1 = Blue 2 = Red
3 = Green 4 = Orange

AV Like Paint by Numbers

Presented By: Eric J. Marshall

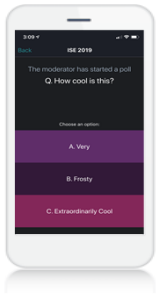
How Can I Participate?

It's as easy as 1-2-3…

1. Download the app – Crowd Mics

2. Connect to Wi-Fi – ERICWifi

3. Join the event in the app – ERICPresent



-Request to Speak
-Use as Mic
-Text questions
-Respond to Polls

1 = Blue 2 = Red
3 = Green 4 = Orange

AV Like Paint by Numbers

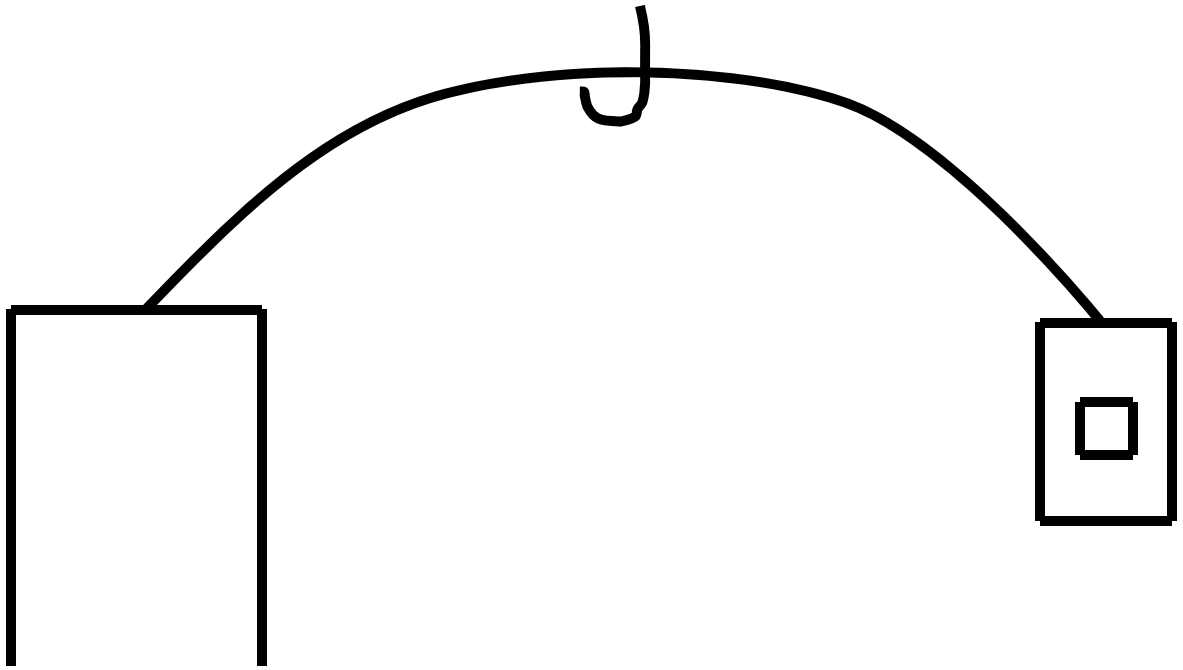
Presented By: Eric J. Marshall

1 = Blue 2 = Red
3 = Green 4 = Orange

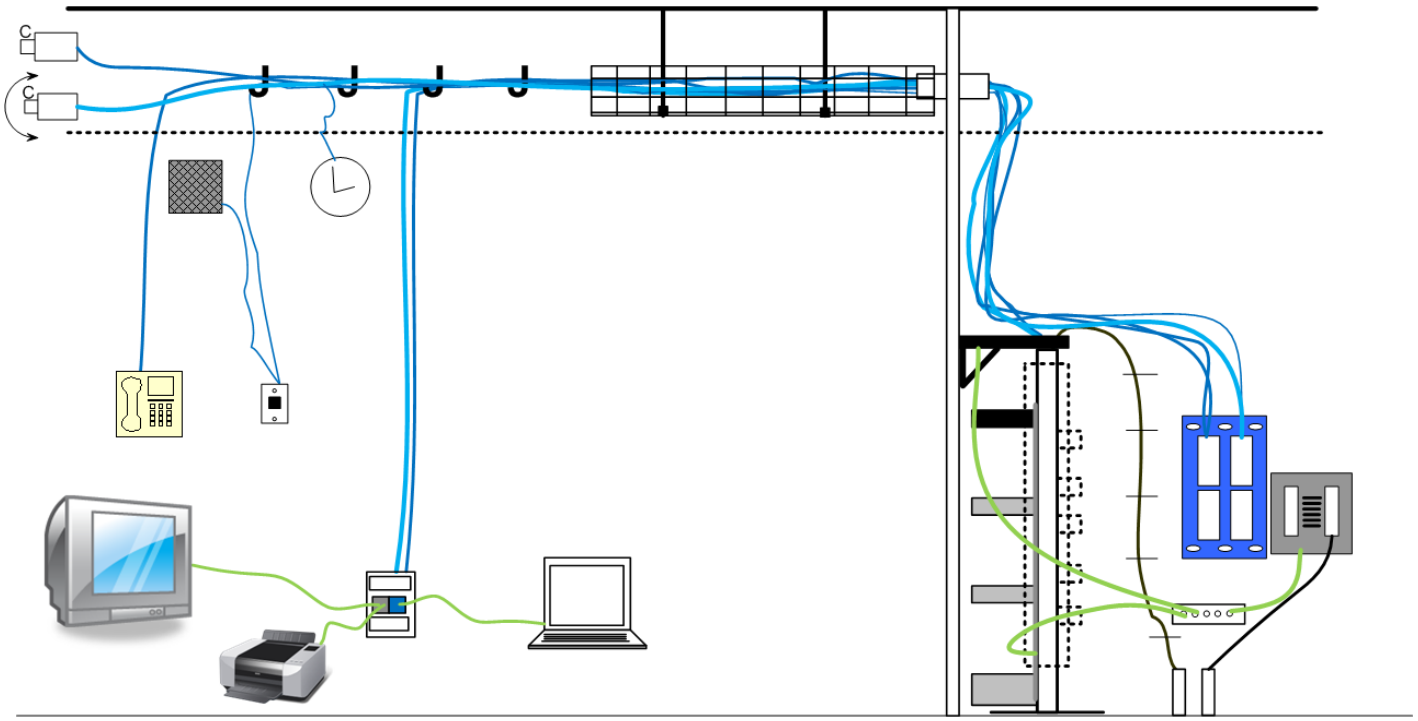
AV Like Paint by Numbers

Presented By: Eric J. Marshall

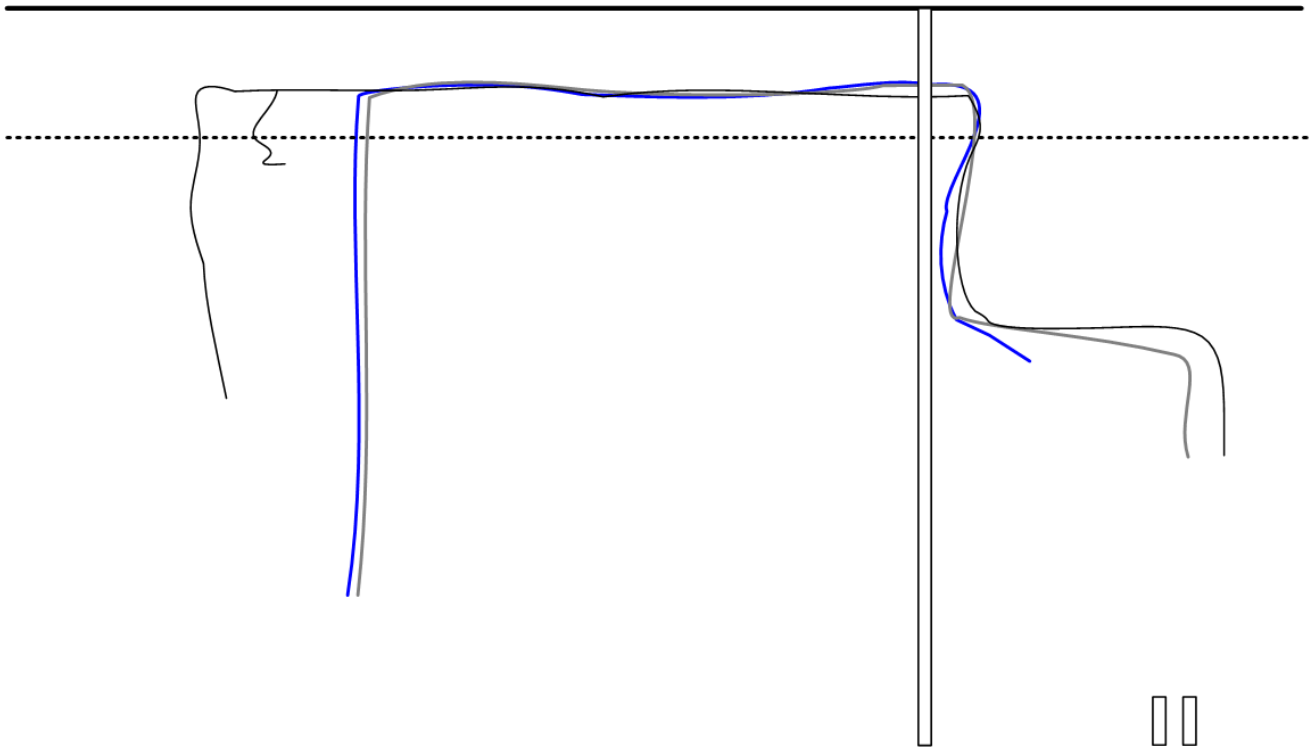
When I started in the industry, my boss drew me a picture of what WE DID.



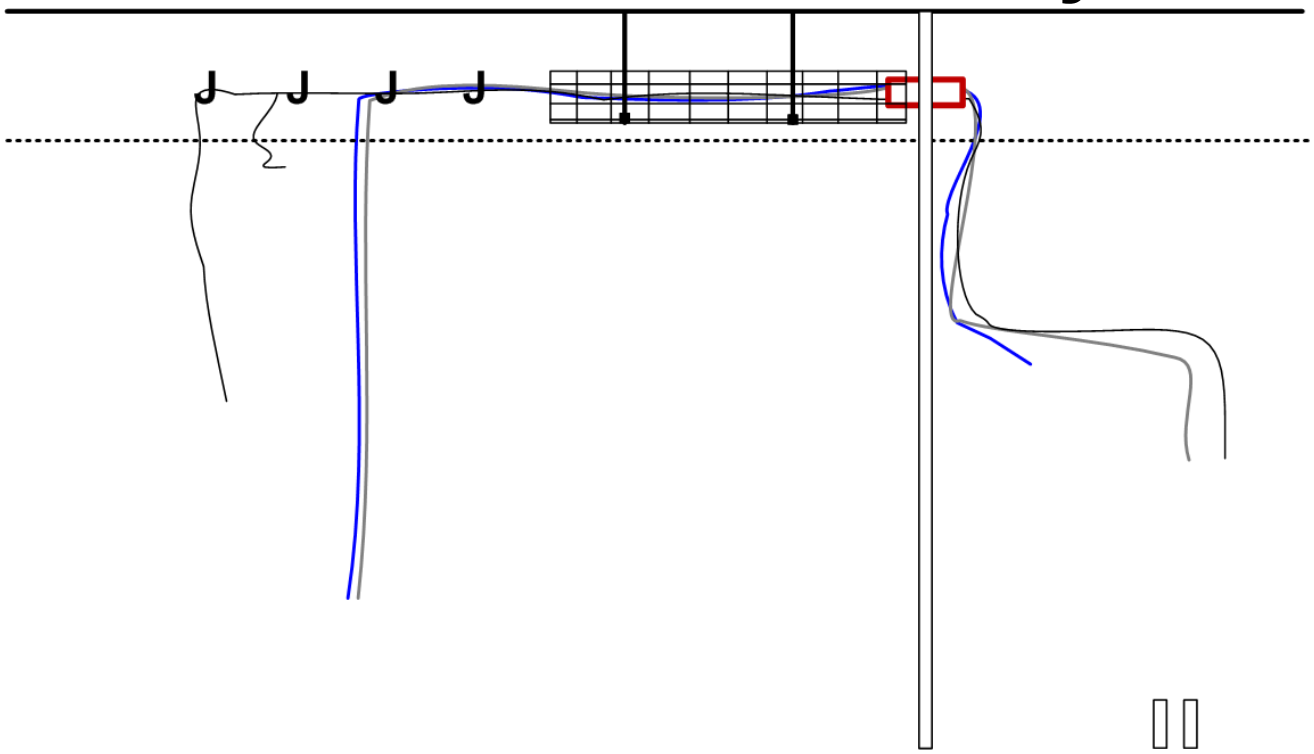
I Upgraded the Drawing



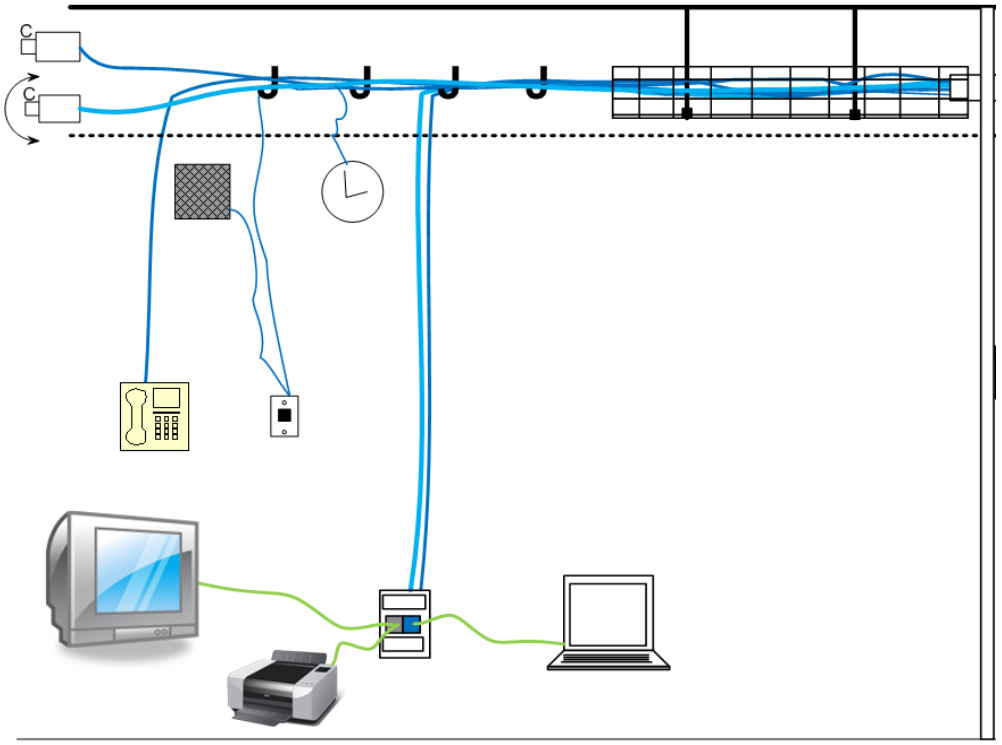
1. Address Cable



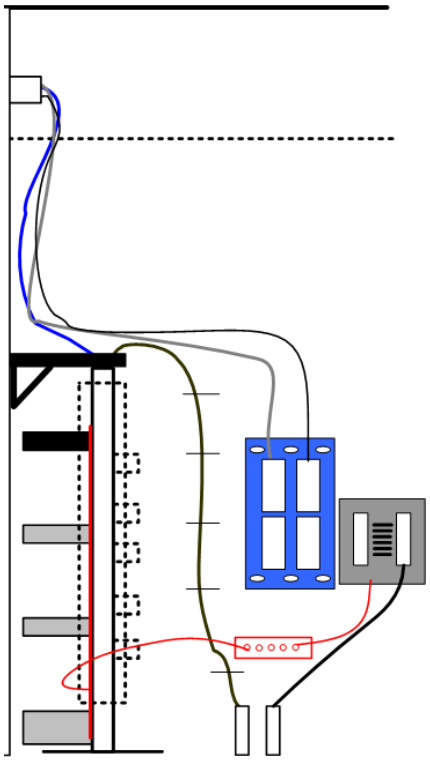
2. Address Pathway



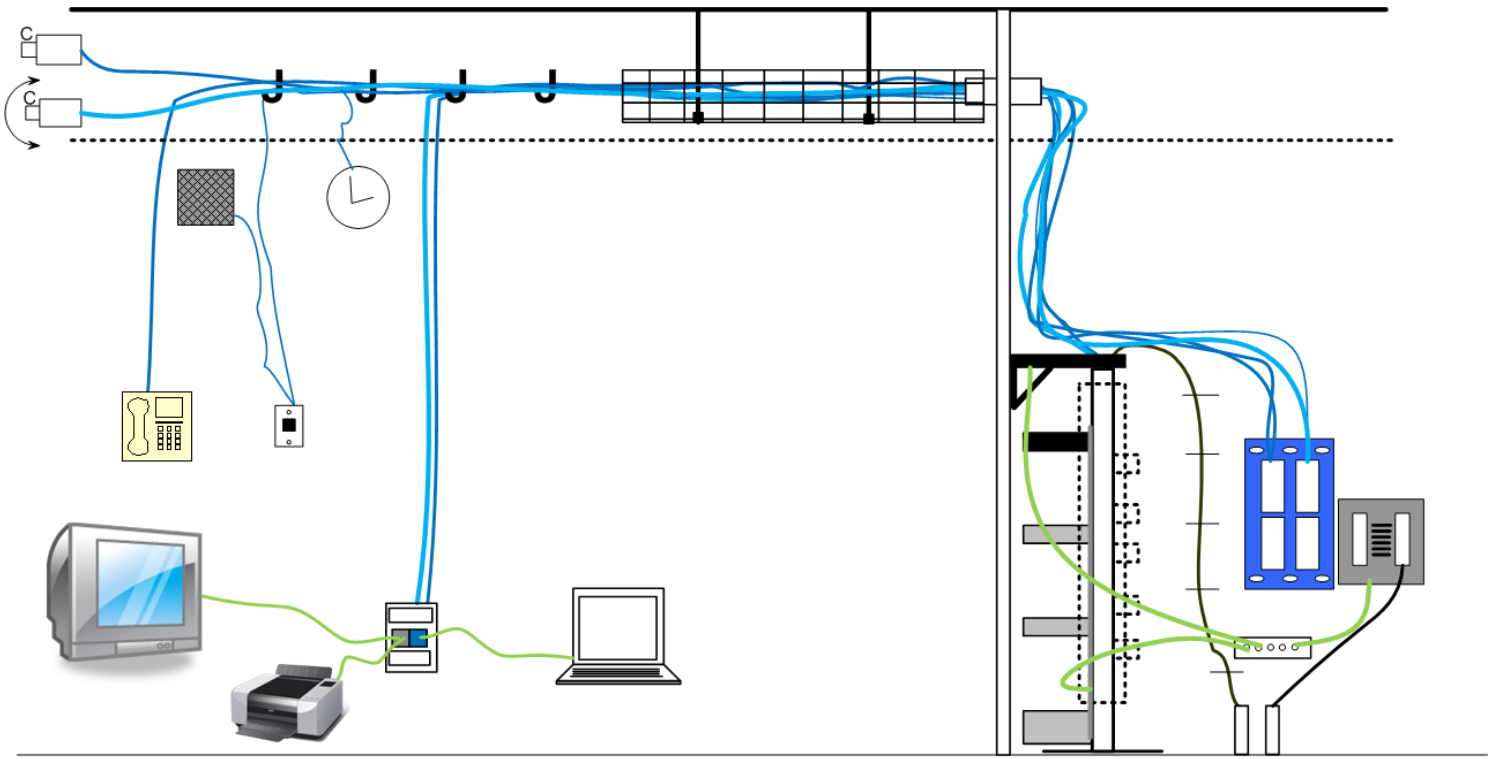
3. Address the Stations



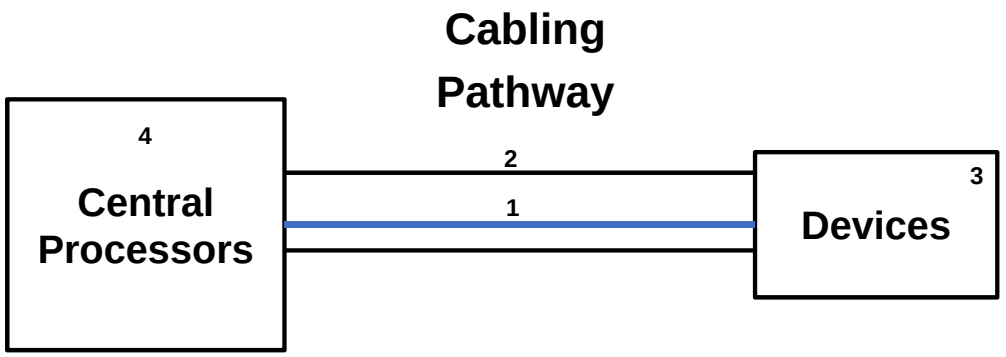
4. Address the Head End



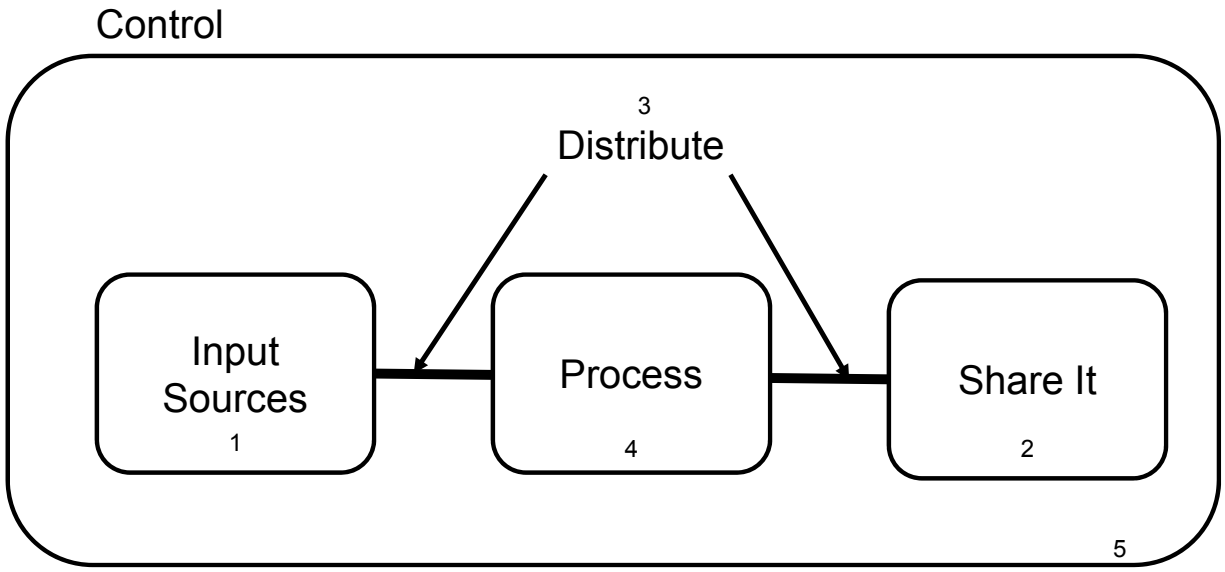
Completed Picture



What Do We Do TODAY?



Audio Video



Who are you?

A. Engineer/Designer
B. Sales Agent
C. Installer
D. Project Manager
E. Commission Agent / Inspector
F. Programmer
G. ALL THE ABOVE!

Can we do AV?

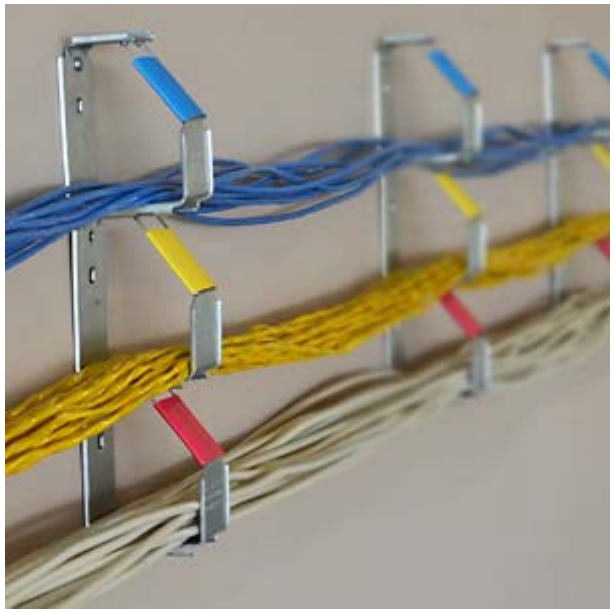
I was hired to start doing AV at a structured cabling company

Do you know how to install cable?

Do you know how to mount things on walls and ceilings?

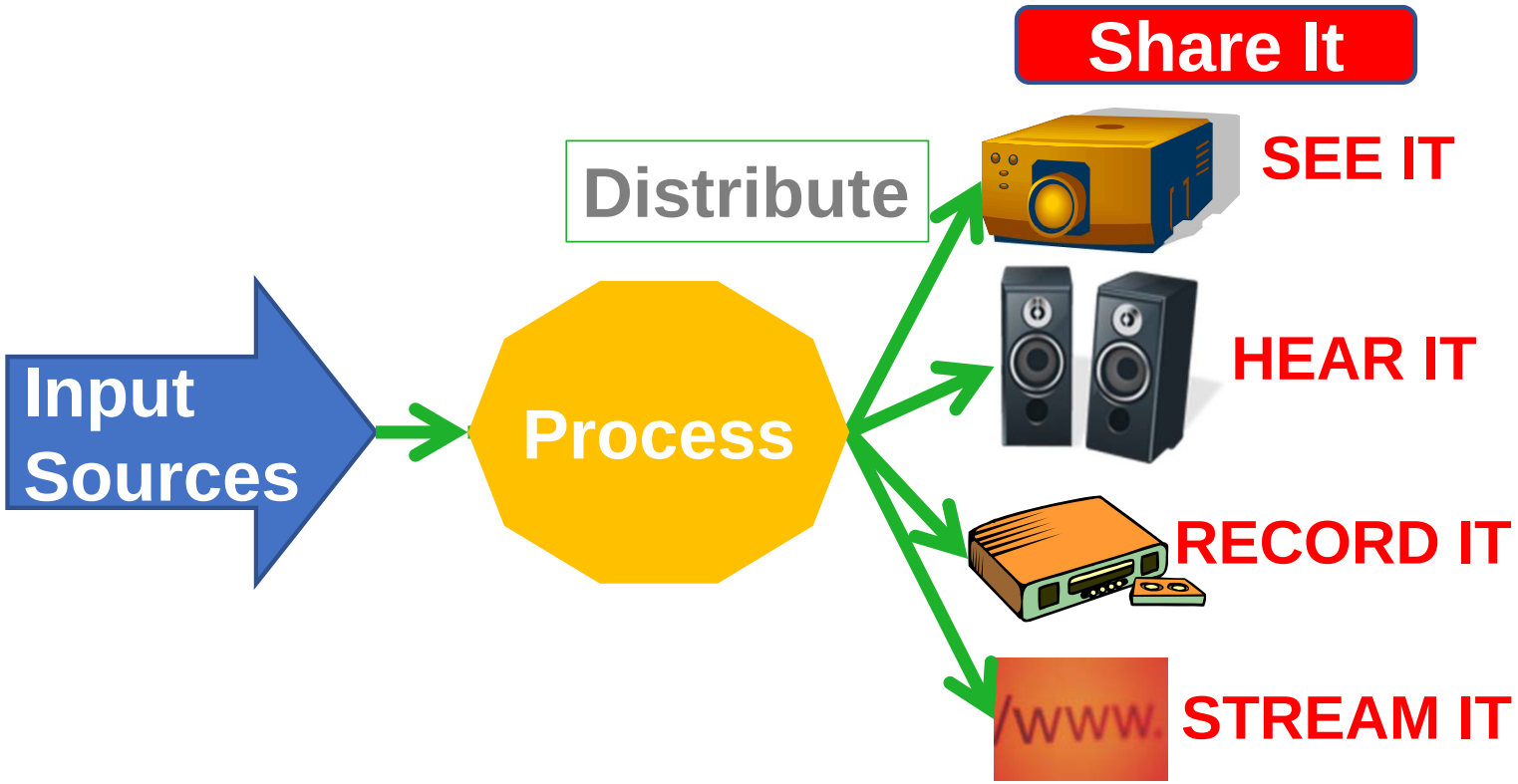
Let me pull your cable!
We are both going to the same place!

TDMM:
Save 30-40%

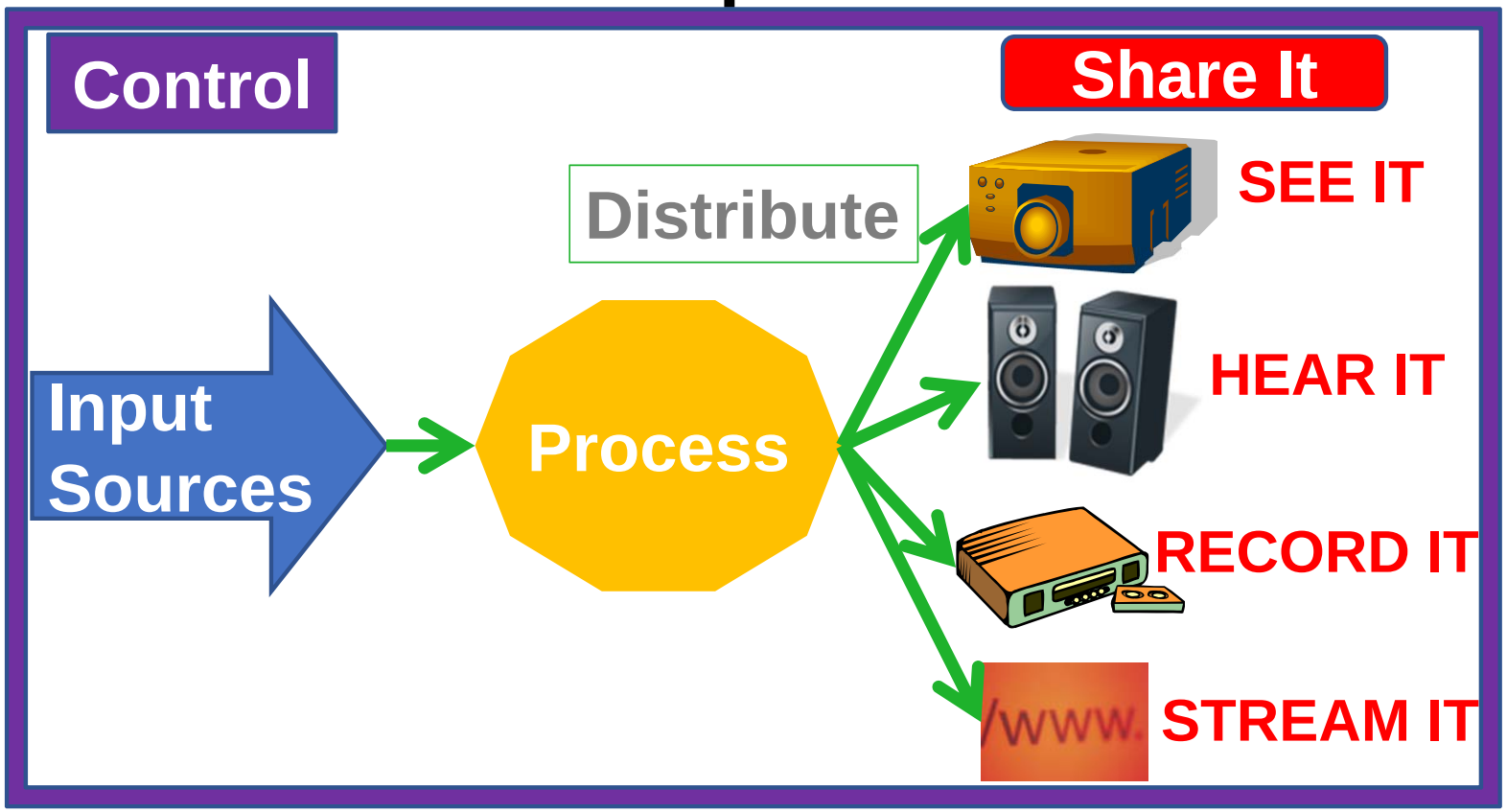


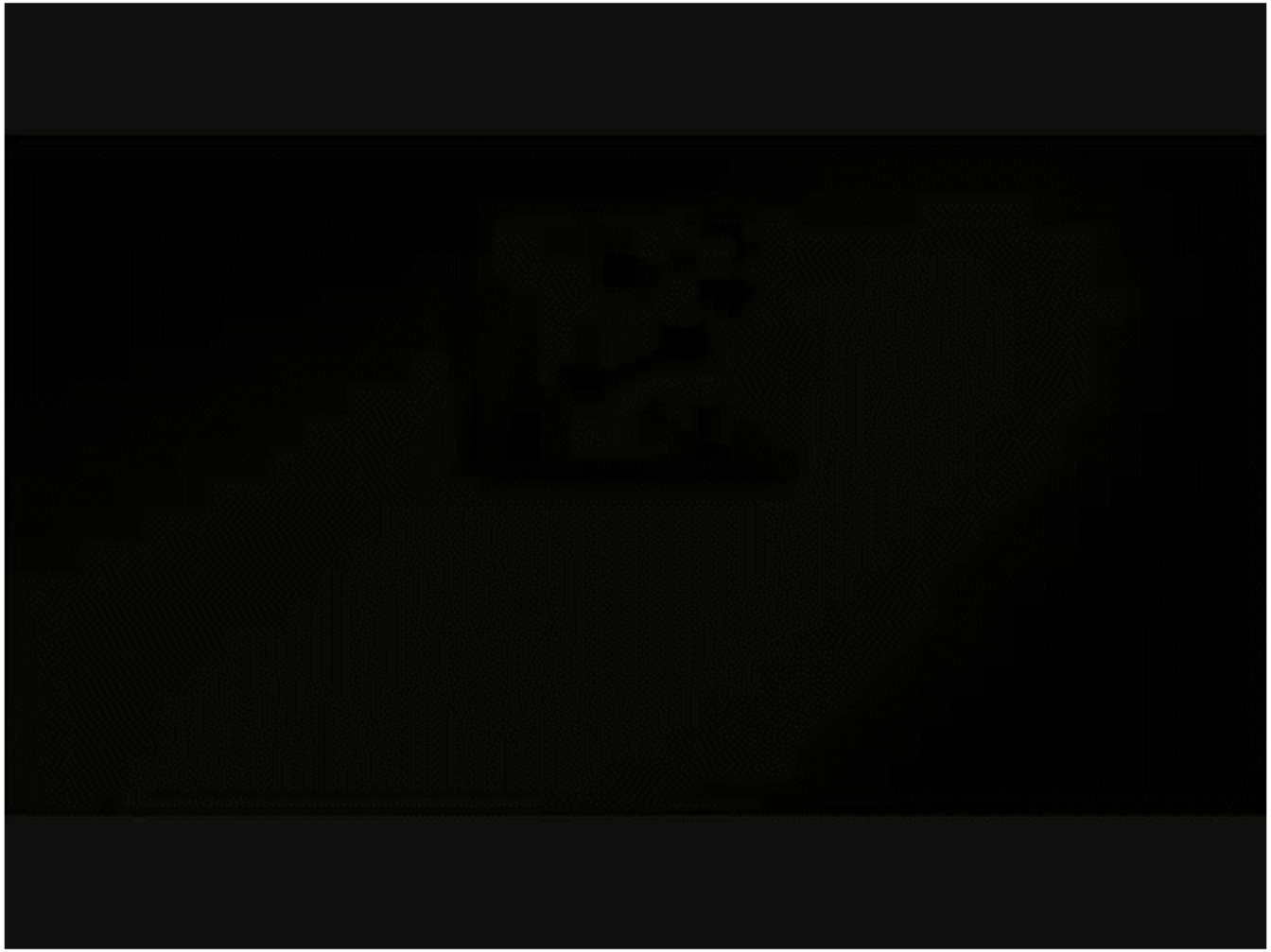
Sold 2.4 million
In 2 months!

