HARMAN
A SAMSUNG COMPANY

DESIGN GUIDE

DISTANCE LEARNING

AKG AMX BSS crown dbx JBL PROFESSIONAL Lexicon Martin Soundcraft STUDER

INTRODUCTION

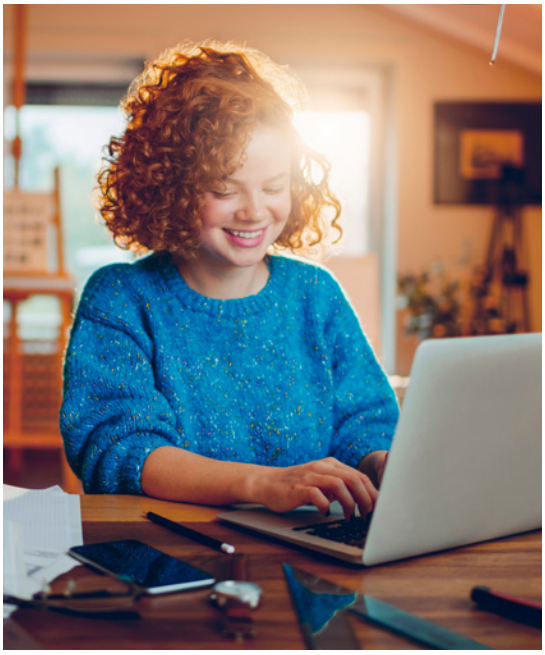
No technology released in the past century has changed the landscape of higher education quite the way the internet has. With the ability to pull data from anywhere, share knowledge, and collaborate across any distance, higher learning has advanced in ways never before thought possible. One of the biggest impacts the internet has made on education is the growth of distance learning. Thanks to the internet's ability to allow students to watch lectures from anywhere, at any time, the days of physically sitting in a classroom for each and every lecture are gone.

1 in 4

students take at least one distance learning course.

More and more schools and universities around the globe are adopting forms of online distance learning. The 2015 Survey of Online Learning, conducted by the Babson Survey Research Group, revealed that one in four students now take at least one distance learning course. That's about 5.8 million students, and going forward, that number is only going to rise.

ACHIEVING SUCCESS WITH HYBRID DISTANCE LEARNING



Distance learning is a large category of learning, and colleges and universities employ a variety of delivery methods to achieve it. Some of these classes are designed specifically for online viewing—with custom-made online course materials and canned "professor speaking to camera" lecture videos. However, many of these classes are actually hybrid distance learning classes.

A hybrid distance learning class combines a traditional class with students attending in person with instruction captured in the classroom that is then shared with learners viewing the class and completing coursework remotely. This hybridization of traditional and online instruction is quite common, but can present some unique challenges to professors.

For hybrid distance learning to be successful, the instructor must try to meet some specific objectives:

Create a consistent experience with students in and outside of the classroom.
Students attending class remotely should recieve a learning experience that mirrors the experience students attending in person receive. Although instruction should be customized to meet the unique demands of each learning delivery method, the underlying quality of instruction should remain the same for both.

Provide students outside the classroom with everything they need to see and hear.
While it seems obvious, it is vital to remember that remote students are not physically in the classroom. For them to be engaged, they need to be able to see both the instructor and the course materials. They also need to be able to hear the professor clearly, along with sound from videos and other materials.

Ensure in-classroom students aren't negatively impacted by the technology.
Having a lot of distance learning technology in the classroom can be a distraction to students who are physically in the room. A good distance learning solution should enhance the learning for students in the room by opening up new perspectives, not take away from their learning experience.

Make the system easy to use so professors are able to use it (and excited about it).
The biggest hinderence to the success of any new classroom technology solution is adoption. Distance learning technology should be simple for professors to use and make the class fun and more engaging. When the professors are successful and happy with the solution, they will continue to use it.

In this design guide, we'll explore how schools can adopt the right distance learning technology to meet all of these objectives and make distance learning a success.

THE TECHNOLOGY BEHIND DISTANCE LEARNING

It takes a wide range of technology to fully capture what goes on inside a classroom and share that content with students either live or in a time-shifted format. The goal of this technology is to capture the audio and video of the classroom environment and the course materials, combine them into a single audio/video stream, and then upload that content to a distance learning platform that delivers it to students.

