THE FACILITY MANAGER'S GUIDE TO AUDIO VISUAL TECHNOLOGY

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CCS Your Audio Video Experts

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This guide was written by CCS Presentation Systems, a leader in the commercial audio-visual integrator industry. Since 1991, CCS Presentation Systems (CCS) has served customers in the corporate, government and education markets with a full-service integration, installation, training and maintenance of audio and video equipment. Through this guide, CCS graciously shares some of its knowledge and expertise for the benefit of the Facility Management profession and real estate industry.

The content of this report is designed to help corporate real estate, workplace and FM teams with knowledge and execution tips for Audio Visual equipment and physical locations that house this equipment. As some office workers return to the office and others work from multiple locations alternatives technology will continue to evolve to enhance synchronistic collaboration and communications across various work environments. Combining space design and technology in areas such as conference rooms that work and are easy to operate enhancing the occupant experience.

This guide provides practical instructions, suggestions, case studies and project management guidance on implementing and maintaining AV technology to improve user customer satisfaction.

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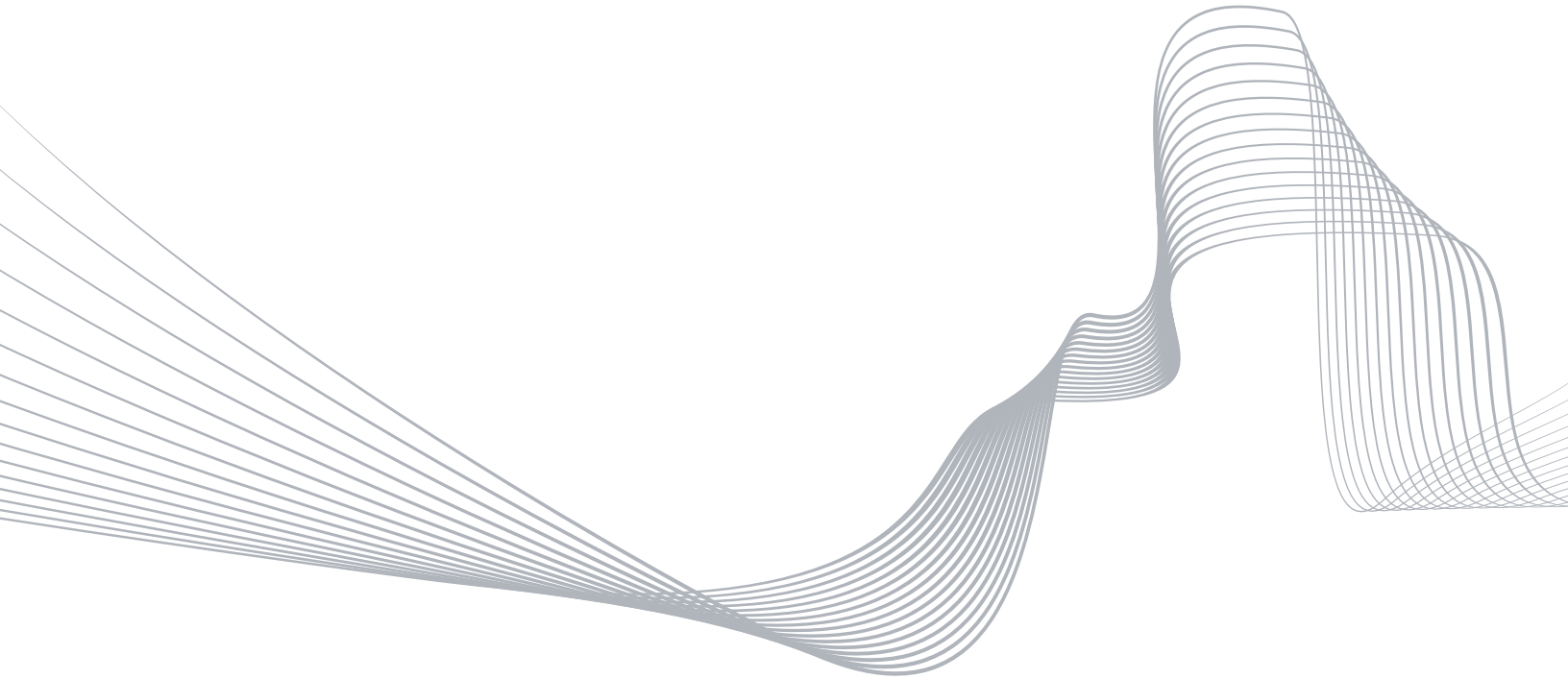
This is designed to help alleviate some of the challenges of equipment that does not work for users at the critical time of need.