4 Steps of AV


Share It
Distribute
SEE IT
HEAR IT
Input Sources
Process
RECORD IT
/www.
STREAM IT

5th Step of AV





1. Input Sources
2. Share It
3. Distribute
4. Process
5. Control

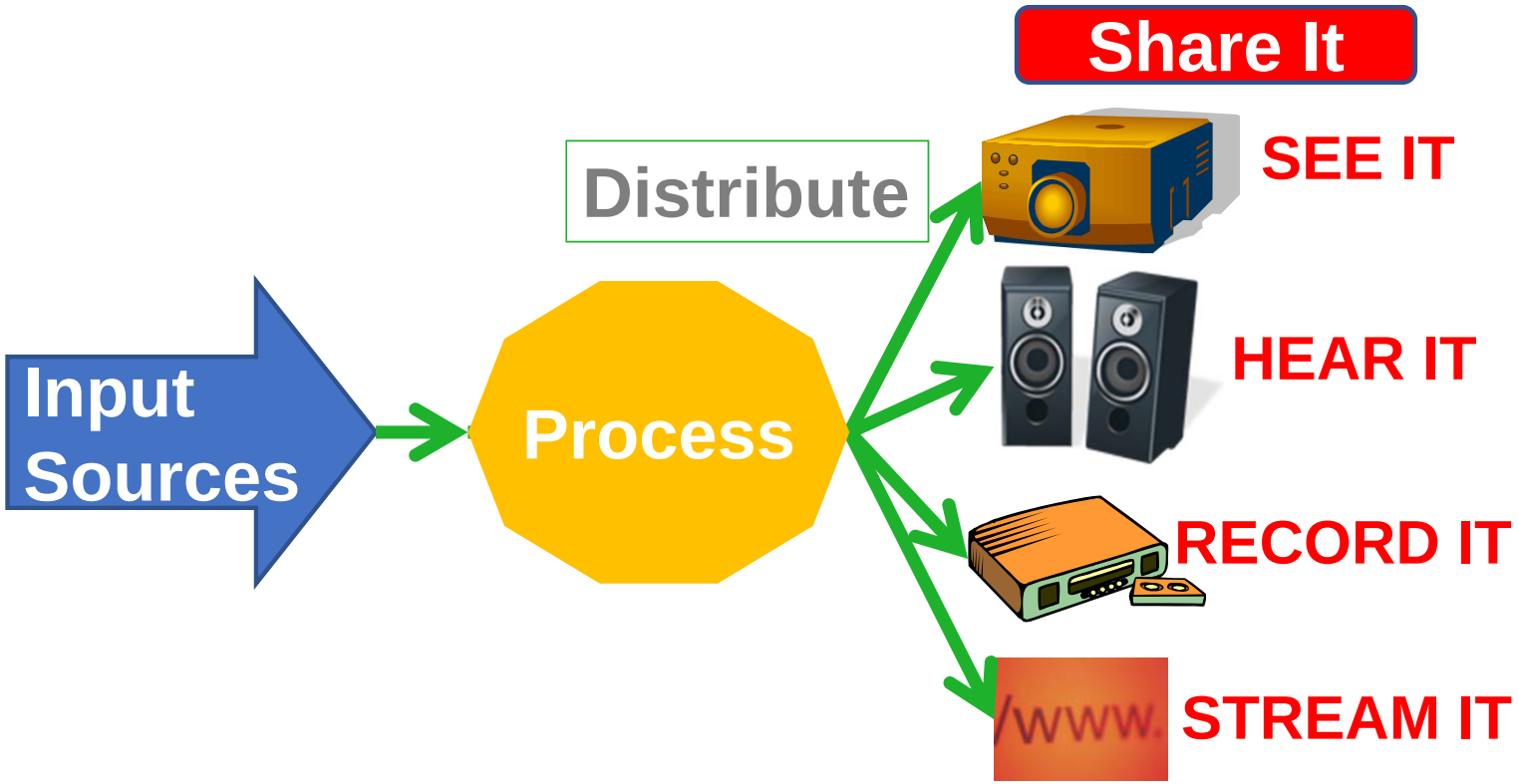
Which are the 5 Steps of AV?

A.
Select Sources – Share It – Cable It – Process – Control

B.
Input Sources – Share It – Distribute – Process – Control

C.
Pick Sources – Pick Outputs – Cable It – Share It – Control It

4 Steps of AV


Share It
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Input Sources
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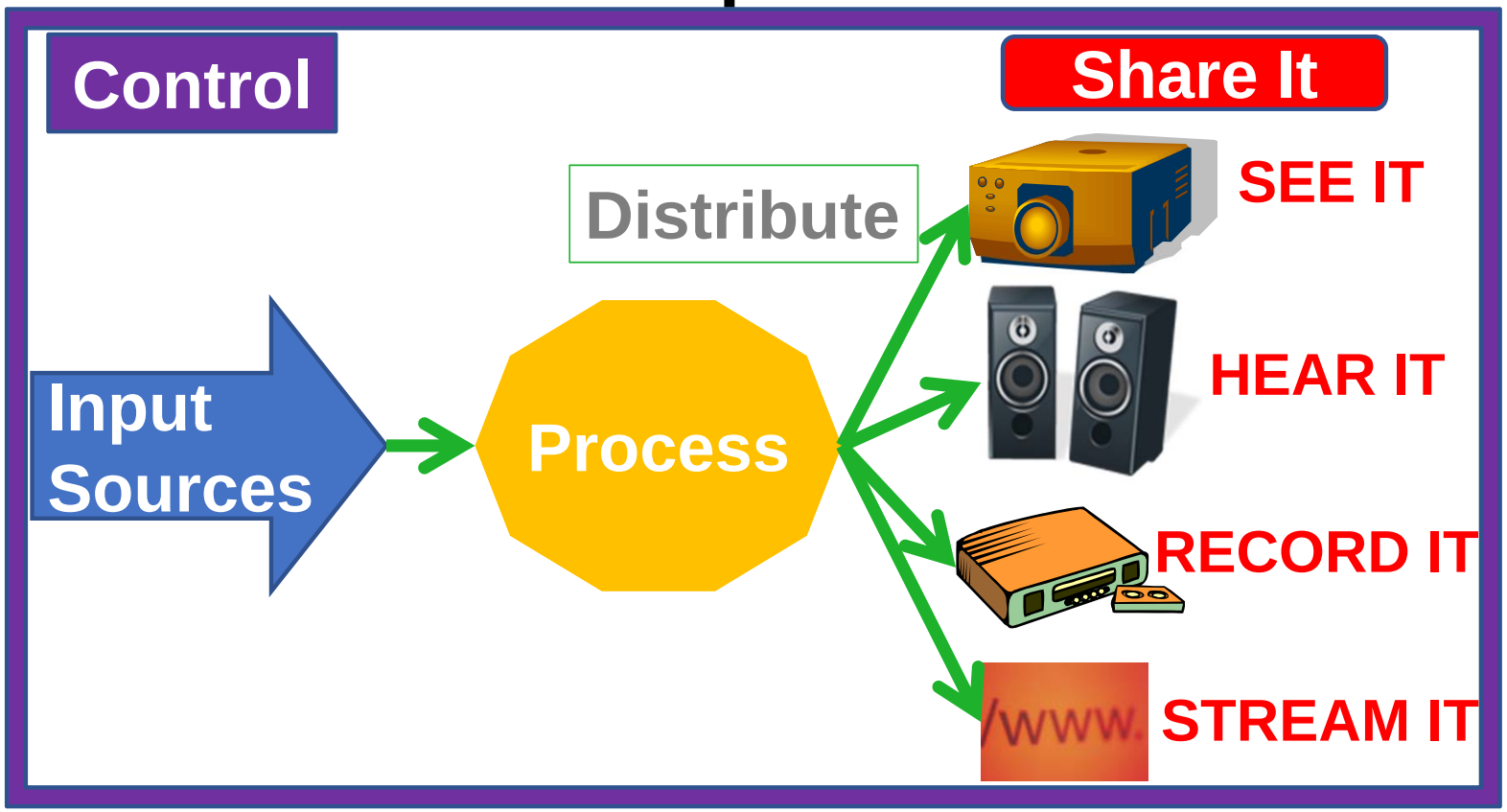
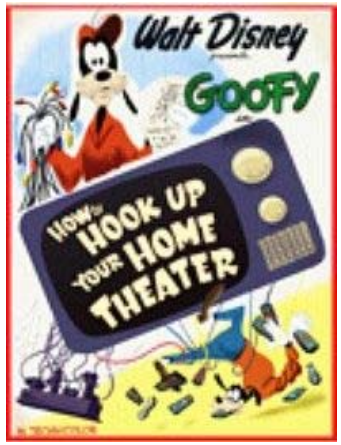
5th Step of AV



Step 1 – Input Sources



What are input sources?

Anything that generates Audio or Video

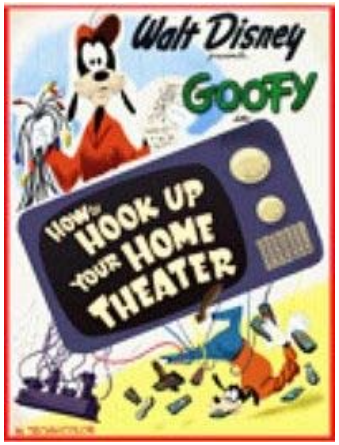
Audio Source Examples

- CD Player / Recorder
- DJ Mixer / Karaoke
- MP3 Player or iPod
- Streaming – Spotify, Pandora…
- Audio Server
- AM/FM Tuner
- Satellite Radio
- Cassette Tape Player / Recorder
- Phonograph / Record Player / Turntable
- Microphone
- Instrument
- Public address / Noise Masking
- Bluetooth from Phone

Video Source Examples

- BluRay Player / Recorder
- TV Box or TV antenna
- Digital Signage
- VCR
- DVR / Video Server
- I-Pod Video / Phone
- Camera
- Computer
- Video CDs
- Document Camera
- Game Console
- Web Conference
- Streaming Service
- BYOD Wireless Collab Device
- Microscope / Telescope

You don’t have to worry about all the sources



INPUT
Sources

Devices have connectors

CONNECTORS CONNECT

BUT

THE REAL CONNECTION IS THE **SIGNAL**

Devices have connectors

CONNECTORS CONNECT

BUT

THE REAL CONNECTION IS THE **SIGNAL**

Devices have connectors

CONNECTORS CONNECT

BUT

THE REAL CONNECTION IS THE **SIGNAL**

High Resolution

- RGBHV = 5 Wire
- RGBS = 4 Wire
- RGsB/RsGsBs = 3 Wire

Can be either

- Component = 3 Wire

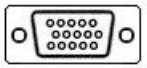
Low Resolution

- S-video (Y/C) = 2 Wire
- Composite = 1 Wire
- Radio Frequency (RF)

BNC Connector

- Used with coaxial cable.
- It is a round metal connector that is pressed and twisted to lock into place.
- BNC stands for “Bayonet Neill Concelman” (the names of the two developers – Paul Neill and Carl Concelman).
- Used for professional AV applications.

DB / HD Connectors

F 

HD15 VGA Plug

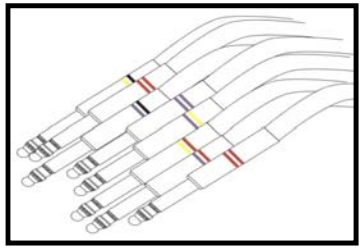
M 

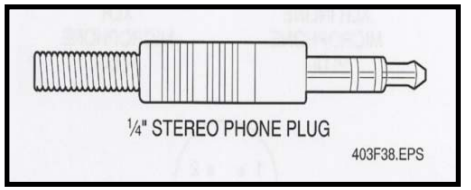
DB9 Serial Plug

- Common connector for computers.
- If it has 2 rows of pins it is called a “D-sub” or “DB” connector.
- If it has 3 rows of pins it is called an “HD” connector.
- The connector type is usually followed by a number telling the number of pins it can hold.
- (ex. DB9, DB25)
- HD15 is what is used by most computers!

Audio plug

- Plugs are used for many audio applications
- Typical sizes are 3.5mm, 2.5mm, ¼”, and 3/16”
- 3.5mm is what is used on most computers and portable audio devices!





Audio Connectors

Female XLR Connector

Pin	Signal
1	Shield
2	Signal +
3	Signal -

Male XLR Connector

RCA Plug

¼” Plug TRS (Tip Ring Sleeve)

1/8” 3.5mm mini-plug TRS

Speakon for Speakers

Euroblock, Captive Screw or Phoenix Connector

Toslink

Digital Connectors

HDMI

DVI

FireWire

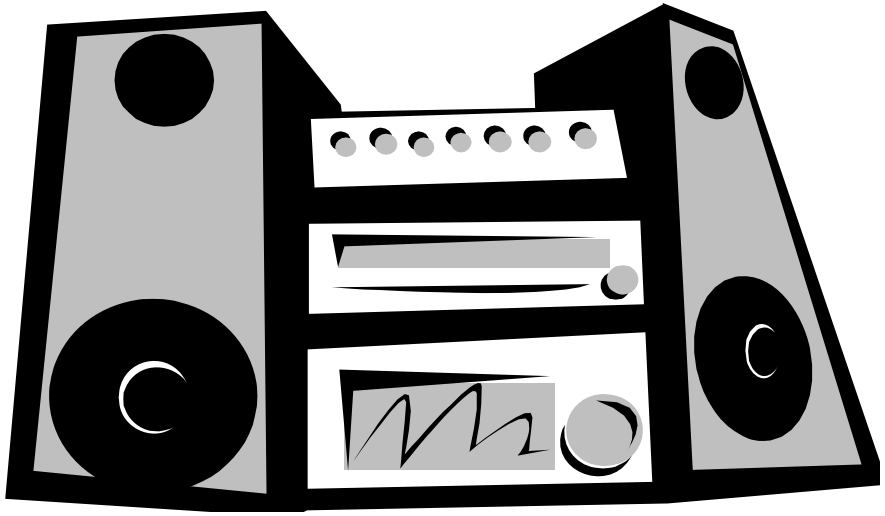
Thunderbolt

Display Port

SDI

USB

What Does Digital Add to Signal?



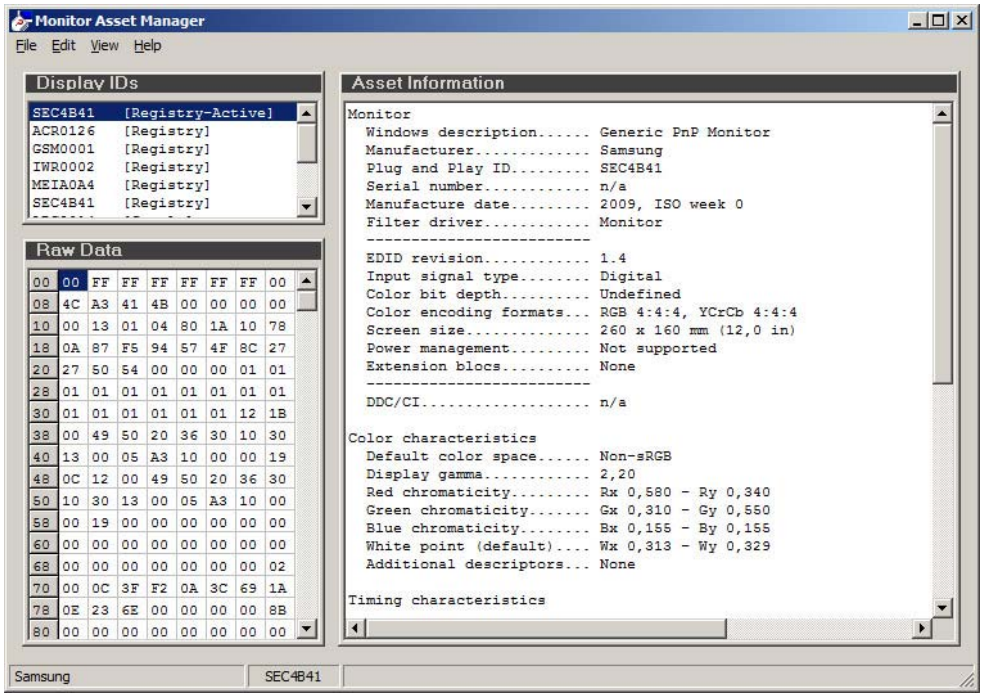
AUDIO

What Does Digital Add to Signal?

EDID

(Extended Display Identification Data)

- Hot Sync
- AV properties
- HDCP

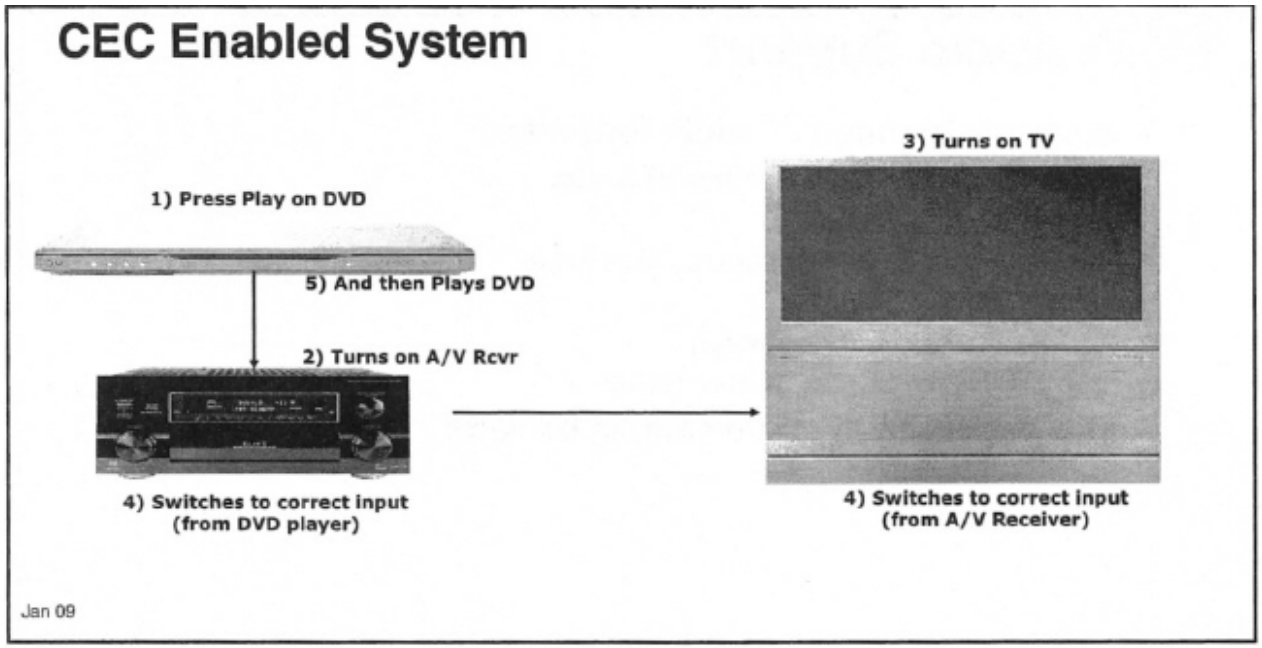


What Does Digital Add to Signal?

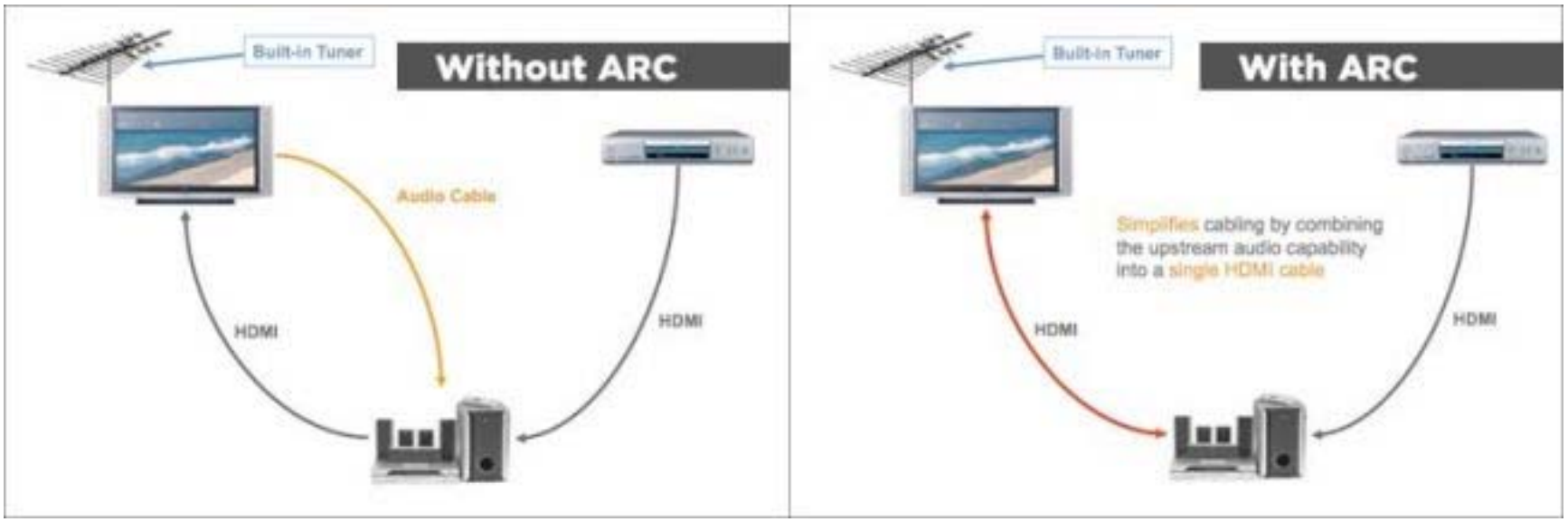
Prevent Non-licensed devices from receiving content

Block eavesdropping – “Man in the Middle” attacks

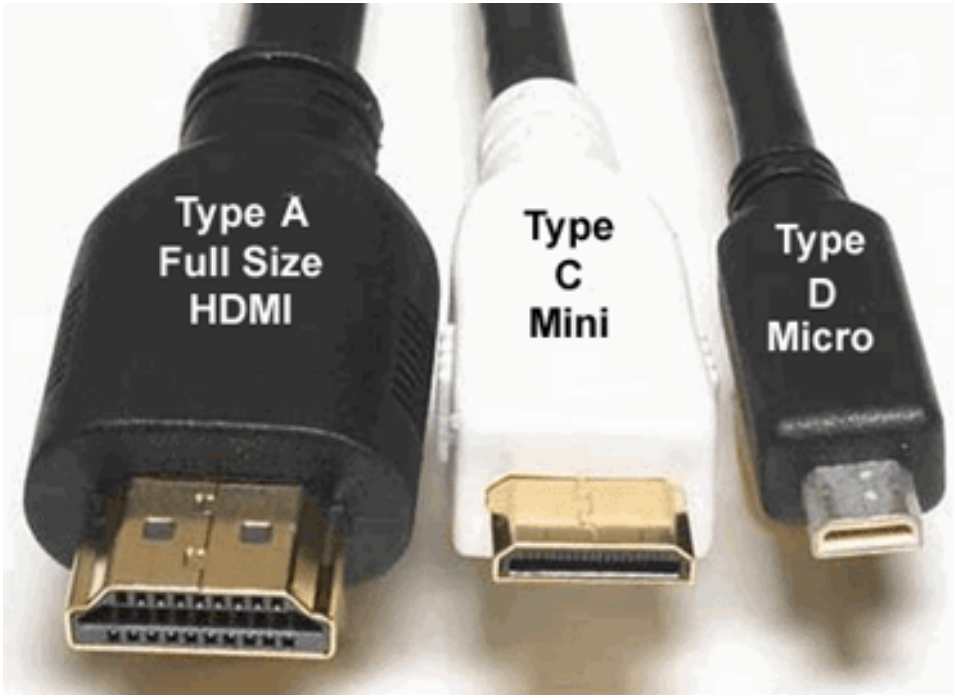
What Does Digital Add to Signal?



What Does Digital Add to Signal?



Different HDMI Examples



Different Display Port Examples

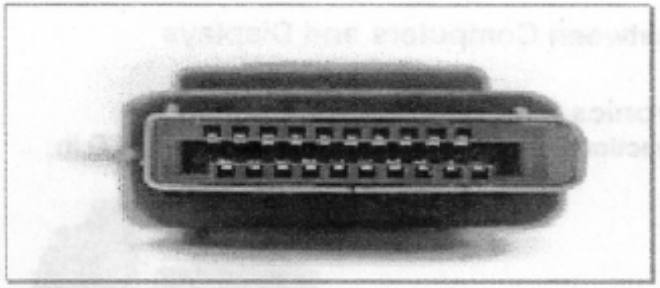
Display Port

Display Port Mini

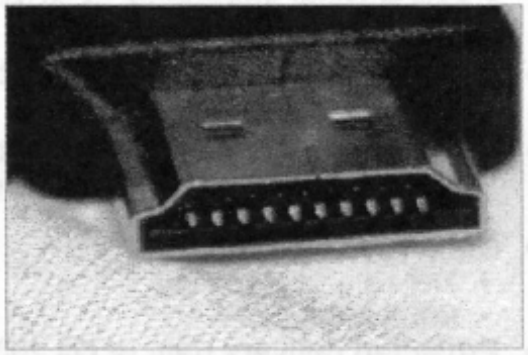
Display Port / HDMI Comparison

DVI

Display Port vs. HDMI



Display Port

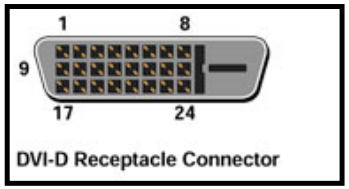


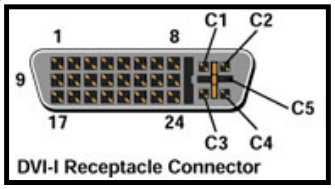
HDMI

Jan 09

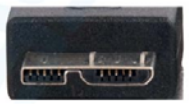
DVI Connector

- LFH (low force helix) connector
- DVI-D = 24 pins and a single larger, offset ground bar; carry a digital signal ONLY.
- DVI-I = have 4 extra pins that surround the offset ground bar; carry both digital and analog signals.
- Used for Digital and High Definition Video





Different USB Examples

Connector Type	USB 2.0 Image	USB 3.0 Image
A		
B		
Micro-B		
Mini-B 5 Pin		–
Mini-B 4 Pin		–
C		

Don’t get confused by the connectors!

COMPUTERS

- D-sub (DB)
- HD
- DIN
- BNC
- DVI
- HDMI

VIDEO

- F-type
- HD
- RCA
- BNC
- DIN
- DVI
- HDMI

AUDIO

- RCA
- Plugs
- DIN
- Captive Screw
- Binding Post
- XLR
- HDMI
- F-Type
- Toslink

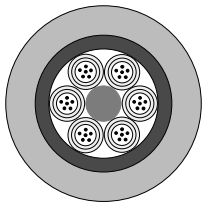
CONNECTORS CONNECT

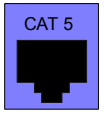
BUT

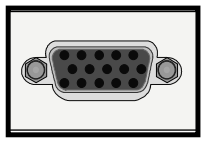
THE REAL CONNECTION IS THE **SIGNAL**

The Physical Connection

- Consists of two major components:
  - Conductors= pieces of wire that carry signals between devices. **$$$$$$**
  - Connectors= mechanical junctions between the conductors and pieces of equipment.
- To properly understand how to connect devices to the AV system you need to understand *CONNECTORS **and** SIGNALS.*







What's the difference on the connector?

F

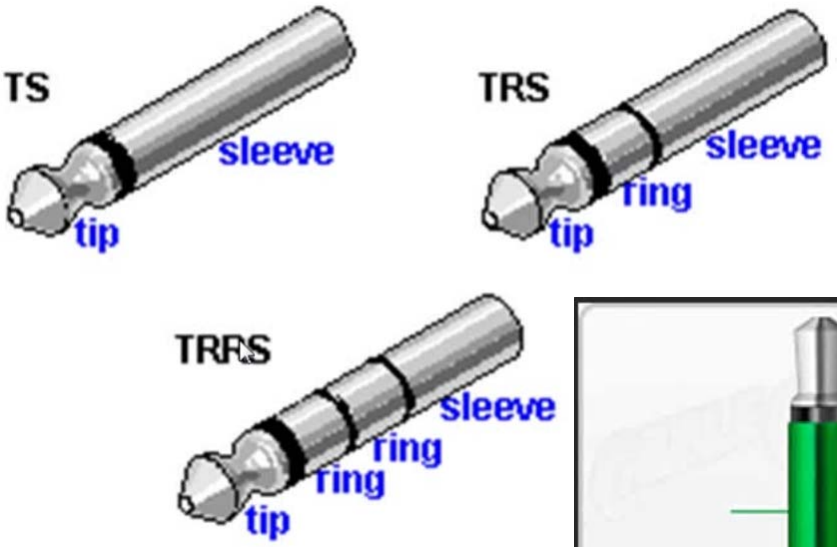
HD15 VGA Plug

M

DB9 Serial Plug

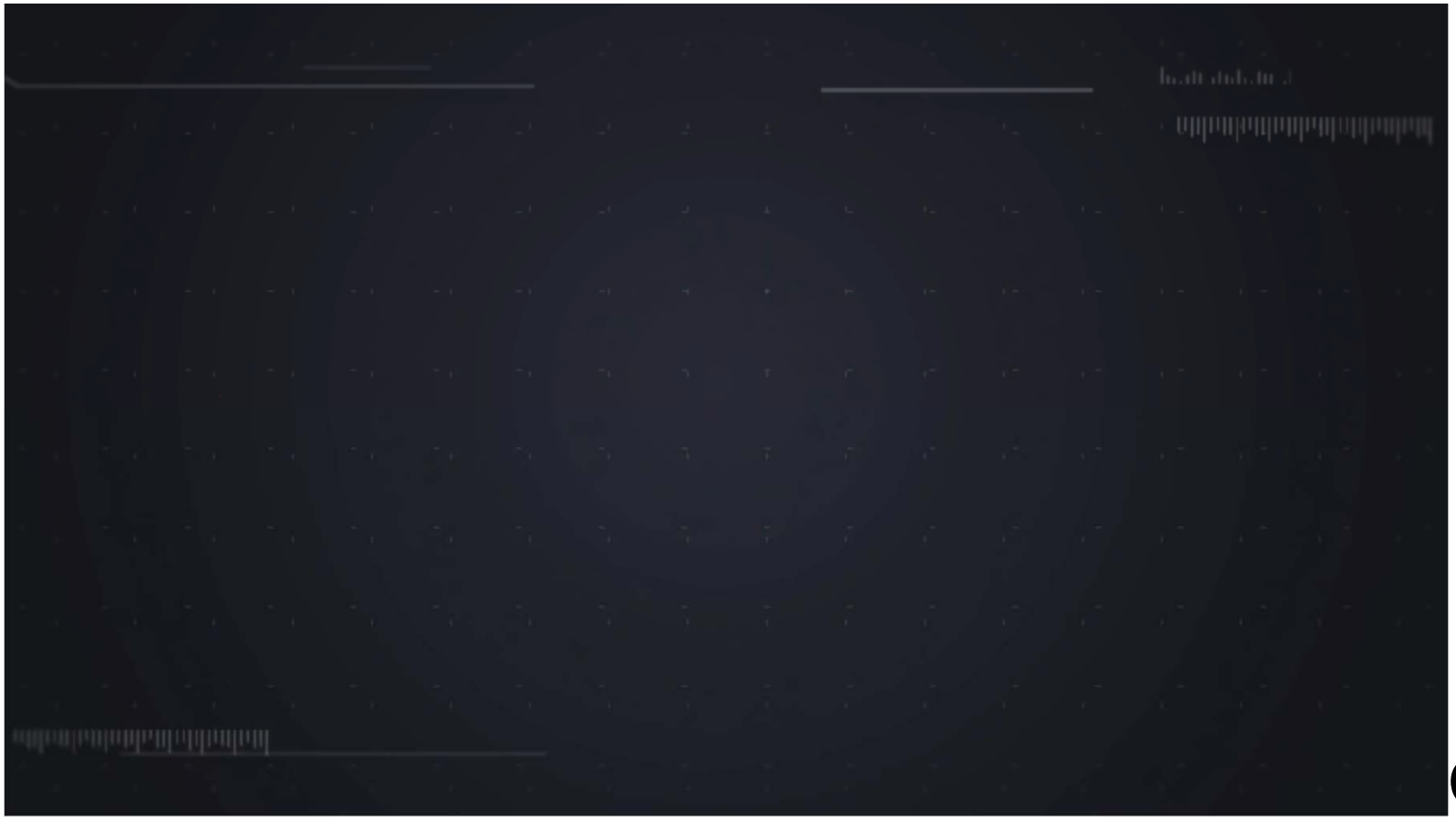
- The Pin Out – the way the conductors are placed in the connectors on each end. The pin out is the "Road Map" for the signal!

