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White Paper

As Easy as One, Two, Three
Three Keys to a Better AV User Experience

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From AV Club to IT Managers

When audiovisual (AV) systems first appeared in classrooms in the mid-twentieth century, teachers and administrators could rely on members of the school AV club to get the system up and running, simply by setting up a film projector or plugging in a VCR.

Today, film strip machines and overhead projectors have been replaced by interactive whiteboards and document cameras. Twenty-first century classroom AV systems present a unique combination of challenges. They must accommodate a range of technologies, from older equipment to cutting-edge innovations. They need to be useable by a wide range of individuals, from teachers who are familiar with their classroom's system to substitutes and administrative staff who may never have used the system before to students of varying ages and technical abilities. And they have to accommodate challenging education and school district technology budgets, with total system affordability that extends from the initial installation through the entire lifecycle of the system years down the road.

Teachers in classrooms from kindergarten to college require AV systems that allow them to extend HDMI®, VGA, and USB signals from their desks to output devices located throughout the classroom. To accomplish this, many school administrators lean toward installing complex, professional AV systems with multiple touchscreen inputs and controls. Though these systems are capable of meeting the technological needs of classroom AV equipment, using them effectively is often beyond the skill-set of teachers and AV club members alike, requiring professional installation, system set-up and maintenance by IT managers, and extensive training to operate.

Classroom AV systems should not be complex. In an education environment, a simpler system maximizes student engagement, is easily integrated into the learning setting, and is upgradable for a longer-lived solution. A simple system is far more likely to accommodate the classroom infrastructure, school budgets, and end-users needs.



When designing an AV system for a classroom setting, there are three keys to a positive user experience:

- 1 Extension for AV signals**
- 2 Minimal components**
- 3 Intuitive interface and easy controls**



School Infrastructure: Know When Passive AV Cables Are Not Enough

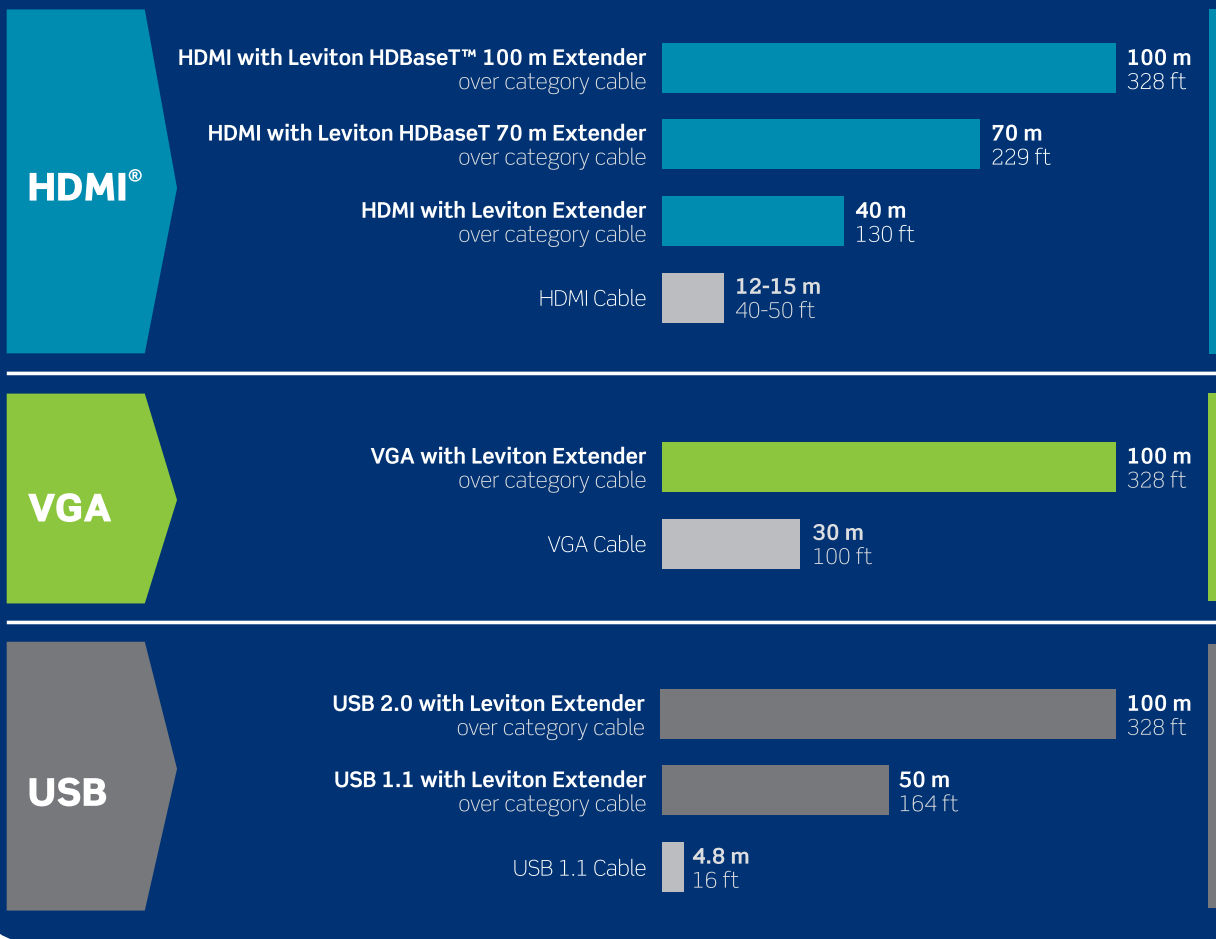
Just as building infrastructure varies in age from school to school, so too does network infrastructure. Cat 5e, Cat 6, and Cat 6A UTP cabling can all be found in educational institutions today. In many school districts around the country, passive cables have been the standard for AV systems for years, but passive cables will not provide adequate support for 21st-century classroom AV signals.

