

# Cable Problem Diagnosis and Troubleshooting

## BACKGROUND

Cables can be one of the more challenging elements of any system. Using cables other than those supplied by the manufacturer can add yet another level of complexity.

The purpose of this document is to help installers, technical staff, and end users identify, diagnose, and resolve cable problems.

## INTRODUCTION

This document covers a broadly applicable diagnostic and remediation approach for technical problems that appear to involve cable issues. A staged approach is described to diagnose, localize, and remediate possible cable problems. This document is not meant to be a detailed engineering tutorial on the surprisingly complex topic of cable technology.

Boxlight tests and warrants its products with a specific set of factory-supplied cables. The great variability among cables, potentially even within different production runs of the same cable, make it impractical for manufacturers to validate, certify, or warrant the performance of any cables or connection method other than exclusively using the factory-supplied cables.

This document is intended to help installers and technicians diagnose and solve cable problems under any conditions, particularly when the factory-supplied cables are not used.

This document assumes technical experience with computers, displays, and projectors, plus operational comfort with MimioStudio. If MimioStudio is not available, Microsoft Paint or an equivalent Mac application can be substituted.

## THE QUICK VERSION

1. Boxlight tests and warrants its interactive products with a specific set of factory-supplied cables.
2. It is simply not practical for any manufacturer to know about and test even a tiny percentage of the available cables and/or associated solutions.
3. Use only the factory-supplied whenever possible—they were carefully selected to go with the specific product.
4. If your room layout forces longer lengths or routes cables through walls, then use active USB repeaters rather than cascading multiple non-active cables or using active USB extenders.
5. If the solutions aren't working properly, reconfigure the room as needed to enable a test using just the factory-supplied cables. If that works, there's something amiss in the cables that were substituted—following the procedure below should enable identifying and replacing the culprit.

## OVERVIEW

It is the nature of electronic systems to sometimes experience issues that require sophisticated diagnostic and remediation processes. A specific configuration of an interactive system might work fine in one classroom, while an apparently identical system might not work at all—or have intermittent problems—in another classroom.

Performance can suddenly be affected by electromagnetic interference caused by the unnoticed introduction of new devices nearby such as a microwave oven, wireless audio system, handheld controller, or a new accessory plugged into the host PC. One particularly vexing problem happened every time a nearby vending machine used its built-in Wi-Fi to notify its supplier that it needed more of an item.

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## THE MOST IMPORTANT RULE

The most important rule in diagnosing and remediating operating problems, particularly intermittent ones, is “only change one variable at a time.”

## DIAGNOSTIC PROCESS

### *Step One: Set up baseline configuration*

The first step in diagnosing possible cable issues is to establish a baseline by setting up the system in its most basic configuration. This is the only way to establish that the system itself works to spec. In the case of Boxlight, this means:

1. Having MimioStudio installed on a PC running a qualified operating system and equipped with at least the minimum specified RAM and having at least the minimum specified free disc space.
2. Connecting the teacher PC to the interactive projector or flat panel display with only the factory-supplied cables. This means no docking station, extension cables, repeaters, cable extenders, or adapters—just the factory-supplied cables.
3. Disconnect all peripherals from the teacher PC except the keyboard, mouse, video to a single desktop monitor, video to the interactive display, and the USB cable to the interactive display.
4. Accomplishing this test setup may require temporarily moving the teacher PC close enough to connect to the interactive display with only the factory-supplied cables.
5. Power down the teacher PC and interactive display.
6. Power up the interactive display, then power up the teacher PC

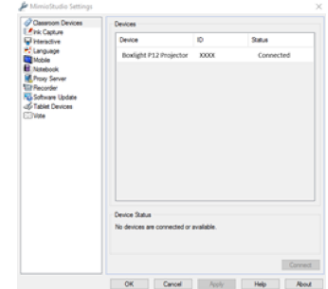


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## Step Two: Baseline testing

Using the baseline configuration, run and document the following tests:

1. Launch MimioStudio.
2. Check Tools -> Settings -> Classroom Devices to verify that the connection to the interactive display is recognized.
3. Test and document the results of the following representative functions:
  - a. Pen or touch
    - i. Select a visible color and use a single pen/touch to draw at high speed, noting if there are significant missing segments.
    - ii. If the system being tested supports multiple pens or touches, use up to 4 to simultaneously draw at high speed, noting if there are significant missing segments.
  - b. Object draw
    - i. Choose the Object tool and quickly draw 4–5 objects, noting if there are any problems with drawing.
    - ii. If the system being tested supports multiple pens or touches, use up to 4 to simultaneously draw multiple objects, noting if there are significant missing segments or other abnormalities when drawing the objects.
  - c. Move object
    - i. Choose the Selector tool and use a single pen to select and move an object, noting if there are any problems with moving the object.
    - ii. If the system being tested supports multiple pens or touches, use up to 4 to simultaneously move multiple objects, noting if any objects are “dropped” while moving them or any other abnormalities.
4. Initial conclusions
  - a. If all works to spec under baseline conditions, then the system itself is operating properly. If the system fails to work properly under baseline conditions, this suggests a problem with one or more of the system components. Please call Boxlight Tech Support for assistance.
  - b. If the system does not work to spec in a classroom installation where cables other than the factory-supplied ones are used, then performance to spec in the baseline configuration indicates that something is amiss in the installed cabling.