What's the difference on the connector?



What are the Pin-outs?

- Computer = HD 15
- S-video = 4 pin din
- Consumer Audio plug = 3.5mm
- Instrument/Professional Audio plug = ¼”
- RCA Color codes
  - Yellow, Green & Blue & Red = video
  - White, Red, Black, Orange= audio
- What version digital cable?



CONNECTORS CONNECT

BUT

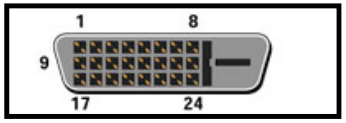
THE REAL CONNECTION IS THE **SIGNAL**

Male vs Female Connectors

Male connectors typically send and female receive.

What else makes the difference?

- Cables are a channel for the signal – WHAT GOES IN COMES OUT!!!!!
- **Cables/Adapters can not change the signal – electronics or special circuitry within a cable can.**
- Examples:
  - DVI signal from a computer is different from DVI signal from a TV.
  - VGA (computer) and component video are different signals.



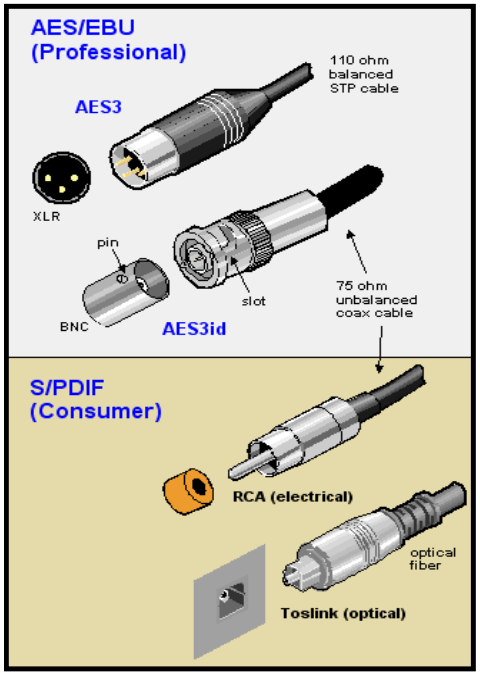
Gender Changers & Adapters

Change pathway at other end?
Useful for coupling

Make sure signal is same!
Make sure pin out is same!

AES/EBU vs. S/PDIF

CONNECTORS CONNECT



BUT

THE REAL CONNECTION IS THE **SIGNAL**

Which is Correct?

A.
Connectors connect, but the real connection is the signal

B.
You can only connect devices with the same connectors

C.
You can use an adapter anytime to connect devices

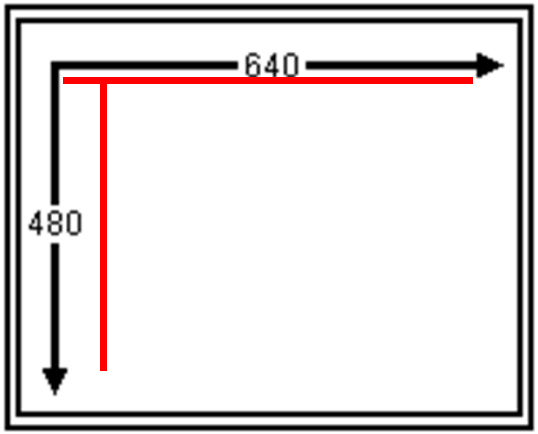
D.
You can use any type of HDMI cable

What is in the signal?
VIDEO

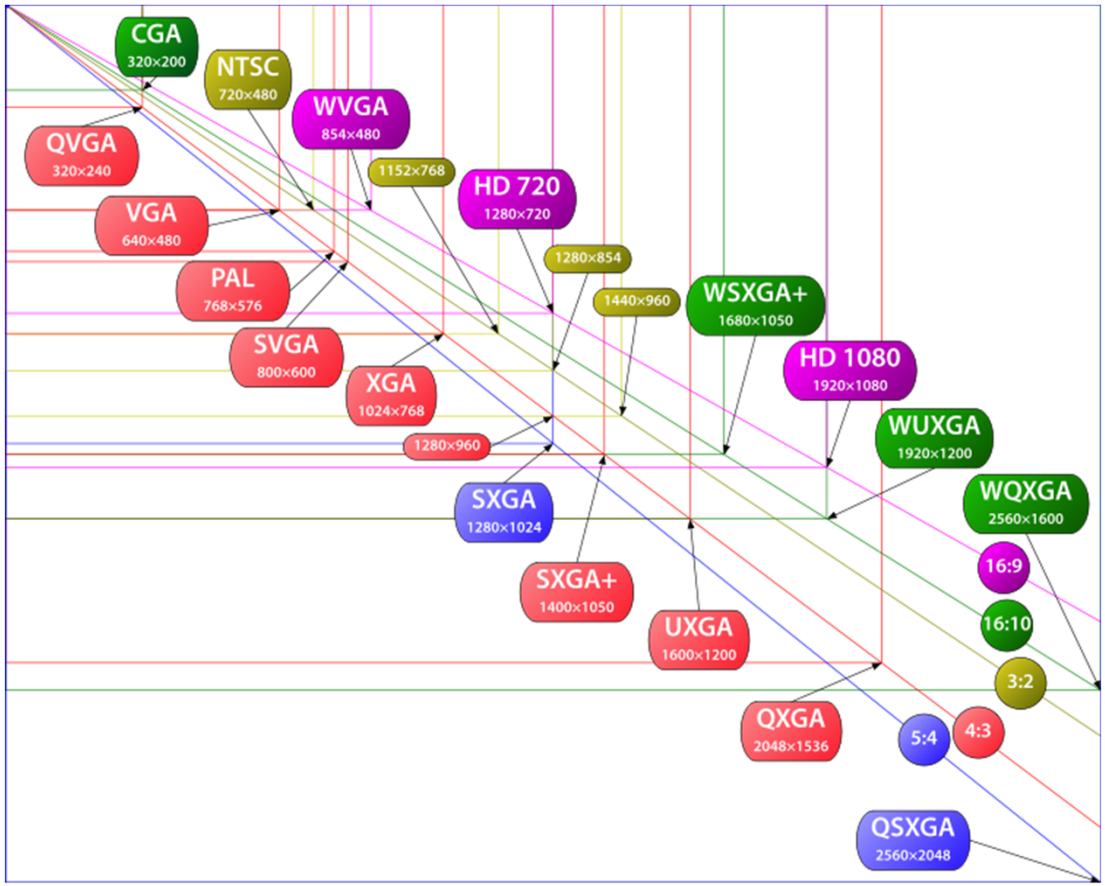
- Resolution
- Signal Type – RGB, Component…
- Digital Add Ons

What is Resolution?

- Resolution = a measure of a video device's capability to make small dots and lines on a screen.
- Horizontal resolution = number of dots that can fill one line
- Vertical resolution = Number of lines.
- NTSC standard = 480 lines
- HDTV = 720 and 1080 lines
- UHD = 2K, 4K, 8K

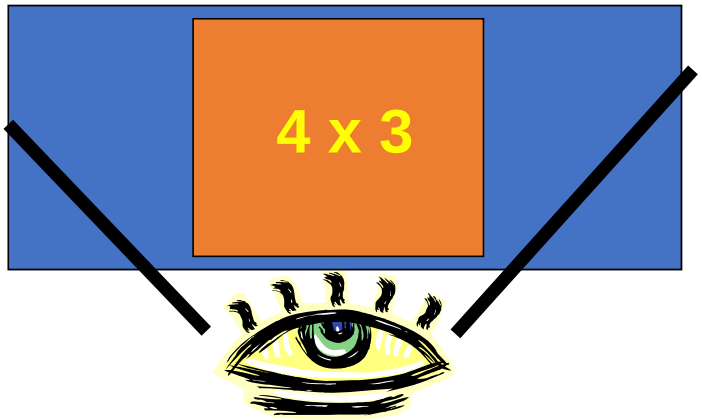


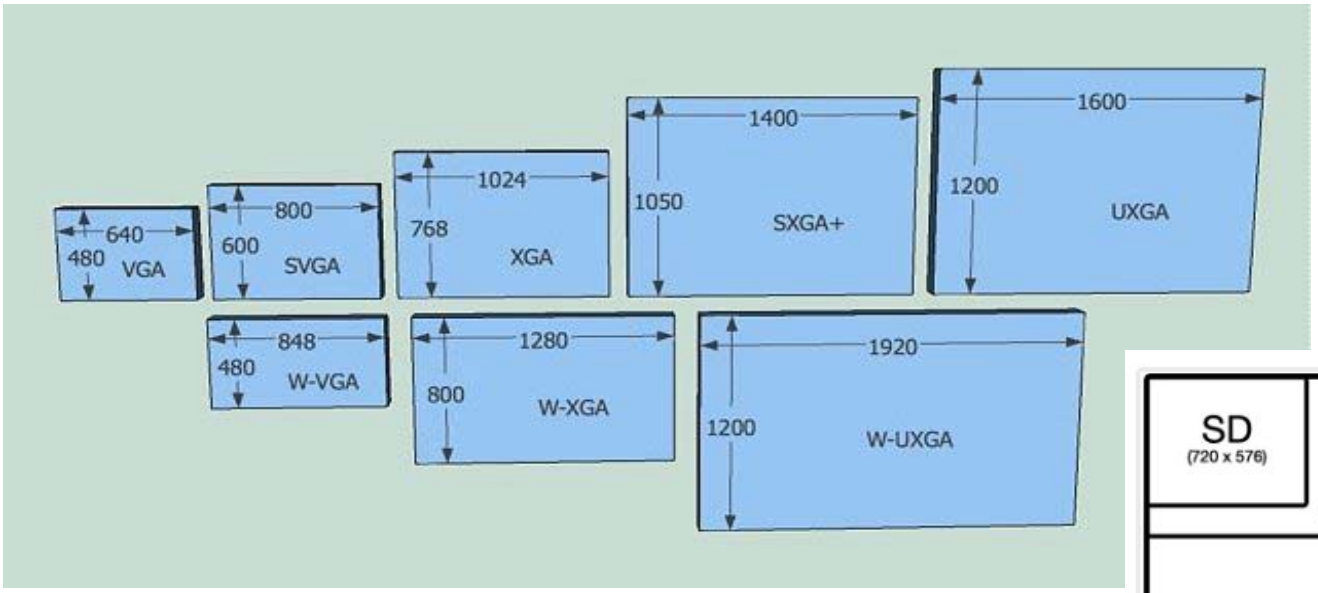
Example Resolutions
640 x 480 VGA
800 x 600 SVGA
1024 x 768 XGA
1600x 1200 UXGA
1920x1080 Full HD

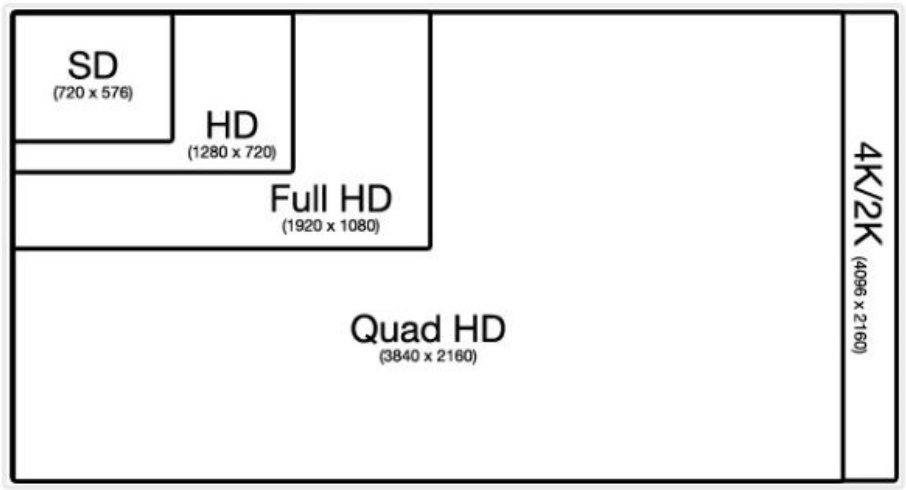

CGA
320×200
NTSC
720×480
WVGA
854×480
QVGA
320×240
1152×768
HD 720
1280×720
VGA
640×480
1280×854
PAL
768×576
1440×960
WSXGA+
1680×1050
SVGA
800×600
HD 1080
1920×1080
XGA
1024×768
WUXGA
1920×1200
1280×960
WQXGA
2560×1600
SXGA
1280×1024
16:9
SXGA+
1400×1050
16:10
UXGA
1600×1200
3:2
QXGA
2048×1536
5:4
4:3
QSXGA
2560×2048

What is High Definition?

- High Definition is wider and fills more of the eyes viewing area.
- High Definition has more pixels.
- High Definition can be both digital and analog.




640
480
VGA
800
600
SVGA
1024
768
XGA
1400
1050
SXGA+
1600
1200
UXGA
848
480
W-VGA
1280
800
W-XGA
1920
1200
W-UXGA

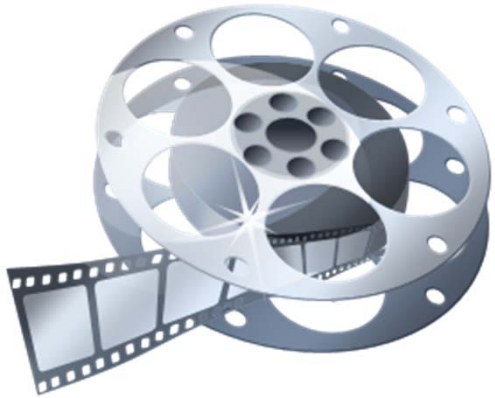

SD
(720 x 576)
HD
(1280 x 720)
Full HD
(1920 x 1080)
Quad HD
(3840 x 2160)
4K/2K
(4096 x 2160)

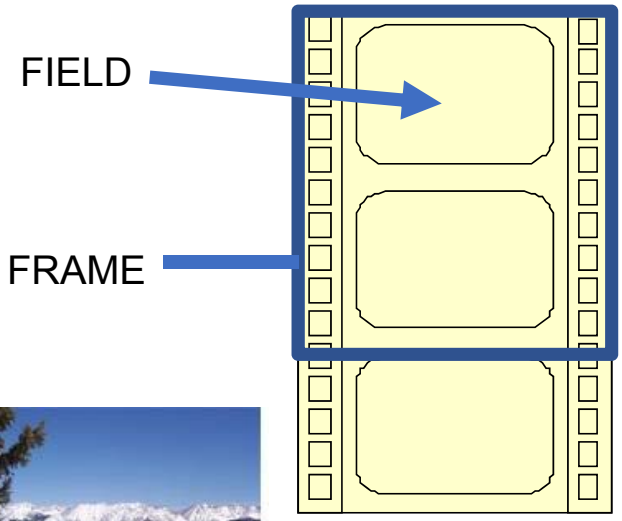

33.177.600 pixels
8K
7680x4320
8.294.400 pixels
4K
3840x2160
3.686.400 pixels
2K
2560x1440
2.073.600 pixels
HD (Blu-ray)
1920x1080
921.600 pixels
HDready
1280x720
Pal (DVD)
720x576
414.720 pixels


FullHD
1920x1080
4K
3840x2160
8K UHDTV
7680x4320

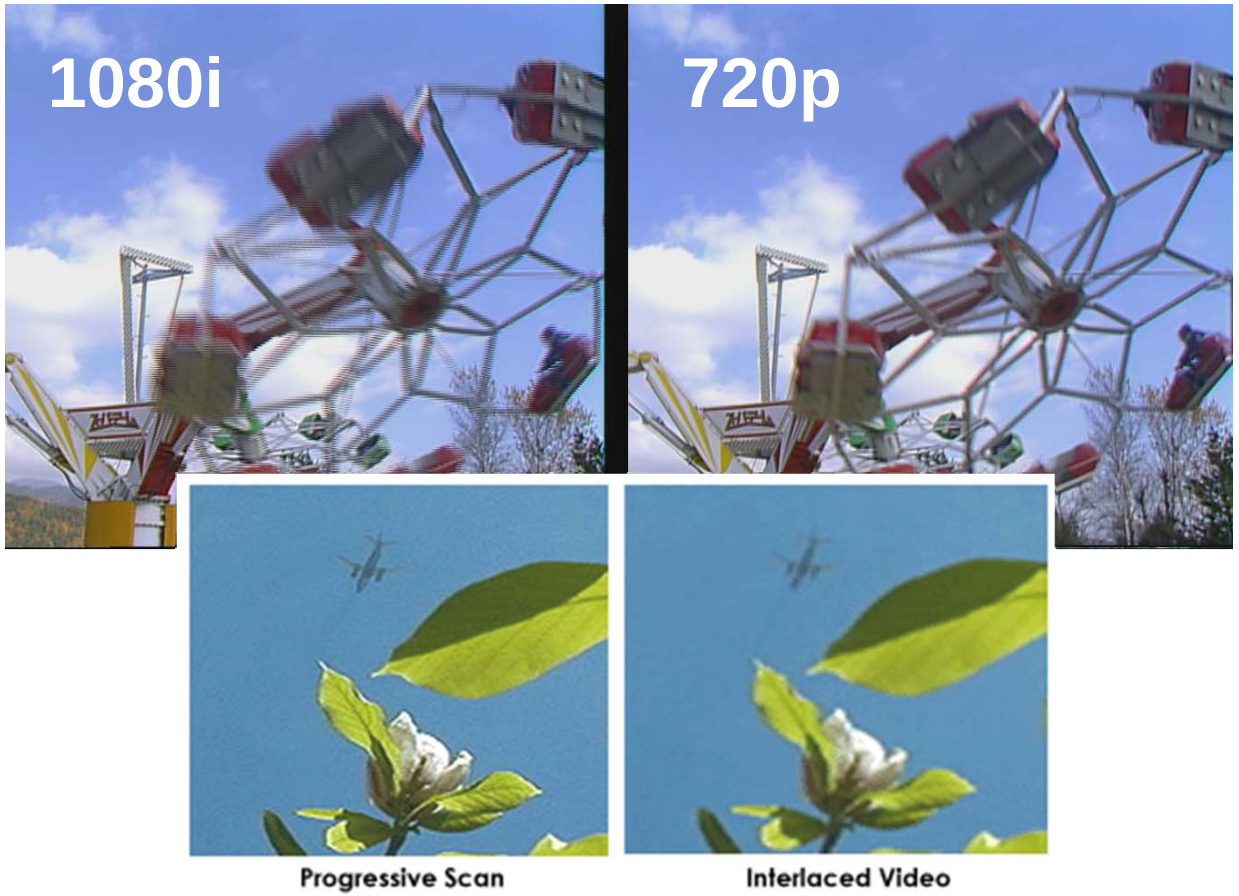
This video was captured in 8K

What is with the “i” and “p”?



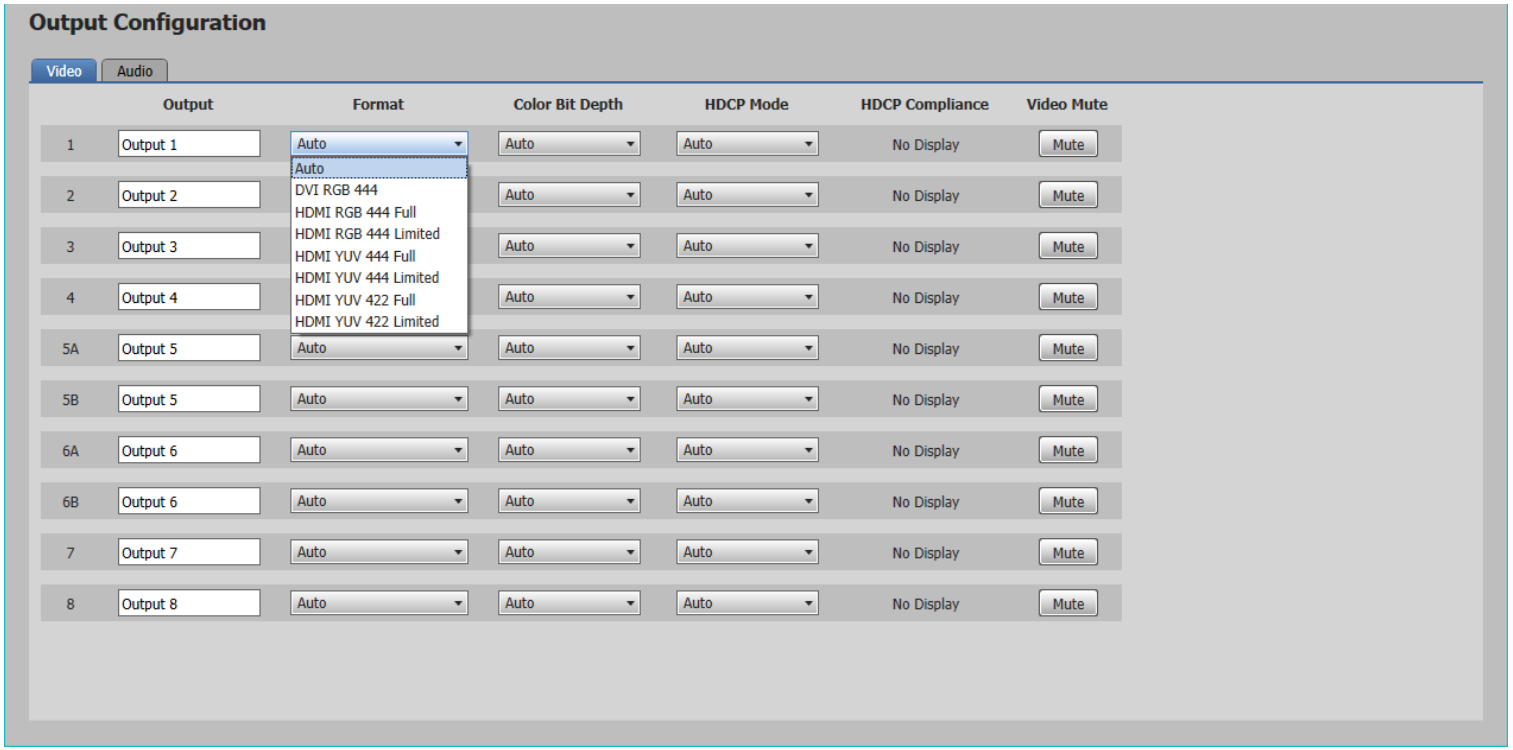


1/60th of a second field + 1/60th of a second field = 1/30th of a second frame

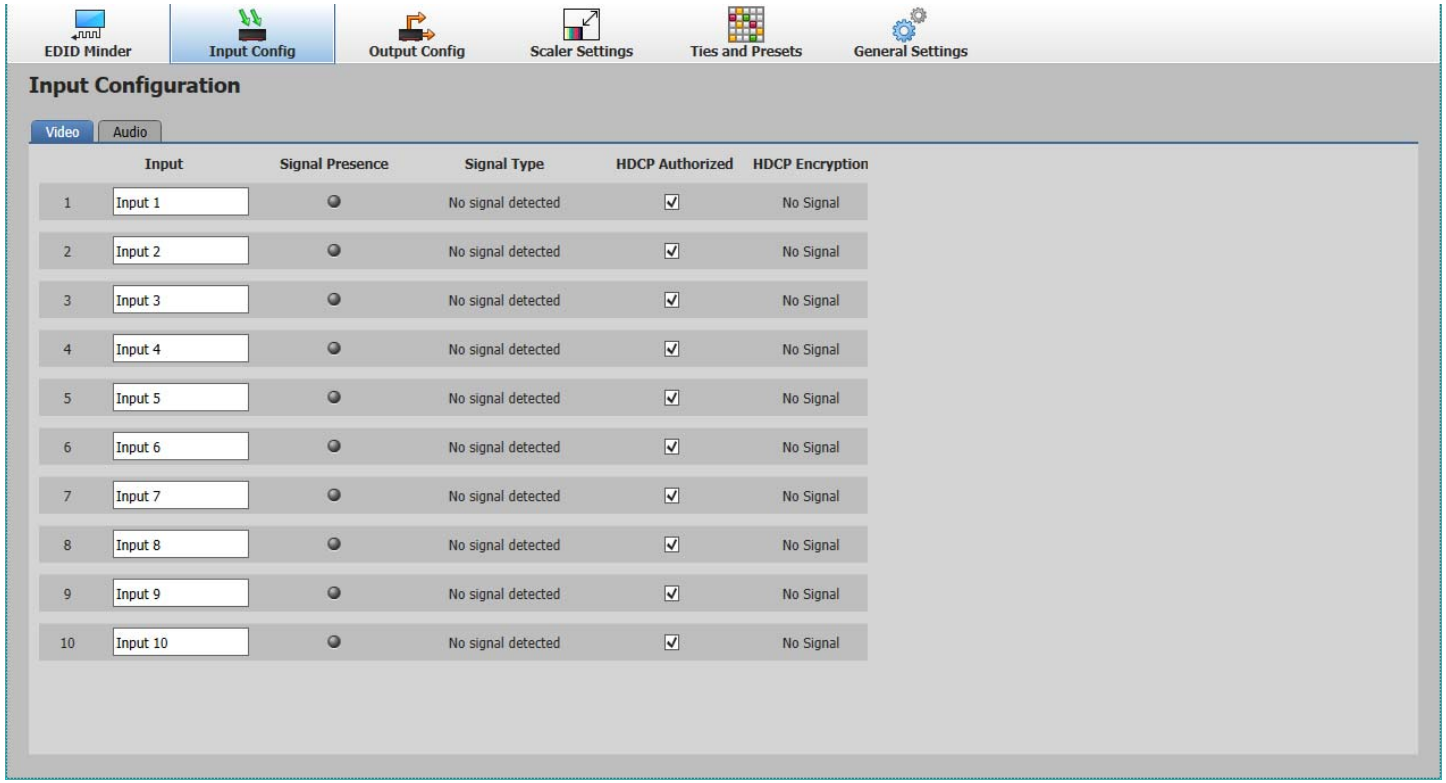

1080i
720p
Progressive Scan
Interlaced Video

30Hz vs 60Hz

What is Signal Type?



Digital Add Ons?



Which is NOT a component of a Video Signal?

A.
HDCP encryption

B.
Audio and control

C.
Resolution, frames/refresh rate, and color

D.
The cable connector

What About Audio?

Pro Audio cables and connectors - an overview: https://youtu.be/AnU27N3Clsw
Measuring 100V line audio systems: https://youtu.be/2RG2i4FtA2M
How to Choose the Best Speaker Cables: Gauge, Resistance and More: https://youtu.be/r7DdcZCbABo
How To Wire Subwoofers - Parallel vs Series - Single Voice Coil and Dual Voice Coil: https://youtu.be/jryFmICR4qA
How To Test Your Speaker System: https://youtu.be/TCdUL5ZvMHc
THE BEST Multimeter tutorial (HD): https://youtu.be/bF3OyQ3HwfU
Audio Impedance Meter- Testing 70/ 100 volt Speakers: https://youtu.be/NKCN_aK9wgQ
Amplifier to Speaker Matching Tutorial | UniqueSquared.com: https://youtu.be/pUou_noD1Gc
Understanding Sound Reinforcement - Power Amplifiers (Part 1): https://youtu.be/xFRH_1WQw4Y
Understanding Sound Reinforcement - Power Amplifiers (Part 2): https://youtu.be/QS2JXG6QWmQ
Troubleshoot and Eliminate AC Hum on Sound System: https://youtu.be/l4famaQmWnA
Biamp Audio 101 - Wiring & Interconnects: Balanced vs. Unbalanced: https://youtu.be/2uHaQ5OY9ew
Biamp Audio 101 - Gain Structure: Steps for Proper Gain Structure: https://youtu.be/rNbbz9swKto
Biamp Audio 101 - Measurements & the dB: Audio Meters: https://youtu.be/S6cUqud7JiY
SynAudCon: Gain Structure: https://youtu.be/lel8FZ4wLf8
What does bridge on an amplifier mean: https://youtu.be/cwXGd4bI-f0
Wiring Speakers and determine ohms: https://www.kicker.com/app/misc/support/tech/tech_papers/docs/SeriesAndParallelSpeakerWiring.pdf

What About Audio?

Pre-Process

–Mic = -60 dBV (0.001 volt) to -40 dBV (0.010 volt)

–Instrument = -20dBu

–Pro Line = +4dBu (1.25V)

–Consumer Line “Aux” = -10 dBV (0.300 volt)

After Process

–Speaker = 25v or 70v or 4/8ohm

Electrical dB reference chart:

Reference Symbol:	Reference type:	Reference level:	Comments:
dBm	power	0 dBm = 1.0 mW	Original electrical dB reference
dBV	pressure	0 dBV = 1.0 V RMS = +2.2 dBu	Rarely used in pro audio
dBv	pressure	0 dBv = 0.7746 V RMS	Older version of dBu, rarely used
dBu	pressure	0 dBu = 0.775 V RMS	Frequently used in pro audio
dB VU	pressure	0 dB VU ~ +4 dBu	Pseudo-reference for VU meters & LED bar graphs

Meters

Scales compared

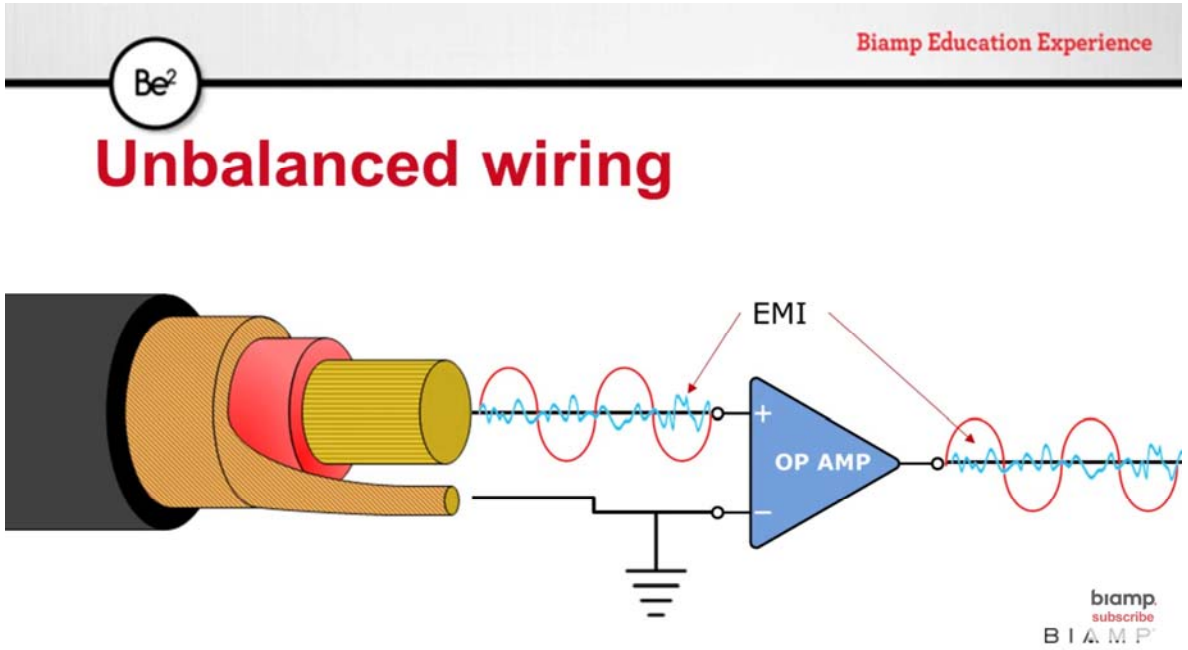
Volts	dBu	VU	dBfs (SMPTE RP155)
12.283V	24dBu		0 dBfs
9.757V	22dBu		-2 dBfs
7.750V	20dBu		-4 dBfs
6.156V	18dBu		-6 dBfs
4.890V	16dBu		-8 dBfs
3.884V	14dBu		-10 dBfs
3.085V	12dBu		-12 dBfs
2.451V	10dBu		-14 dBfs
1.947V	8dBu		-16 dBfs
1.546V	6dBu	+2	-18 dBfs
1.228V	4dBu	0	-20 dBfs
0.976V	2dBu	-2	-22 dBfs
0.775V	0dBu	-4	-24 dBfs
0.616V	-2dBu	-6	-26 dBfs
0.489V	-4dBu	-8	-28 dBfs
0.388V	-6dBu	-10	-30 dBfs
0.309V	-8dBu	-12	-32 dBfs
0.245V	-10dBu	-14	-34 dBfs
0.195V	-12dBu	-16	-36 dBfs
0.155V	-14dBu	-18	-38 dBfs
0.123V	-16dBu	-20	-40 dBfs
97.6mV	-18dBu		-42 dBfs
77.5mV	-20dBu		-44 dBfs
61.6mV	-22dBu		-46 dBfs
48.9mV	-24dBu		-48 dBfs

biamp subscribe BIAMP

“Unity Gain”

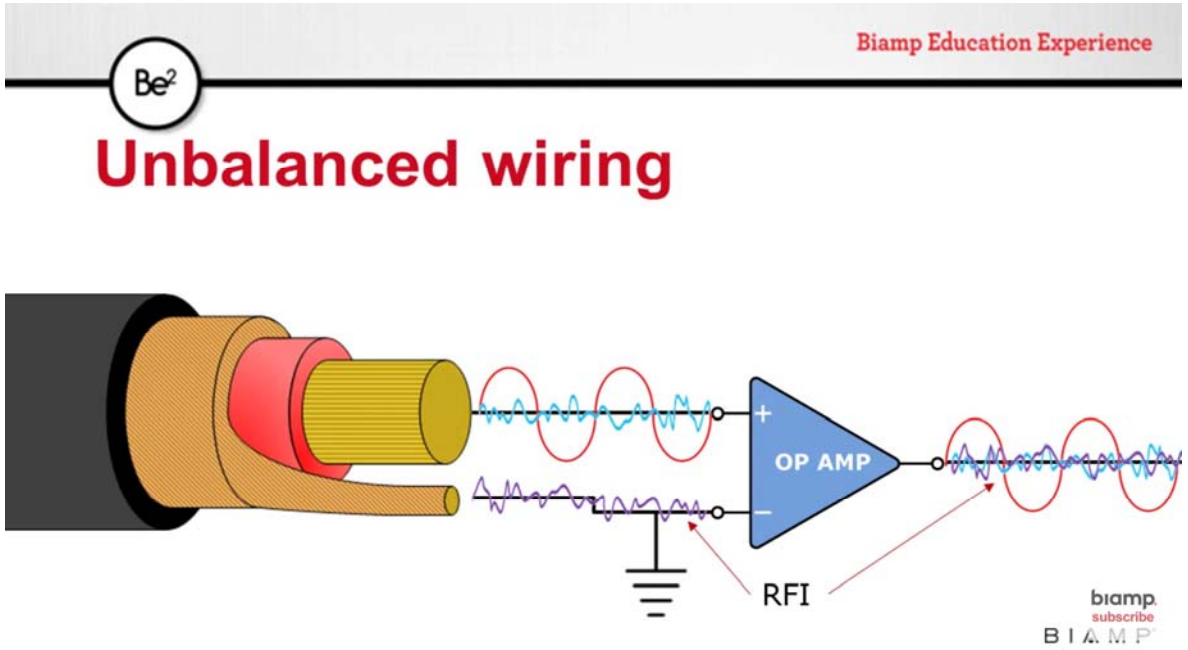
What About Audio?