Some of the particular technology solutions required to accomplish this include:

Microphones and Cameras that capture the audio and video of the professor and students in the classroom.

Video Switching and Distribution to connect video from the cameras and source devices both to screens in the room and for viewing online.

Audio Processing to combine sound from microphones and other sources together so the professor and classroom materials can both be heard clearly.

AV Recording to capture the audio and video of the event for later viewing.

AV Streaming to distribute video to remote students watching live.

Sound Reinforcement to ensure students in the room can hear the professor and other content at sufficent volumes.

Clearly, it takes a significant amount of effort to ensure the audio and video is captured correctly and then distributed to students in the classroom and online. Unfortunately, this technology is highly specialized and expensive, and using it in a hybrid distance learning environment doesn't fully meet the objectives we identified because it doesn't provide a consistent, quality experience to both sets of students.

THE CHALLENGE OF CONSISTENCY

At the heart of the challenge, students in the room have the benefit of being in the room. They can see and hear the presenter without the aid of technology. If they use technology to help students in a large classroom see and hear better, it is only to support what they can see and hear already. This purpose is apparent right in the name for these technologies: sound reinforcement and image magnification (IMAG). These technologies simply reinforce what they can already hear and magnify what they can already see.

Online students don't have the benefit of being in the room and have a completely different set of requirements for audio and video. Unfortunately, distance learning technology doesn't often provide this amount of flexibility. The goal of distance learning is to provide the "in-room experience" to those students who aren't actually in the room. To do that, schools need to show not just the presentation content (from a laptop, document camera, etc.) but the presenter as well. After all, a lecture is not just the instructor or the instructor's presentation. You need to see both. This means having video of the presentation content and having video of the instructor speaking. The trouble with this is that online learning tools don't typically have a way for students to watch two different video streams simultaneously and video switchers haven't provided a way to switch between different inputs (a camera and the presentation, for example) in a seamless way.

Up until now, the schools have addressed these two independent video feeds in a couple different ways:

- They deal with these as two separate streams to capture. They would then go into video editing software and manually time synchronize after the fact.
- They go through an external compositing device to blend the two images into a single video path, which is then streamed to the distance learning system.

Both of these options are possible but require additional time, equipment, and processes.

For audio, there is a similar problem. While schools already implement technology to ensure the instructor and audio from the content is heard in the room, what students need to hear in the room is different the students who are viewing remotely. Because we are dealing with two separate environments (local and distance), we'll want to provide an independent audio treatment on the audio being recorded or being sent out via the distance transport feed as compared to the audio being heard in the actual presentation environment. For example, if the lecturer believes the room volume is too loud and turns the in-room volume down, this changes the volume level on the stream being sent to the distance learning system. These solutions also need to be equalized separately, one to optimize for the classroom and the other to optimize for student learning, and there may be other independent audio processing requirements as well. Clearly, what works for in-room audio doesn't necessarily work for on-demand audio and without two completely separate signal paths, the technology settings tend to compete with each other.

Most rooms will require presentation switching. With AMX Incite, you have presentation switching and windowing in a single device that also offers world-class audio, making any classroom a distance learning classroom.

ENSURE EVERYONE SEES EVERYTHING

To solve these problems, HARMAN created AMX Incite, an all-in-one 4K60 seamless presentation device. AMX Incite offers integrated video switching, scaling, windowing, and distance transport, as well as signal processing, amplification, and control—all in a single 1RU or 2RU device.

For distance learning applications, this means that schools can take two of the available eight inputs and combine them into a single scaled output. That way, video of the lecturer and the presentation, document camera, or student device can be dealt with as a single HDMI stream. AMX Incite automatically captures two available inputs and combines them into a single output, and automatic scaling ensures that only the best possible resolution is displayed, regardless of destination display resolution capability. A device like the AMX N3000 Series H.264 encoder can then take that combined HDMI signal and record it locally to USB or stream it over the network to the distance learning platform. This windowing capability is included with Incite as part of the device and doesn't require expensive external window processing equipment or additional editing processes.

To meet the presentation needs of any application, Incite offers several image combination options that are switchable on the fly, including picture-in-picture, top/bottom, and side-by-side. For applications where you would like full screen video of the instructor or the presentation, Incite also offers seamless switching and professional-quality transitions. This allows for a smooth shift from presentation to camera, if desired. That way, there is no prolonged black image as video switches from one input to another. Transition options include: fade in, diagonal top left/top right/bottom left/bottom right, horizontal from left/from right, vertical from top/from bottom.