The International Facilities Management Association's IT Community and BETA were honored to work with CCS Presentation Systems to provide this guide to help support the success of facilities managers tasked with AV responsibilities and others for general knowledge.

Ted Ritter & Colette Temmink
Co-Chairs IFMA ITC and BETA



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01 INTRODUCTION

As a Facility Manager, you act as the mediator and translator between the end-user and the Audio-Visual Integrator.

It's your role to work with both parties to create the best solution for any given space.

You also act as the first troubleshooting step before calling an AV service.

This book provides you with quick definitions of standard Audio-Visual equipment, where you might find it, and how to research/troubleshoot it.

Which trades doesn't it include?

Not everything involving cords, cameras, and wiring is AV. Depending on your AV

Integrator, **some include the following services and some do not:**

- **Security,**
- **Low Voltage Structured**
- **Cabling, Electrical,**
- **Lighting,**
- **Acoustics**
- **etc.**

Check with your AV Integrator to determine which services they offer.

***We always recommend researching the model number of the item you are researching online to see if it is a consumer or commercial product, as this will save you time attempting to reconcile warranty issues with a manufacturer.**

02 VIDEO PRESENTATION OPTIONS- KEY TERMS

Consumer vs. Commercial Warranty

Specifically with displays, warranties will vary dependent upon if it is a consumer or commercial grade model.

Consumer warranties are commonly between 1-3 years in a residential environment, while commercial warranties are typically 3-5 years.

Rating

When you see a rating in either of these formats , or _/_, it demonstrates what the warranty will cover with standard use in hours and days.

For example, a 24/7 monitor can be on all day and night and still be covered under the warranty, whereas a 16/5 display should be turned off for eight hours every night and all-day during weekends.

TVs, Displays, and Monitors

Most users refer to an LCD display as a TV, Display, or Monitor. Many will use these names interchangeably, however,

they all have very different meanings.

TV OR TELEVISION - typically made for a residential environment and has a built-in tuner for allowing cable TV content. Some users will call these plasmas, although the plasma technology has not been sold for many years.

MONITOR - typically used with a laptop or desktop computer at a personal workstation. These don't usually exceed 40" diagonal, and are typically only used in specific environments, such as are typically only in specific environments, such as for drawing creation software or monitoring operations centers.

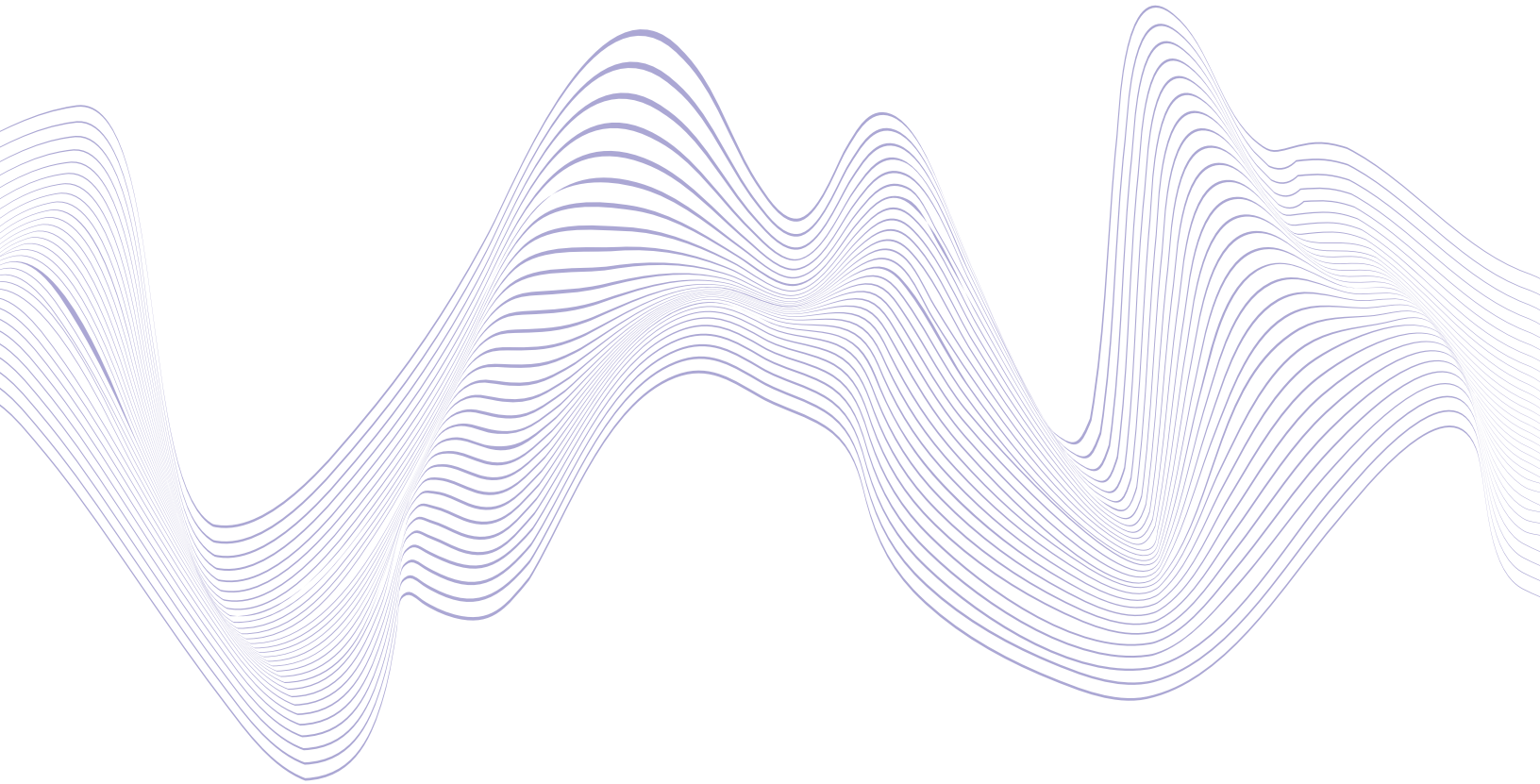
DISPLAY - the standard device you see in the front of a boardroom as one large image. These can be combined to form video walls. You'll know it's an LCD display video wall if bezels are viewed within the large image.