Balanced vs Unbalanced



What About Audio?

Balanced vs Unbalanced



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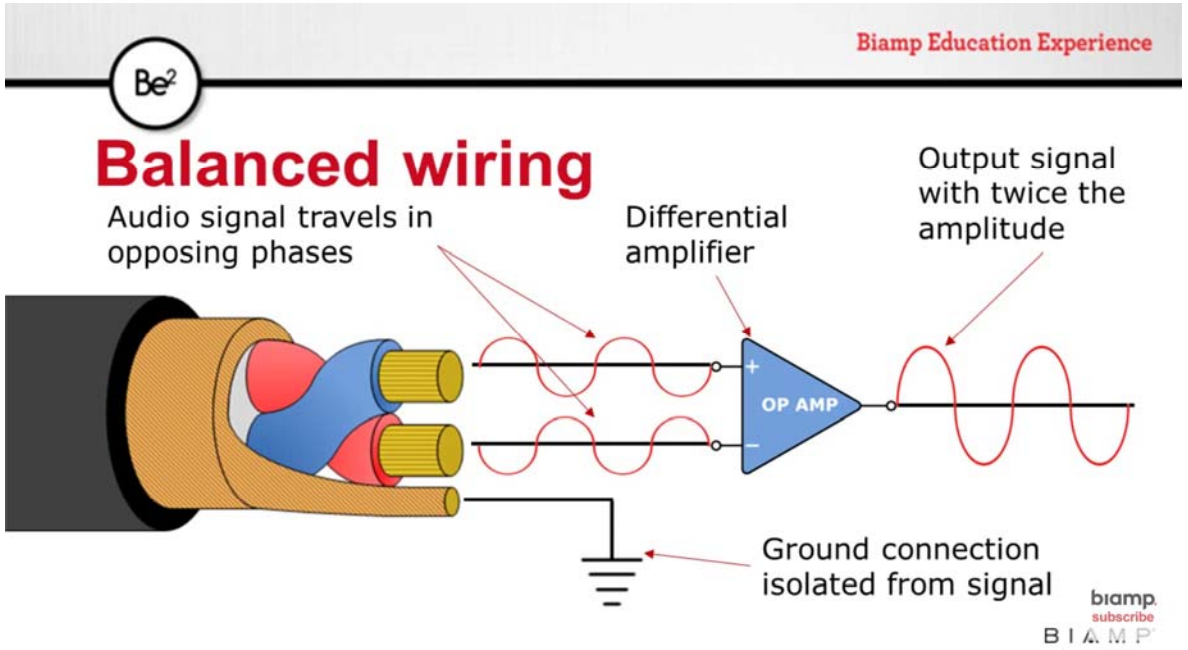
Balanced vs Unbalanced



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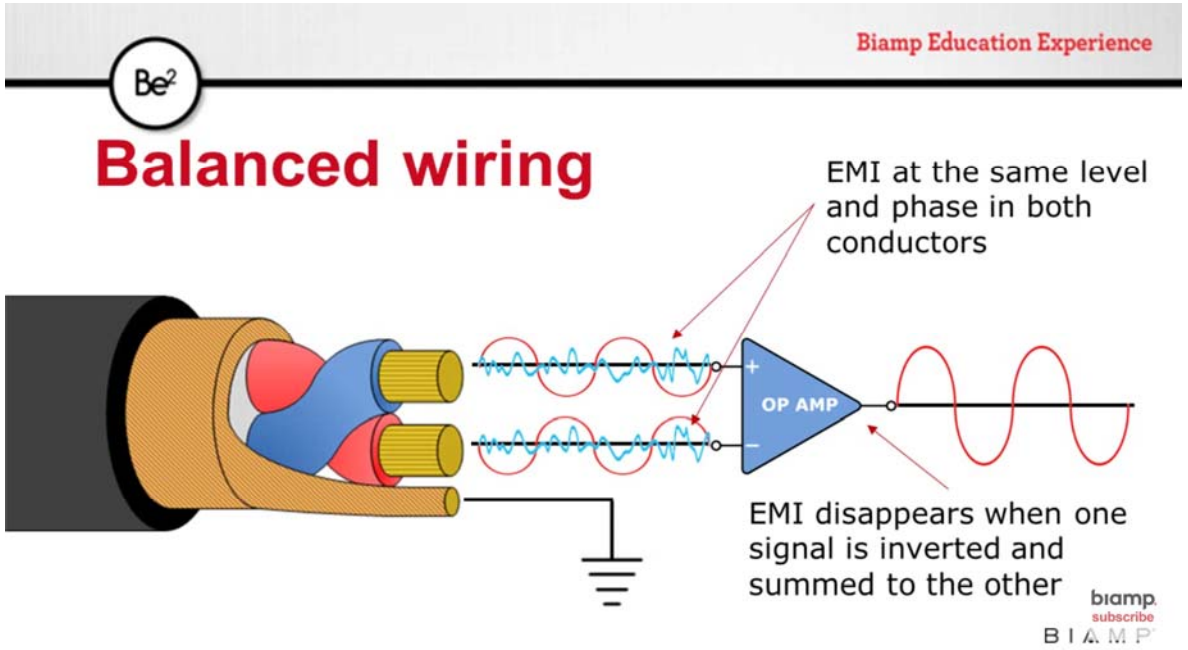
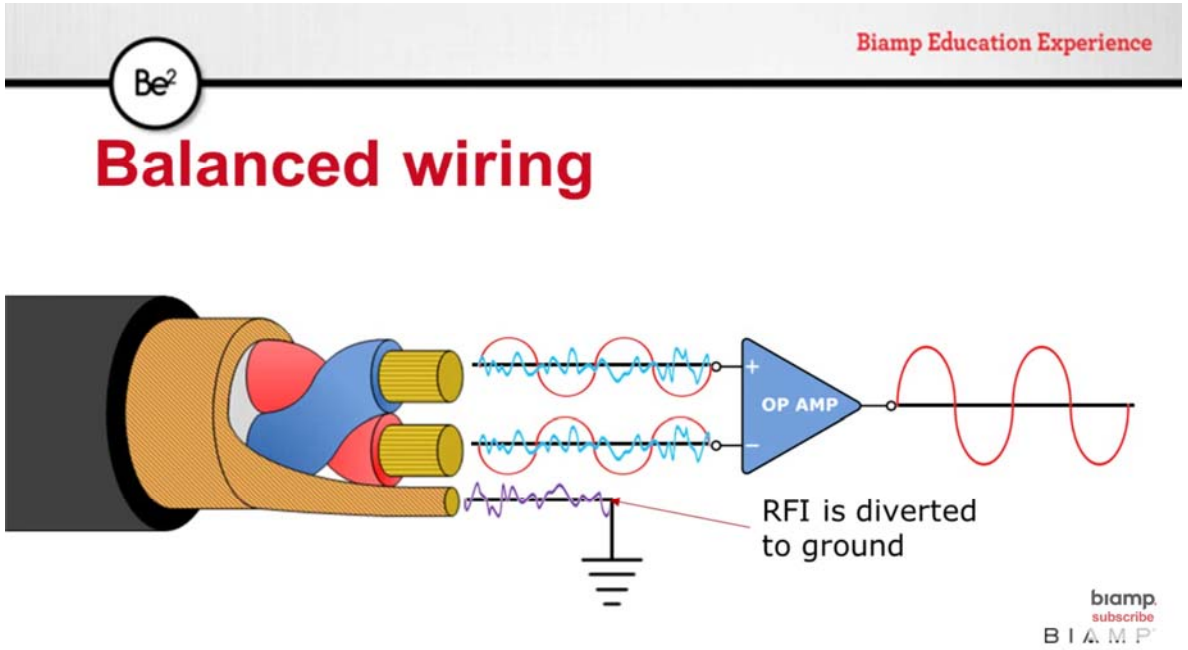
Balanced vs Unbalanced



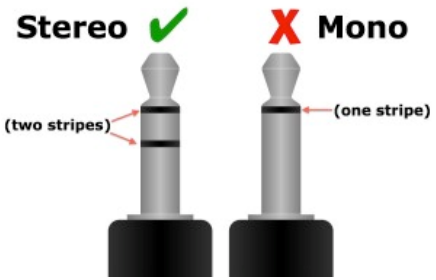
What About Audio?

Balanced vs Unbalanced



What About Audio?

Mono vs Stereo



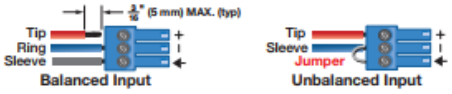


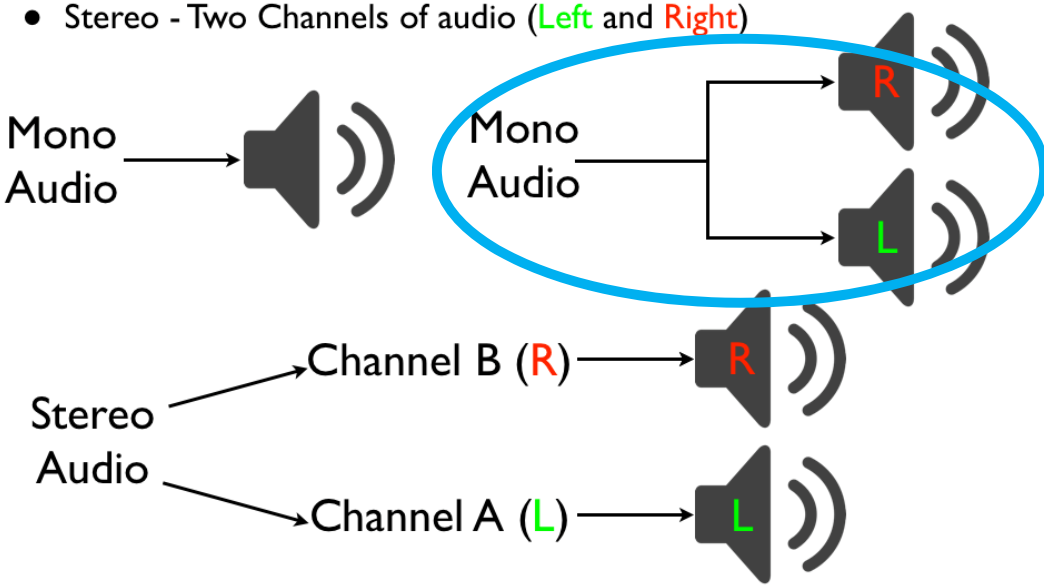
Figure 4. 3-pole Audio Input Wiring

Figure 5. 6-pole Audio Input Wiring

Figure 6. 3-pole Audio Output Wiring

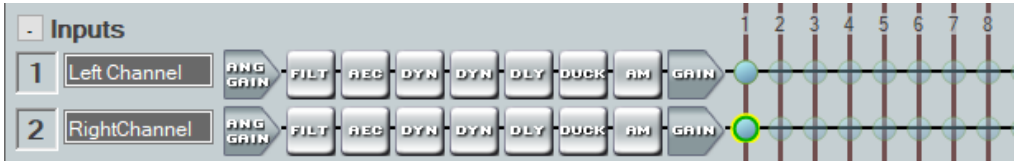
Figure 7. 6-pole Audio Output Wiring

- Mono - One single Chanel of Audio
- Stereo - Two Channels of audio (Left and Right)



What About Audio?

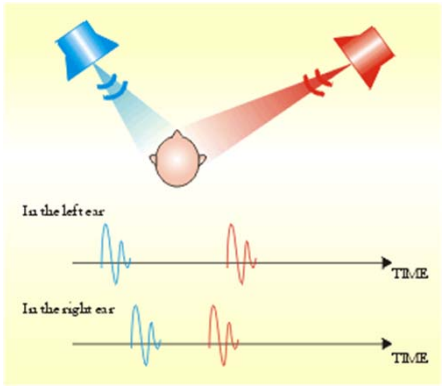
Mono vs Stereo



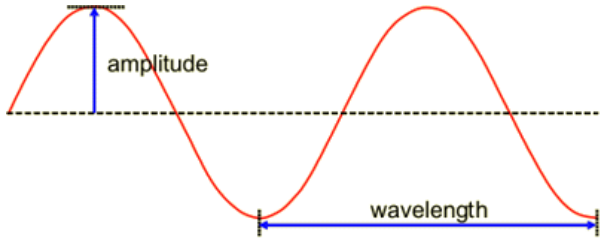
When mixing stereo to mono, attenuate both channels by -6dB to the output bus and the sum will be at the same 0 dB as both input channels

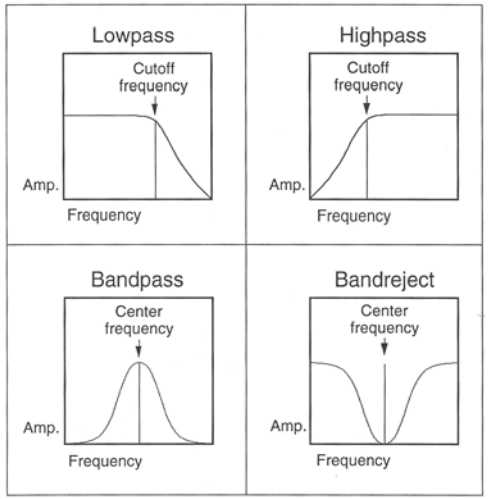
What About Audio?

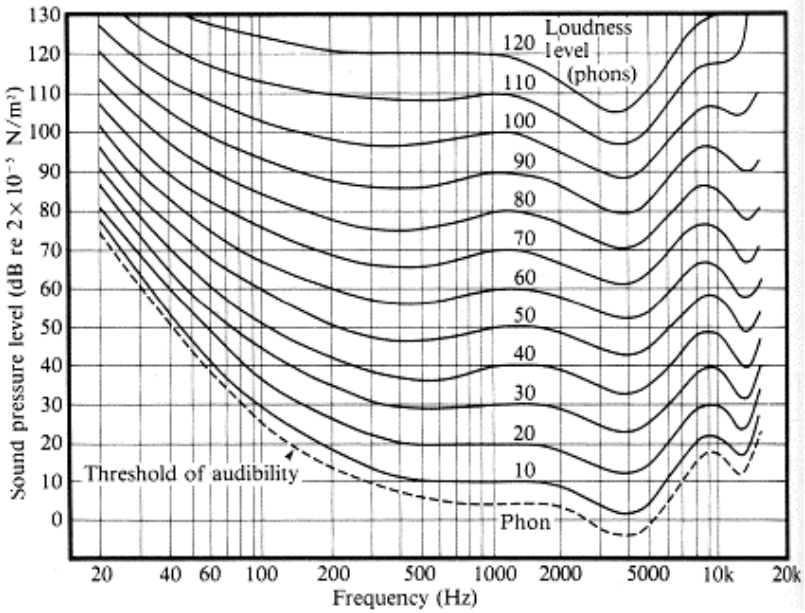
Frequency, Loudness, and Timing



1-35 ms







Which is NOT a component of an Audio Signal?

A.
Voltage / Level

B.
Balanced vs Unbalanced

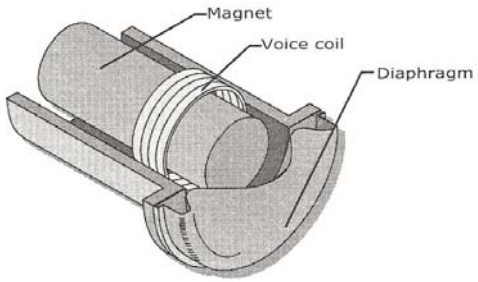
C.
The cable connector

D.
Frequency and timing

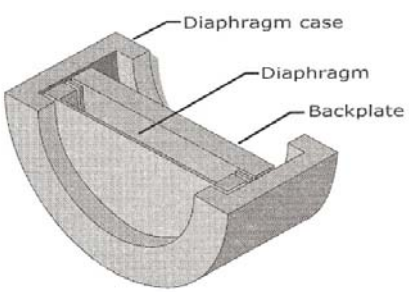
Microphones for Applications

- Handheld
- Shotgun - Theatre
- Parabolic – Sporting events
- Lavalier – Attach to clothing
- Contact pickup – Musical instruments
- Pressure response – Lay on flat surface
- Boundary – Set on Table for meeting
- Ceiling – Theater or Conference Room

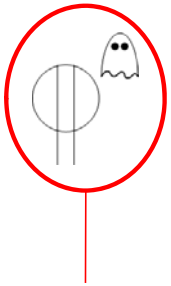
- Two common types of microphones are…
  - Dynamic Microphones



  - Condenser Microphones

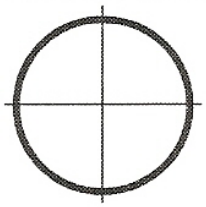
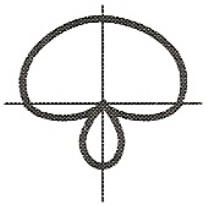
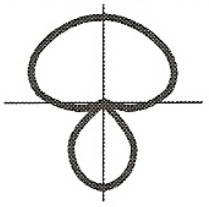
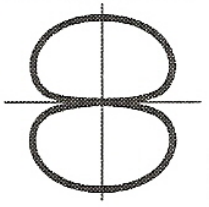


(Requires phantom power)

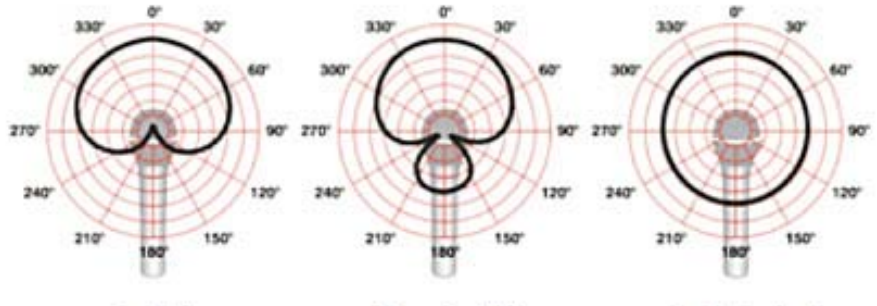


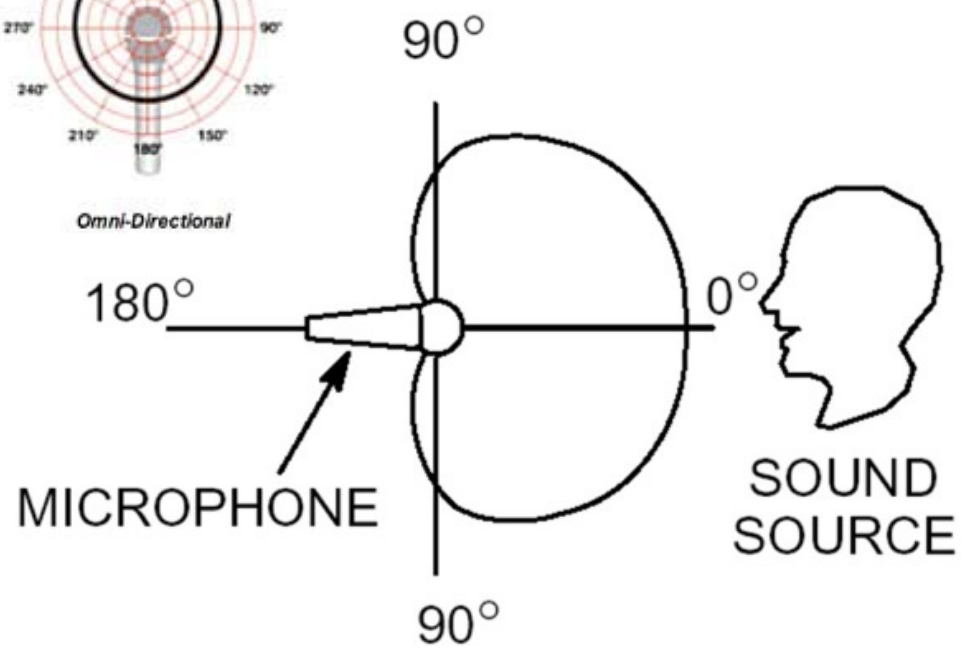
Phantom Power

Microphone Pick Up Patterns

Characteristic	Omni - directional	Cardioid	Super - cardioid	Hyper - cardioid	Bi - directional
Polar response pattern					
Coverage angle	360°	131°	115°	105°	90°
Angle of maximum rejection (null angle)	–	180°	126°	110°	90°

Microphone Pick Up Patterns





Antenna Distribution

How many channels?

Depends on Frequency!
More money is typically better (features)

- VHF
- UHF
- UWB

Ultra Wide Band

- Ethernet

Note: Pay attention to “Frequency” with THE MIC also!

Which is NOT a concern with microphones?

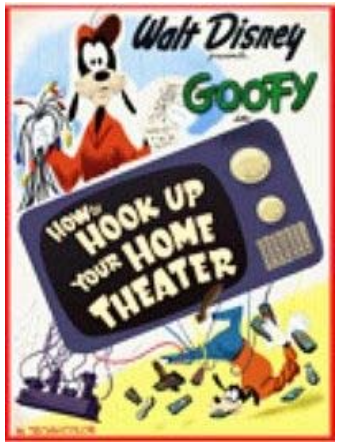
A.
The cable connector

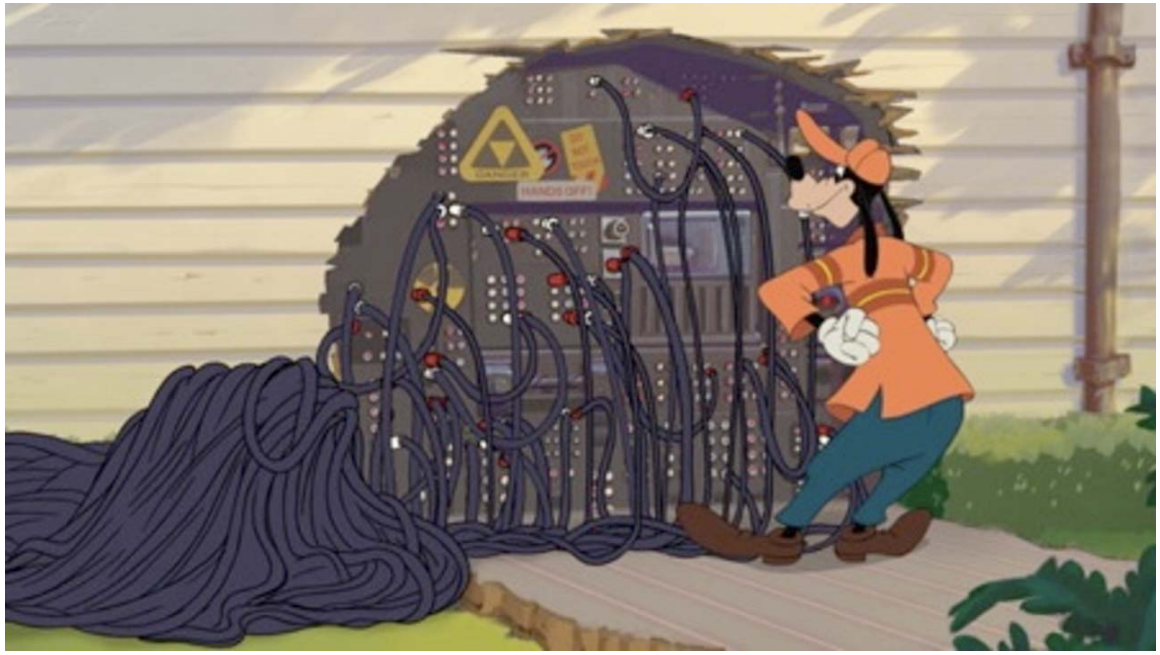
B.
Pick Pattern

C.
Application and power requirements

D.
Frequency, channels, and antennas

Give the User an Input





- Traditional
  - Skill Required
- Plug and Play
  - Not Hard Lid
  - Limited Futureability
- Twisted Pair
  - Solid conductor plugs
  - 2 cables? = 1 UTP/1 STP
  - Pay attention to A vs. B
  - Cat5E better for analog (Skew Free/Low Skew)
  - IF sending video – USE SHIELDED Cat6 or better
  - IP video follows same rules as our data cabling

Pre-made and Custom Plates

Decora Inputs

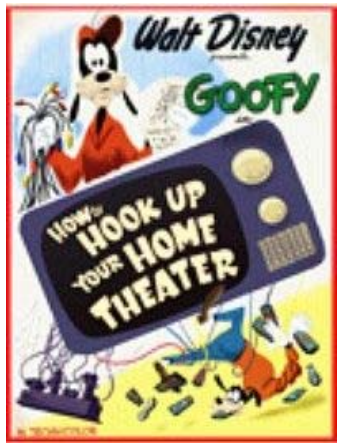
Cable Cubbie

AV3ATCBK

Floor Box Inputs

AAP Plates

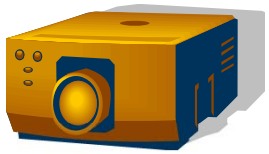
Step 2 – Share



4 Steps of AV

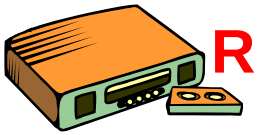
Input Sources

Share It



SEE IT

HEAR IT

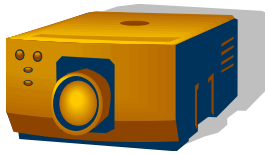


RECORD IT

STREAM IT

4 Steps of AV

Share It



SEE IT

Input Sources

Projector Types

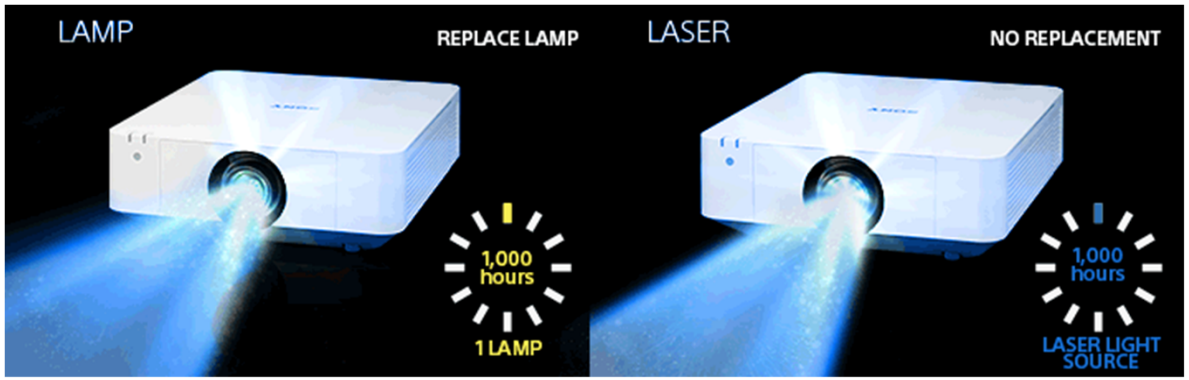
- ✓Pico
- ✓Portable
- ✓Multi-purpose
- ✓Professional \ Large Venue
- ✓Interactive

Projectors are the lowest cost method to show video content to a large group

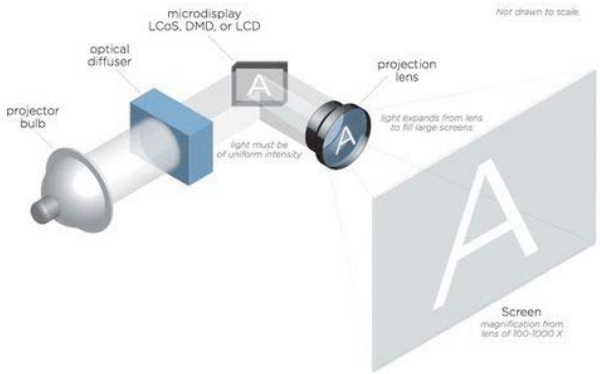
Projector Types

- ✓Standard Throw
- ✓Short Throw
- ✓Ultra Short Throw
- ✓Ultra WIDE Throw

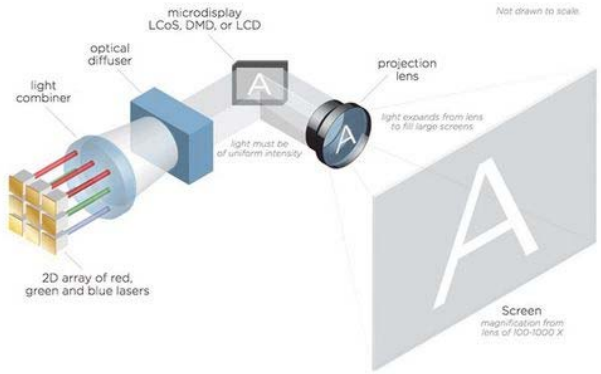
Laser vs Bulb



Bulb Projector



RGB Laser Projector



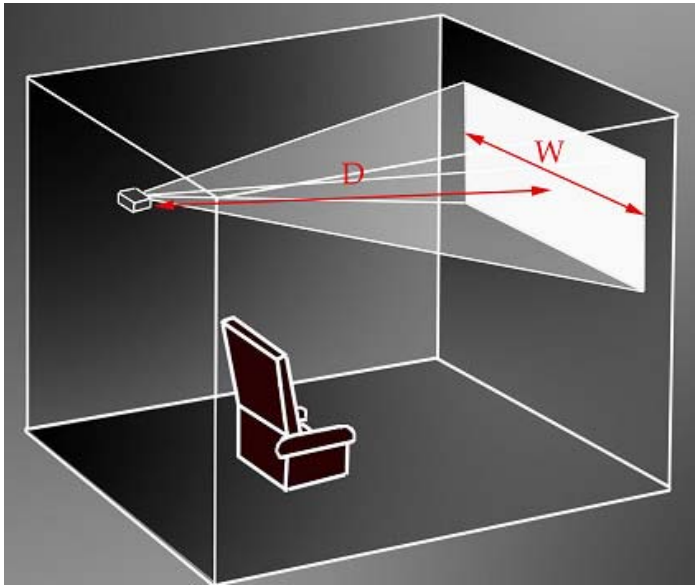
Projector Specs

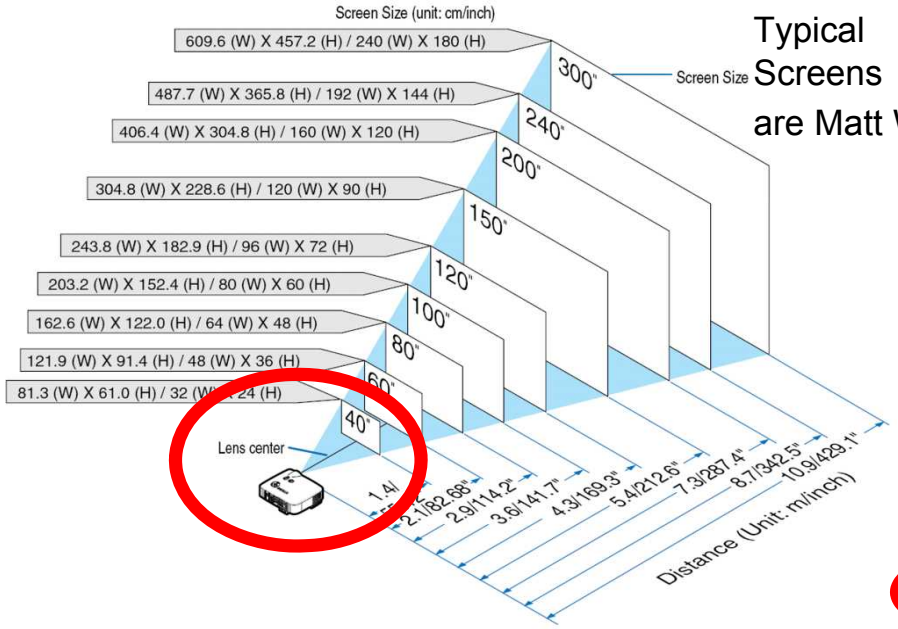
- **Lumens**
  - Minimum 3000
  - Double is noticeable
    - fade over time
  - Keystone can half
  - Color Brightness
- **Contrast Ratio**
  - Light cancels

CAUTION: Use specs MOSTLY to compare models by same manufacturer

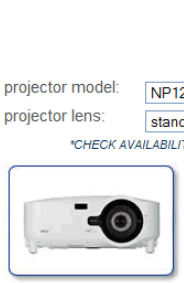
Projector Specs

- Throw Ratio
  - Multiply by width
- Native Resolution
  - Rescales to within
- Warranty
- Inputs





Typical Screens are Matt White



Enter only 1 Dimension below
[inches or mm]

select Aspect Ratio

projector model: NP1250
projector lens: standard
*CHECK AVAILABILITY || **NOT AVAILABLE

screen width: 80
screen height:
diagonal screen size:
throw distance:

4 X 3:
16 X 9:
16 X 10:

Choose Measurement
US inches
Metric mm

Lens Range [select lens first]
scr width min: 24
scr width max: 400

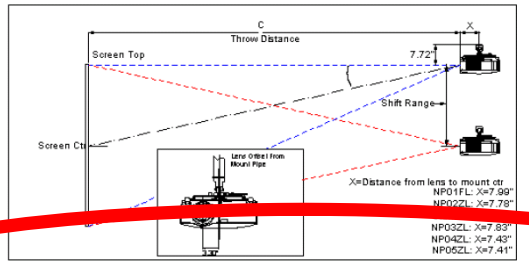
calculate
Refresh

Note: Distances may vary +/-5%

	Scr Diagonal	Scr Width(H)	Scr Height(V)	Scr Drop(B)	Dimension (D)	Throw Distance(C) [max]
TELE	100	80	60	variable	0	162.4
	Scr Diagonal	**Scr Width(H)**	**Scr Height(V)**	**Scr Drop(B)**		**Throw Distance(C) [min]**
WIDE	100	80	60	variable		121.6

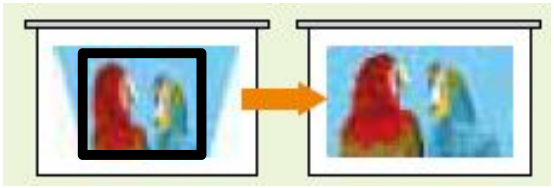
13.5’

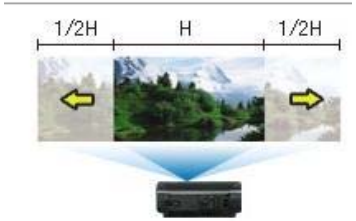
10’



Distance from bottom of screen to floor should be 3-4 feet.