The best part about this solution is that this input compositing functionality is available—for no additional cost—within a device that is needed in the room already. Most learning rooms will require presentation switching. With AMX Incite, you have presentation switching and windowing in a single device that offers world-class audio and control as well.

HARMAN has led innovation for over 70 years. Our products are backed by thousands of patents, hundreds of industry awards, 3 technical Grammy awards, 2 Academy Awards and more to come.

LEGENDARY SOUND BOTH IN-CLASS AND ONLINE

HARMAN has been driving audio innovation for more than 60 years. Incite draws upon that vast experience by integrating best-of-breed audio technologies, including BSS digital signal processing (DSP), dbx Advanced Feedback Suppression®, and Crown DriveCore® amplification along with AMX video processing and NetLinx® control. This technology ensures that students will be able to clearly hear the instructor, receiving a quality audio experience free of feedback or other audio issues.

To ensure the experience is the right one for students both in-class and online, AMX Incite provides two independent audio mix busses. Each mix bus provides a complete fixed DSP chain, which is fully adjustable and includes independent microphone mixes per path, automatic mic ducking, compression limiting, gating, 10-band parametric EQ from BSS and Advanced Feedback Suppression from dbx. Each of Incite's audio outputs is assignable to one of the audio mix buses.

With these two audio mix busses, Incite offers a comprehensive solution for easily dealing with the competing audio requirements found between in-room and out-of-room presentation scenarios.

A SYSTEM INSTRUCTORS WILL LOVE TO USE

No matter how capable the technology solution, it will never be effective unless the instructor feels comfortable and confident using it. To provide this capability, Incite is available in a version with built-in NetLinx control processing. At the press of a button on a touch panel, keypad, or mobile device, the instructor can control the entire classroom environment, selecting windowing layouts, switching inputs, adjusting volume, controlling source devices, and more. By providing a simple and intuitive interface, instructors will have the confidence to use the equipment successfully.

As an added incentive to encourage instructor participation, the transitions included within Incite make every switch look like its being performed by a production crew. With numerous fade and wipe options on live motion video, Incite ensures that instructors will look and sound like the rock star educators they truly are.

ANY ROOM IS A DISTANCE LEARNING ROOM WITH INCITE

AMX Incite provides schools with a cohesive solution for distance learning in any space that already needs a presentation switcher. HARMAN does this by integrating all of the key pieces required for distance learning in a single device.

Let's take a look at our list from before, and see how Incite brings this technology together into an integrated solution:

Microphones and Cameras now all connect into a single device for ease of design, installation, and troubleshooting.

Video Switching and Distribution is included with AMX Incite, along with built-in windowing and production-quality transitions.

Audio Processing built into AMX Incite leverages industry-leading technology from BSS and dbx.

AV Recording is simplified by using an AMX N3000 Series encoder for local or distance recording.

AV Streaming to the distance learning platform is an easy matter with the AMX N3000 Series H.264 encoder.

Sound Reinforcement is always clear and efficient when using the Crown DriveCore amplifier technology built into the AMX Incite.

Here are some of the benefits of teaching with AMX Incite:

Engage Distance Learning Students

The right mix of technology can provide nearly the same experience to distance learning students as "in-room students." With windowing technology and two audio mixing buses, instructors can focus on delivering impactful content instead of worrying about the technology.

Maintain Attention Span

Even the slightest hiccup with presentation technology can cause a presenter to lose the attention of the class. Conversely, using presentation effects like seamless transitions, wipes and windowing (i.e. picture-in-picture, side-by-side or top-bottom) can help capture an audience and keep them engaged.

Improve the Audio Experience

Nothing can ruin a presentation more quickly than poor audio. Incite can address audio issues with industry-leading technologies from BSS, Crown, and dbx, ensuring the instuctor is heard clearly by everyone inside the room and beyond.

Simplify Command and Control

For a presentation system to be used, it needs to be intuitive. Onboard NetLinx control instills confidence and assurance by ensuring the solution is as easy to use as it is effective.

ABOUT AMX INCITE

AMX Incite Digital Video Presentation Systems are the next generation of presentation switchers that combine AMX control and signal distribution with industry-leading audio technology from BSS, Crown, and dbx.