BEZELS - the frame of the display. Usually thin and black in a commercial environment.

Digital Signage

HARDWARE - digital signage displays can have a landscape (wider than it is tall, horizontal) or portrait (taller than it is wide, vertical) orientation. They can be wall-mounted or free-standing to make your signage mobile. You can usually find a small digital signage player behind a display or in a rack.

SOFTWARE/CONTENT - many digital signage companies offer a wide variety of software options. Typically, these are broken into desktop application software and cloud-based, offering the ability to change the content from anywhere. In most cases, content is managed by your Marketing or IT departments. Sometimes the license can come with the purchase of the player, and other times these are paid subscriptions.



03 DIRECT VIEW LED OR DVLED

Direct view LED is a display type that uses light-emitting diodes (LED) as individual pixels throughout the whole display. These light-emitting diodes are grouped together by red, green, and blue to cast the image seen on the screen. One benefit of LED is that these displays aren't reflective, so users won't have to struggle with troublesome screen glares.

PROCESSORS - these devices are responsible for switching the content seen on video walls. Processors can be installed locally at the display location, but with some manufacturers, can also be installed at a rack location in another room.

Environment

This display is best used where a larger or unique size display is required, and a clear image is important. It has superior image quality and is usually priced higher than alternative display options.

What should I research?

Often, when a dvLED display wall is purchased, additional panels are purchased in case a pixel becomes damaged and needs to be replaced. Please ensure your AV integrator is quoting a couple of replacements to reduce downtime. Power supplies for video walls can be installed locally at the display location, but with some manufacturers, can also be installed at a rack location in another room. This is important to keep in mind if your video wall is not getting power.