- PC-free presentations
- Wireless
- AUTO keystone
- Wireless mouse control
- Lense Shift
- Corner Adjustments
- Network Capable
  - Control and Monitor
  - Content





- Use furthest distance to determine HEIGHT
- IF showing…
  - Video ÷ 8
  - Data ÷ 6
  - Graphics ÷ 4
- WIDTH is determined by ratio…
  - 4:3 = 1.33
  - 16:9 = 1.78
  - 16:10 (8:5) = 1.6

4:3 NTSC Video
H = D x .6
W= D x .8
D= H x 1.667
D = W x 1.25

16:9 HDTV
H = D x .49
W = D x .87146
D = H x 2.04
D = W x 1.1475

16:10
H = D x .5299
W = D x .848
D = H x 1.8868
D = W x 1.1793

5:4 Data Graphics
H = D x .625
W = D x .781
D = H x 1.601
D = W x 1.281

1.85:1 WideScreen(Letterbox)
H = D x .4762
W = D x .881
D = H x 2.1
D = W x 1.135

2.35:1 CinemaScope
H = D x .3915
W = D x .92
D = H x 2.554
D = W x 1.0868

15:9
H = D x .5146
W = D x .8576
D = H x 1.9433
D = W x 1.166

QLED TV

QLED (Samsung Q7F)

QLED PROS AND CONS

Pros:
Brilliant whites
Ultra-bright (1,500nits)
Variety of screen sizes between 49-88-inch

Cons:
Not as slim (25.4mm)
Overly bright
Less convincing blacks
Slower refresh rate

OLED TV

OLED (LG B6)

OLED PROS AND CONS

Pros:
Lighter and thinner (2.57mm)
Self-lighting pixels
More convincing blacks
Faster refresh rate (0.001ms)
Judder and blur-free

Cons:
Only found in three screen sizes: 55, 65 & 77-inch
Muted brightness (1,000nits)
Expensive

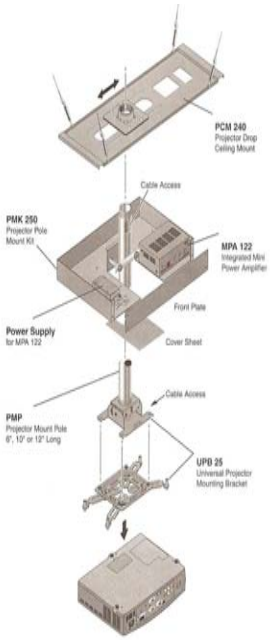
LED TV

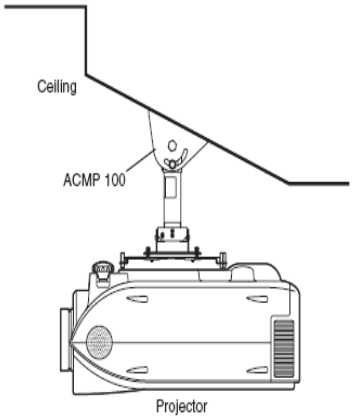
LED (Samsung KS8000)

	QLED	OLED	LED
Black Level	Good	Perfect	Good
Motion Blur	Great	Perfect	Good
Viewing Angle	Poor	Great	Poor
Color volume	Great	Good	Good
Gray Uniformity	Average	Good	Average
Luminosity	Good	Good	Great
Image Retention	Great	Poor	Great
Price and Availability	Poor	Average	Great

https://www.rtings.com/tv/reviews/by-type/qled-vs-oled-vs-led

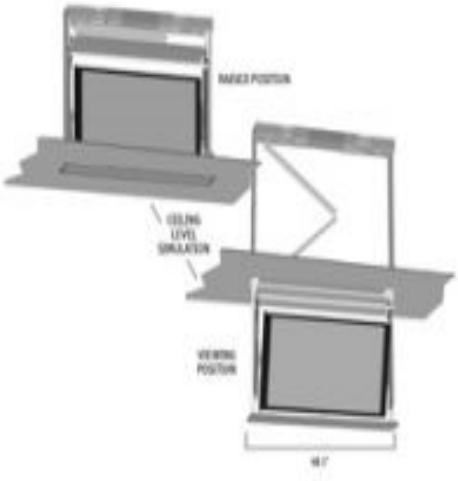
Projector Mounting Examples



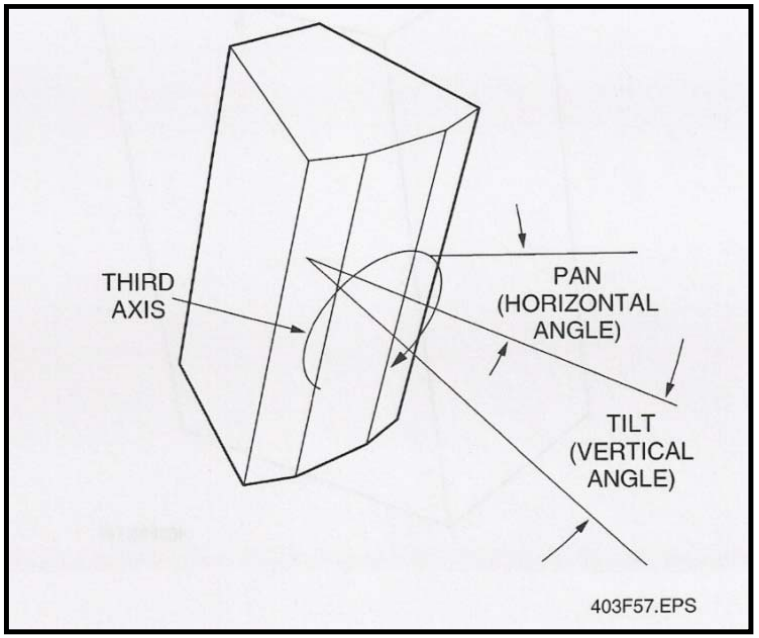


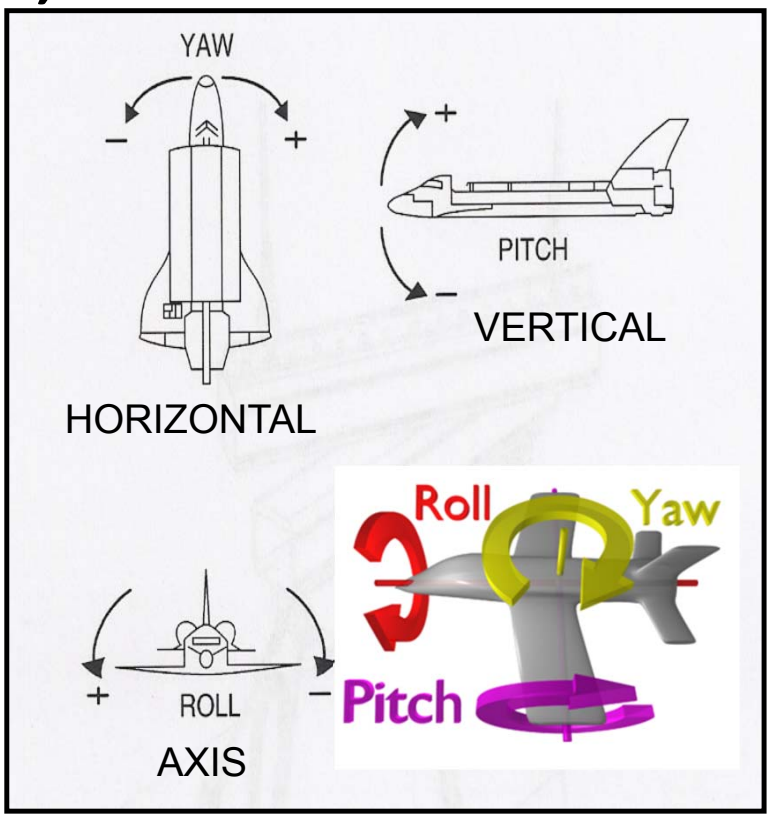
Measure twice…
Pay attention to alignment and height
Beware of building vibration

Monitor Display Mounting Examples



Pitch, Roll, & Yaw





A Word About Digital Signage

- Commercial TVs – made to run brighter longer (16/7 & 24/7)
- Built in Software or External Box

A Word About Video Walls

- Thin bezel vs video wall
- Built in video wall capability drawbacks

-Can mount vertically or horizontally or architecturally (Remember aspects!)

Which is NOT a concern with projectors or displays?

A.
Light source and native resolution

B.
Size for height and distance and type of mount

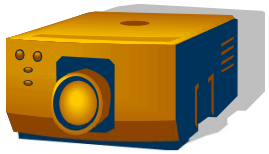
C.
Warranty and connections/features

D.
Different manufacturer specs to compare brightness

4 Steps of AV

Input Sources

Share It



SEE IT

HEAR IT

Ceiling (Flush Mount) Speakers

Wall (Surface Mount) Speakers

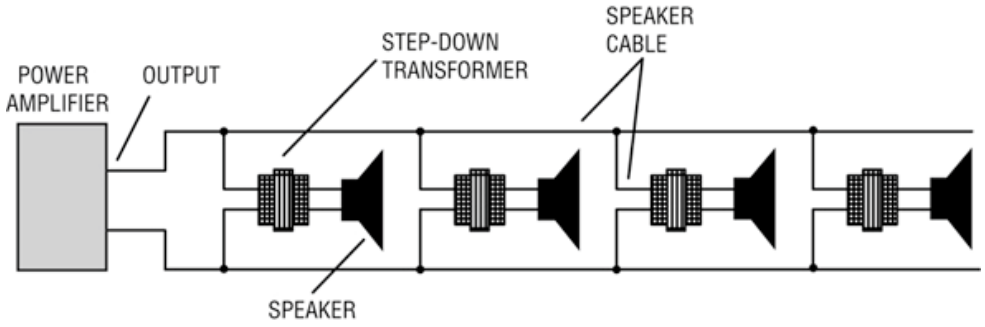
Wall (Flush Mount) In-Wall Speakers

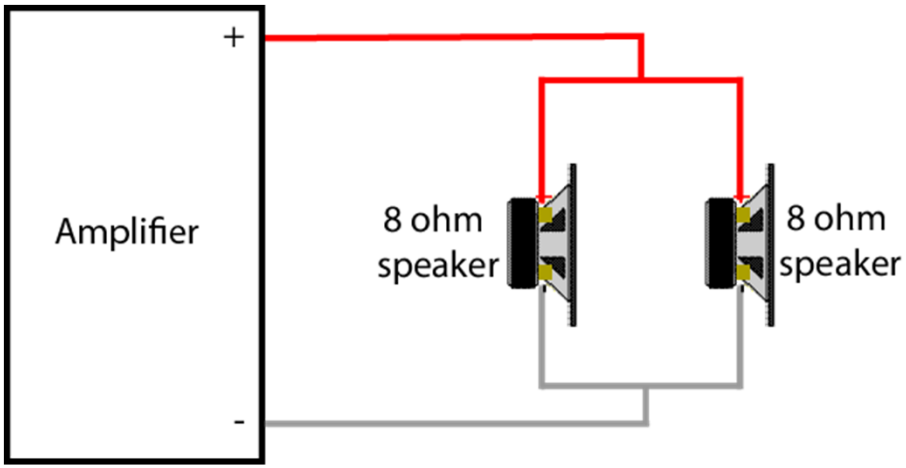
Pendant Speakers

Hidden Speakers

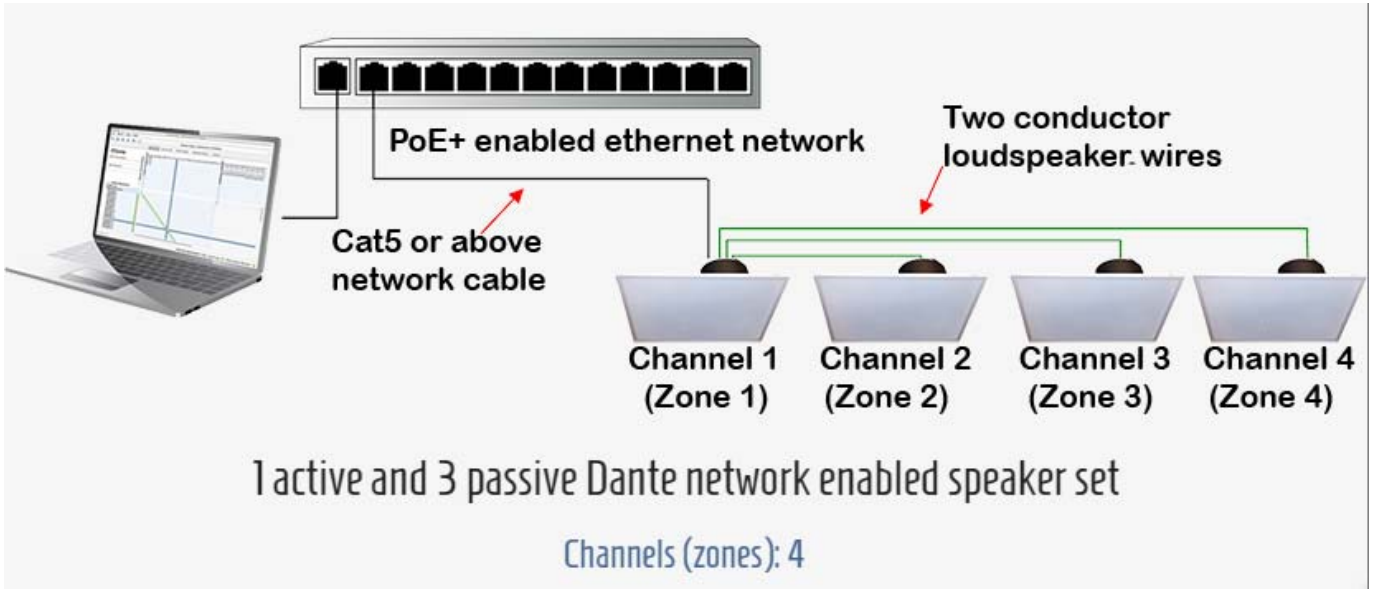
Architectural Options for Aesthetics

Constant Voltage vs 4/8 ohm direct





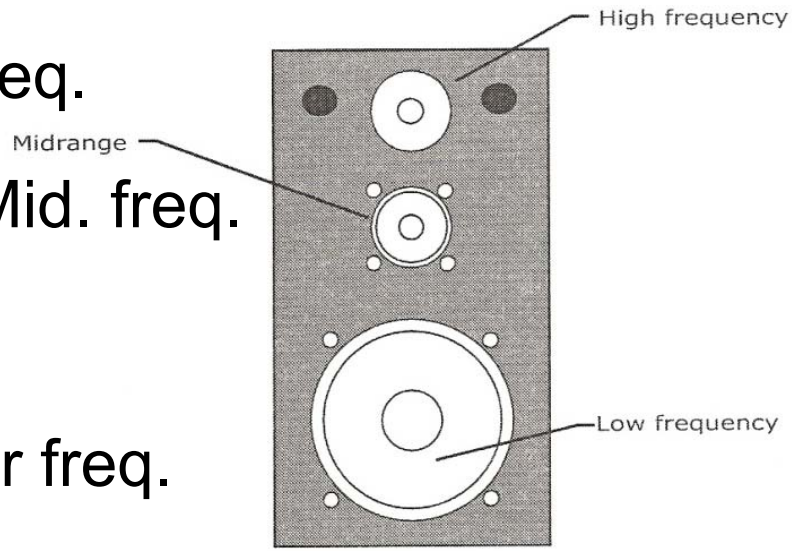
CV can go longer and do more speakers. Direct can go louder and can sound better.
CV speaker is actually an 4/8ohm speaker!



Dante Speakers

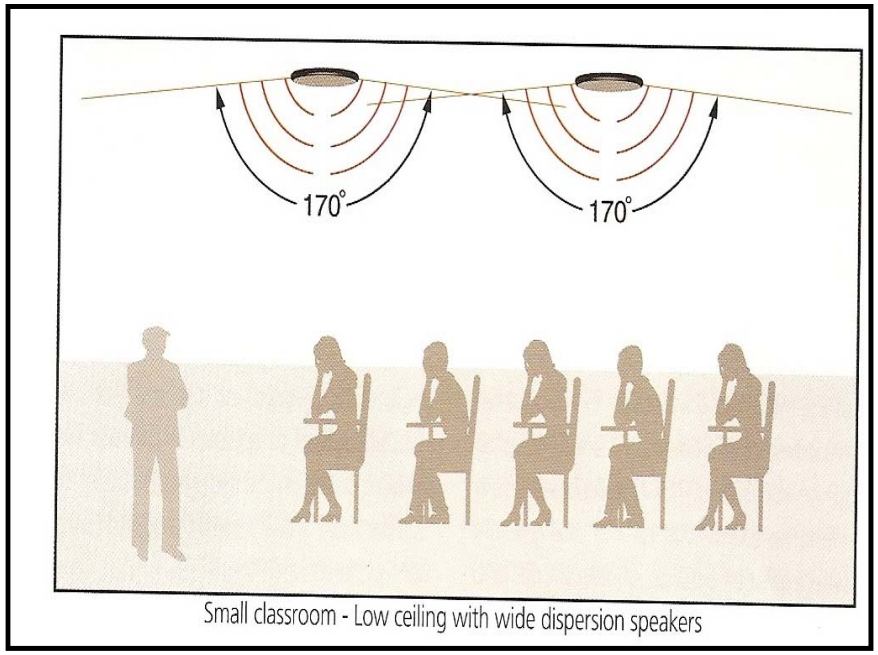
Powered Speakers

- Speakers frequency ranges…
  - **Tweeters**-High freq.
    (2,000-20,000 Hz)
  - **Horns**-Mid.-High freq.
    (300-8,000 Hz)
  - **Midrange cones**-Mid. freq.
    (200-8,000 Hz)
  - **Woofers**-Low freq.
    (40-600 Hz)
  - **Subwoofers**-Lower freq.
    (20-200 Hz)

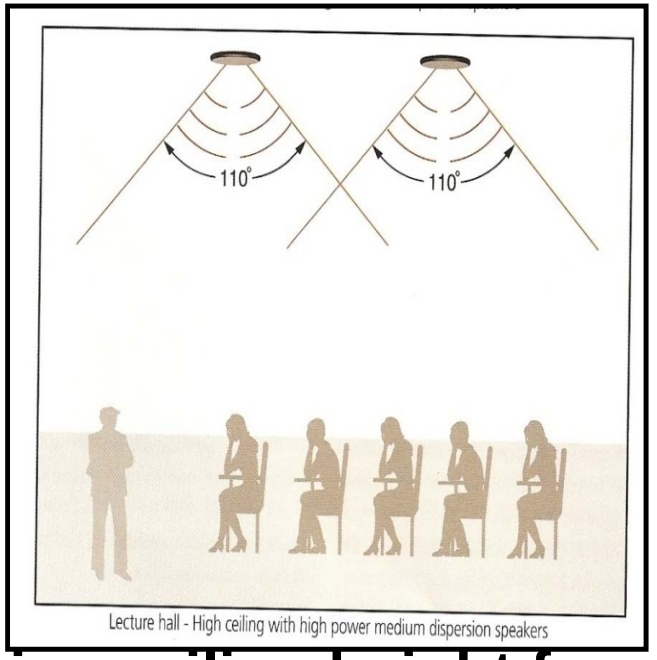


If crossover is not built in will have more than one termination block and need processing to filter frequencies.

Speaker dispersion



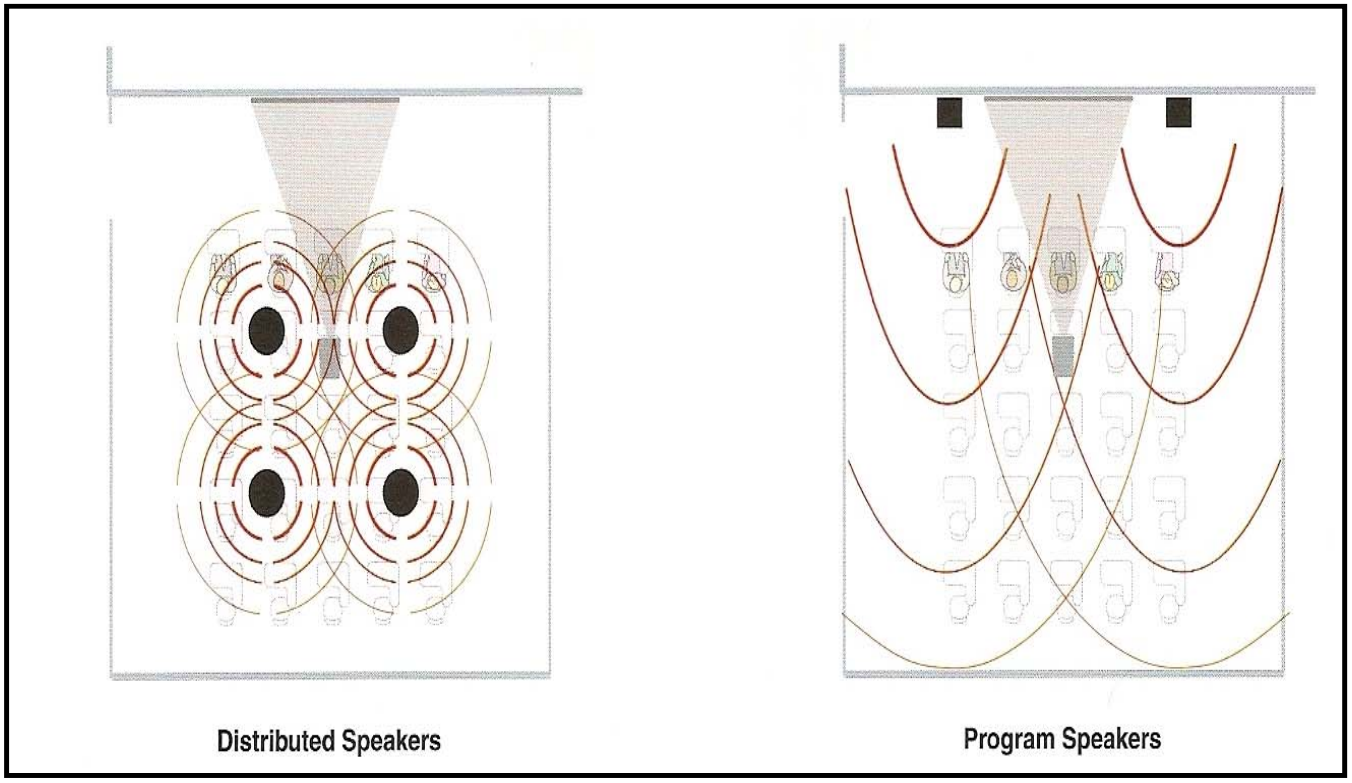
Small classroom - Low ceiling with wide dispersion speakers



Lecture hall - High ceiling with high power medium dispersion speakers

Work with architect to determine ceiling height for speakers and adequate screen height!

Speaker dispersion



Speaker Placement

- ***Turning volume up does not increase coverage area only loudness***
- Ceiling Speakers
  - Determine # of speakers using ceiling height X2 rule
- Wall Baffles
  - Determine # based on height from floor to speaker
    - 8’ high = space 20’ apart
    - 16’ high = space 30’ apart
    - Stagger on opposing walls

Know the requirements for ADA and your region

California:

11B-219.2 Required systems = An assistive listening system shall be provided in assembly areas**, including conference and meeting rooms.**

The minimum number of receivers to be provided shall be equal to 4 percent of the total number of seats, but in no case less than two…25% hearing aid compatible…building seats determine actual #...

Which is NOT a concern with audio outputs in our system?

A.
Architectural Aesthetics and Application

B.
Speaker dispersion patterns and placement

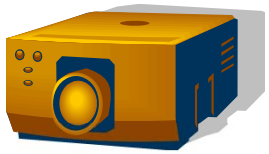
C.
People with hearing loss and frequencies

D.
What the audio source is

4 Steps of AV

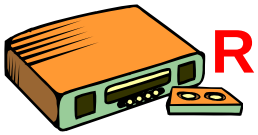
Input Sources

Share It



SEE IT

HEAR IT



RECORD IT

STREAM IT

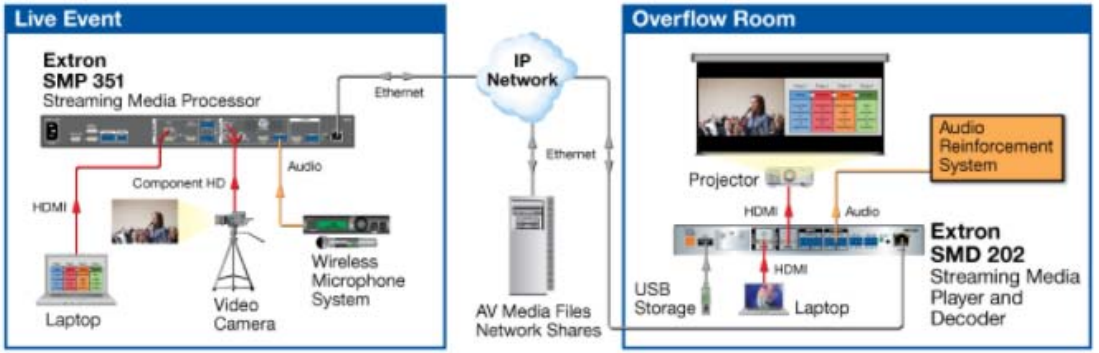
Recording


TASCAM
POWER
SD
CF
EJECT
REMOTE
USB
00:03:14
SS-CDR200
STOP
PLAY
READY
RECORD
PHONES

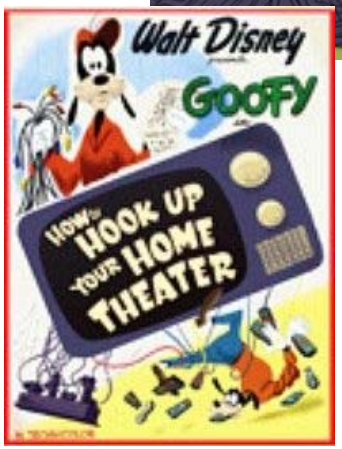
Streaming

INput

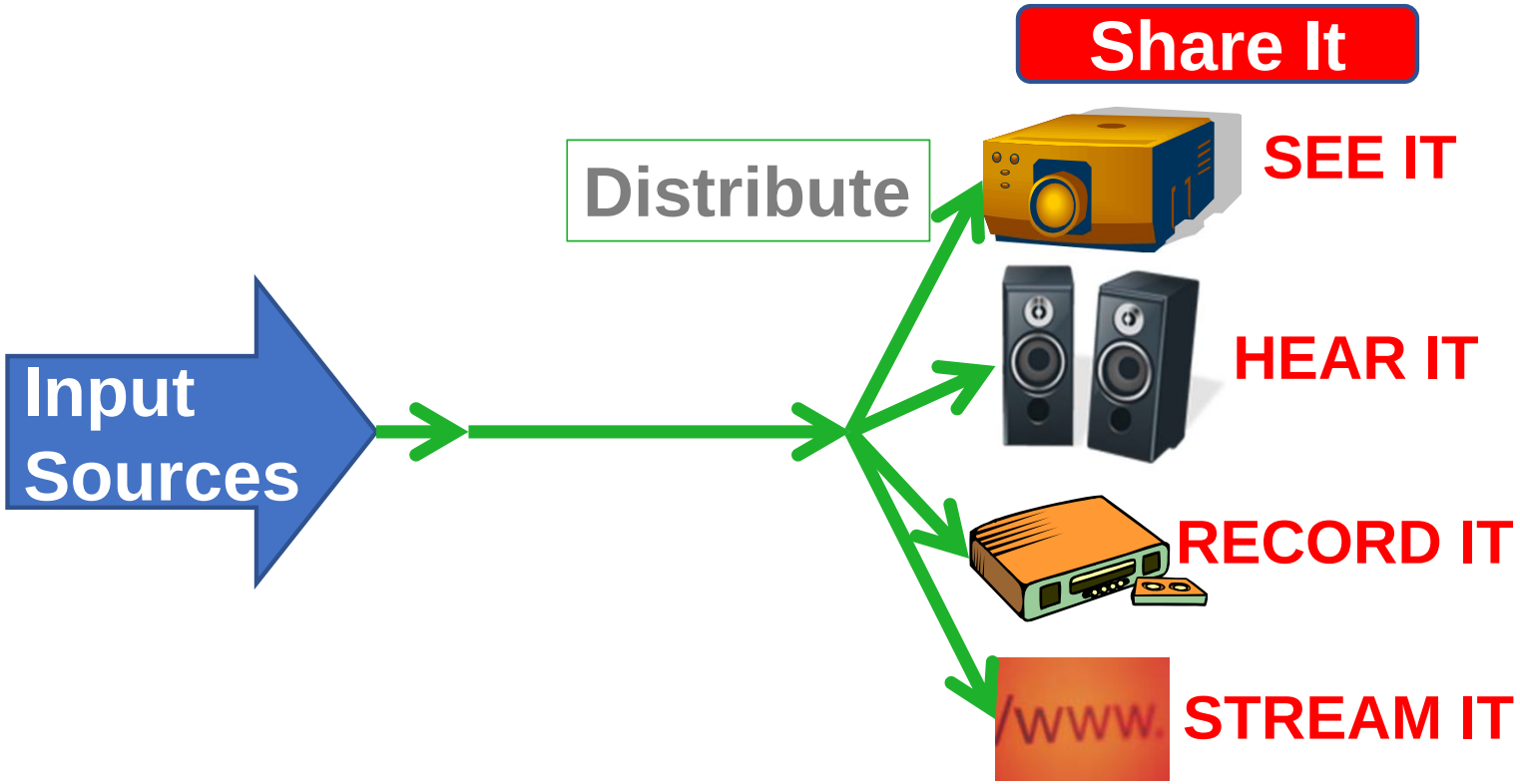
OUTput



Step 3 – Distribute



4 Steps of AV


Share It
Distribute
SEE IT
HEAR IT
Input Sources
RECORD IT
/www.
STREAM IT

High Res Coax

Shielded & Control

Twisted Pair

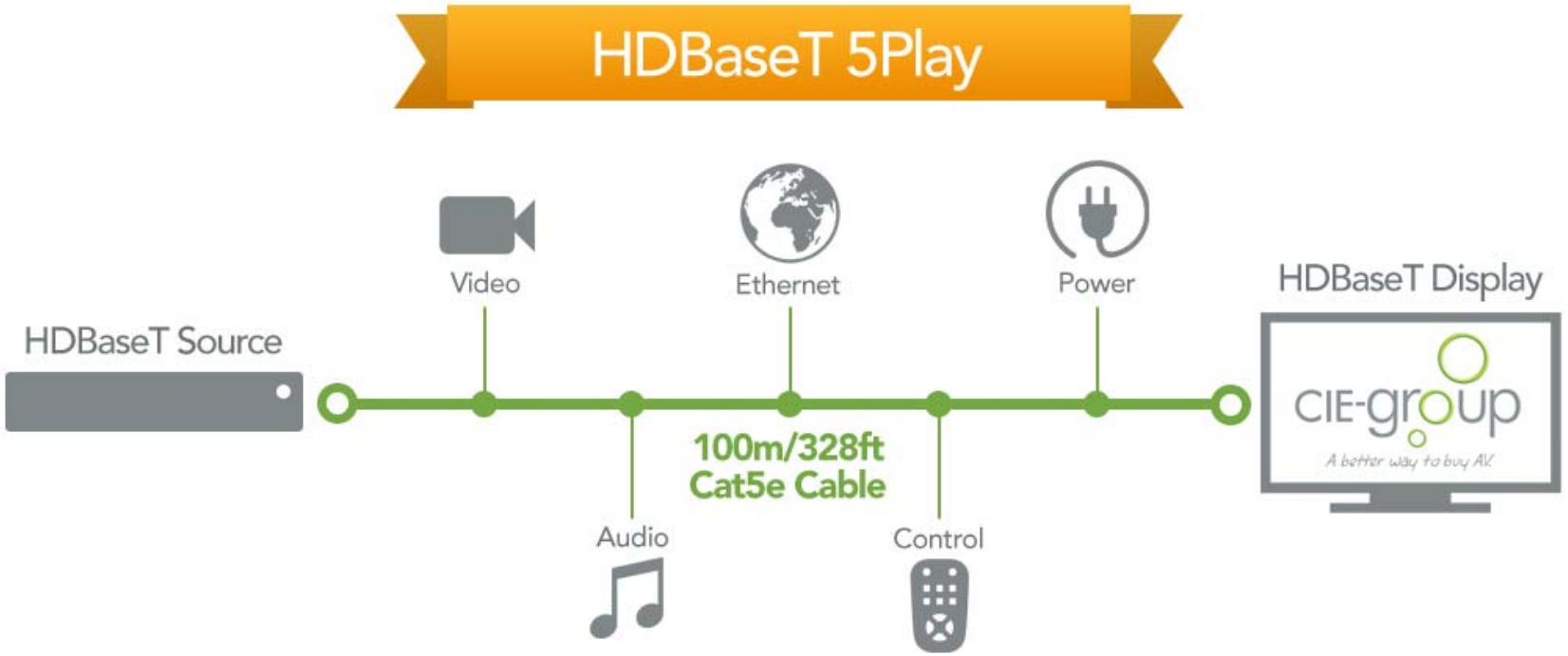
Fiber

Plug & Play

Skew Free / Low Skew UTP

- Not to be used for Digital
- Mark with colored tag for easier identification
- Terminate with different colored jack than data

