

Video and AV Basics

Most corporate events run on one thing: a presenter's laptop, a screen the room can read, and sound that comes with the video. This module covers the cables and links, resolution and screens, the presenter laptop, getting laptop audio into the desk without hum, why a screen stays black, and the basics of a video mixer and a stream. It is for crew who set up and run the AV side of conferences, awards and product launches.

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01 What AV covers at a corporate event

AV means audio and video, but at a corporate event most of the job is one thing: somebody's laptop, a slide deck, a screen the whole room can read, and sound that comes with it. Awards add videos. Launches add cameras. Conferences add a stream. The basics are the same every time.

LAPTOP PRESENTATIONS

Slides and video from a presenter's laptop. By far the most common source. By far the most common fault source too.

SCREENS

Projector and screen, LED wall, or TVs on stands. What the audience actually sees.

CAMERAS

A camera on the stage shown large on the screens is called IMAG (image magnification). It helps the back rows see the speaker.

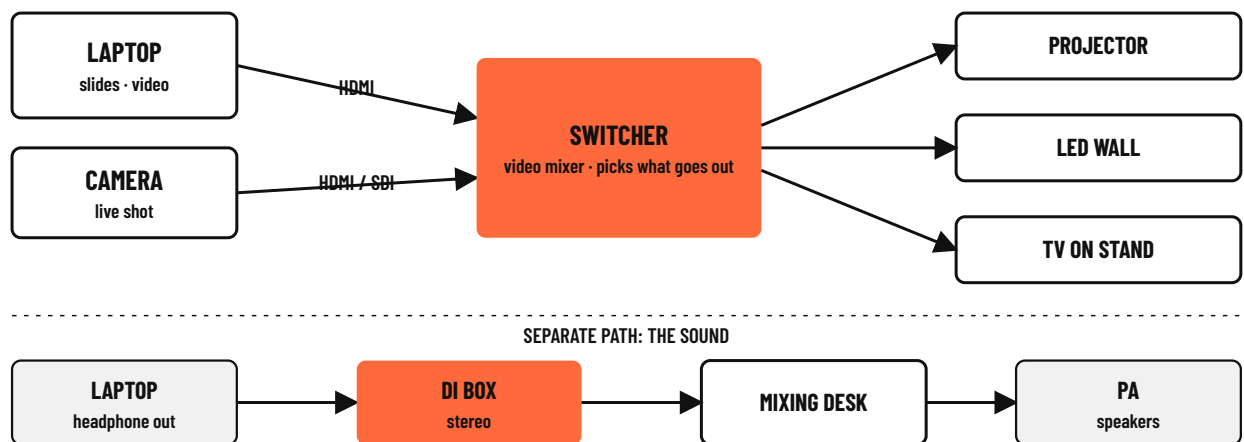
STREAMING AND RECORDING

Sending the show out over the internet, or saving it to a drive. Same picture as the screens, plus sound.

THE LECTERN

Where the speaker stands. It holds the mic, the clicker, a small monitor and often the laptop. Treat it as part of the AV.

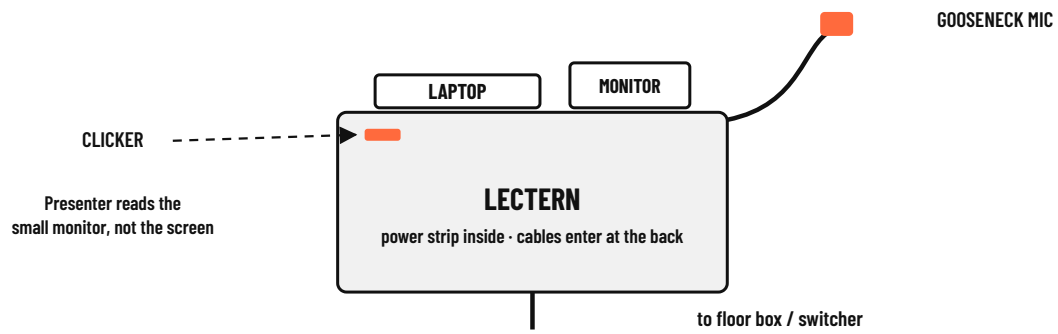
Typical hire kit: a video mixer or switcher that takes laptop, camera and graphics, and sends the program to screens, a stream encoder and a recorder.



Picture and sound take two routes. The picture goes laptop to switcher to screens. The sound leaves the laptop by its headphone socket, through a DI box, into the desk. If the picture works and the sound does not, you are in the wrong path.