04 LCD DISPLAY

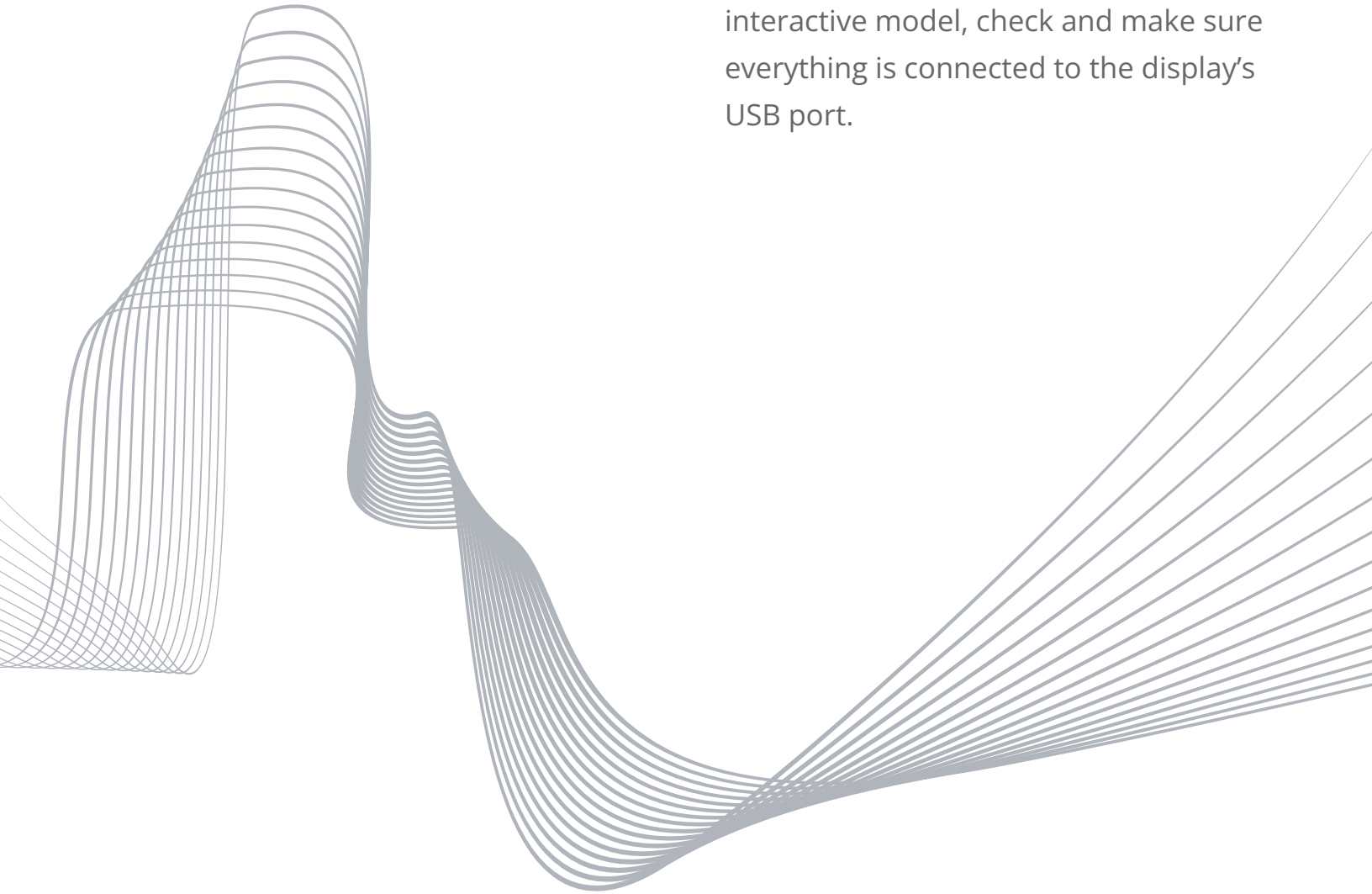
LCD panels, or Liquid Crystal Displays, are comprised of a layer of liquid crystals sandwiched between two polarized pieces of glass. These liquid crystals themselves aren't what's casting the light, so these displays shine a backlight through the layer of liquid crystals to create the image seen on the display. LCDs are the most commonly installed display in the commercial environment. A large benefit to these displays for these displays is that they can be standard or interactive (touch enabled) interactive touch screen.

Environment

These displays are commonly seen with digital signage content, conference rooms, and training rooms, basically anywhere with video walls.

How do I troubleshoot?

Firstly, be sure to check your video connection. For the vast majority of LCDs, this can be found, and solved, by making sure everything is connected to the displays' HDMI port. And similarly, if you're having touch issues on an interactive model, check and make sure everything is connected to the display's USB port.



05 PROJECTORS/SCREENS

A **projector** is a display that casts an image by projecting it onto a surface– hence the name projector.

Lamp projectors do this by shining a light small transparent lens, but some newer models of projectors known as laser projectors can project an image by using lasers.

Laser projectors require lower maintenance while providing higher brightness and color contrast. Whereas lamp projectors are more affordable and the lamp can be replaced easier than replacing the entire projector.

05 PROJECTORS/SCREENS

Projectors provide a great solution when a larger size display is required for a space and budget is a factor.

These can also be used in specialized environments that require edge blending, a technique using multiple projected images to create one single, seamless image.

PROJECTOR SCREEN - the surface the image or digital content from the projector is typically cast on, which is usually a part of the structure installation.

These screens can be made from different types of fabric with different reflective properties and colors, it varies depending on user needs and the setting they are installed in.

Screens are typically specified based on the diagonal size. A good way to determine a screen's diagonal in a room is to measure dimensions and apply the Pythagorean theorem

(a^2 + b^2 = c^2).

LUMENS - the unit of measurement for a light's brightness, the higher number of lumens, the brighter the projected image.

When in a space with more ambient light, or outside light that can potentially wash out your projected image, a higher lumen count is required so your image can still be seen.

Light dimmers can also help an image appear brighter in in rooms with more ambient light.

RESOLUTIONS - these are the pixel dimensions, or the number of pixels in each dimension, that can be displayed. When specifying a projector and screen, it is important to take into account the content that will be displayed.