HD Base T


HDBaseT 5Play
Video
Ethernet
Power
HDBaseT Display
HDBaseT Source
CIE-group
A better way to buy AV
100m/328ft
Cat5e Cable
Audio
Control

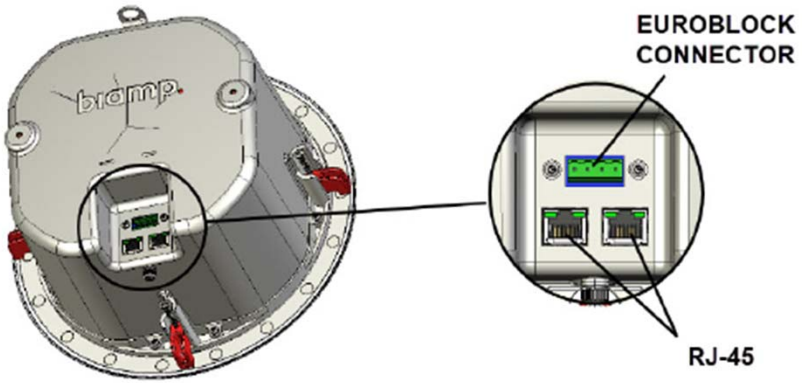
Audio over Ethernet

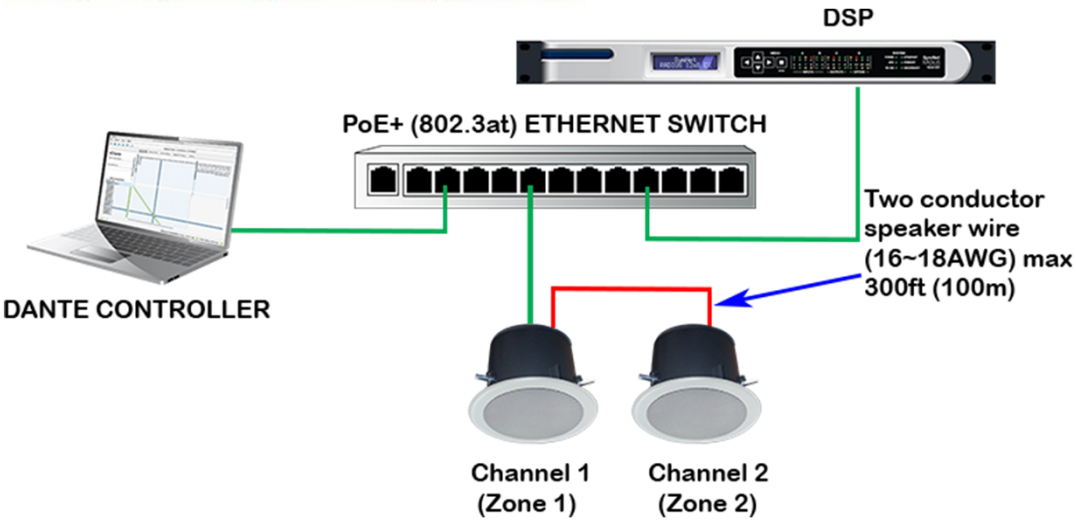
Dante™

CobraNet®

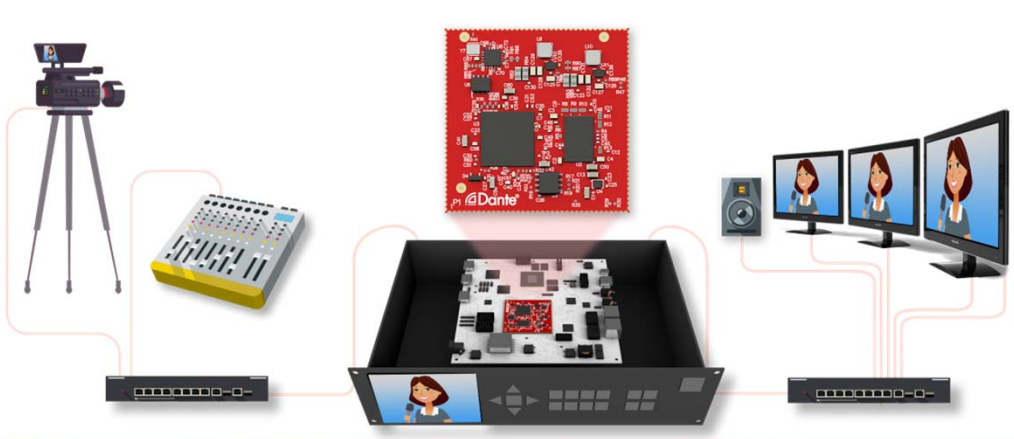
IEEE 802.1 AVB

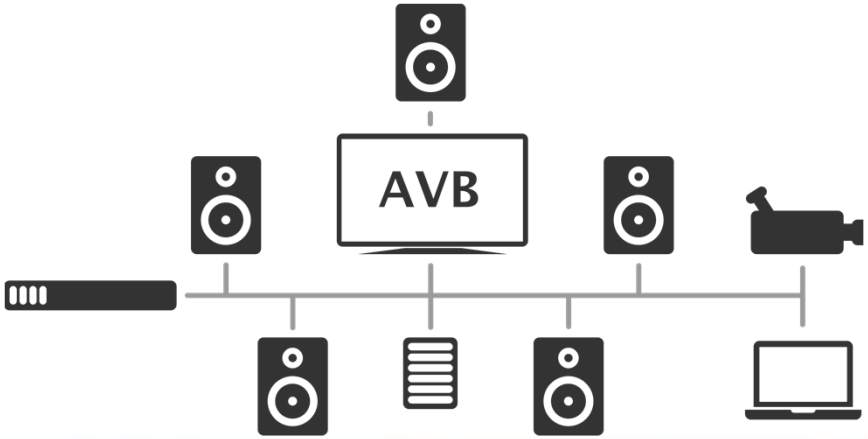
Audio over Twisted Pair





Video over Ethernet





Over Ethernet – Switch Recommendations

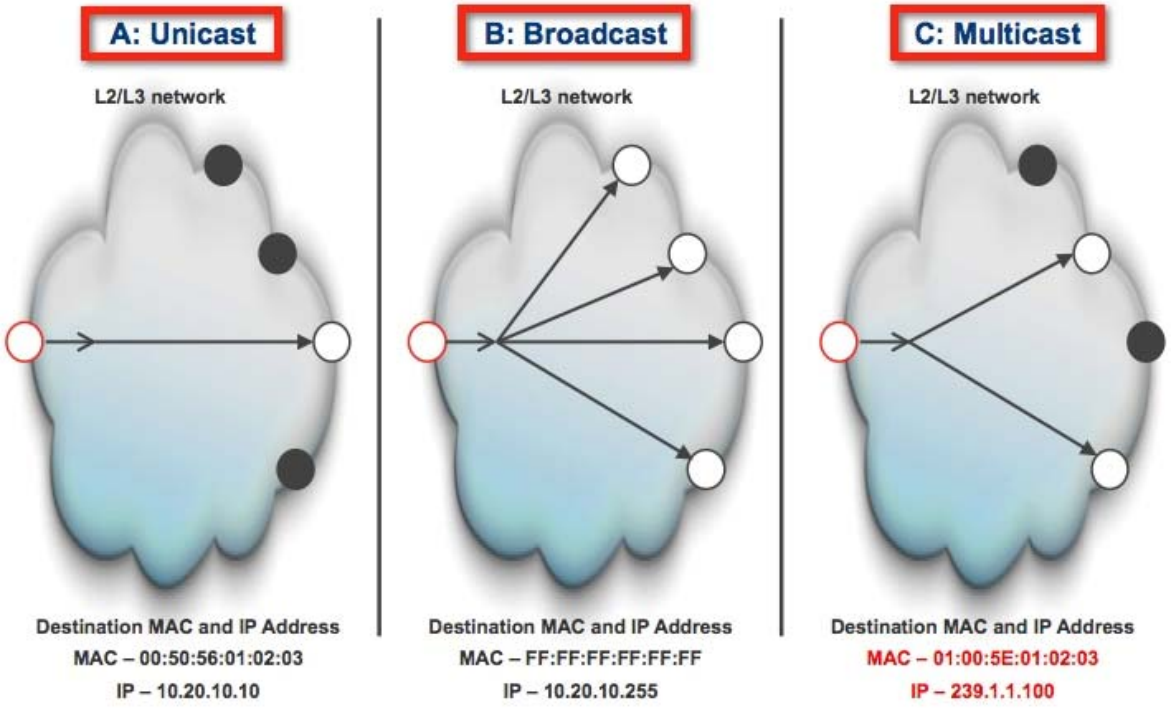
Dante Recommended Network Switch Features

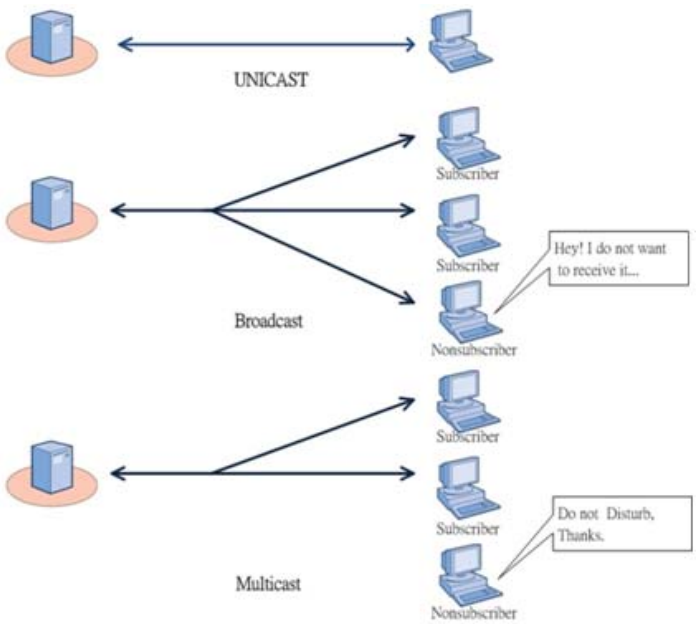
- No EEE or Green Ethernet features enabled 
- Gigabit switches
- Unmanaged Switches
  - Single network switch applications
  - Dedicated Dante traffic
- Managed Switches
  - Multiple network switch applications
  - Mixed traffic

EDSP – Dante Network Connectivity

Over Ethernet – Switch Recommendations

Over Ethernet – Switch Recommendations





You want a managed switch!

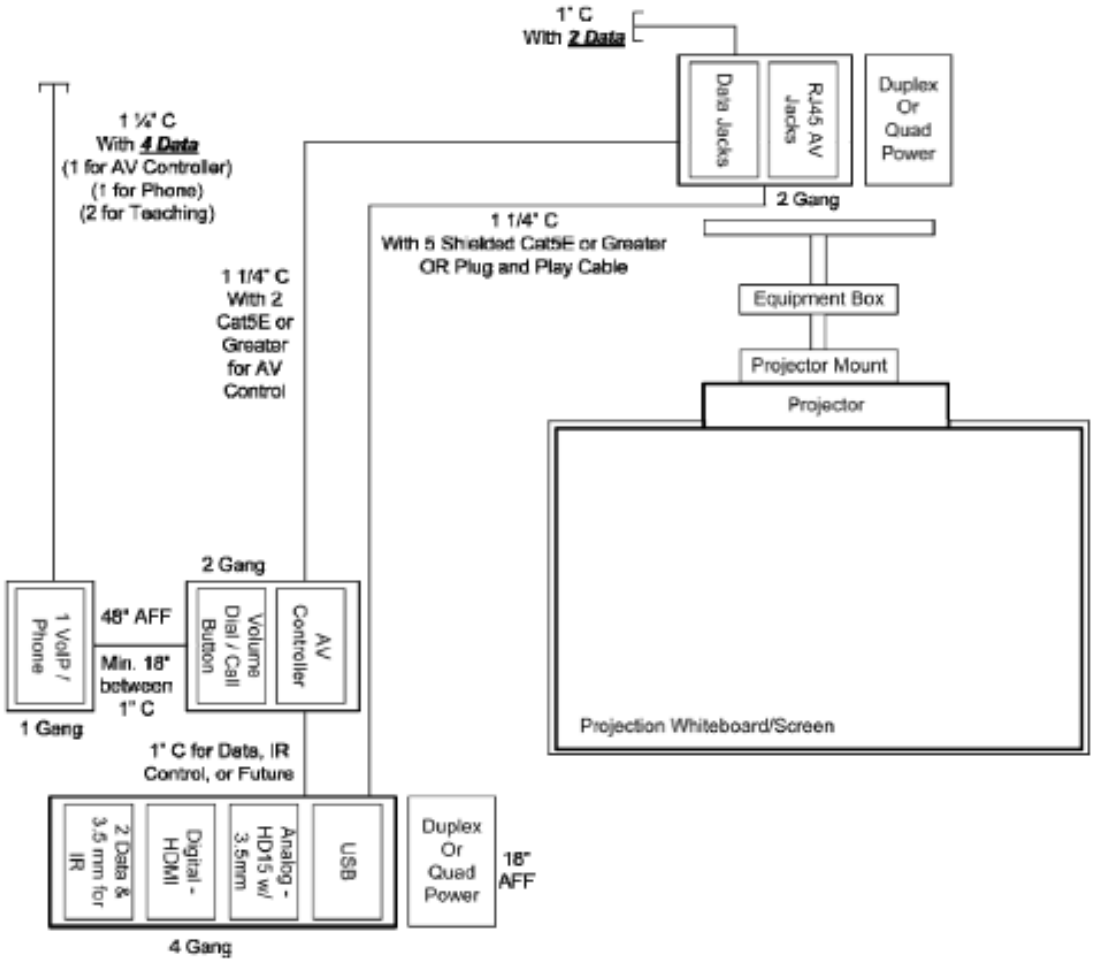
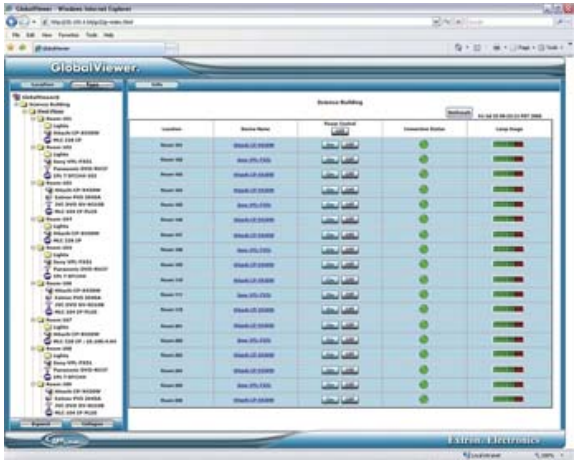


Figure 7-3
Minimum Recommended AV Infrastructure

Make sure to have data connections:

- At input locations
- At displays
- At processing and control equipment



Which is NOT a concern when it comes to distribution in our system?

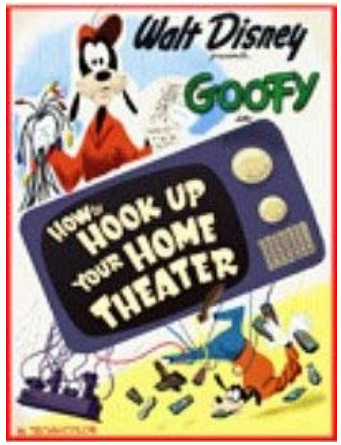
A.
Type of cable

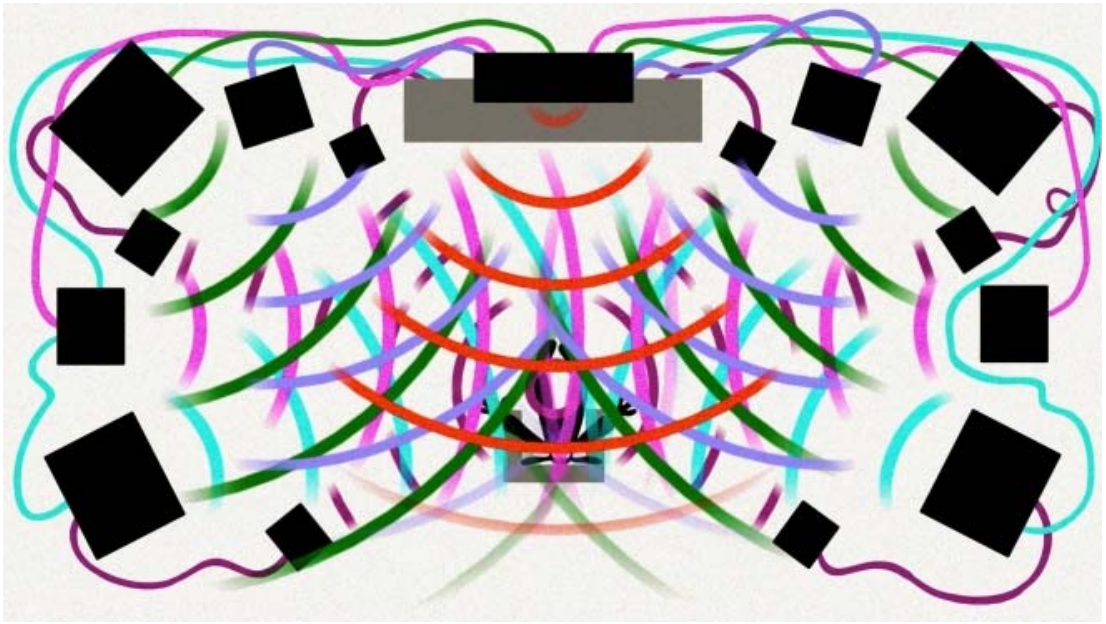
B.
What is the latest technology craze

C.
Where inputs & outputs are located & data and power near

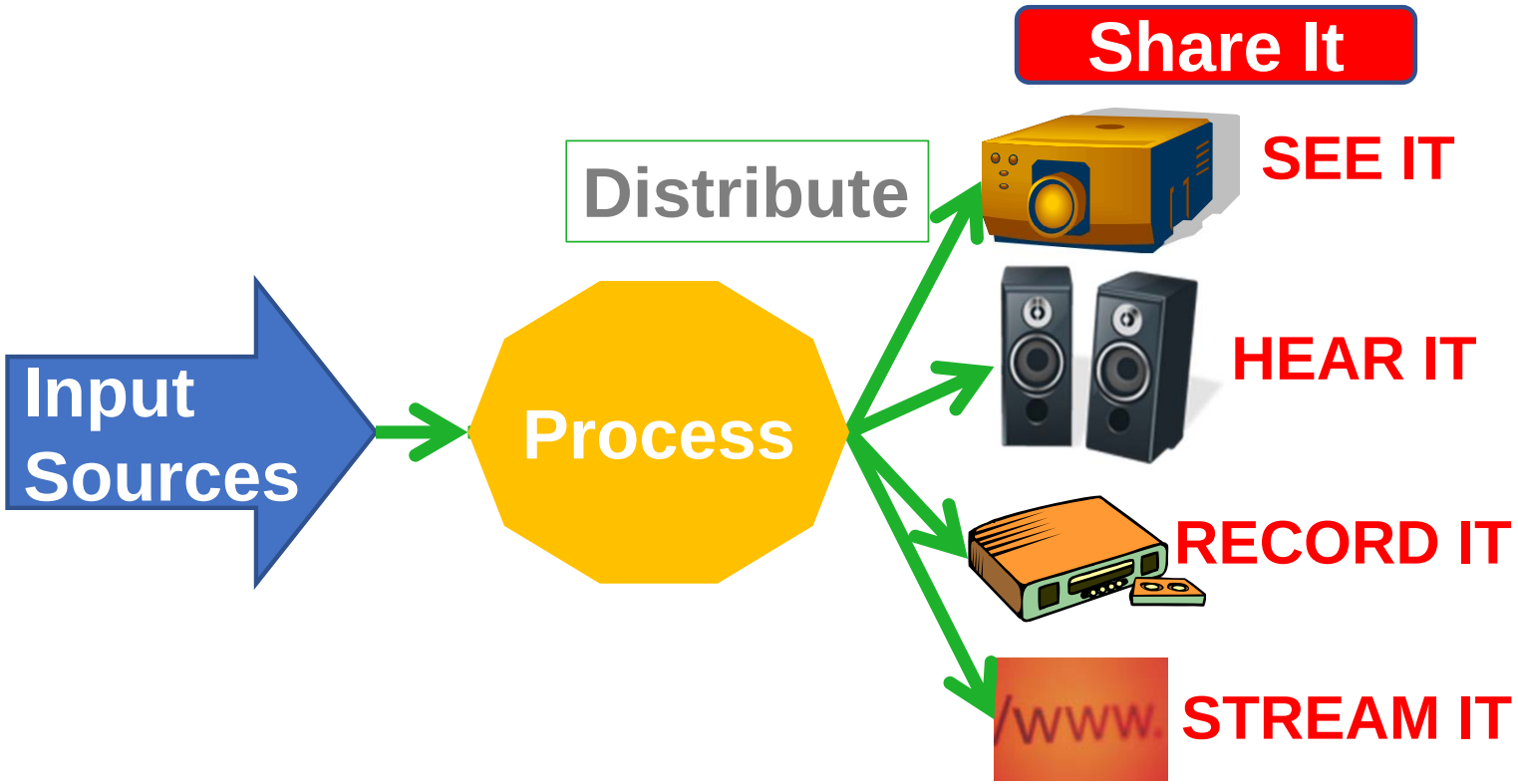
D.
Size of conduits and outlet boxes and paths between

Step 4 – Process





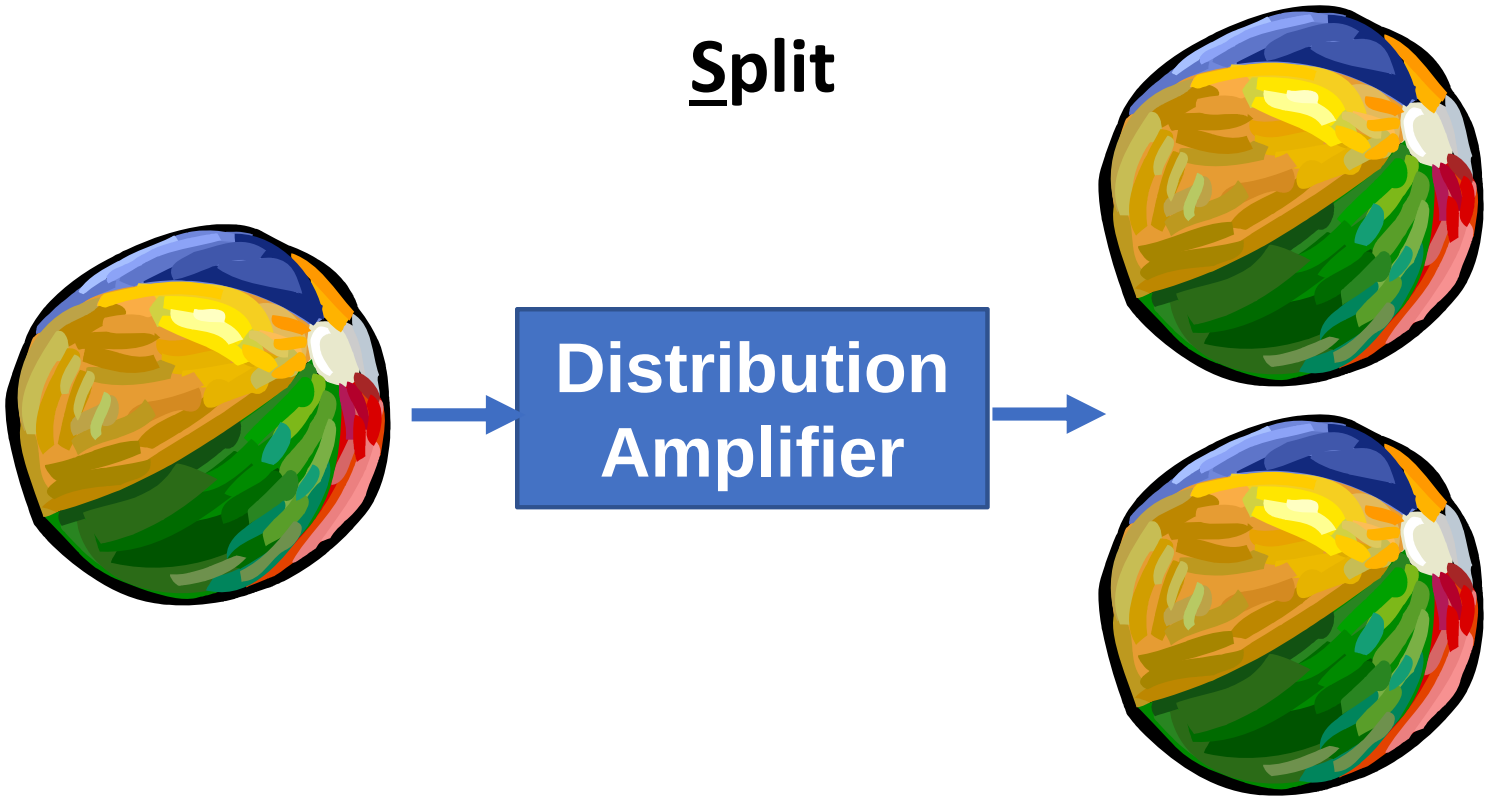
4 Steps of AV


Share It
Distribute
SEE IT
HEAR IT
Input Sources
Process
RECORD IT
/www.
STREAM IT

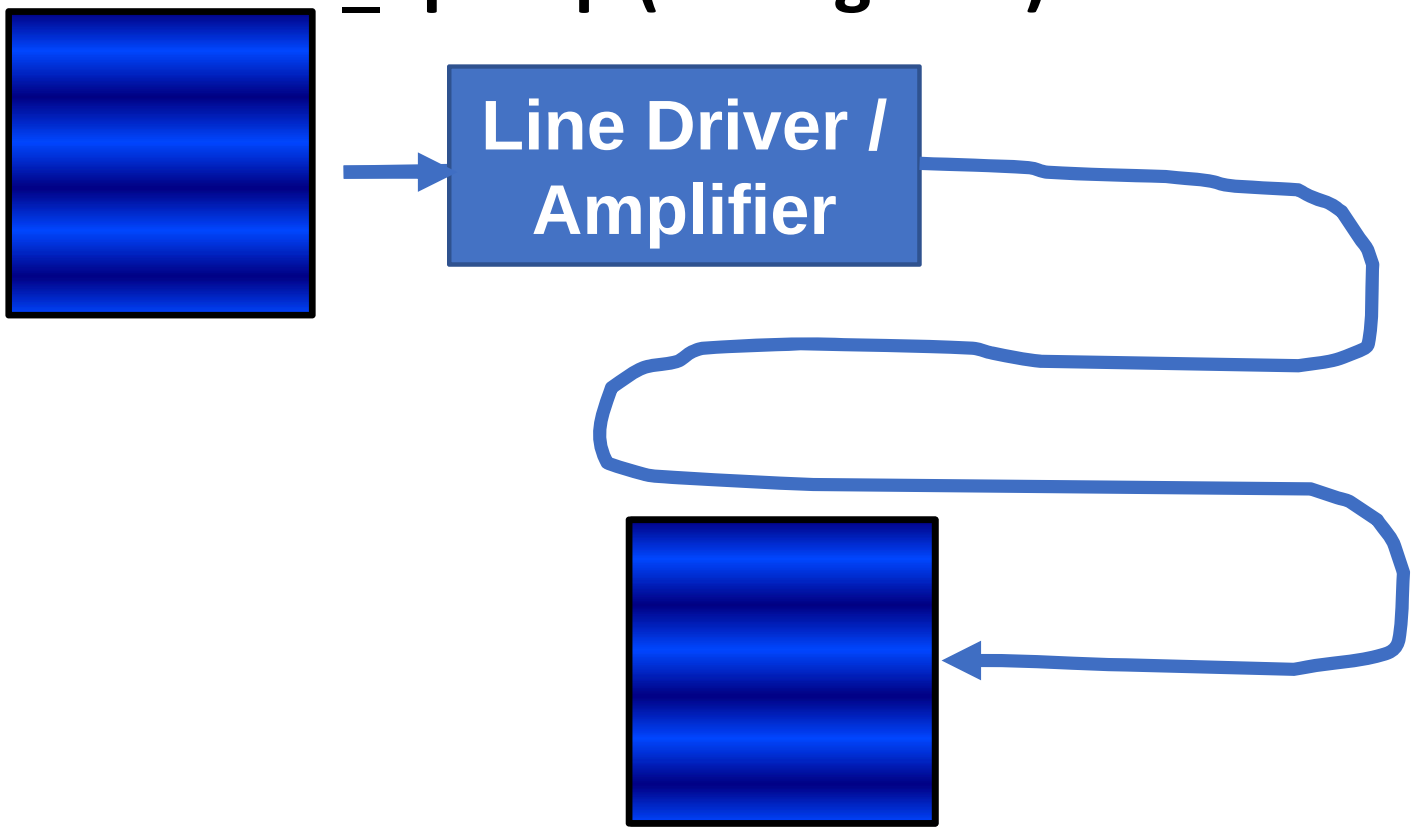
STEP 4 - Process

- Can be separate pieces of equipment or built into equipment used in step 2
  - Best to use separate
- Can be separate pieces of equipment for each option or one box can do several processing options
  - Save money and space with a box that does many features

Split



Supe Up (Strengthen)

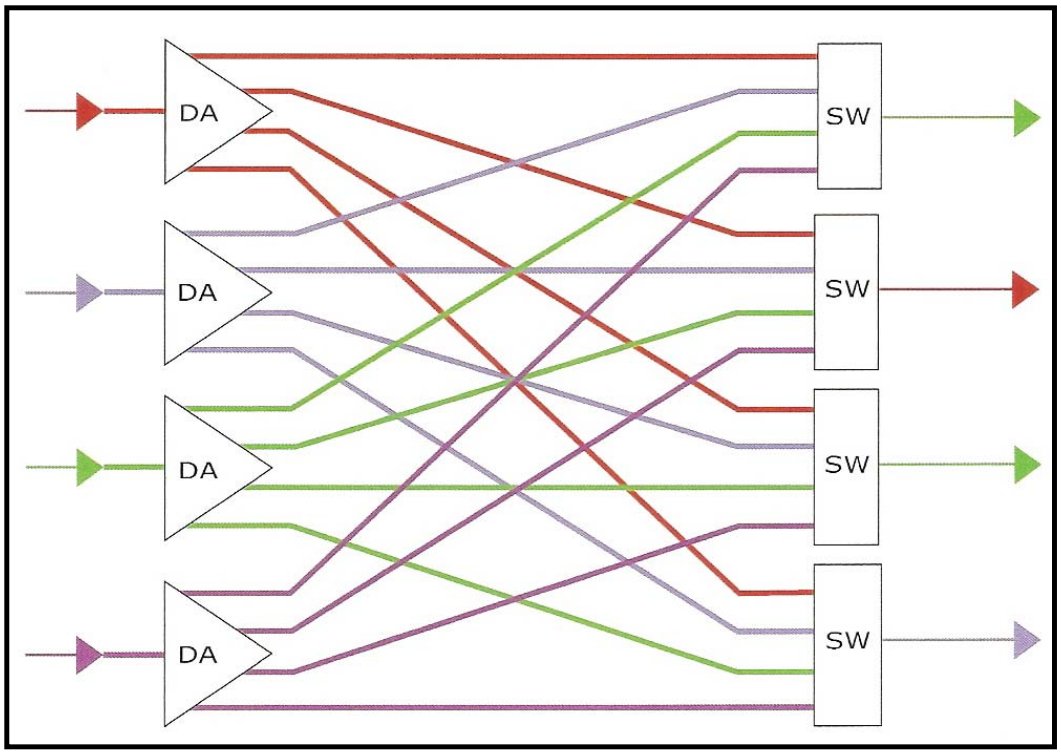


Switch

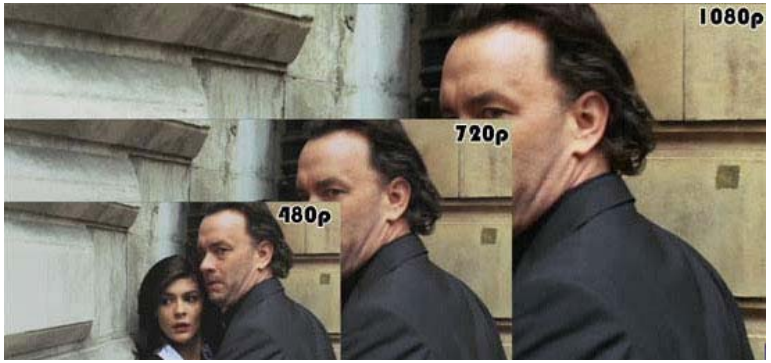
Switcher

Mixer for Audio

Matrix Switcher



re-Size



Superimpose

Title Generator / Graphic Processor

Mixer for Audio

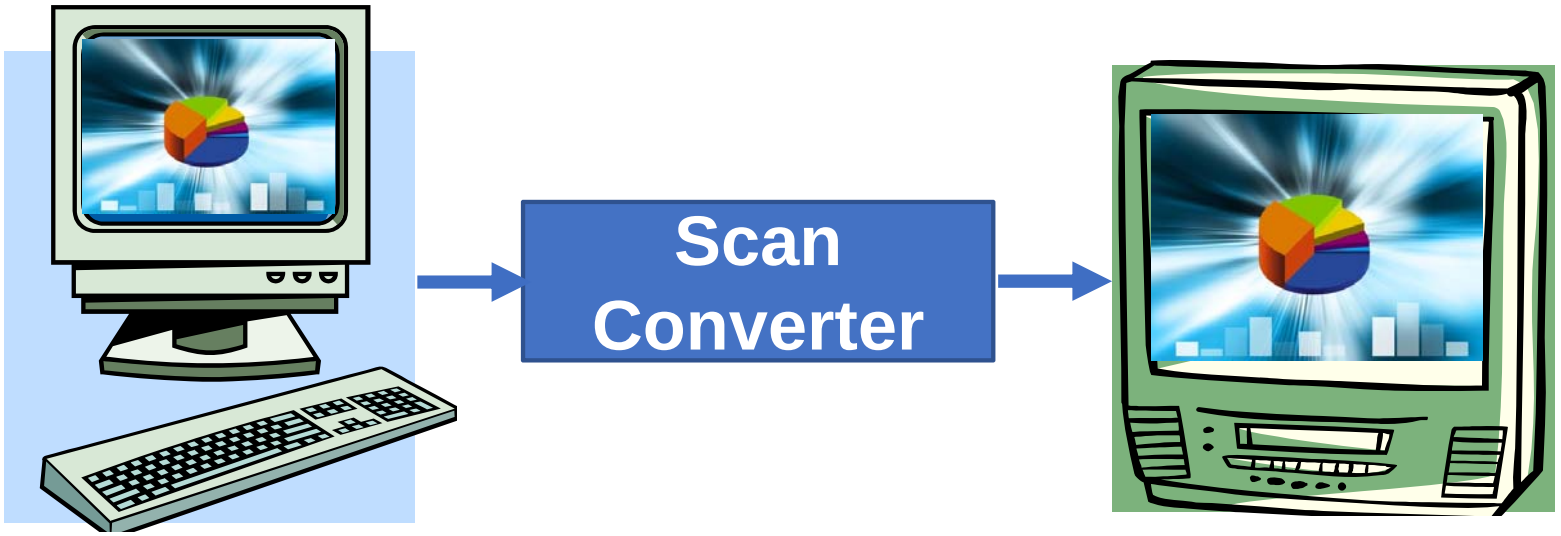
Side by Side

PIP Processor

PIP = Picture in Picture

Window Wall Processor

Swap



Which is a correct statement?