Who owns what

Two crews meet at the lectern. Audio crew own the desk and the PA. AV or video crew own the switcher and screens. At small events that is the same two people. Either way, someone must be named as the one who talks to the presenter. Agree who before doors.



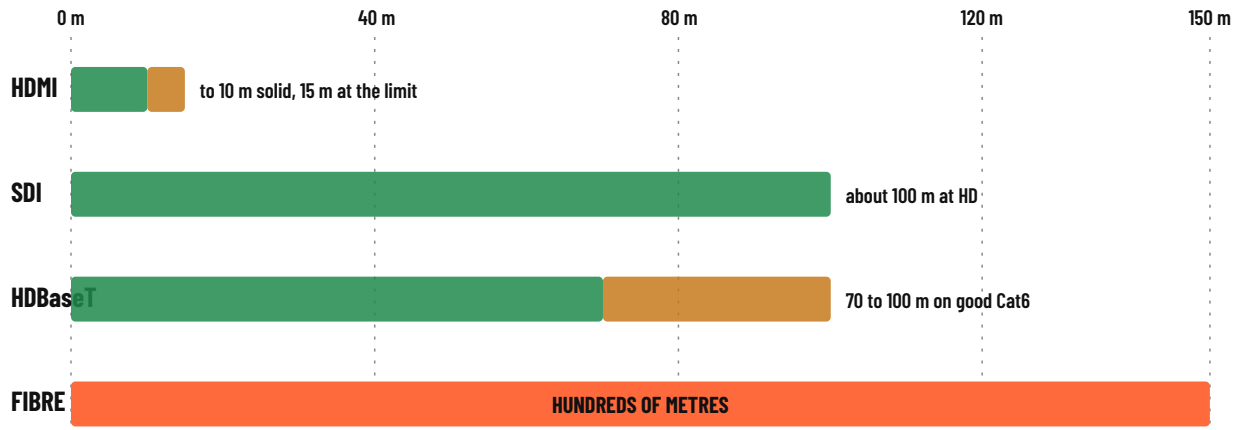
A lectern is a desk with a job. The presenter sees notes and the next slide on a small monitor. Everything that needs a cable runs inside it, so nobody trips and nobody sees wires.

REMEMBER

Picture and sound travel separately. Fault-find them separately: first is there a picture, then is there sound.

02 Video signals and cables

Four ways to move a picture. They differ by how far they go and how rugged they are.
Pick by distance first, then by resolution.



Green is comfortable, amber is the edge. Past the edge you get sparkles, flicker or nothing.
Be conservative: a run that works in the workshop must still work in a hot hall with a cable that has been run over twice.

LINK	PRACTICAL DISTANCE	LOCKS?	NOTES
HDMI (passive cable)	10 to 15 m at 1080p. 4K: about 5 m	No. It just pushes in	On every laptop, TV and projector. Cheap, long cables fail first. Tape a loop of slack so a tug does not pull the plug out.
SDI (coax with BNC)	About 100 m at HD	Yes. BNC twist-locks	Cameras and broadcast kit. One cable carries picture and embedded sound. 4K needs faster (12G) gear and shorter runs.
HDBaseT over Cat6	70 to 100 m on good cable. 4K at the short end	Clip only (RJ45)	Needs an extender box at each end, powered. Point to point. Not a network: never through a network switch.
Fibre (HDMI over fibre)	Hundreds of metres	Varies. Keep dust caps on	Light, thin, immune to interference. Needs a converter at each end. Do not kink it or stand on it.

Typical hire kit: HDMI extenders over Cat6 for long runs, and HDMI-to-fibre converters on fibre lines for the longest.

Field rules for cable runs

- HDMI is for the last few metres, laptop to switcher. Do not run 15 m of HDMI across a hall because you have one.
- For HDBaseT use solid, shielded Cat6 in one piece. No couplers, no patch leads stuck end to end.
- Run video away from power cables where you can. Cross at 90 degrees.
- Label both ends. Tape anything that crosses a walkway under a ramp.

TRY IT: WHICH LINK FOR THIS RUN?

DISTANCE	1080P	4K
0 to 10 m	Passive HDMI	Passive HDMI to about 5 m, then active HDMI or HDBaseT
10 to 15 m	HDMI at the limit; HDBaseT safer	Active HDMI or HDBaseT rated for 4K
15 to 70 m	HDBaseT over Cat6	HDBaseT rated for 4K
70 to 100 m	HDBaseT at the edge; fibre safer	Fibre
Over 100 m	Fibre	Fibre

NEVER

Never join two HDMI cables with a coupler to make a long one. Each join is a place for the picture to die. Use the right link for the distance.