- **XGA (1024x768 pixels) 4:3 aspect ratio**
- **WUXGA (1920x1200 pixels) 16:10 aspect ratio**
- **1080p (1920 x 1080 pixels) 16:9 aspect ratio**
- **WXGA (1280x800 pixels) 16:10 aspect ratio**
- **720p (1280 x 720 pixels) 16:9 aspect ratio**
- **4K (4096 x 2160)**

Environment

These are typically installed in large training rooms, auditoriums, and houses of worship. Portable projectors can also be used for travel as well.

How do I troubleshoot?

If the issue is that the image isn't bright enough, check if your projector has a lamp. It might be time to replace it.

If it's a laser projector, it could be time to replace the projector itself. It's important to note that replacing a laser projector shouldn't happen frequently as most lasers cover 20,000 hours, or just over two years, of use. To get the most life out of your projector, always remember to turn it off when it's not in use.

When displaying images and video, check to make sure your display and content are compatible.

06 CONTENT: WIRELESS PRESENTATION

Wireless presentation options allow users to present to different displays without the use of a hard-wired connection.

Also known as Screen Mirroring, Screen Casting, and Screen Sharing – this technology allows the user to send content from their device to another larger display. Often, you'll see these come in the form of native casting options such as Miracast and AirPlay.

Environment

Anywhere you'd find a display with wireless sharing capabilities.

How do I troubleshoot?

First, check your display's connection. If your user is experiencing lag time with connectivity, the issue could be a weak Wi-Fi connection.

If there is an issue connecting to the wireless presentation system, there is a chance the presenting device needs to be connected to the same network as the wireless presentation device. Always make sure your display is showing the correct input.

If Wi-Fi checks out then see if Bluetooth is being used as a casting option. It's rare, but there are casting options that utilize a Bluetooth connection.

Please ensure the presenting device is within proximity to the receiving wireless presentation device.

Finally, make sure to check that the display you are trying to cast on can support the casting option you are trying to use. Some devices don't support Miracast or Airplay.

To get the most out of your display, please check for firmware updates whenever possible. If you need assistance, please contact your local AV integrator.

07 CONTENT: HARD WIRED (HDMI, TX/RX, & AV OVER IP)

Typically, you'll see hard-wired connections in the form of HDMI, or High-Definition Multimedia Interface, cables. These cables are the most common hard-wired connection and most known for TV connections. It transfers both High-Definition video and audio through a single cable. What used to be RGB, S Video, RCA, DVI and VGA have now transitioned into HDMI and sometimes Display Port or USB-C.

There's also display port. Similar to an HDMI cable, display port is shaped differently. It is more commonly found on PCs.

Finally, there's USB-C. This is a newer type of connection. Some of these transfer audio and video, some offer charging capabilities and some even allow for interactive functionality. They currently only support a distance of six feet, so most integrators shy away from specifying these for professional installations.

Environment

Anywhere you'd find a display– or the backside of one where its ports are. You could find an HDMI input in the form of a wall plate or table connection.

How do I troubleshoot?

First, check the connection itself. Make sure it's connected tightly, but without force. If that doesn't work, try another HDMI cable to determine if a lack of connectivity is due to the cable itself or the display input.

Make sure you don't bend your cable during this process. If a cable is bent at a hard angle it can damage the cable. Also, when you're displaying HD videos and images check that your HDMI cable supports 4K resolution.

For MAC users, it's important to note Apple products do not typically have these connections built into their products natively. Please ensure your Apple users have appropriate adapters for your specific room requirements.

08 CONTENT: VIDEO CONFERENCING

Video conferencing is the act of people in different locations communicating in real-time through the transmission of audio-video signals. Communication typically provides users with both an audio and video feed. Years ago, most video conferencing was achieved using, which means encode/decode. In recent years, however, video conferencing has shifted to primarily web-based platforms.

Video conferencing is accomplished through platforms. If a client uses primarily one platform, one-touch join options are most appropriate for ease of use. Because many users need to use multiple platforms when meeting with external users, BYOD or Bring Your Own Device environments, are becoming more and more popular. Typical platforms used for video conferencing include Teams, Zoom, and WebEx among others.

09 CAMERAS

Cameras used in video conferencing provide the visual aspect for communication. They can be a computer webcam or a conference room camera that's sole purpose is for conferencing. It's important to note different cameras provide different resolutions.

Certain cameras allow for a certain range of a shot. A **static camera** is one that does not move. These cameras are usually locked - they cannot pan or tilt while streaming a shot. Meanwhile, a **PTZ Pan Tilt Zoom** camera allows users to manually adjust the image with manual controls or with presets. These cameras allow different areas of a space to be seen on camera and move to provide close-up or wide views. Then there are **tracking cameras** which work through voice tracking, facial recognition, or movement tracking.