Most AV applications will require some form of signal extension. For example, HDMI cables are specified to be operational at lengths of 40 to 50 feet. However, in reality they are only trustworthy up to about 35 feet for 1080p signals. Their reliability for 4K is much shorter.

VGA cables can reach up to 100 feet, but this technology is gradually becoming obsolete in today's classroom AV systems.

The range for USB cables is approximately 16 feet, but will be greatly reduced when used with USB 3.x devices.

Below are recommended maximum lengths for different AV links, compared to maximum lengths using Leviton extenders:



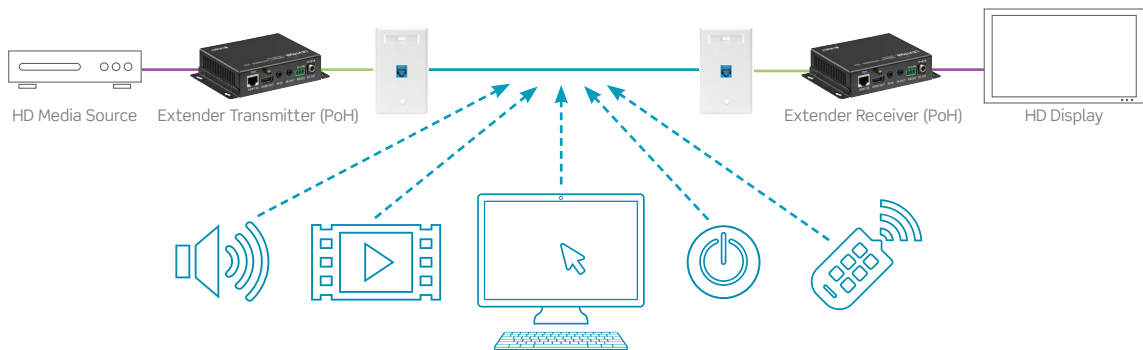
To accommodate high-bandwidth, ultra-high-definition HDMI signals, options range from an upgrade to an expensive professional AV system to the addition of cost-effective signal extenders. Passive HDMI cables are only reliable for high definition up to 15 meters. For an education environment, deploying extenders is the better option because they reduce system complexity while fitting within a school's limited budget, and simple control capabilities are an easy add-on.

