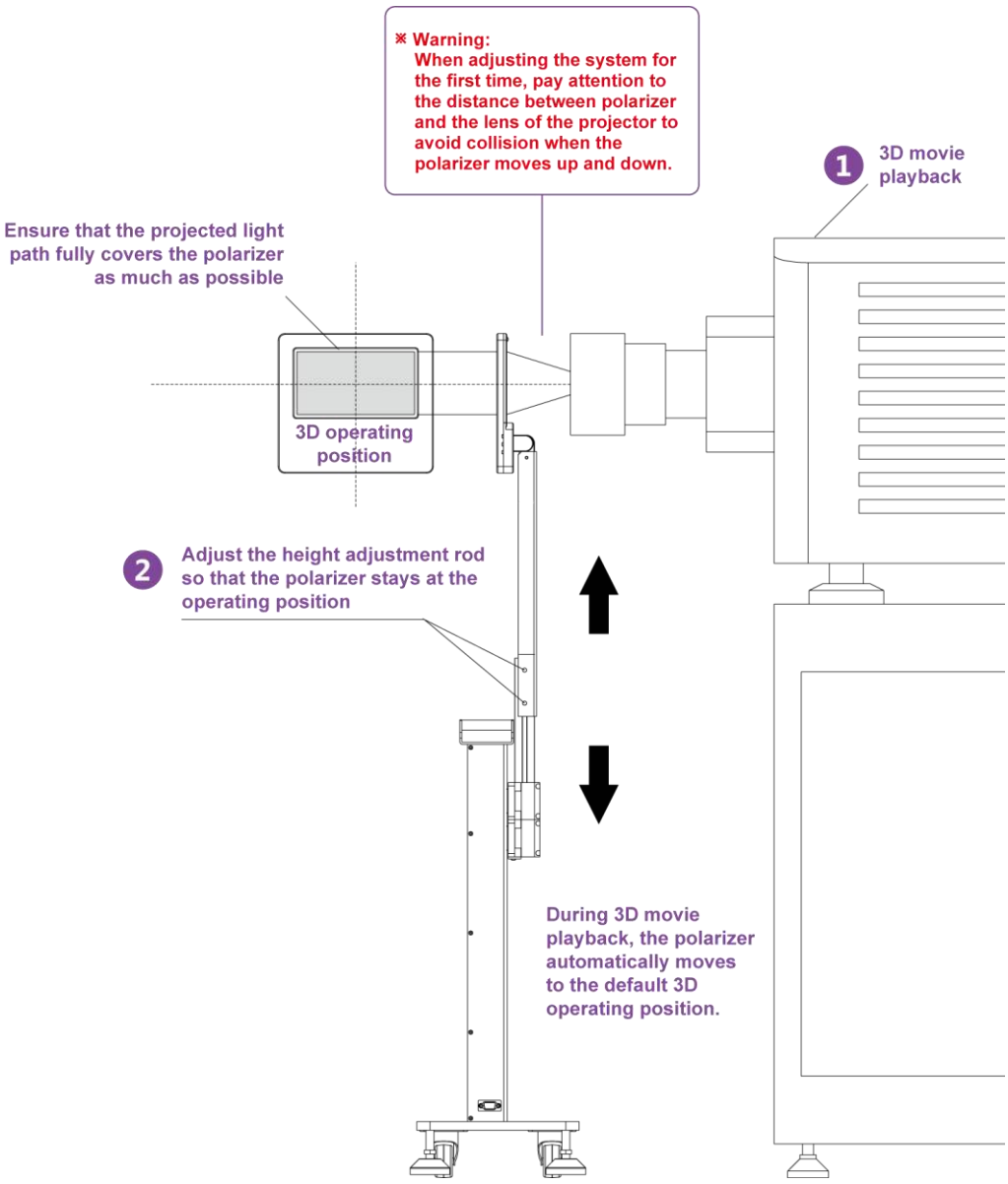


Figure 12: Adjusting the operating position of the Polarizer for 3D Playback

5.7. Adjusting the default 3D operating position of the Motorized Bracket (When adjustments mentioned in Section 5.6 cannot be performed)

When the aluminum rods fail to enable the polarizer to be aligned to an appropriate operating position, you would need to set the default 3D operating position of the motorized bracket, as shown in **Figure 13**.

Step ①: Turn OFF the power switch on the polarizer.

Step ②: Manually raise the clamping block of the motorized bracket to a height of about 300 mm from the bracket support base, and then adjust the 3D operating position of the polarizer (so that the light path projected out of the digital cinema projector from the lens can be completely reflected on the polarizer and falls in its center).