10 AUDIO

Let's talk about the most common device you'll see in all environments; speakers. Speakers are devices that convert electrical energy into acoustical signal energy, or sound, that we hear in a room. They can be ceiling mounted, wall/surface mounted, or freestanding/portable. The most commonly seen speaker are ceiling speakers that are cut and mounted to the ceiling of a room such as drop tile or open ceilings.

While typically you might think of speakers being used to make sounds louder, sometimes they're used to make other noises seem quieter.

Sound masking emitters use speaker technology to help people focus by reducing noise distractions around them, like a loud conversation outside a closed-door or someone stomping down the hall, by masking it with unobtrusive noise.

They are typically small and can be placed in any setting necessary for collaboration and focus.

Then there are speakers meant to take a sound source to be broadcasted for a large area of space. In these scenarios, **PAs**, or a public address system would be used.

These systems are used to increase the volume of an audio source, whether that be a human voice, musical instrument, or recorded sound or music so it can be audible at a distance.

You would typically find these in sports stadiums, public transportation vehicles and facilities, and live or recorded music venues and events.

The power or wattage behind a speaker is driven by it's amplification or Amplifier. Power amplifiers come in all shapes/sizes/ratings and determine the impedance of a speaker 70v or 8/4ohm.

70 volt speakers systems are common on large commercial spaces while 8/4 ohm speakers are commonly used in enterainment, theatre and performancing arts venues.

Above all else, when you're planning sound for your facility - speakers and amplifiers are significant components that have the largest impact.

Another essential element to an audio system is a **microphone**. Microphones are tools that convert sound waves into electrical energy variations which can be heard by the ear and can be used to amplify, transmit or record noise.

They work to make sure what needs to be heard is heard against ambient, or background, noise. In a setting where clear communication is vital, a functioning microphone is essential.

They can be designed to be held in a user's hand, commonly referred to as handheld mics, or placed on a mic stand. Microphones are often used in panel discussions, performances, and presentations and can be wired or wireless.

When a microphone is needed to pick up on a specific person's sound while being hands-free, **Lavaliere Lapel microphones** are used. These small microphones are commonly referred to as lav mics, lapel collar mics, body mics, clip mics, neck mics, or personal mics. They discreetly attach to a specific person's clothing and are typically hidden and wireless. They work by transmitting sound through radio frequencies.

Another microphone you might see to pick up the sound of a specific person is a **headset**. They are worn on the head of a user. Unlike a lav mic, headsets also have speakers that provide a direct audio feed to the user.

Headsets can be wired or wireless, and while usually not as subtle as lav mics, they come in a range of sizes.

A microphone can also be designed for groups, like a table mic. A **table mic** is used to pick up audio in group settings and is placed in the center of a table.

They work by using built-in microphones to determine a primary speaker and stream their voice directly to any audio feed. These can be wired or wireless.

Another microphone that can work for groups while being less obtrusive in appearance is the **ceiling microphone**, such as a drop tile ceiling mic and dropdown. These give the benefit of 360-audio coverage, while not cluttering a surface area.

How do I troubleshoot a microphone?

If your wireless microphone is fully charged but does not transmit sound to your speakers, please check the frequency of your mics. Over time, certain areas will experience RF interference which may impact the functionality of your wireless microphone systems.

A **digital signal processor (DSP)** is a specialized microprocessor chip used to process all these audio signals picked up by a microphone.

DSP takes real-world digitized signals such as voice, audio, video, temperature, pressure, or position and mathematically configures them, like “adding”, “subtracting”, “multiplying” and “dividing.”

Finally, when multiple sound inputs need to be merged, a soundboard is used. This tool streams sound from microphones, instruments, smartphones, and DJ turntables to speakers as a single signal.

11 CONTROL

This function allows users to control certain functional operations in a room such as display on/off, volume up/down, camera presets, content selections, etc. This will commonly be seen with touch panels that provide conference room automation through a single push of a button.

These will do things like lower the shades, dim the lights, and turn on the projector in a conference space.

Much like touch, a button panel is similar, but with a button interface design. Regardless of which interface, when choosing a control in your space it's important to use a certified programmer who can make sure it is installed correctly.

How do I troubleshoot?

If a piece of equipment is replaced in a room, this could require programming changes to your control system in order for the new equipment to function

12 ROOM SCHEDULING

There are many versions of scheduling panels, but most allow users to visually see if and when a room is in use or available. This is most commonly seen on a touch screen. Some have lighting indicators, such as green for available and red for booked.

How do I troubleshoot?