AMX Incite includes 8x1:3 video switching, meaning it has 8 video inputs (4 HDMI, 2 DXLite, and 2 RGBHV/VGA). These inputs are switched to a single scaled video feed that is presented simultaneously to 2 local HDMI outputs and 1 DXLite output. On the audio side, the Incite offers 2 mic inputs and 6 line-level inputs, as well as audio over HDMI and DXLite. These are routable to 2 line-level audio outputs, audio over HDMI and DXLite, as well as 1 amplified audio output on models that come with the Crown DriveCore amplifier (including both low and high impendence options).

Here are more of AMX Incite's many great features:

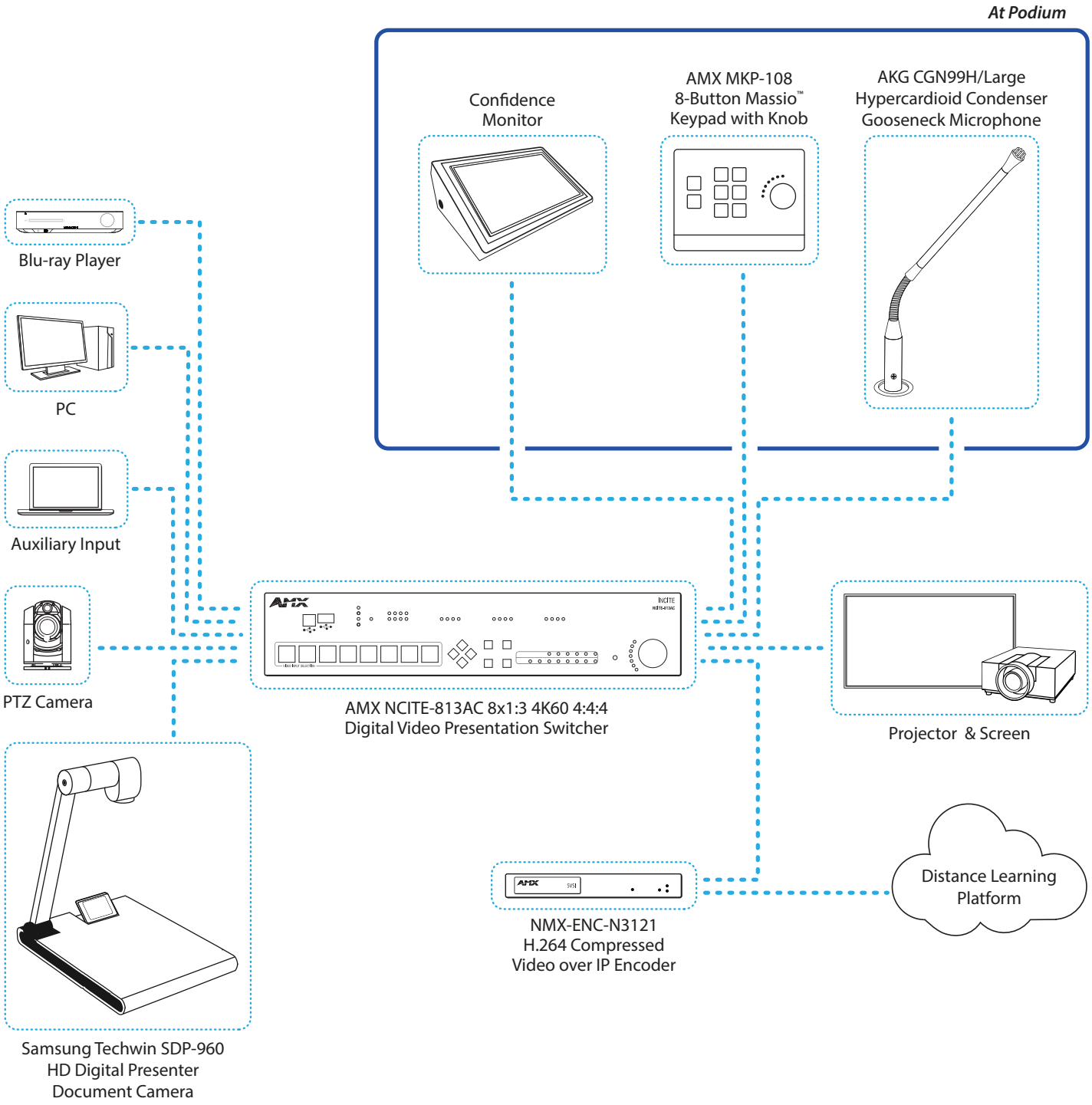
- 4K/60 4:4:4 Support – Incite supports today's 4K content without modifying the color space or reducing the frame rate.
- HDMI 2.0 and HDCP 2.2 Support – By incorporating HDMI 2.0 and HDCP 2.2, Incite is compatible with all the latest 4K sources and displays.
- Scaled Outputs – Provides current and future support for permanent and visiting source devices connected at the same time, both 4K and non-4K. Current HD signals can be up-scaled, while 4K60 can be downscaled, providing flexible compatibility from source to display.
- Advanced Windowing with Scaling – Send two sources to a single display in various preset configurations (side-by-side, top-bottom, and picture-in-picture). Regardless of source resolution, Incite will scale the sources to fit the resolution requirements of the destination display. Incite also includes "Live Production"-style video features, such as transition effects when switching between sources to provide presenters with a professional look and feel.
- DSP by BSS – Includes integrated DSP with advanced capabilities like independent 10-band parametric EQ, independent input gain adjustments, and variable compression, allowing precision tuning to match unique source and room attributes. Enhanced microphone processing includes 3-band EQ, compression, gating, auto-ducking, and limiting on each microphone input to ensure crystal clear communication.