A.
You do not need to spend money on processing
You can split signals using cables and adapters

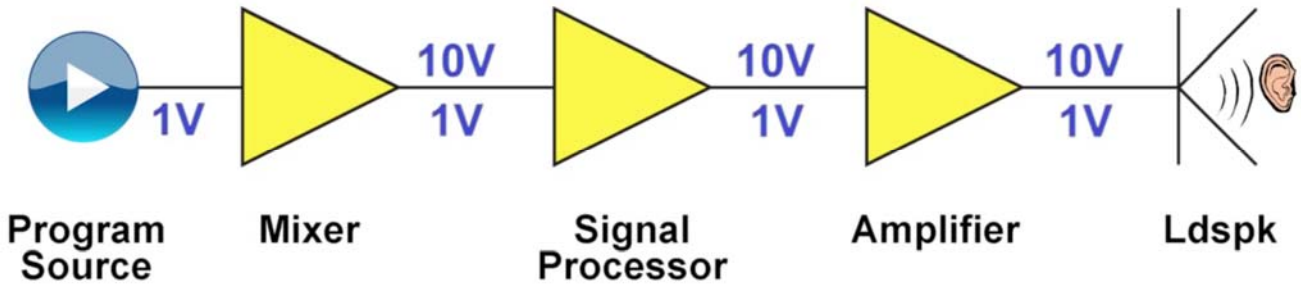
B.
Displays and sources will perfectly auto adjust their images to match after getting EDID settings

C.
External processors are better than ones in displays

D.
You will need a separate box for each processing option

Audio Processing

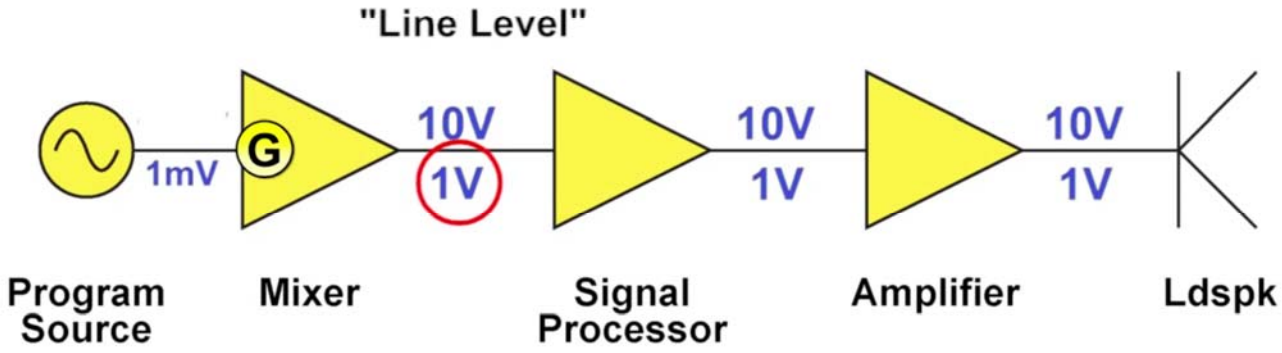
A Simple, Ideal Case



SynAudCon

Audio Processing

A Real-World System



Audio Processing

Line Input Building Blocks – Gain Levels

- Individual gain is added based on operating level of the source (gain compensation)
- Target level -17dBFS (allow enough headroom)

Input Type	Operating Level	Gain Compensation	Target Level
Codec Rx	+4 dBu	0 dB	-17dBFS (+4dBu)
Program Audio	+4 dBu	0 dB	-17dBFS (+4dBu)
Computer Sound Card (analog)	0 dBv	+1.8 dB	-17dBFS (+4dBu)
DVD Player	-10 dBv	+11.8 dB	-17dBFS (+4dBu)
Blu-ray Player	-10 dBv	+11.8 dB	-17dBFS (+4dBu)
iPod (analog)	0 dBv	+1.8 dB	-17dBFS (+4dBu)
VCR/DVD Combo	-10 dBv	+11.8 dB	-17dBFS (+4dBu)
Pro Level CD/DVD Player (balanced)	+4 dBu	0 dB	-17dBFS (+4dBu)

EDSP – Building Blocks

Wireless Microphone Building Blocks

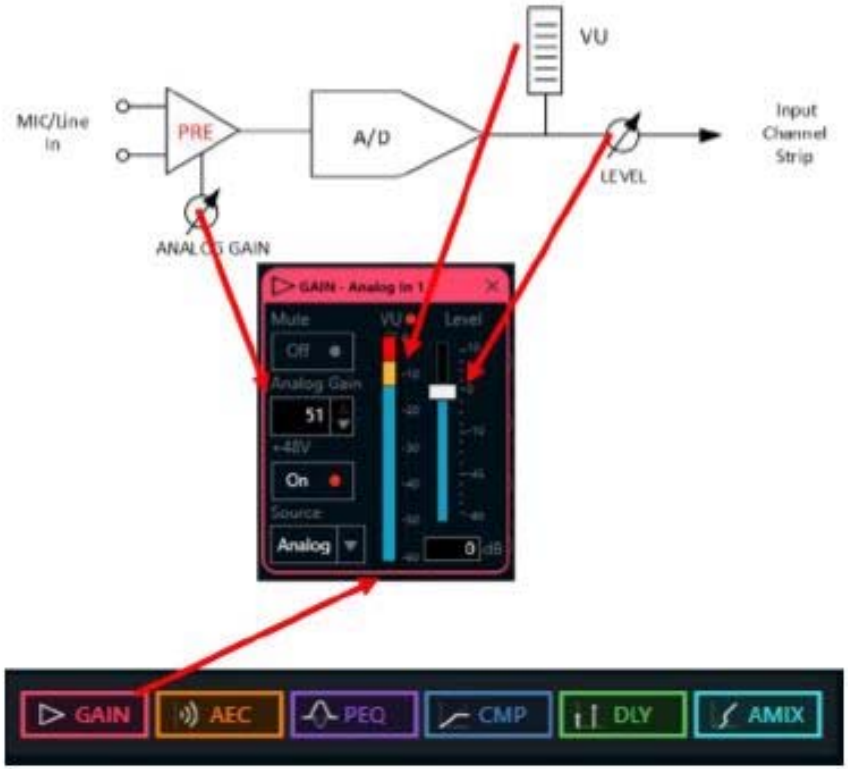
Microphone Type	Operating Level	Gain Compensation	Target Level
Wireless Mics (+4 dBu)	+4 dBu	0 dB	-17 dBFS (+4dBu)
Wireless Mics (-10 dBv)	-10 dBv	+11.8 dB	-17 dBFS (+4dBu)
Wireless Mics (-30 dBu)	-30 dBu	+34 dB	-17 dBFS (+4dBu)

EDSP – Building Blocks

Audio Processing

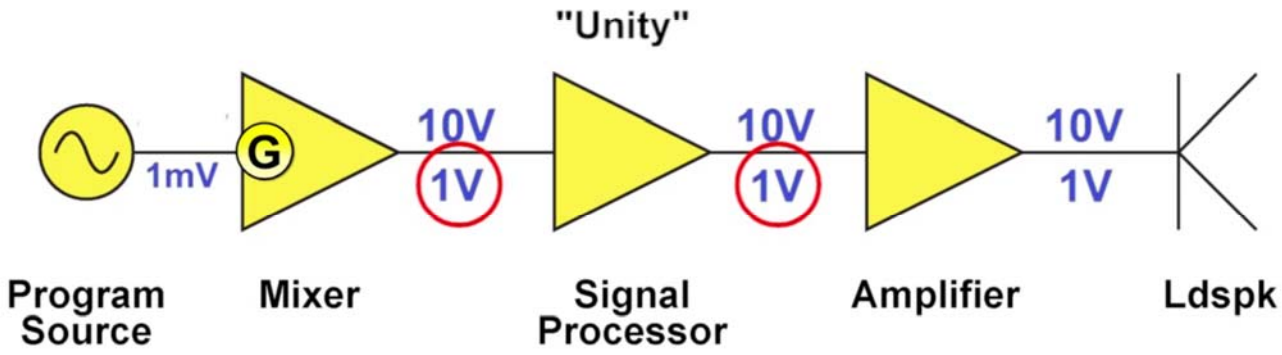
Audio Processing

Audio Processing - INPUT



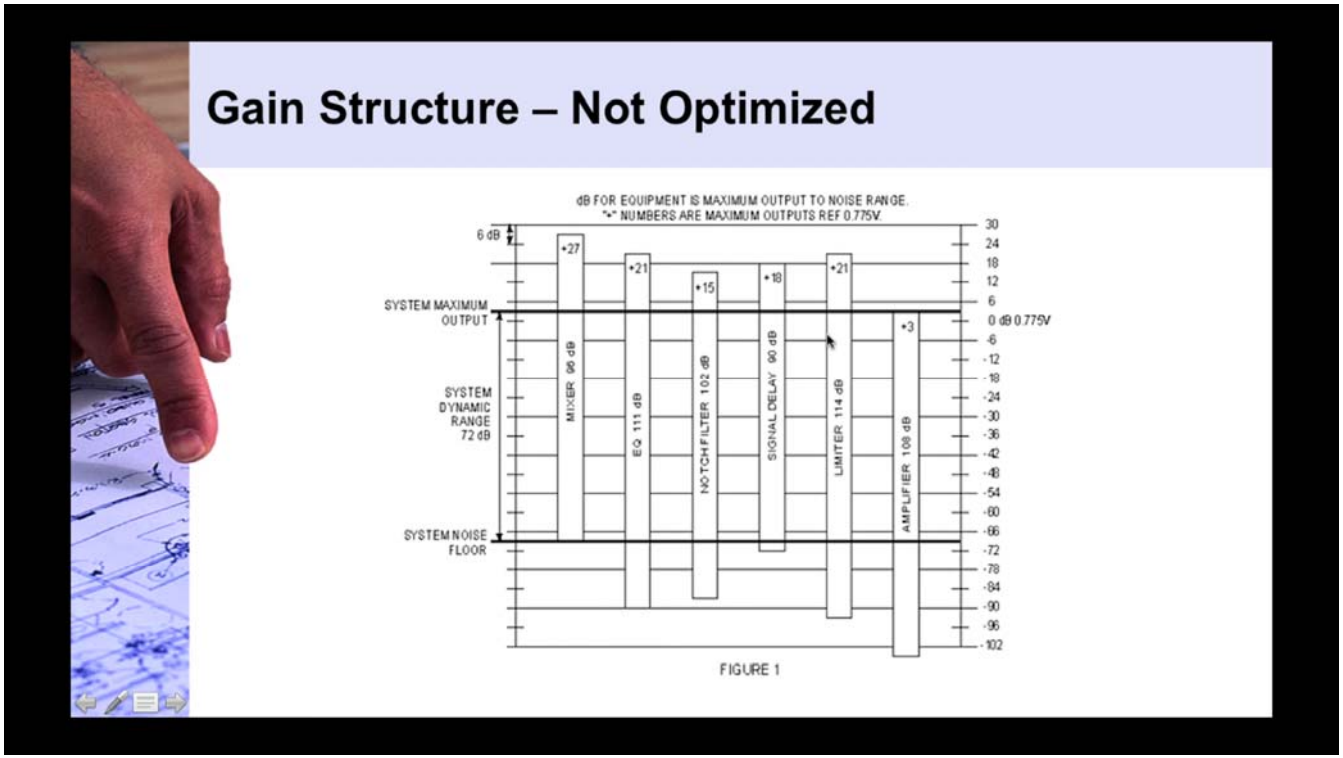
Audio Processing

A Real-World System

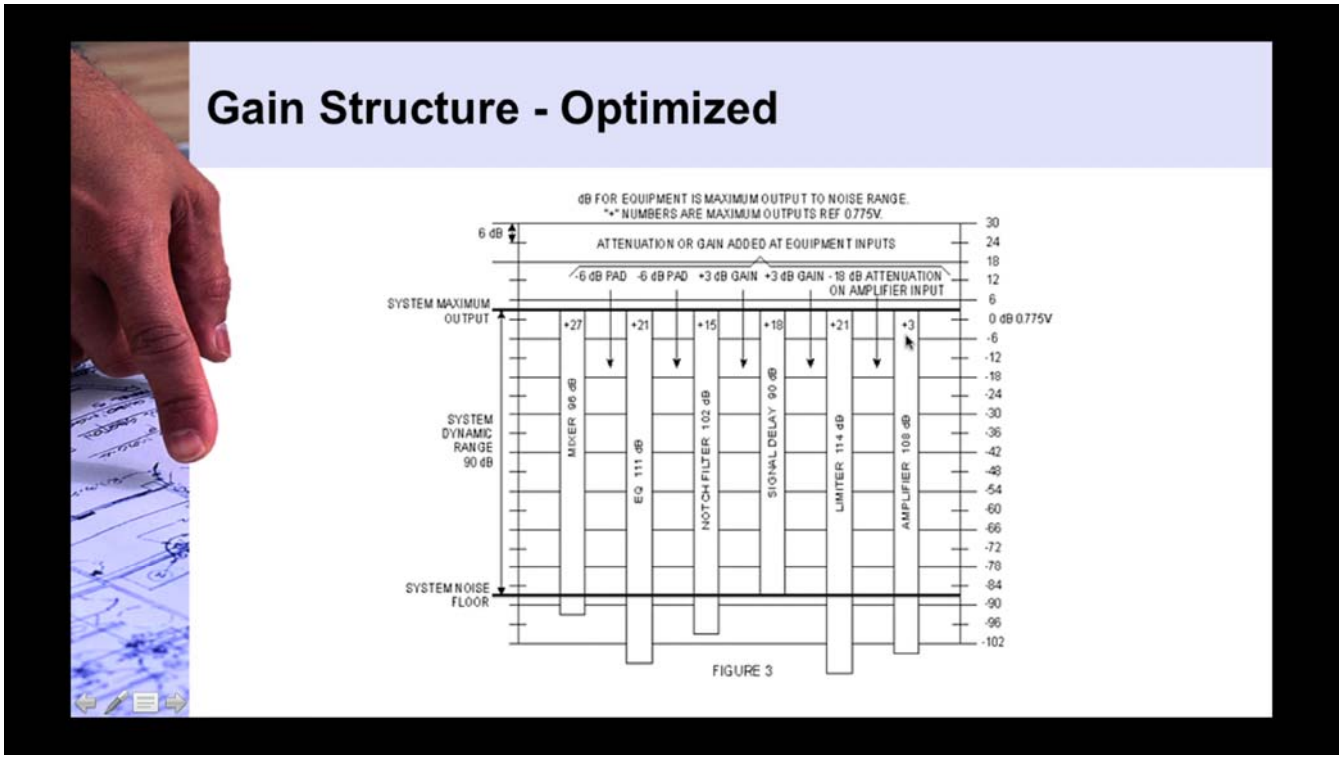


SynAudCon

Audio Processing

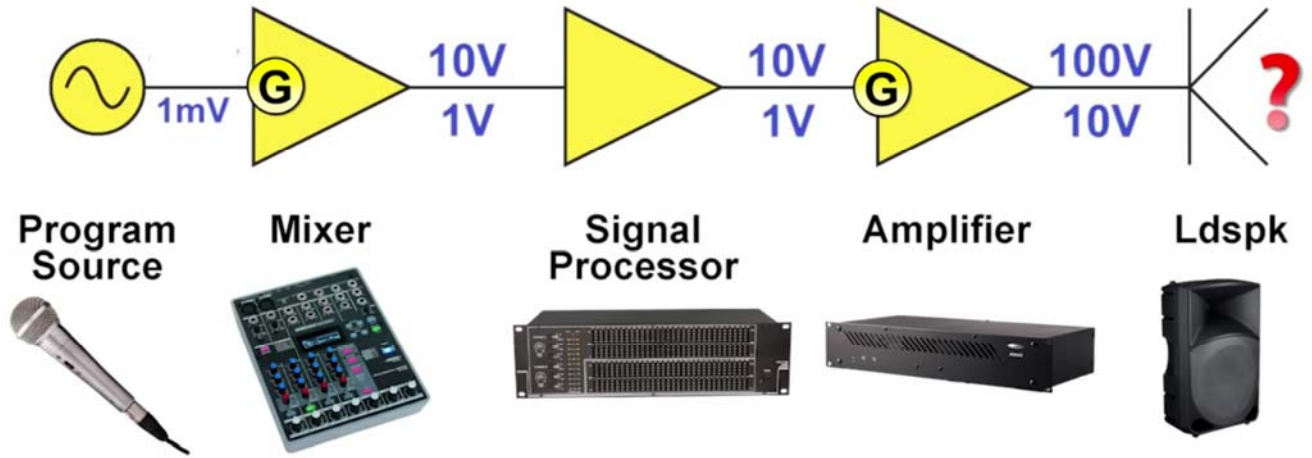


Audio Processing



Audio Processing

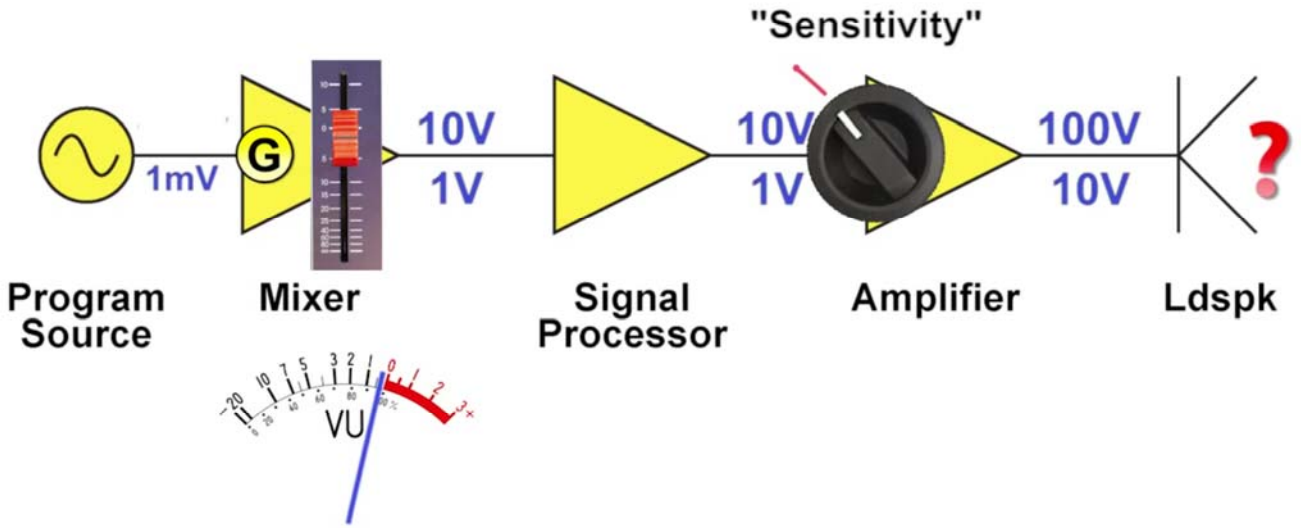
The Signal Chain



SynAudCon

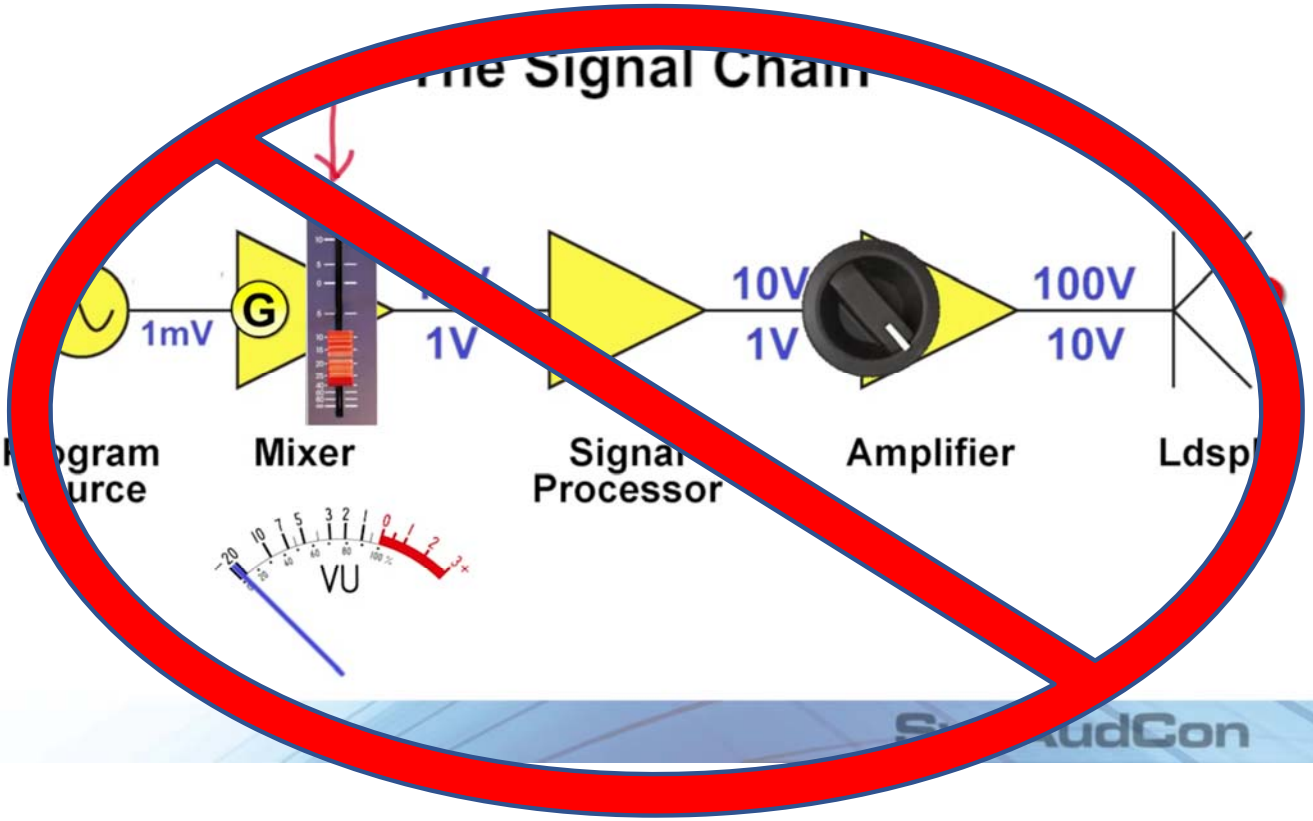
Audio Processing

The Signal Chain

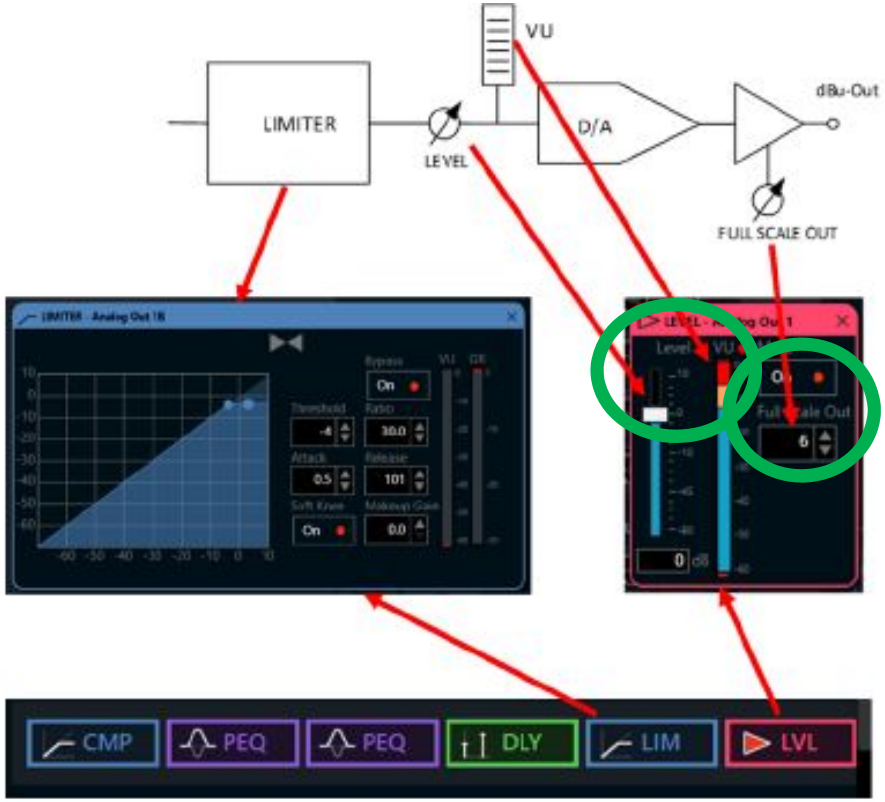


SynAudCon

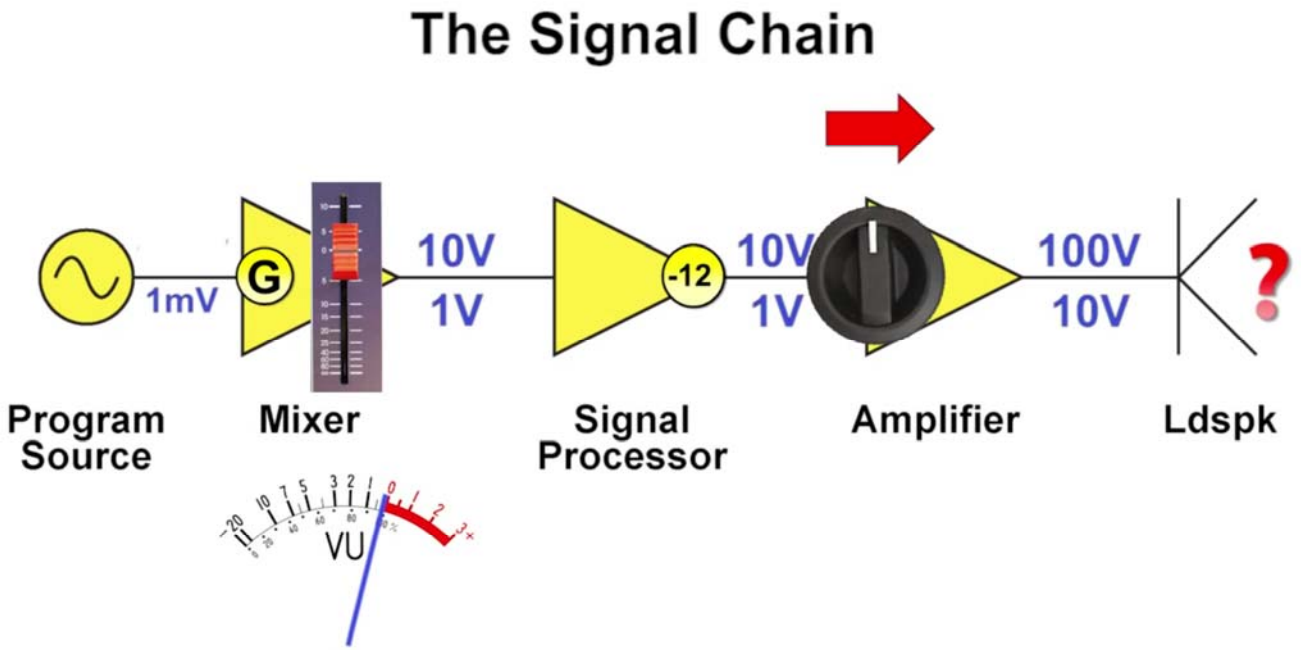
Audio Processing



Audio Processing - OUTPUT

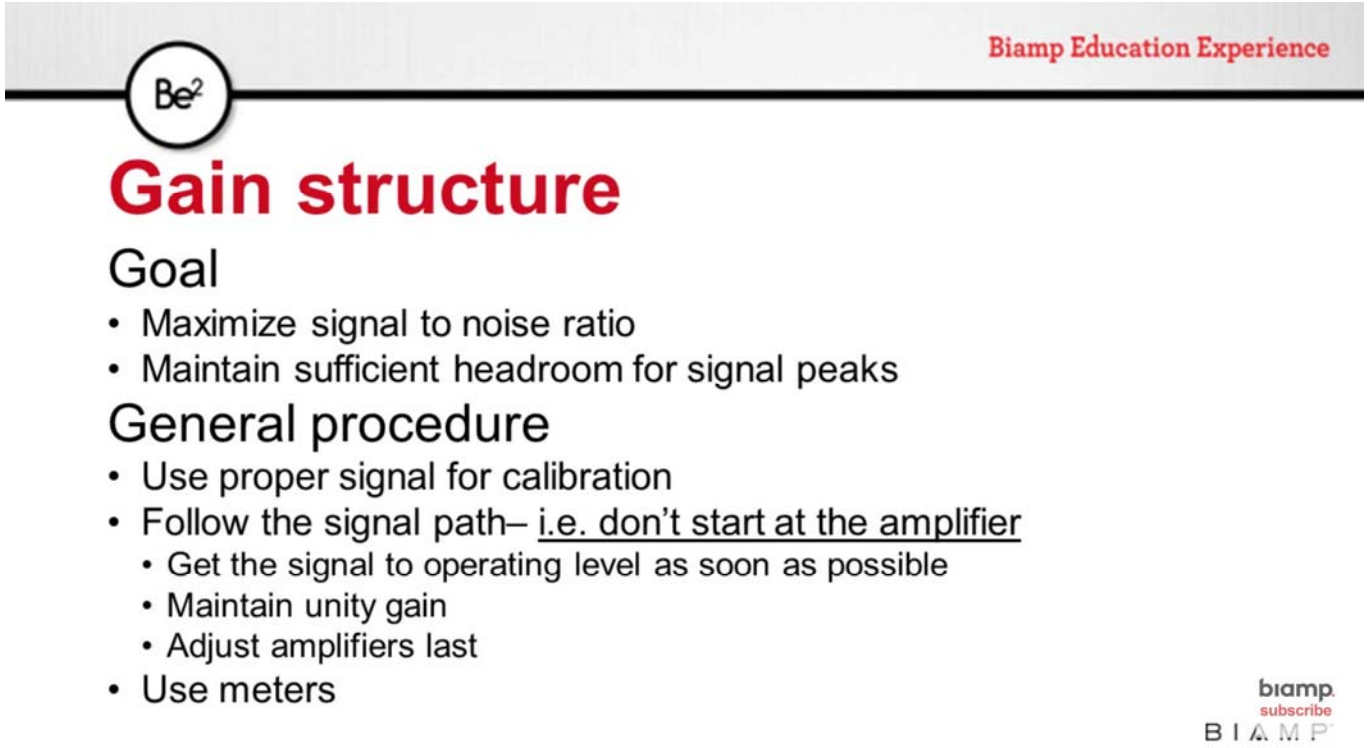


Audio Processing

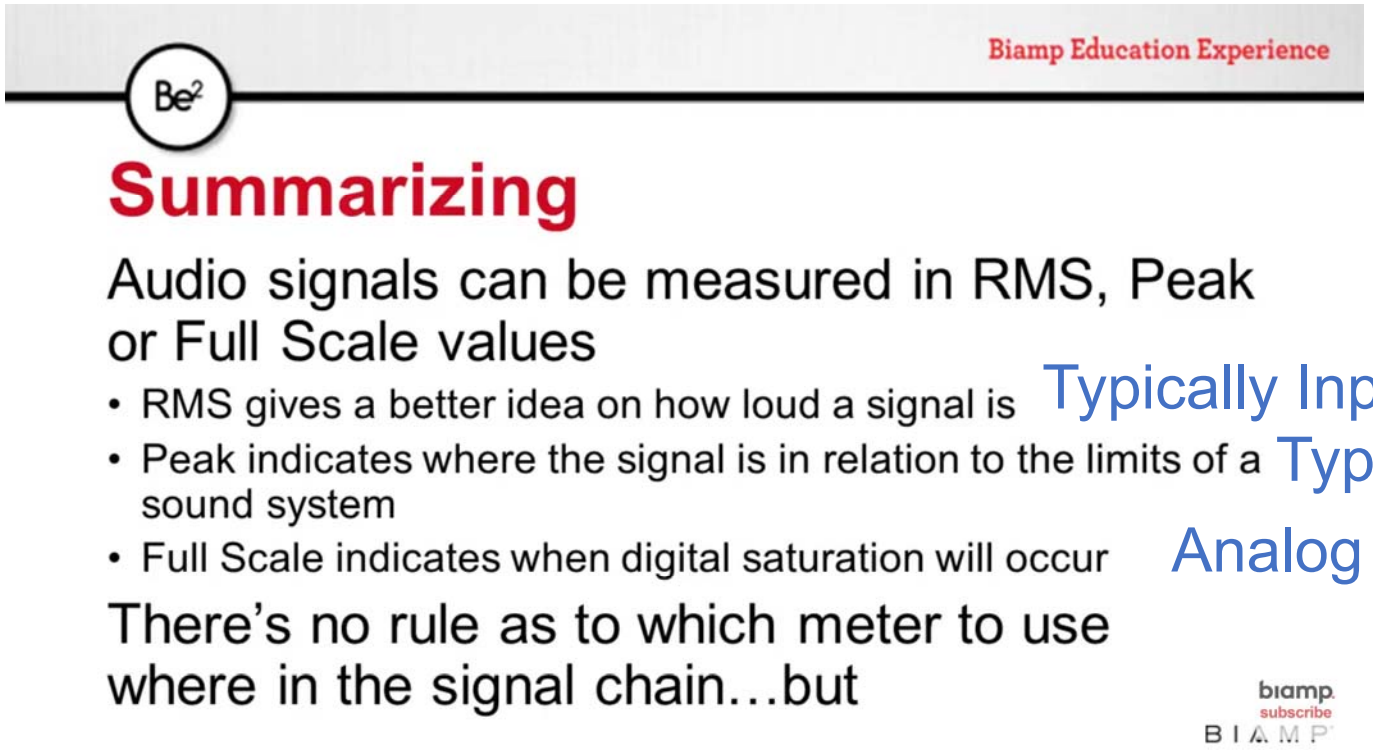


SynAudCon

Audio Processing



Audio Processing



Typically Input

Typically output

Analog Gain Points

Meters

Scales compared

Volts	dBu	VU	dBfs (SMPTE RP155)
12.283V	24dBu		0 dBfs
9.757V	22dBu		-2 dBfs
7.750V	20dBu		-4 dBfs
6.156V	18dBu		-6 dBfs
4.890V	16dBu		-8 dBfs
3.884V	14dBu		-10 dBfs
3.085V	12dBu		-12 dBfs
2.451V	10dBu		-14 dBfs
1.947V	8dBu		-16 dBfs
1.546V	6dBu	+2	-18 dBfs
1.228V	4dBu	0	-20 dBfs
0.976V	2dBu	-2	-22 dBfs
0.775V	0dBu	-4	-24 dBfs
0.616V	-2dBu	-6	-26 dBfs
0.489V	-4dBu	-8	-28 dBfs
0.388V	-6dBu	-10	-30 dBfs
0.309V	-8dBu	-12	-32 dBfs
0.245V	-10dBu	-14	-34 dBfs
0.195V	-12dBu	-16	-36 dBfs
0.155V	-14dBu	-18	-38 dBfs
0.123V	-16dBu	-20	-40 dBfs
97.6mV	-18dBu		-42 dBfs
77.5mV	-20dBu		-44 dBfs
61.6mV	-22dBu		-46 dBfs
48.9mV	-24dBu		-48 dBfs

biamp subscribe BIAMP

“Unity Gain”