Using a system built on the HDBaseT™ standard embraces that simplicity by allowing the integration of VGA, HD, UHD, and USB signals on a single system and cable, covering the full range of AV technology. HDBaseT is an industry standard that provides high-definition AV solutions over category-rated cable. HDBaseT allows the user to transport an HDMI signal over a single cable, and is essential to a simplified, easy to use AV system because it enables the implementation of HDBaseT 5Play™ technology. 5Play offers five key AV system capabilities: digital audio, HDMI uncompressed video, 100 Mb Ethernet, Power over HDBaseT (PoH), and RS-232 and IR control signals. To accommodate all five signals without 5Play technology, three or four different cables would be needed.

5Play™
HDBaseT™

1. Full digital audio
2. HDMI uncompressed video
3. 100Mb Ethernet channel
4. Power (PoH up to 100w)
5. Control via RS-232 and IR

Simultaneous transmission of **All 5** on a **single** category cable



Just as passive AV cables have distance limitations, older category cables have limitations, too. With 5Play, transmission of AV signals is possible at speeds of 10.2 Gb/s and a frequency of 300 MHz over one category cable. TIA UTP cable specifications define the frequency capability for Cat 5e at 100 MHz, Cat 6 at 250 MHz, and Cat 6A at 500 MHz. To determine the capability of different category channels, cable, and connector types for use with HDBaseT signal extenders, Leviton conducted a series of tests using 1080p/60 video sources.

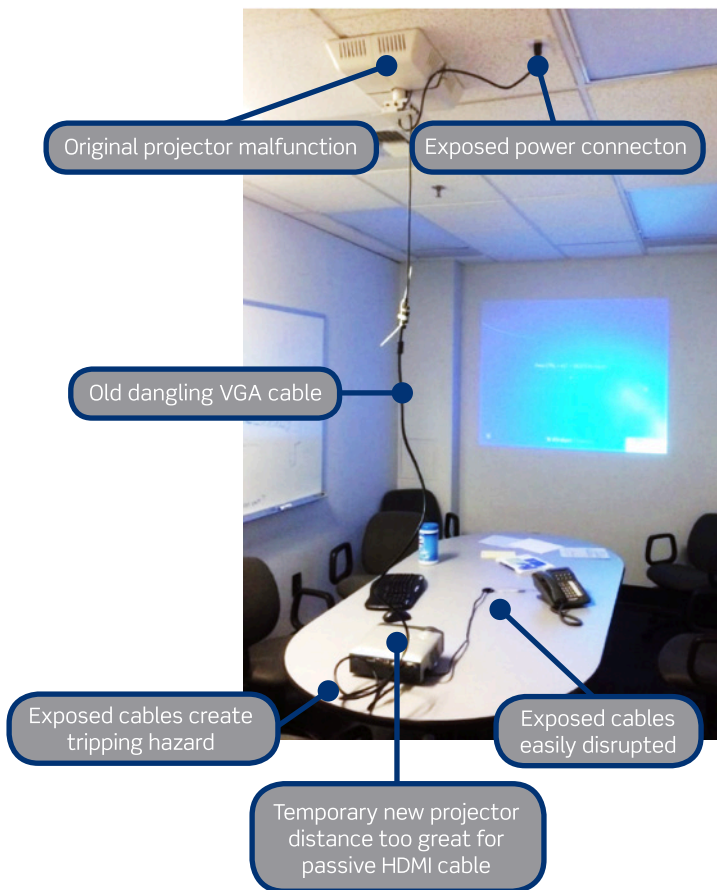
Cat 6A was the only category-rated cable to consistently deliver reliable signal performance, and Cat 6A cable with alien crosstalk prevention technology provided top-tier performance. Testing showed that Cat 5e UTP cable is unable to provide signal reliability over long distances. Cat 6 UTP cable may meet network signal requirements and deliver acceptable performance in an education environment, but issues with alien crosstalk mean signal integrity can't be reliably assured.

To eliminate alien crosstalk and avoid dropouts or link loss at high resolutions, a Cat 6A UTP channel with alien crosstalk prevention technology is recommended. Not only are Cat 6A UTP cabling systems able to provide infrastructure that is durable and typically less expensive than alternative forms of AV cabling, they also offer the ability to upgrade an AV system without upgrading the entire network. And no other UTP cable option reliably supports AV signal integrity over long distances while offering easy installation compared with FTP (shielded) cable. A simple AV system built on a Cat 6A UTP cabling infrastructure offers maximum longevity and upgradability; a move from VGA to a 1080p or 4K system is nearly effortless on the same link.