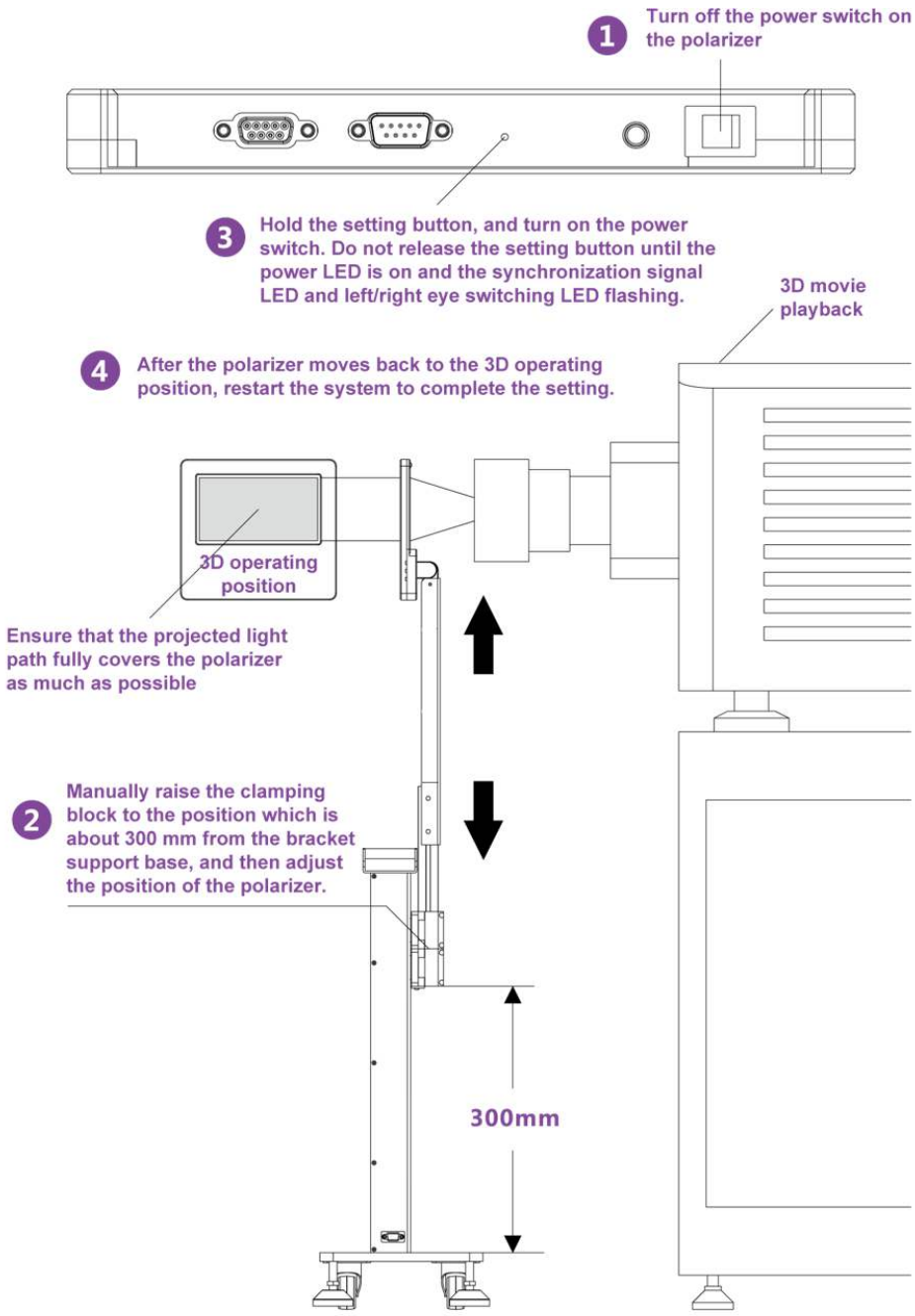
Step ③: Hold the setting button and turn ON the power switch. Do not release the setting button until the power LED is ON and the synchronization signal LED and left/right eye switching LED starts flashing.

Step ④: After the above setting is completed, the polarizer automatically moves back to the standby position and then moves to the designated 3D operating position. Restart the system to complete the setting operation.

If the position of 3D projection is not accurate after adjusting, you may need to adjust the aluminum rods by loosening the screws on the clamping block to fine tune the position.

To confirm whether the installation positions are appropriate, perform the following checks:

- During 3D movie playback, the light path projected out of the digital cinema projector just falls within the polarizer glass frame.
- During 2D movie playback, the passive 3D system does not block the light path projected out of the digital cinema projector.
- The motorized polarizer stays apart from the digital cinema projector by moving downward when transit from 3D to 2D mode.



*** If the position of 3D projection is not accurate after adjusting, you may need to adjust the aluminum rods by loosening the screws on the clamping block to fine tune the position after 3D operating position setting.**

Figure 13: Adjusting the default 3D operating position of the Motorized Bracket

6. Optical Alignment

Load the cross-calibration pattern of the digital cinema projector and slightly adjust the top, bottom, left, and right positions of the polarizer, so that the projected light path coincides with the cross-calibration pattern on the projection screen.