- dbx Advanced Feedback Suppression (AFS) – Never experience feedback problems again, Advanced Feedback Suppression takes the guesswork out of controlling feedback, which is not only annoying but can even damage speakers – and ears. AFS is flexible and easy to use: just choose the level of suppression you want, and you're done. AFS automatically stops feedback in its tracks.
- Crown DriveCore Amplification – Seamlessly integrates the amplifier drive stage into the power output stage, fusing everything into a chip the size of a dime. The foundational DriveCore™ circuitry is based on breakthroughs by Crown's own Gerald Stanley, with five patents applying to the advanced feedback, modulation and output stage technologies. DriveCore's front-end drive circuits leverage the inherent efficiency of Class D output stages while also maintaining superb sonic characteristics. The end result is an ultra-efficient, one-piece audio amplifier circuit that exhibits the exemplary audio quality of a highly evolved Class AB design.
- Distance Transport – Extend the reach of 4K60 4:4:4 to 70 meters, well beyond the capabilities of typical HDMI cabling.
- Flexible Interface Options –Includes integrated web GUI, front control panel and on-screen menu setup. It is also a Native NetLinx device, meaning it can be controlled via native AMX NetLinx ICSP commands. Full feedback and notifications are provided for NetLinx integration.
- Integrated NX Central Control – The NetLinx NX-2200 Integrated Controller is a programmable network appliance, specifically designed to control AV and building technology using multiple analog and digital formats. The NX-2200 provides a scalable platform for the future by combining high performance, backward compatibility and extensive network security features. The NX-2200 is ideal for control and automation of medium-sized rooms and multi-room applications.

Incite is available in three models:

	NCITE-813	NCITE-813A	NCITE-813AC
Video Switching 8x1:3	X	X	X
Video Resolution: 4K60 4:4:4 w/HDCP 2.2	X	X	X
Automatic Video Scaling	X	X	X
Distance Transport (Up to 70 Meters), on DXLite Output	X	X	X
Advanced Presentation Windowing	X	X	X
Digital Signal Processing by BSS	X	X	X
Advanced Feedback Suppression by dbx	X	X	X
DriveCore Amplification by Crown		X	X
Integrated NetLinx NX Control			X

Distance Learning with Incite



About AMX by HARMAN

Founded in 1982 and acquired by HARMAN in 2014, AMX® is dedicated to providing AV solutions for an IT World. AMX solves the complexity of managing technology with reliable, consistent and scalable systems comprising control, video switching and distribution, digital signage and technology management. AMX systems are deployed worldwide in conference rooms, classrooms, network operation/command centers, homes, hotels, entertainment venues and broadcast facilities, among others. AMX is part of the HARMAN Professional Group, the only total audio, video, lighting, and control vendor in the professional AV market. HARMAN designs, manufactures and markets premier audio, video, infotainment and integrated control solutions for the automotive, consumer and professional markets.

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