System Design: Minimize the Number of Components

Common Situation



In today's economic environment, school district budgets must accommodate a number of competing needs. AV systems are typically the final line item to be budgeted for and the last infrastructure component to be installed. Upgrades all too often occur only because of the failure of a key component such as a display or projector.

An AV system's total lifecycle is often not budgeted for at all. System maintenance and upgrades over the lifetime of the system are frequently overlooked. Typical maintenance for a complex, professional AV system can include repairs to projector lamps, control software updates to touch panel systems, connectivity updates to accommodate newer technology such as VGA to 1080p to 4K, and IT service calls for systems that just "aren't working" either due to end-user confusion or component failure.

A simple AV system with minimal components, on the other hand, has a lower initial purchase price and installation cost, and a greatly reduced total system maintenance and upgrade budget. When designing an AV system with the goal of reducing components and system complexity, two options are available: centralized or decentralized systems.

Centralized AV systems offer the benefits of greater control and easier overall system management. Every classroom system can be monitored and controlled from a single, central administrative location. With uniform system design for every classroom and patching into the school telecommunication room, a centralized AV system offers the benefits of easier system management and greater oversight of power use, including the ability to automate some processes.

However, a centralized AV system is a complex system, not only in number of components but in the difficulty of installation and long-term maintenance needs. A single component failure can impact not one but multiple rooms — or even the entire school. This increases the potential for a high system lifecycle cost that may be beyond most school budgets.

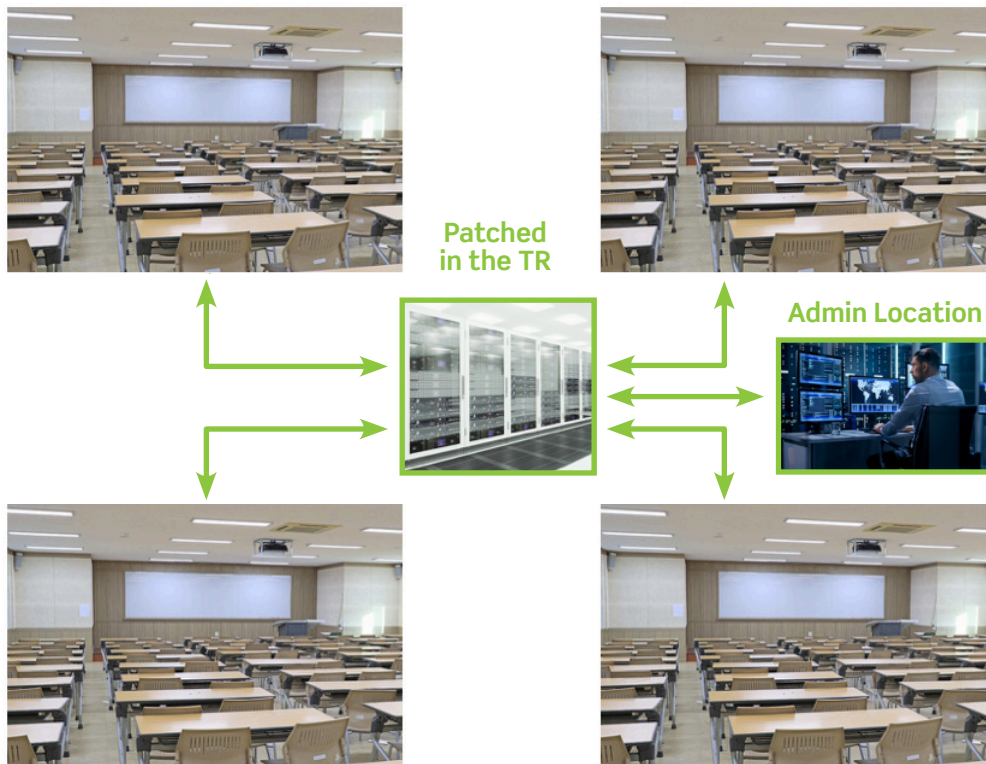
Centralized AV System

Upside:

- Central administrative control and monitoring

Downside:

- Complexity
- Lifecycle cost
 - Components, installation and maintenance



Decentralized AV systems, on the other hand, are based on individual, self-contained classroom systems that are not patched into the building telecommunication room. This design is far simpler than a centralized system, which reduces the installation and component costs. The system lifecycle cost is typically lower than it would be for a similar centralized system since maintenance and upgrades can be made on a room-by-room basis, rather than requiring a system-wide shut-down, reprogramming, or repair.