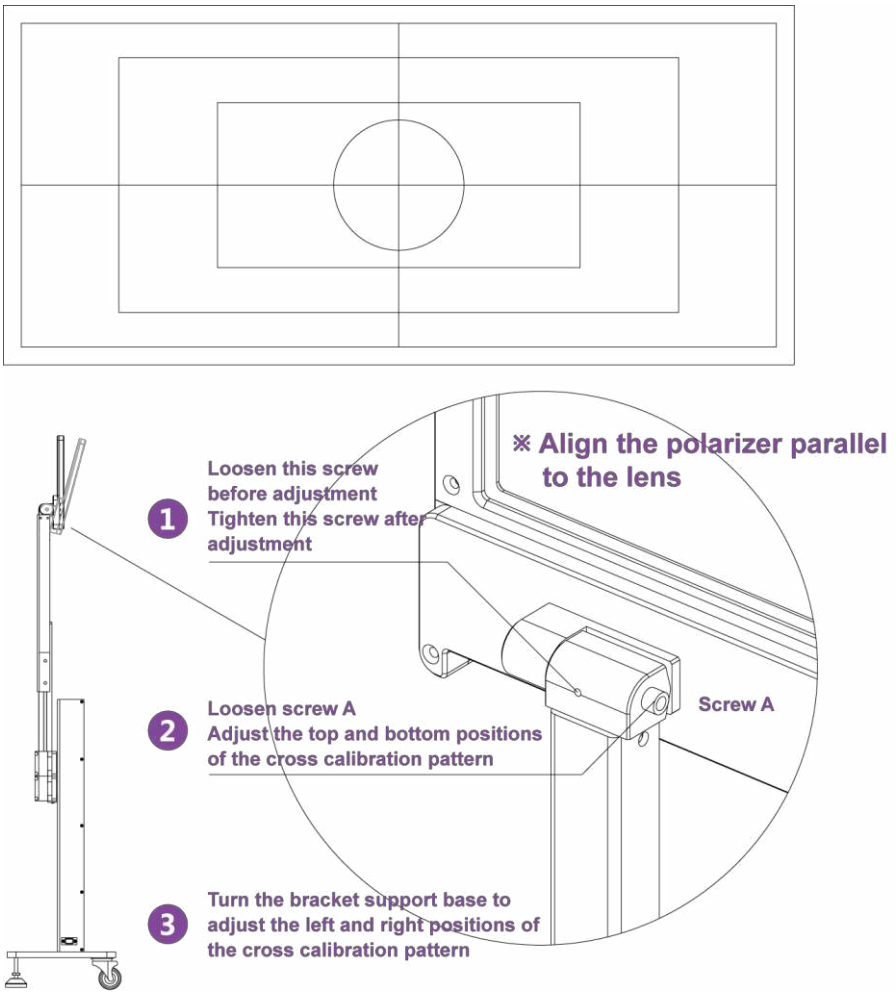


Figure 14: Adjusting the Calibration Pattern

- Loosen the lock screen screw on the back of hinge as indicated in **Figure 14** (refer to Step ①), prior to making any adjustments
- Loosen screw A to turn the polarizer to adjust the top and bottom positions of the cross- calibration pattern, note to
- Turn the bracket support base to adjust the left and right positions of the cross-calibration pattern.
- If the tilt level is out of above range, try to adjust the height of the legs to level the system with reference of level meter that locate on top of polarizer during the adjustment.
- Tighten the lock screen screw on the back of hinge, after the adjustments have been made.

7. Notes

7.1. Installation

- There is a level meter on one side of the polarizer for which is the incident plane. It should be placed opposite to the lens of the projector.
- The light spot of the projected image on the polarizer should be about 5 to 10mm away from the inner edge of the polarizer frame.
- Pull the protective film off the polarizer once the installation is complete.

7.2. Routine Maintenance

- Keep the surface of the polarizer clean and wipe it with absolute alcohol wiping paper. Prevent the alcohol from flowing into the interior of the polarizer.
- Operating Environment: Temperature 0-50°C; Relative Humidity ≤ 60%.
- DO NOT scratch or wipe the surface of the polarizer with any hard object.
- DO NOT wash the polarized glasses with water. Clean the polarized glasses with absolute alcohol if necessary.
- Place the polarizer back into the corresponding protective case if it is left idle for a long period.

7.3. Transportation

- DO NOT throw or toss the passive 3D system. Keep it away from fierce vibration.
- The polarizer is fragile and must be separately placed. DO NOT place any heavy object on it in order to avoid damage.

7.4. Safety

- DO NOT knock or scratch the surface of the polarizer with any sharp or hard object; otherwise, the polarizer will be damaged.
- Keep the polarizer away from water and humid places.
- DO NOT excessively bend the plugs or electric cables, or place any heavy object on it to avoid damages.

7.5. Tips

- Power OFF the system before making any cable connection changes.
- Hold the plugs tightly when removing them.
- Power OFF the system and remove the connection cables before moving or cleaning the 3D system.
- DO NOT touch the plugs with wet hands.

Espedeo Website

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