03 Resolution and aspect ratio

Two numbers decide whether slides look sharp and fill the screen: the shape (aspect ratio) and the count of dots (resolution). Both are set before the event, by asking the right question.



16:9 slide
16:9 screen
fills it. This is the goal.



4:3 slide
16:9 screen
black bars at the sides



16:9 slide
4:3 screen
black bars top and bottom

**Never stretch to fill. Stretched logos and faces look wrong to everyone in the room.
Ask for 16:9. Match the screen.**

Black bars are the picture being honest. They are better than a stretched, squashed one.
The fix is not on the screen: it is asking for slides built in the right shape.

Shape: aspect ratio

Aspect ratio is width to height. **16:9** is the modern wide shape: TVs, LED walls, new projectors, YouTube, every current laptop slide template. **4:3** is the old squarish shape from older projectors and older decks. Some laptops are 16:10, slightly taller than 16:9, so slides can show thin bars even on a wide screen.

Sharpness: resolution

NAME	PIXELS	SHAPE	WHERE YOU MEET IT
720p	1280 x 720	16:9	Older projectors, small streams
1080p (Full HD)	1920 x 1080	16:9	The normal for projectors, TVs, laptop outputs and streams
4K (UHD)	3840 x 2160	16:9	Big TVs, some projectors. Four times the pixels of 1080p, so it needs better cables and gear

Every screen has a **native resolution**: its real grid of dots. Send it anything else and it scales the picture, which softens text. So set the laptop output to the screen's native resolution, at 60 Hz, and the picture is as sharp as that screen can be.

LED walls are often a custom shape. Get the exact pixel size from the LED supplier and build slides to that, or the content will not fill the wall.

FIELD RULE

When the client sends slides, ask: "Are they 16:9?" Ask for 16:9. Tell the presenter on the day: the slide is the shape of the screen, so no black bars, no stretching.

04 Screens



Projector on a screen



LED wall panel close-up

Projector or LED wall: the projector needs a dark room; the LED wall needs distance from the front row.

Three ways to show a picture. Each has one number that matters and one way it goes wrong.

PROJECTOR AND SCREEN

Lumens measure brightness. A dark room copes with a few thousand. A hall with lights on and sun through windows needs far more and still looks washed out. **Ambient light is the enemy**: dim the house lights over the screen and keep sun off it.

THROW

Throw is how far the projector sits from the screen for a given image width. Check the lens ratio on the projector. A longer room needs a longer lens. Keep the projector square to the screen, or the image goes trapezoid.

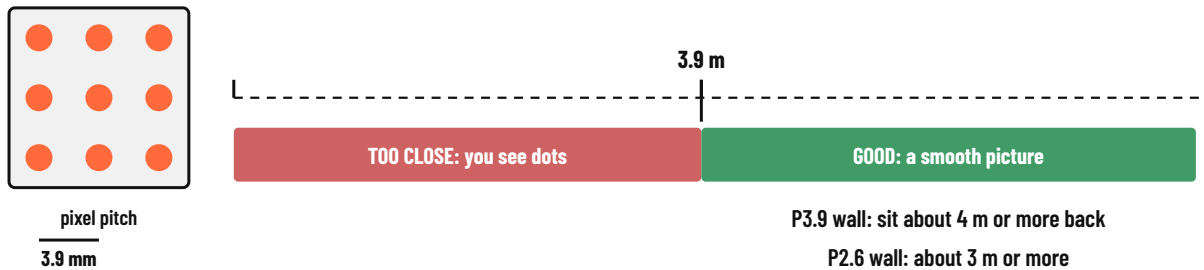
LED WALL

Bright, works in daylight, any size. The number is **pixel pitch** in millimetres. Rule of thumb: the closest comfortable viewing distance, in metres, is about the pitch in mm. P3.9 means sit about 4 m back or more.

TV ON A STAND

Easy and sharp, but small. Fine for small rooms and side screens. Size it to the back row: if people cannot read the slide from the back, add a screen, do not add apologies.

LED WALL: SITTING CLOSER THAN THE PITCH IN METRES SHOWS DOTS

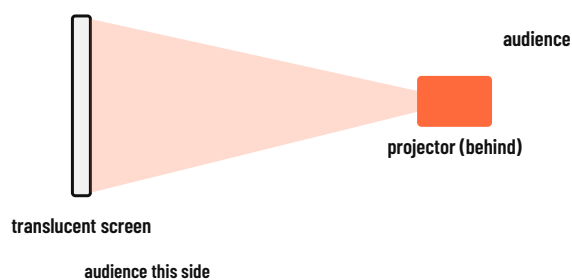


A wall is built from tiny lights. The pitch is the gap between the centres of two of them. The finer the pitch, the closer people can sit, and the more the wall costs.