This flexibility and affordability can have drawbacks, however. Since each room comprises a separate AV system, no central administrative control or monitoring is available, though some overall system control and automation can be added with web-based system monitoring applications often supplied with the projector or display operating system.

Decentralized AV System

Upside:

- Simplicity
- Lifecycle cost
- Capability for limited control/automation
- Every room the same

Downside:

- Completely separate room systems
- No central control



Individual In-Room AV Systems



For the majority of schools, a decentralized system will meet their needs both now and as AV technology evolves. The ease of installation, reduced amount of regular maintenance, and lower total system and lifecycle cost (including components, upgrades, and IT staff support) offer school administrators the flexibility to add components that meet the needs of their teaching staff and students now, as well as the ability to predict and control their classroom technology budget in the long-term.

3

AV Set-Up: Keep it Simple and Intuitive

Classroom AV system users come with a range of technical skill-sets, from savvy to easily intimidated. Because the end-user is the ultimate judge of an AV system, their willingness to use the system, their level of satisfaction with the interface, and the amount of time they spend activating the system are all factors that will be taken into account when assessing the quality of a legacy or newly installed system.

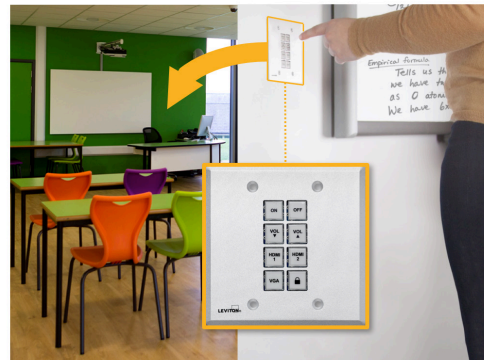
Teachers and administrators want AV systems that have intuitive ON/OFF controls, instant ON capability, and clear feedback that the system is working. They need easy and fast connections to all devices in the classroom, and consistent system-wide dependability without support from an IT professional.

There a number of ways in which AV technologies can be deployed in real-world classroom applications. The majority of classroom AV systems can be accommodated by a single AV source extended to a single display or projector. This simple solution reduces unnecessary complexity, unplanned maintenance, and end-user confusion.

Basic control panel systems and autoswitching wallplate inputs make system access effortless and instantaneous. Choose autoswitching wallplates that accept both HDMI (HD 1080p and UHD 4K) and VGA+ audio inputs, while also offering the ability to switch to the active input without user interaction. Add a dedicated push-button control panel with simple ON/OFF, VOLUME, and SOURCE selections to accommodate non-technical end-users.