## Step Three: Diagnosis

This next stage is where the process of determining the cause of the cable trouble begins.

1. Power down the teacher PC and interactive display.
2. Replace the suspect factory-supplied cable with one identical to those used in the problematic classroom installations. If the installed cabling is multiple cascaded cables, use that setup. If the installed cabling uses active extenders, adapters, and such, then use exactly that setup.
3. Once the system is wired up identically to the classroom installation, repeat the tests above and document the results. In the case of intermittent troubles, it may be necessary to leave this temporary setup in place for an extended period.
4. If the trouble that has appeared in the classroom installation does not appear in this test setup, this suggests

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something is different in the classroom installation. Perhaps a different batch of cables; a damaged connector; proximity to electrical or data wiring; electrical interference from a nearby device such as a microwave oven, cell phone, infrared classroom audio system; etc.

## *Step Four: Solutions*

As stated above, Boxlight tests and warrants its products with a specific set of factory-supplied cables. It is not possible for Boxlight to test, certify, or even recommend from among the wide range of available products. This is particularly true since manufacturers change those products without notice, which can render any standing endorsement moot.

The following are suggestions for resolving problems with cables not supplied with our products:

### **1. Cable extenders/repeaters**

- a. Cable extenders and repeaters are different technologies aimed at addressing the same challenge: longer USB cable runs.
- b. Both technologies serve their designed purpose well, though “you get what you pay for” and “let the buyer beware” remain solid principles.
- c. Improperly installed, inadequately powered, defective, or poorly designed offerings can themselves be the source of significant problems. One of the most difficult to troubleshoot, requiring sophisticated test equipment, is signal delay.
- d. Definitions
  - i. A passive extender is just a fancy name for an extension cable.
  - ii. An active USB extender is an active device that buffers and shapes the USB signal to enable it to go longer distances. The basic models are recommended for distances in the 30–50' range. USB extenders that are able to handle even longer distances are significantly more expensive. One variation is to use an active USB hub, which will perform a very similar process.
  - iii. A USB repeater is an active device that converts the USB signal into a different format and sends it over Cat 5 or Cat 6 networking cables (other cables are sometimes used, but Cat 5 and Cat 6 networking cables are most common). USB repeaters can usually handle cable lengths of 150–200'.
- e. Options
  - i. There are many, many offerings for active USB extenders and active USB repeaters. The market experiences a rapid introduction of new products that replace current ones and even new revisions of current ones that affect performance. This makes it impractical for any manufacturer to test and certify specific models.
  - ii. Boxlight recommends using active USB repeaters or a single active USB extender.
  - iii. Boxlight strongly advises against cascading multiple active USB extenders.

### **2. Wall plates**

- a. Wall plates introduce connectors, which means they introduce the possibility of poor connections, loose connectors, and even dirt from within the walls.
- b. In a situation where cable troubles are being experienced, it is recommended that all connections to the front and back of the wall plate be checked to be sure they are screwed in and not merely press-fit.

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### 3. Adapters

- a. Sometimes even the best of planning ends up with a plug and a socket that just cannot plug into one another. This can be due to them being different formats, different sizes (the various types of USB connectors), or even two male or female plugs that just cannot connect.
- b. The best solution is to change the cables so as to avoid needing to use an in-line adapter.
- c. If changing the cable to avoid an in-line adapter is impractical, then a high-quality adapter should be used and the assembly secured to prevent it from coming apart. Particular attention should be paid to adapters right at the teacher PC or interactive device as they are easily jostled and/or snapped off.
- d. Adapters add both physical and electrical length to the total—yet another reason to avoid them when possible.

### 4. Cable length

- a. As mentioned above, cable length is critical. It is also the most common reason for cable problems.
- b. When the only available cable run is a long cable run, it might be advisable to replace cables with a wireless solution such as Boxlight's Unplug'D Wireless Presentation Network Device.

## SUMMARY

The ideal implementation, and the only one covered by the warranty, is to use the factory-supplied cables. When that just will not work, the best alternative for runs longer than 50' is an active USB repeater. For 50' or less, an active USB extender will usually suffice.

When cable troubles are experienced, the diagnostic and troubleshooting approach in this document should enable verifying that the system components are working properly and identifying which of the substituted cables may be the cause of the troubles—all of which sometimes requires multiple steps and patience.

## CONCLUSION

As stated above, Boxlight tests and warrants its products with a specific set of factory-supplied cables. This document is intended to help installers, technical staff, and end users identify, diagnose, and resolve cable problems when the factory-supplied cables are not exclusively used.

Boxlight is not in a position to test configurations that do not use the factory-supplied cables. That task needs to fall to the system designer or installer.