FRONT PROJECTION



REAR PROJECTION



Front projection is simple but the audience can walk through the beam and see the projector. Rear projection hides the kit and keeps shadows off the screen, but needs a clear space behind and the image set to flip.

Front or rear?

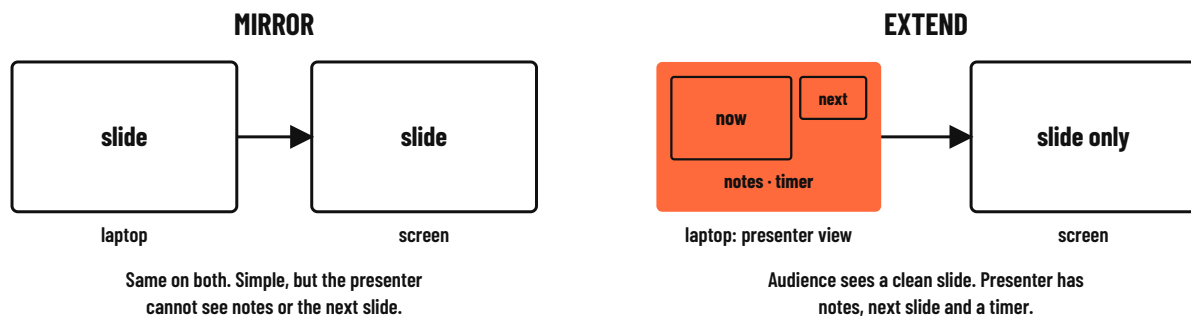
- **Front:** cheaper and quick. Mount the projector where nobody walks or stands in the beam.
- **Rear:** cleaner on stage and no shadows. Needs space behind the screen, a way for crew to get there, and the projector menu set to *rear* so the image is not mirrored.

SAFETY

Screens and walls are tall and catch the wind. Ballast every stand. LED panels are hung or stacked by the rigger or LED tech, not by general crew. Never climb a wall to adjust a panel.

05 The presenter laptop

Most AV problems at a conference are not the kit. They are the laptop: an update at the wrong moment, a missing font, a video that will not play. You cannot control the presenter's laptop, but you can control the checks you make with it.



Extend is the normal for presenters. If the screen shows the laptop desktop, you are on extend with the wrong window.

In extend mode the screen is a second desktop. In PowerPoint and Keynote, start the slideshow and it goes to the second screen. Dragging windows to the screen by mistake is the usual cause of a desktop on the wall.

The presenter's setup

1. **Extend, with presenter view.** Presenter sees notes and the next slide. The audience sees the slide.
2. **A clicker** with fresh batteries. Plug its receiver into the laptop and check it from where the presenter will stand. Carry a spare.
3. **Turn off sleep and the screensaver.** A laptop that dozes mid-talk sends a blank screen to the room.
4. **Turn on Do Not Disturb or Focus.** No chat pop-ups, no email banners, no calendar alerts on a 6 m wall.
5. **Stop updates.** Pause automatic updates before the event, and close everything not needed.
6. **Plug the charger in.** Laptops slow down on battery. Mains power is part of the setup.

The files

- **Fonts.** If the fonts are not embedded, the slides change shape on another machine. Embed them, or save a PDF copy as a last resort.
- **Videos.** A PowerPoint can link to a video file instead of holding it. Put the video files in the same folder as the deck, or embed them.
- **Test every video with sound.** Play each one on the actual system, through the actual desk. Silent video is the commonest surprise at an awards show.
- **A second machine.** Keep a second laptop with the same files, ready, on a stick and online. If the first one dies, you swap and carry on.

Bring adapters: USB-C to HDMI, mini-DisplayPort to HDMI. Many laptops have no HDMI port at all and the presenter only finds out at the lectern.