Autoswitching



Control Panel

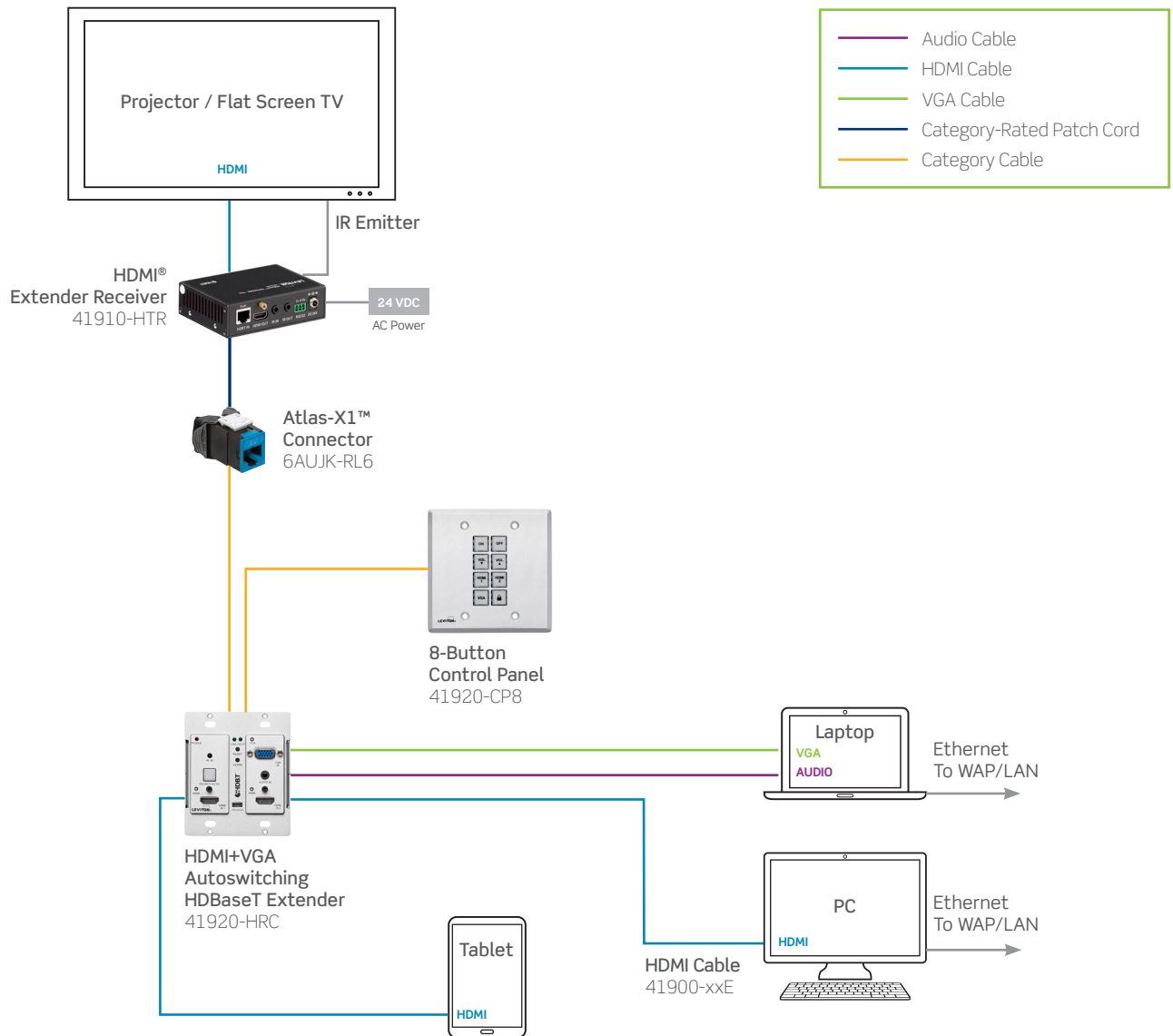
Interactivity can also be added with USB extension between the source and projector that requires only another tested Category cable link and USB 2.0 plug-and-play transmitter and receiver pair.



USB Extender Set



This easy to use system eliminates network security vulnerabilities and maintenance, while minimizing classroom disruptions by unfamiliar users such as substitute teachers and new staff.



An uncomplicated plug-and-play AV system is a reliable AV system. By focusing on simplicity and ease of use, network installers and IT managers can provide system longevity, reliable performance, and end-user satisfaction. Such systems offer straightforward installations, stress-free set-ups with no programming required, and cost-effective technology upgrades accomplished via simple alterations to the signal extenders, with no change to the network infrastructure needed. These solutions can even be added to an existing certified permanent link, reducing labor costs and installation time.

Leviton IT/AV solutions are designed for optimal functionality with a limited number of components that are easy to install and maintain, with no programming required. These systems are engineered with intuitive interfaces, instant-on feedback, and fast connectivity.

To learn more about AV system design for education environments, visit Leviton.com/ITAV.

We invent and manufacture the industry’s best cabling and connectivity. We build them to last. And we stand behind every product and end-to-end system — delivering the highest performance and unbeatable service and support — throughout the life of your network. Add the peace of mind that comes from working with a stable, century-old supplier, and you get the **highest return** on **infrastructure investment**.

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