If your scheduling panel is not receiving invites, first check with your IT as it could be a permission/licensing issue. Also, ensure that the panel is always operating with the latest firmware. For hardware failures make sure to check the power source.

13 HYBRID

In today's flexible workplace, everchanging communication standards seem to be redefining the traditional meeting space. Hybrid working environments are the new norm allowing users to join any meeting from almost any device and location.

It's not unusual for a video conferencing call to include someone from their desk at the office, an attendee from the home environment, and a caller from the field. The flexible workplace is making remote communication easier than ever before and setting the standard for the future. With the right tools, the flexible workplace brings people from all over the globe together, allowing everyone to see and hear each other as if they were in the same room. Users are even able to share content from their screens while remotely communicating. Each at-home setup requires a camera, mic, speakers, display, network connection and web

application. These can come in the form of what's included with your phone or laptop set up, however, a higher quality solution is often best. These tools help ensure remote communication is as effective, personable, and collaborative as their in-person counterpart.

Now more than ever, it is imperative that Audio Visual (AV), Information Technology (IT), and Facility Management (FM) collaborate to ensure a seamless user experience. Each role has its own unique function.

AV is responsible for the design, install, programming, training, and service the system. While IT manages the network configuration and PC set up at home and in-office.

Then finally, FM is responsible for managing live meetings, offering support to users, and providing electrical and physical network infrastructure requirements.

However, as the workspace has become flexible and remote, the responsibilities of these duties, and their relation to one another, have changed.

An increasing amount of AV equipment has become heavily reliant on network capabilities, meaning network support is more vital than ever before., IT, and FM are no longer independent of one other, but rather synergistic and reliant on each other for success.

For example, if a network fails, the video capabilities of that network will fail too.

This is just one example of the interconnectedness these roles have to one another. If one role falls short, the others fall with it.

Similarly, if all pieces of the puzzle are working cohesively, the hybrid environment thrives.

14 STANDARD WORK PLAN

Operating Approach/Method of Performance

In this section, we will describe how an AV integrator approaches a project. They start off by explaining their general approach to projects. The next section will describe a standard approach to integration of audio/video products. This general project approach and standard approach to integration applies to 95% of projects.

General Project Approach

This section is an example of a standard approach to audio/video work. Since all AV Integrators operate differently, be sure to ask your local AV Integrator for their specific work plan.

PROJECT REVIEW

Upon receipt of a purchase order and prior to beginning work on a project, an AV integrator will request a meeting or phone call to review the project equipment list and scope of work with client. If the project is large and complicated, or if the project has work that requires other trades, they may request an additional site walk through to review those requirements by other trades, including conduit work and electrical work (if applicable).

SCHEDULE/DEADLINE REVIEW

Once they have confirmed the scope or work and the work performed by other trades, they will review the schedule and coordinate installation. In many cases work cannot begin until other trades have completed their work. Conduit paths and electrical must be ready prior to work beginning in order to pull cable and test, align and calibrate equipment. Equipment orders are placed to coincide with the project's schedule and are based on the final review of the project. The general lead times on equipment range from 1-3 weeks for most equipment, cable, etc. Screens may require 3-4 weeks. Any custom furniture or custom screens/equipment may take up to 4-6 weeks. Supply chain issues may push leads times out much further.

CONFIRM SPECIAL/CUSTOM REQUIREMENTS

In cases where a project might differ from a standard room design format, they will initiate a review process specifically related to those changes. For example, if a room requires a custom touch panel interface and program that is not similar to a previous project or existing standard, they will then initiate a review process before creating the program and deploying it in the project.

CONFIRM ROOM AVAILABILITY OR READINESS

Staff will check in regularly to follow progress on work being performed by other trades. If no work is being performed by others, an AV integrator will check with the client to ensure they have access to the room on the date scheduled for installation.

14 STANDARD WORK PLAN

General Scope of Work

This section describes a standard approach to performing installations.

ONSITE KICK-OFF MEETING

At the beginning of every project a project manager will walk the jobsite to identify any potential hazards to ensure the site is ready for work, and to familiarize staff with the environment they will be working in. If the project consists of more than one week of work, they hold weekly meetings on site to discuss the previous week's progress and to address any safety issues/concerns. The client may be requested at this meeting if there are items to review including safety items, access or a review of the work performed to date.

LOAD IN

After the kick off meeting, staff will load in and/or stage equipment in the room. If the room is not secure they only load in the equipment required for the period of time they will be working in the room. If possible, they will ask the client to provide a secure storage space on site which will enable us to bring in more equipment, thus limiting the number of trips to the job site and allowing the integrator to adhere to their schedule.