FIELD RULE

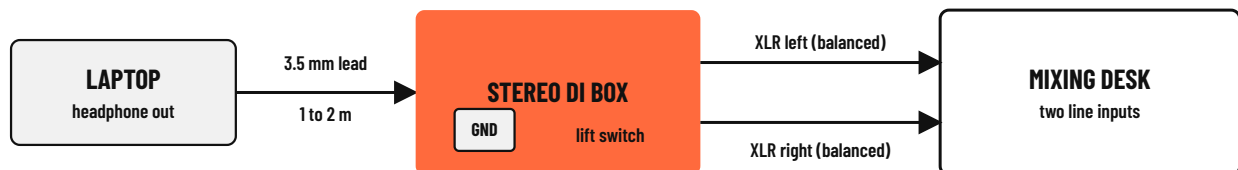
Rehearse with the real laptop before doors. Start the slideshow, run every video, click the clicker from the lectern. If it works then, it will usually work live.

06 Laptop and video audio into the desk



Picture by HDMI to the switcher, sound by a short lead into a stereo DI box, then XLR to the desk.

The sound of a video does not come from the screen. It comes from the laptop's headphone socket, down a cable into the mixing desk, and out of the PA. This is where hum and noise get in. One small box fixes it.



Short unbalanced lead at the laptop. Long balanced XLR to the desk.
The DI converts the signal and isolates the two ends from each other.
That kills the hum.

The DI box sits at the laptop, not at the desk. The weak link is the unbalanced lead, so keep it short and let the balanced XLR do the distance.

Why a DI box

A laptop output is **unbalanced**: two wires, no protection from noise. The desk wants a **balanced** line: three wires that cancel noise over long cables. A DI (direct injection) box converts one to the other. It also isolates the laptop's earth from the desk's, which is where hum starts.

- Use a **stereo** DI or two mono DIs. Videos and music are stereo. A mono DI on one side loses half the sound.
- Use a short lead from laptop to DI. Make the long run XLR.
- Turn the laptop volume most of the way up and set the level at the desk. A weak signal makes the desk boost the noise too.
- Check the laptop is playing from the headphone socket, not the speakers or an HDMI sound device.

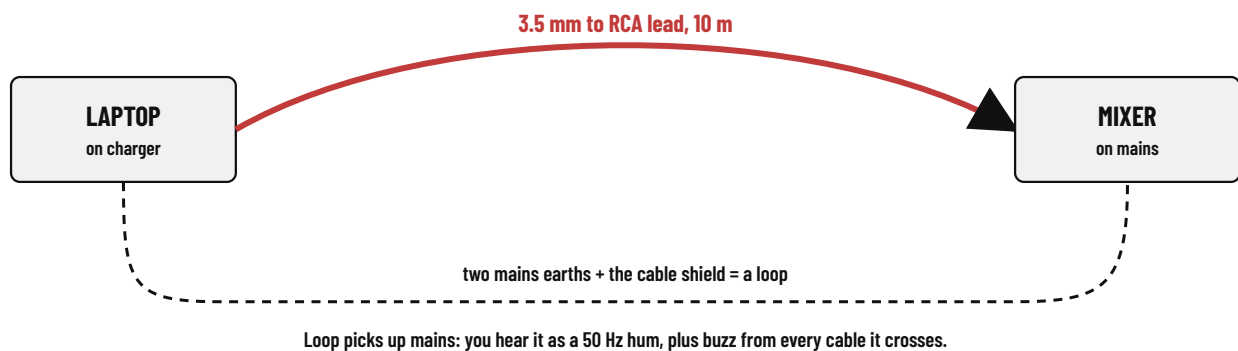
Hum and the ground lift

A steady 50 Hz hum or buzz is a **ground loop**: more than one earth path between two pieces of kit. The DI box has a **ground lift** switch that breaks the audio earth link between the two ends.

1. Hear hum? Flip the ground lift switch on the DI.
2. Still there? Unplug the laptop charger and run on battery for a moment. If the hum stops, it is the charger.
3. Still there? Swap the lead and try another DI.

SAFETY

The ground lift is on the DI box and only affects the audio signal. Never lift the earth pin on a mains plug or use a "cheater" plug. Mains earth keeps people alive.



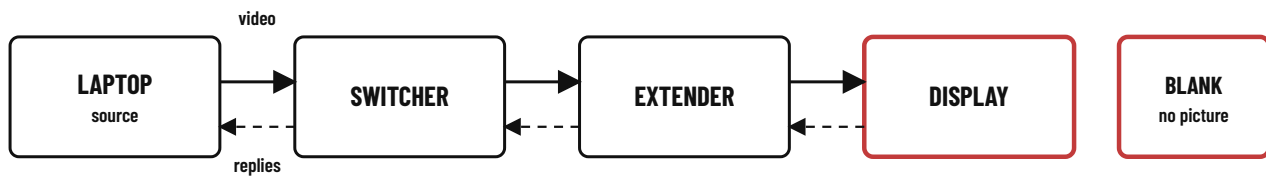
Unbalanced cables over distance are antennas. The loop through the mains earths makes it worse. Do not do this, even if the plugs fit.