PREPARE AREA FOR WORK

Prior to work beginning, all work areas must be clear of hazards. Typically, they ask the client to have rooms ready for them prior to arrival. In some cases, they may be required to move small tables and chairs as needed. Staff will then proceed to remove ceiling tiles in affected work areas, open j-boxes for the conduits they will be using and stage the equipment for installation.

PULL CABLE

After confirmation that the conduit supplied by others has been installed, they will pull cable to each required location.

INSTALL EQUIPMENT

Install equipment: After the cable has been pulled, they begin to install ceiling speakers, screens, projectors, LCD displays and other equipment that mounts to the building structure. All products are installed to manufacturer specifications. They secure all products to the building structure following all applicable local codes.

CONNECT ELECTRICAL

An AV integrator typically requests the client have power for projectors and motorized screens installed prior to arrival. When possible, they request this power to be provided via a 4-6" MC whip at designated locations.

14 STANDARD WORK PLAN

PREPARE LECTERN/RACK FOR EQUIPMENT

Prior to installing equipment into a rack or lectern, they will verify that this furniture is not damaged. In some cases, a lectern may be delivered with openings that are not 100% to exact dimensions. When possible they will correct these minor flaws to properly fit the equipment into those spaces. If a room has a lectern or a rack full of equipment to be installed, they will consult with the client and ask their consent to install and test this equipment at their shop. If racks or lecterns are built in their shop, they test and configure portions of the equipment prior to bringing the unit back to the site. They will log all serial numbers and utilize security screws for this project.

TERMINATE WIRE AND WIRE IN COMPONENTS

Upon completion of populating and/or delivering the racks or lecterns, they will begin to land and terminate wire into the rack. An AV integrator utilizes cable lacing bars and Velcro ties to neatly land wire to components within racks. Prior to terminating a wire, they will label the wire following the client's standards. All terminations, wiring, labels, etc. will follow standards established with the client when required. When possible, they will test signals prior to wiring them to components in the rack. CAT5 testers will be utlized to test cabling prior to attaching to equipment.

CONFIGURE EQUIPMENT

When the equipment has been fully installed into the rack, they will begin to turn on components one by one. They will then configure the various devices adjusting things like audio levels, mic levers, CaT5 video skew, etc. During the configuration process, they will also upload and test the rooms' control interface if one has been provided.

FINAL TEST

An AV integrator will provide a full function test prior to leaving. If they are waiting for parts, or if last minute changes require additional work, the final test may be delayed until all work is completed.

CLOSEOUT

Upon completion of the project, they will demonstrate the functions of the system to the client. Project closeout documentation will be provided within a reasonable period of time, coordinated with the client beforehand.

WARRANTY AND SUPPORT

An AV integrator provides superior support that meets or exceeds the requirement for this RFP. They will dedicate personnel familiar with the installations and/or products installed to provide support.

14 STANDARD WORK PLAN

SALES

This is the main point of contact that manages the relationship. This individual, often called an Account Executive or Customer Representative can help direct you to the correct con-tact to best help you. When the client has a new AV need, a sales contact will be the best place to start.

DESIGN

This contact is typically referred to as the Project Engineer or Design Engineer. This person's role is to design how the technology will interact in a given system. They create the bill of materials needed to purchase the system. They often utilizing AV line drawings and are responsible for explaining how a system will work to the team.

PROJECT MANAGEMENT

A Project Manager, often referred to as the PM leads a team to implement the installation of the job. This can include managing schedules, customer communication regarding logistics, customer delivery expectations, etc. They are responsible for seeing the project through to completion.

FIELD ENGINEER

Often referred to as a Programmer, a Field Engineer writes code and implements that code to allow a system to function. This can include writing control panel code, programming a DSP, and commissioning the system. This individual should meet with the end user prior to programming a system to ensure they have met customer expectations regarding the user interface.

TRAINING

There are different forms of training. Once a job is complete, training can be requested. Whether it is a basic user interface training, or a deep-dive technical training, this stage allows the user to know how to use their new system optimally.

SERVICE

This department helps support a project post-completion. Depending on the AV integrator, many offer proactive product maintenance visits, as well as service calls when needed. Please check with your AV partner regarding the type of service they offer.

While there are many individuals involved in bringing a successful AV project to life, these are the main customer-facing roles.

15 CREDITS

We are grateful to the organizations that provided photographs of their facilities to support this publication.

Cover
MCL CONSTRUCTION
– Breakroom
Omaha, NE
(Brad Anderson, photographer)

Page 5
INDIANA UNIVERSITY
- PUI Innovation Hall Theater
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CASINO ARIZONA AT SALT RIVER
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TUCSON POLICE DEPARTMENT
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MCL CONSTRUCTION
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UNIVERSITY OF NEVADA,
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– Meeting Room
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ZION AND ZION
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Prescott, AZ
(Ris Marek, photographer)

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