FIELD RULE

Laptop audio goes through a DI box, with a short lead at the laptop and XLR to the desk. Never a long 3.5 mm to RCA lead across the room.

07 HDCP and handshake problems

You plug in, the laptop says it sees the display, and the screen stays black. Nothing is broken. The laptop and the screen are still agreeing how to talk. This lesson is about why it fails and the order to fix it.



Before it sends a picture, the laptop asks every device in the chain two questions.

EDID: "what picture can you show?" **HDCP:** "are you allowed to receive this?"

One device that does not answer right, and the laptop sends nothing.

Work back from the display until the picture returns.

A blank screen is usually a conversation that failed, not a broken cable. Remove one device at a time and see where the picture comes back.

Two words in plain English

EDID

The display's business card. It tells the laptop which resolutions and refresh rates it can show. The laptop picks one from that list. If a device in the middle gives a wrong card, the laptop picks something the screen cannot do.

HDCP

Copy protection built into HDMI. The laptop only sends a picture if every device in the chain confirms it is allowed to receive it. The check takes a few seconds and can fail when a device is slow, cheap or switched on late.

Fix it in this order

1. **Power order.** Screens, switcher and extenders on first. Connect the laptop last. Or pull the HDMI out, wait ten seconds, push it in.
2. **Lower the resolution.** Set the laptop output to 1920 x 1080 at 60 Hz. 4K needs everything in the chain to cope.
3. **Swap the cable, port or adapter.** A bad adapter is the most frequent cause with Macs and thin laptops.
4. **Go direct.** Plug the laptop straight into the screen. If that works, the fault is in the middle: switcher, extender or splitter. Add them back one at a time.
5. **Check the screen's input.** Is it on the right HDMI input? Is it asleep?

Protected content

Streaming apps and some discs mark their video as protected. If the chain fails the HDCP check, the picture goes black or you get an error. Do not try to get round it. Ask the client for a downloaded video file instead, and play that. Rehearse it.

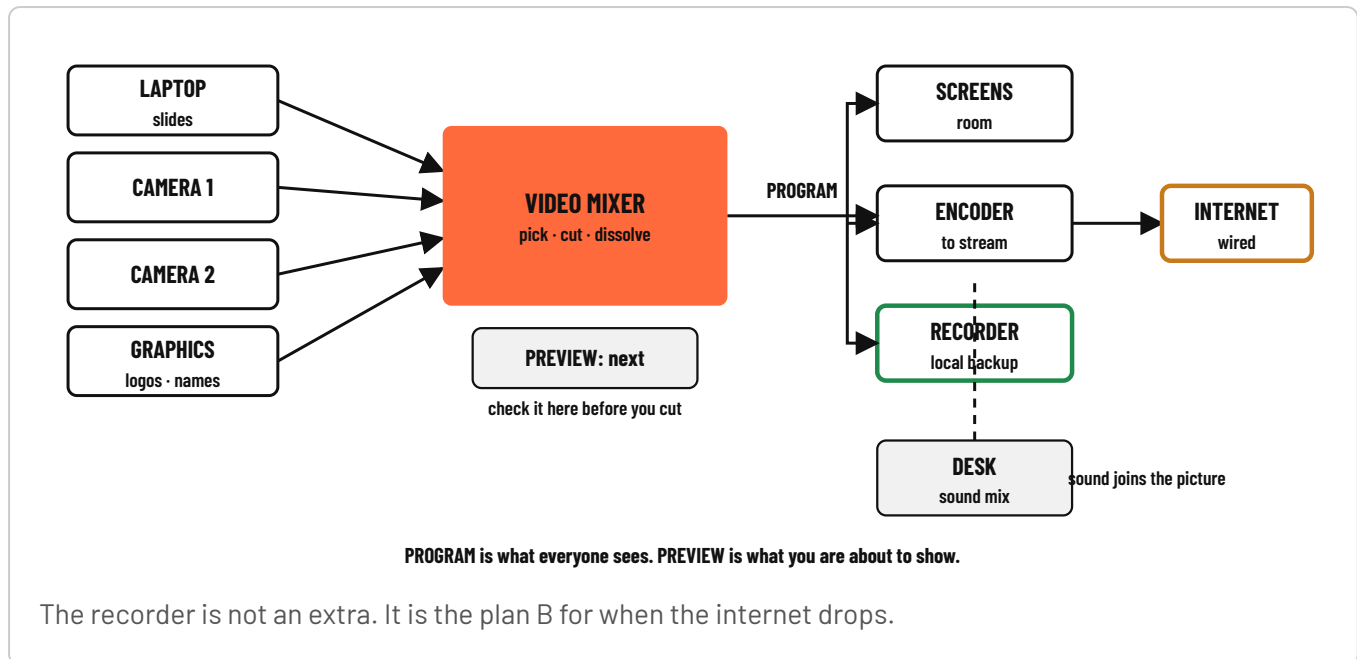
FIELD RULE

Black screen? Do not swap everything at once. Go direct to the display. If it works, add one device back at a time until it breaks.

08 Video mixer and streaming

When there is more than one source (a laptop and a camera, say), you need something to choose between them. That is a video mixer, or switcher. It also feeds the stream.

Typical hire kit: a video mixer or switcher that takes laptop, camera and graphics, and sends the program to screens, a stream encoder and a recorder.



Program and preview

- **Program** is live: what the room and the stream see right now.
- **Preview** is next: a shot you set up first and check. Never cut to a source that is not on preview.
- A **cut** is instant. A **dissolve** blends. Use cuts and the occasional dissolve. Fancy wipes date a show.
- The screens in the room take the program output. A stage or lectern monitor can show preview or program for the presenter: decide which beforehand.

Streaming

A stream is the program picture and the desk's sound, squashed by an encoder and sent over the internet. The internet link is the weak spot. Sending a picture needs **upload** speed, not download. Venue wifi is the usual trap: shared, slow in the upload direction, and it drops when the hall fills with phones.

1. **Use a wired connection.** Cable from the encoder to the venue's router or a port the venue provides. Not wifi.
2. **Test upload speed** on site, on that cable, at the time of day of the event.
3. **Keep double.** Your upload should be about twice the stream bitrate, so a dip does not drop the stream.
4. **Record a backup locally** from the first minute, to a drive on the mixer or encoder.

Typical hire kit: a streaming-capable switcher or a separate encoder, with a recorder for the local backup.

TRY IT: IS THE UPLOAD ENOUGH?

STREAM	BITRATE	UPLOAD TO HAVE (ONE DESTINATION)
720p	3 Mbps	6 Mbps
1080p 30	5 Mbps	10 Mbps
1080p 60	8 Mbps	16 Mbps
4K	20 Mbps	40 Mbps

Each extra destination sent from the venue multiplies the need. Always twice the bitrate.

FIELD RULE

Wired, tested, double the bitrate, and a recording running from the first minute.
Wifi is not a stream plan.

09 AV checklist and fault table

Work down this list before doors. Tick each box. A system that passes ten checks in the quiet is far more likely to pass the one that counts.

1

☐ KNOW THE CHAIN

Sources, switcher, screens, audio path. Who is the contact for the presenter.

2

☐ RIGHT LINK FOR EACH RUN

Passive HDMI only for short runs, HDBaseT or fibre for the rest. Labelled at both ends, taped down.

3

☐ POWER ON EVERYTHING

Screens, switcher, extenders and converters. Extenders need power at the ends.

4

☐ SCREENS AT NATIVE RESOLUTION

Correct input selected. Picture fills the screen, no stretching.

5

☐ LAPTOP CONNECTED LAST

Extend mode, presenter view working. Slides are 16:9.

6

☐ VIDEOS WITH SOUND

Every video played through the real system, with sound at the desk.

7

☐ AUDIO THROUGH A DI

Stereo, laptop volume up, level at the desk. Listen for hum. Ground lift tried if needed.

8

☐ CLICKER, CHARGER, SLEEP OFF

Clicker tested from the lectern. Charger in. No notifications.

9

☐ SPARES AT THE LECTERN

Second laptop with the files. Spare HDMI cable and adapters. Spare clicker batteries.

10

☐ STREAM AND BACKUP

Wired, upload tested, recording started before the first speaker.

Start at the source. Move forward until the picture stops.



Where it stops is the fault. Cable, power and input cause nine out of ten.

Do not change two things at once.

Same method as the audio signal chain: start at the source, walk forward, stop where it disappears.

If it goes wrong

YOU SEE OR HEAR	MOST LIKELY	CHECK
No picture	Cable out, no power, wrong input, or a failed handshake	Walk the chain. Go direct to the screen. Reconnect the laptop last. Lower to 1080p
Wrong aspect: stretched, or black bars	4:3 slides on a 16:9 screen, or the laptop set to another resolution	Set output to the screen's native resolution. Ask for 16:9 slides. Never stretch
Flicker or sparkles	Cable too long or poor, refresh rate mismatch, loose connector	Shorter or better cable. Set 60 Hz. Reseat both ends. On an LED wall seen by camera, ask the LED tech to match the camera shutter
Hum or buzz in the sound	Ground loop, or an unbalanced lead	Ground lift on the DI. Try the laptop on battery. Short lead at the laptop, XLR to the desk
No sound from a video	Laptop output set to HDMI or speakers, volume muted, desk channel muted	Choose headphone out in the laptop sound settings. Raise laptop volume. Check the desk channel and fader
Stream dropping	Wifi, or upload too small for the bitrate	Wired cable. Test upload. Lower the bitrate. Keep the local recording running

REMEMBER

Source first, then forward. One change at a time. Picture and sound are two paths.

10

Check what you learnt

Ten questions. Circle one answer for each. The answer key is on the last page. Pass mark: 8 out of 10.

1. The picture works but a video has no sound in the room. Where do you look first?

- ☐ **A** The projector lens
- ☐ **B** The Cat6 cable to the screen
- ☐ **C** The screen's resolution setting
- ☐ **D** The separate audio path: laptop headphone out, DI box, desk

2. A passive HDMI cable is reliable to about...

- ☐ **A** 10 to 15 m at 1080p
- ☐ **B** 5 m at 1080p only
- ☐ **C** 50 m on good cable
- ☐ **D** 100 m

3. You need a 40 m run for a 1080p picture. The best answer is...

- ☐ **A** Two HDMI cables joined with a coupler
- ☐ **B** One 40 m HDMI cable
- ☐ **C** An HDBaseT extender pair over one length of solid shielded Cat6
- ☐ **D** Wifi

4. What must you NOT do with an HDBaseT run?

- ☐ **A** Use shielded Cat6
- ☐ **B** Power both extender boxes
- ☐ **C** Send it through a network switch
- ☐ **D** Label both ends

5. A client sends 4:3 slides for a 16:9 screen. What happens?

- ☐ A The slides fill the screen
- ☐ B Black bars appear at the sides
- ☐ C Black bars appear top and bottom
- ☐ D The screen turns off

6. On an LED wall with a pixel pitch of 3.9 mm, the closest comfortable viewing distance is about...

- ☐ A 4 m
- ☐ B 40 m
- ☐ C 0.4 m
- ☐ D 400 mm

7. Which presenter laptop setting do you want?

- ☐ A Mirror, with sleep on
- ☐ B Extend, with presenter view and sleep off
- ☐ C Mirror, on battery
- ☐ D Extend, with notifications on

8. Why use a DI box for laptop audio?

- ☐ A To make the picture sharper
- ☐ B To charge the laptop
- ☐ C To turn the signal balanced and isolate the earths, which stops hum
- ☐ D To add bass

9. You hear a steady hum from the laptop audio. First try...

- ☐ **A** Lift the earth pin on the laptop plug
 - ☐ **B** Turn the PA off
 - ☐ **C** Change the slide template
 - ☐ **D** Flip the ground lift switch on the DI box
-

10. The laptop shows the display but the screen stays black. After lowering to 1080p at 60 Hz, a good next step is...

- ☐ **A** Plug the laptop straight into the screen to find which device in the chain fails
- ☐ **B** Add more extenders
- ☐ **C** Play a streaming app
- ☐ **D** Turn the screen off and leave it

Answer key

1. **D.** Picture and sound travel separately. Sound goes laptop headphone out, DI box, desk, PA. Check that path.
2. **A.** About 10 to 15 m at 1080p, shorter at 4K. Past that use HDBaseT or fibre.
3. **C.** HDBaseT reaches 70 to 100 m on good Cat6 with an extender at each end. Joined HDMI cables are unreliable.
4. **C.** HDBaseT is point to point, not a network. A network switch will not pass it.
5. **B.** A 4:3 slide on a 16:9 screen leaves black bars left and right. Ask for 16:9 slides.
6. **A.** Rule of thumb: the distance in metres is about the pitch in millimetres. P3.9 means about 4 m or more.
7. **B.** Extend gives the presenter notes and the next slide while the audience sees only the slide. Turn off sleep and notifications.
8. **C.** A DI makes an unbalanced laptop output balanced for the long run to the desk, and isolates the two ends.
9. **D.** The ground lift is on the DI and breaks the audio earth link. Never lift a mains earth pin.
10. **A.** Go direct. If it works, the fault is in the chain. Add devices back one at a time.

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