Audio Processing

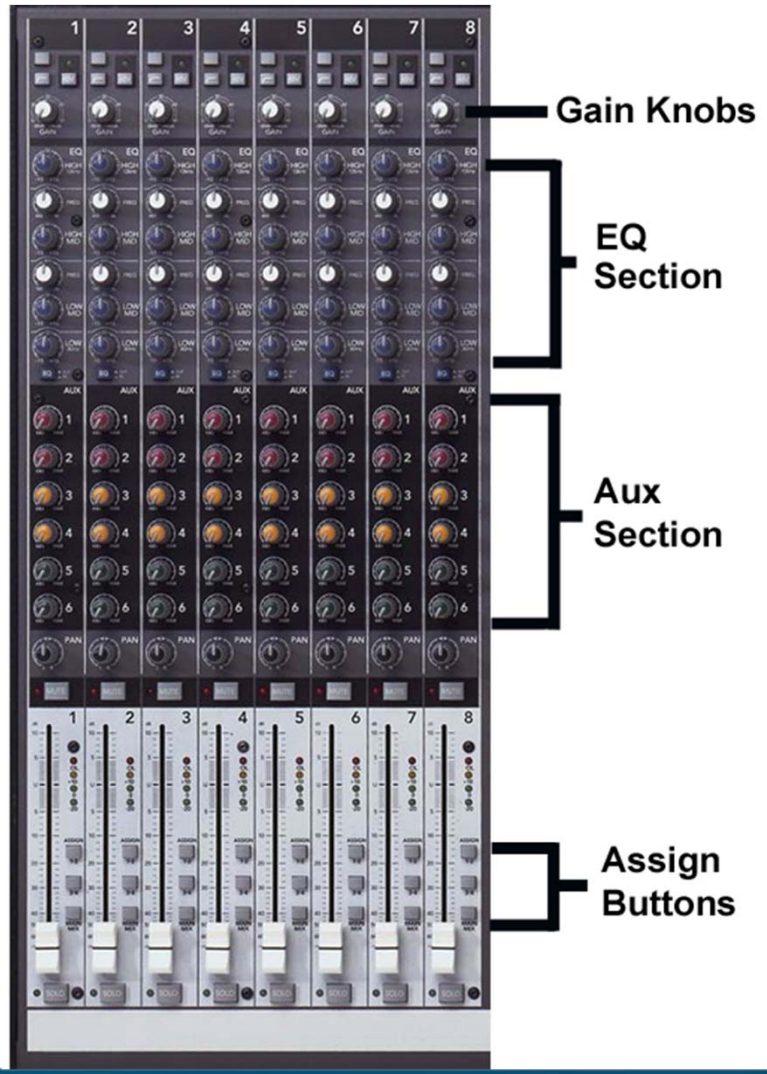
Gain structure

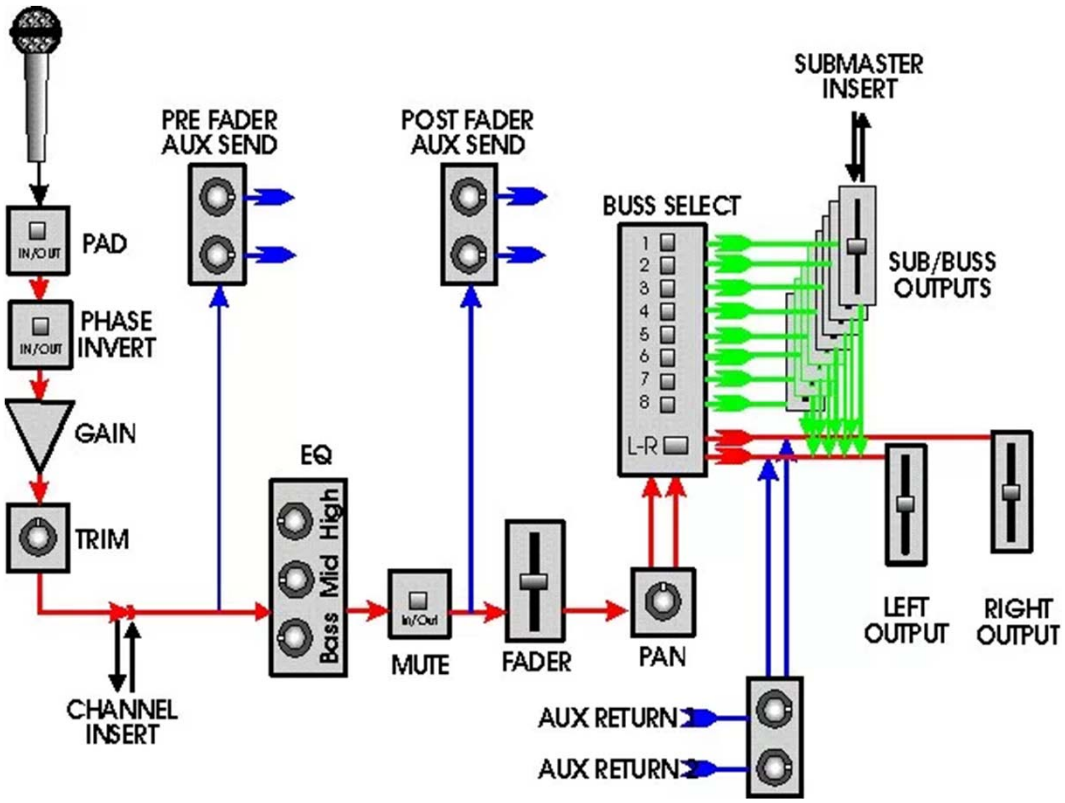
Adjust input gain for proper operating level

- Use peak meters
- Adjust gain until the peak indicator starts to flash
  - Usually 3~6dB before actual clipping
- Then reduce gain 6~12dB to provide additional headroom

Maintain unity gain throughout the signal chain

- Maintain faders and level controls at 0dB
- Compensate level where needed


Gain Knobs
EQ Section
Aux Section
Assign Buttons

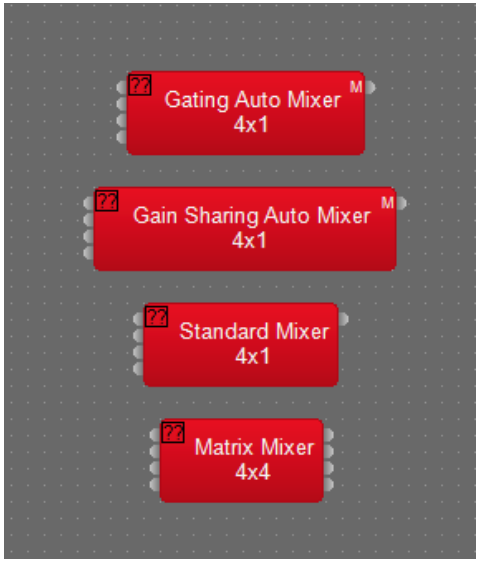

PAD
PHASE INVERT
GAIN
TRIM
CHANNEL INSERT
PRE FADER AUX SEND
EQ
High
Mid
Bass
POST FADER AUX SEND
MUTE
FADER
PAN
BUSS SELECT
L-R
SUBMASTER INSERT
SUB/BUSS OUTPUTS
LEFT OUTPUT
RIGHT OUTPUT
AUX RETURN
AUX RETURN

Audio Processing

- Mixer = Combines sound levels
- Equalizer = adjust frequencies (filter or enhance)
- Reverb and Delay = adjust for reflections
- Compressors & Limiters = adjust frequency range
- Gates and Expanders = eliminate low noise

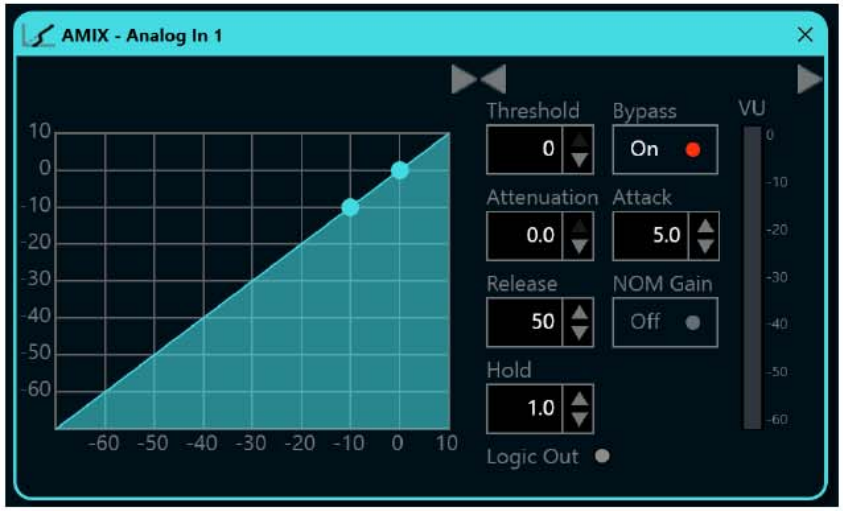
Audio Processing

– Mixer = Combine sound levels



Automatic mixer suggested settings:

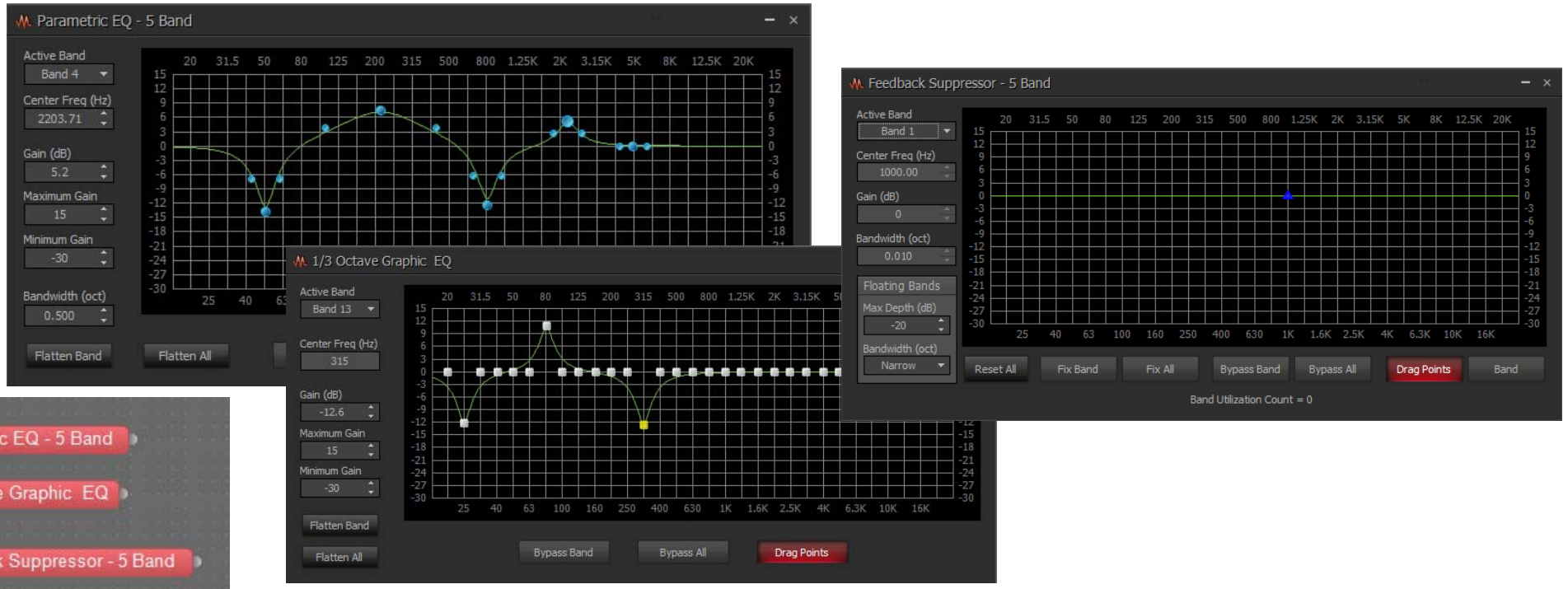
- Threshold: -40 dB
- Attenuation: -40 dB
- Attack: 1.0 ms
- Release: 50 ms
- NOM Gain: On
- Hold: 1.0 seconds
- Last Mic: Last
- NOM Limit: 4



CRESTRON

Audio Processing

– EQ



– EQ – Starting Points

Vocals

- < 200 Hz: Cut for clarity
- 150 Hz – 600 Hz: Warmth
- 500 Hz – 2 kHz: Nasal (Cut to eliminate) Around 350
- 3 kHz – 5 kHz: Sibilance (Cut to eliminate) Around 2750
- 1.5 kHz – 8 kHz: Clarity and Presence 2-4K sweet spot
- 10 kHz+: Airy (Breathy)

– EQ

First, understand that prerecorded program sources like Blu Rays, DVDs, and music CDs have been optimized as audio sources when produced

Therefore, other than gain, these sources do not need any other input processing

If these don’t sound good through the system loudspeakers, look to improper equalization on the output processing strip feeding the loudspeakers

– EQ

Input source parametric equalization is only for

- Microphone
- Telephone
- CODEC optimization

Fixing its response if:

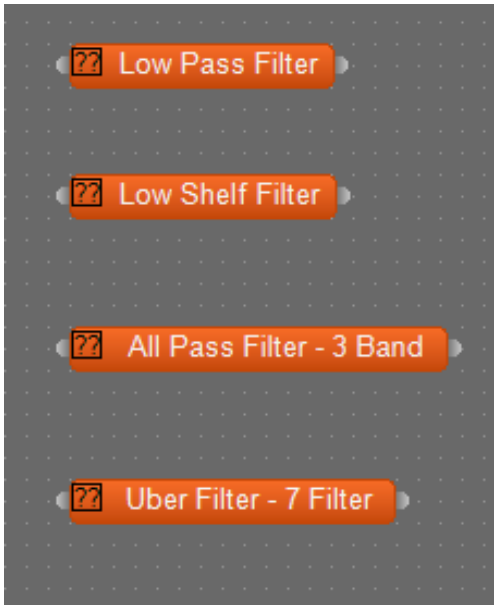
It is too thin or tinny

Has too much bass

To notch out feedback ringing in the case of local mics

Audio Processing

– Filters



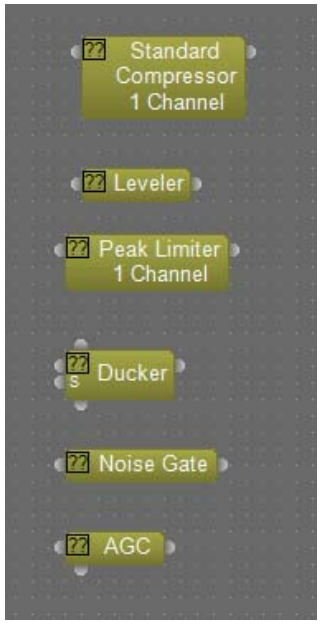
Audio Processing

– Filters

Filters
• Use High Pass Filters on speech microphones to reduce rumble • Use Low Pass Filters on conferencing microphones to reduce noise and reflections in problematic rooms • Boost to 2KHz range for enhanced speech intelligibility • User higher "Q" filters to remove unwanted resonances

Audio Processing

– Dynamics



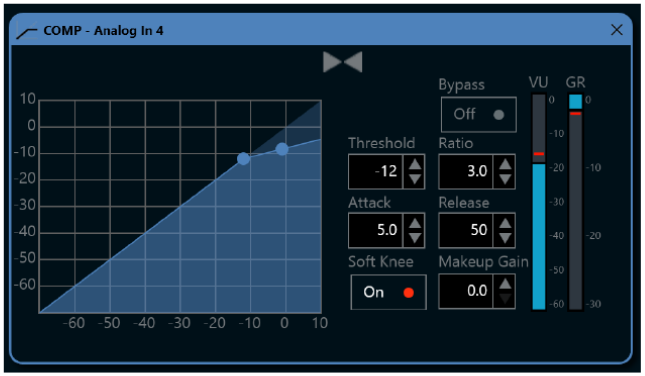
Input CoMPression (CMP):

A compressor is used to reduce the level of overly loud signal sources

Since recorded and broadcast sources are already level-limited, only microphone, telephone and CODEC conference sources can benefit from compression

A good rule of thumb for setting parameters of an Avia input compressor is:

- Threshold: -12 dB, Ratio: 3:1
- Attack: 5.0 ms, Release: 50 ms
- Soft knee: On, Makeup gain: Off



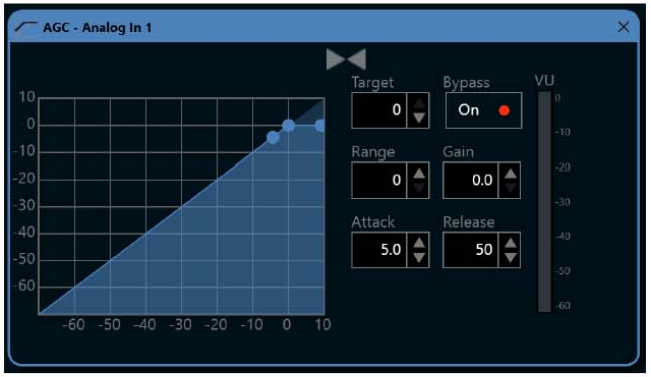
Input Automatic Gain Control (AGC):

Automatic Gain Control (AGC) is generally used in broadcasting to limit the dynamic range of a signal source whose nominal level varies too much

It is tempting to employ AGC for that soft talker who is afraid to speak loudly into their mic, and isn't loud enough in the local loudspeakers

But often feedback will occur before they are loud enough

AGC should only be used if absolutely necessary, and only on remote outputs like far-end teleconferencing telephones & CODECs or recording feeds



CRESTRON

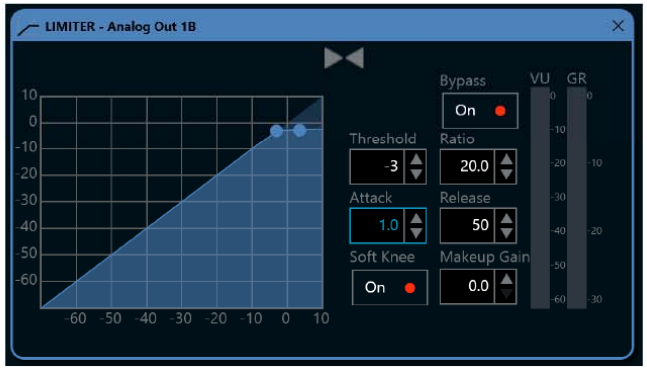
Output LIMiter (LIM):

To prevent excessive output levels:

- Threshold: -3 dB
- Ratio: 20:1
- Attack: 0.1 ms
- Release: 50 ms
- Soft knee: ON
- Makeup Gain: 0 dB

For a 14-dB crest factor (headroom):

- Threshold: -10 dB
- Ratio: 10:1
- Attack: 0.1 ms
- Release: 50 ms
- Soft knee: ON
- Makeup gain: +6 dB



Audio Processing

Dynamics

- Use limiters on outputs to amplifiers and recording devices to prevent overdriving
- Use compression on microphones:
  - 2:1 to 4:1 on conversational speech
  - 4:1 to 6:1 on lecture/presentation
  - 4:1 or greater on dynamic instruments
- Use gates on conferencing microphones when automixing is not used
- Use AGC on telephone and recording device feeds

Audio Processing

Automixing

- Use gated automixing for conferencing
- Use gain sharing automixing for panel discussions and recording applications

General Procedures

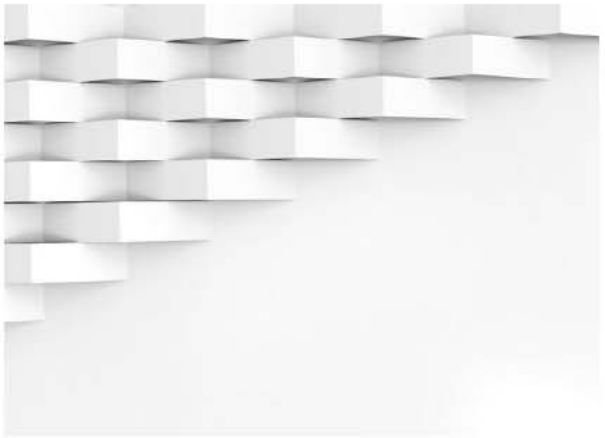
- Equalize using a "subtractive" process (use cut rather than boost)
- Understand the bandwidth of any content
- Know loudspeaker frequency response and power handling capabilities
- Perform delay alignments before performing equalization
- Understand the target levels for your application
- Understand how to accurately use your test equipment
- **Practice**

Audio Processing

Room Acoustics

Reflection

Absorption



Diffusion

Which is a correct statement?

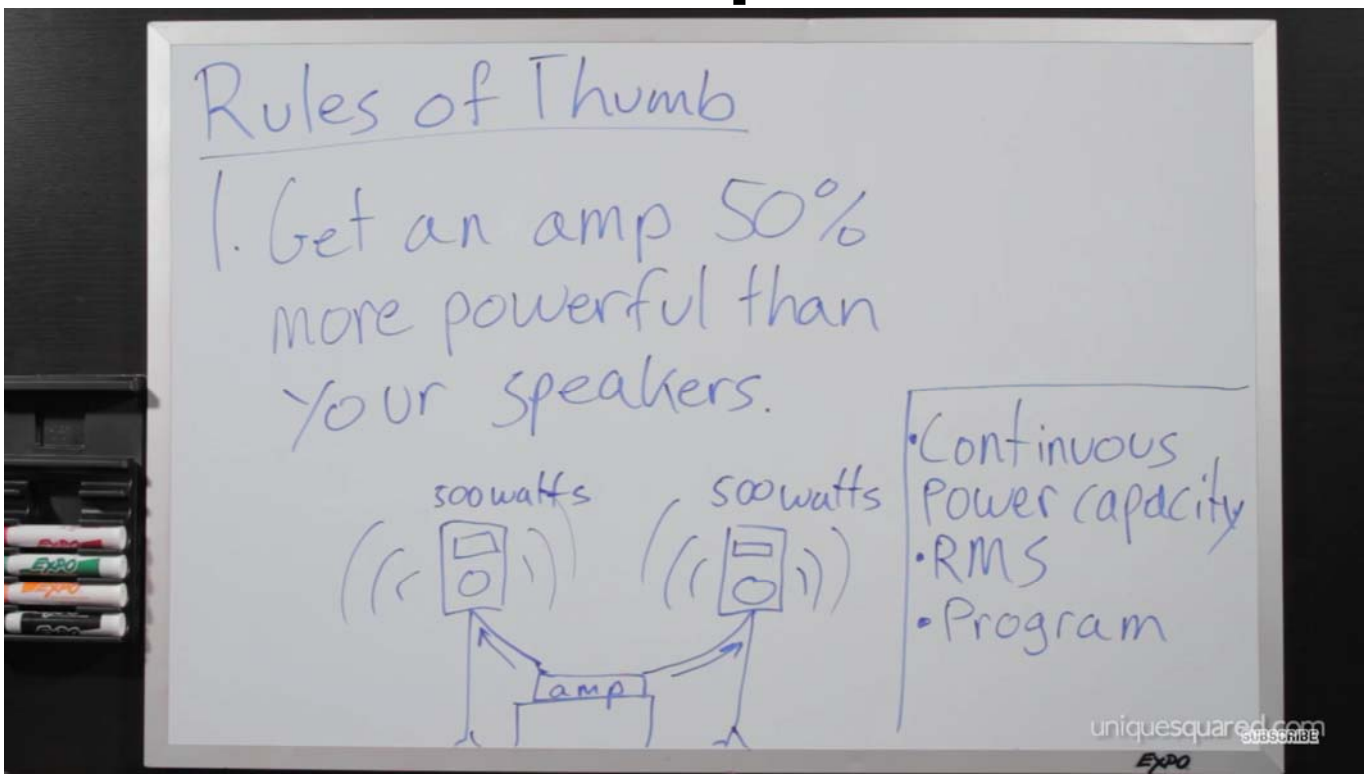
A.
Start with the amplifier and work back to set levels

B.
Amplifiers can handle any level sent to them and you just attenuate the signal if it is too loud

C.
Processing can fix any audio issue and especially if you use a lot of processing options

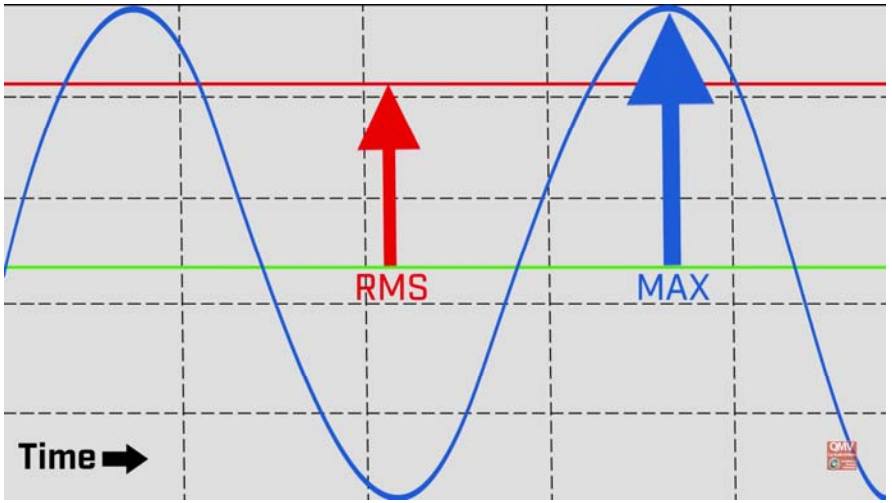
D.
Get input to Unity Gain asap and then maintain throughout

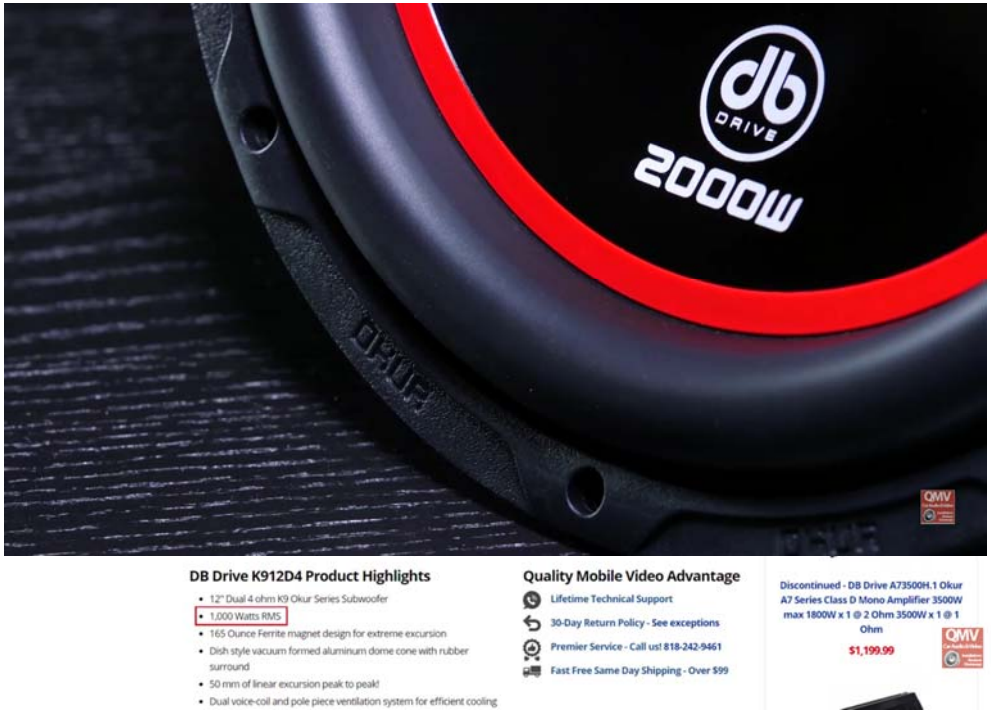
Audio Amplifiers



At minimum – 20%

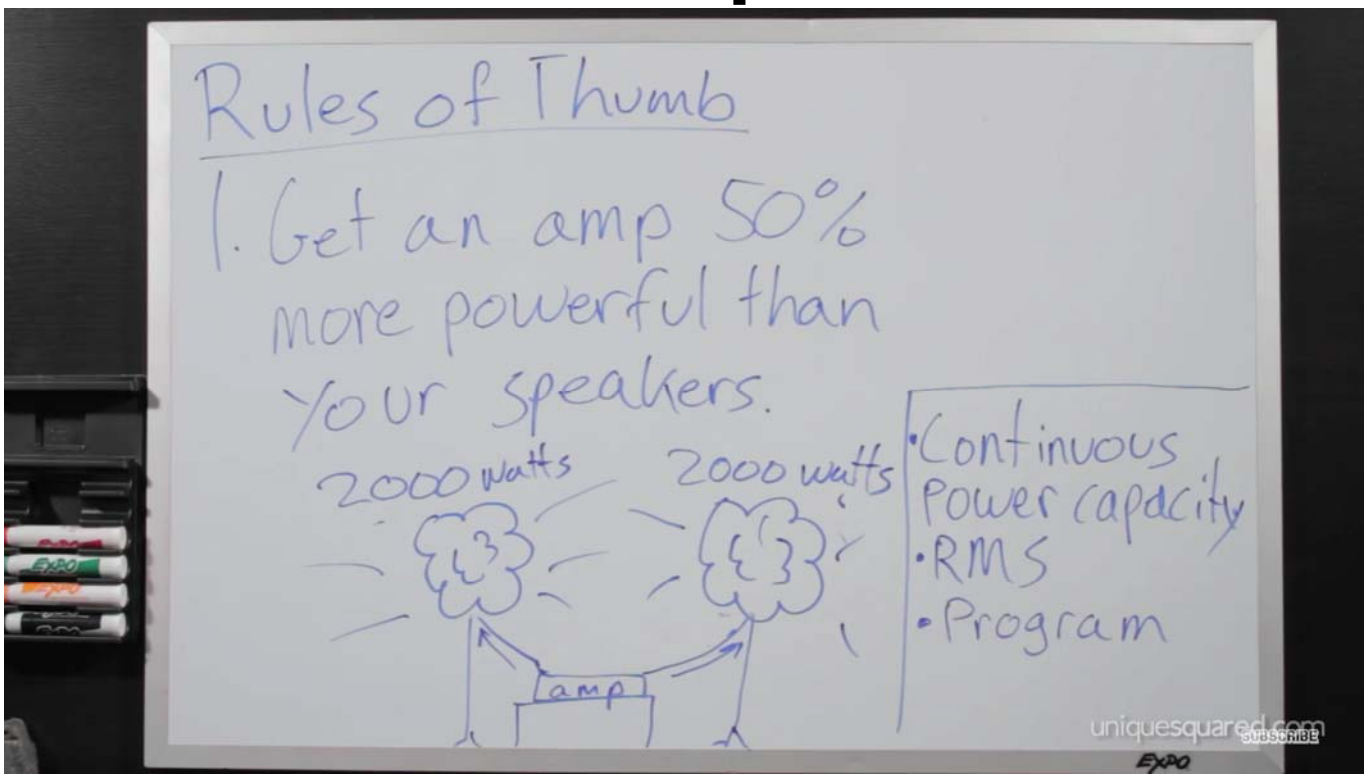
Audio Amplifiers



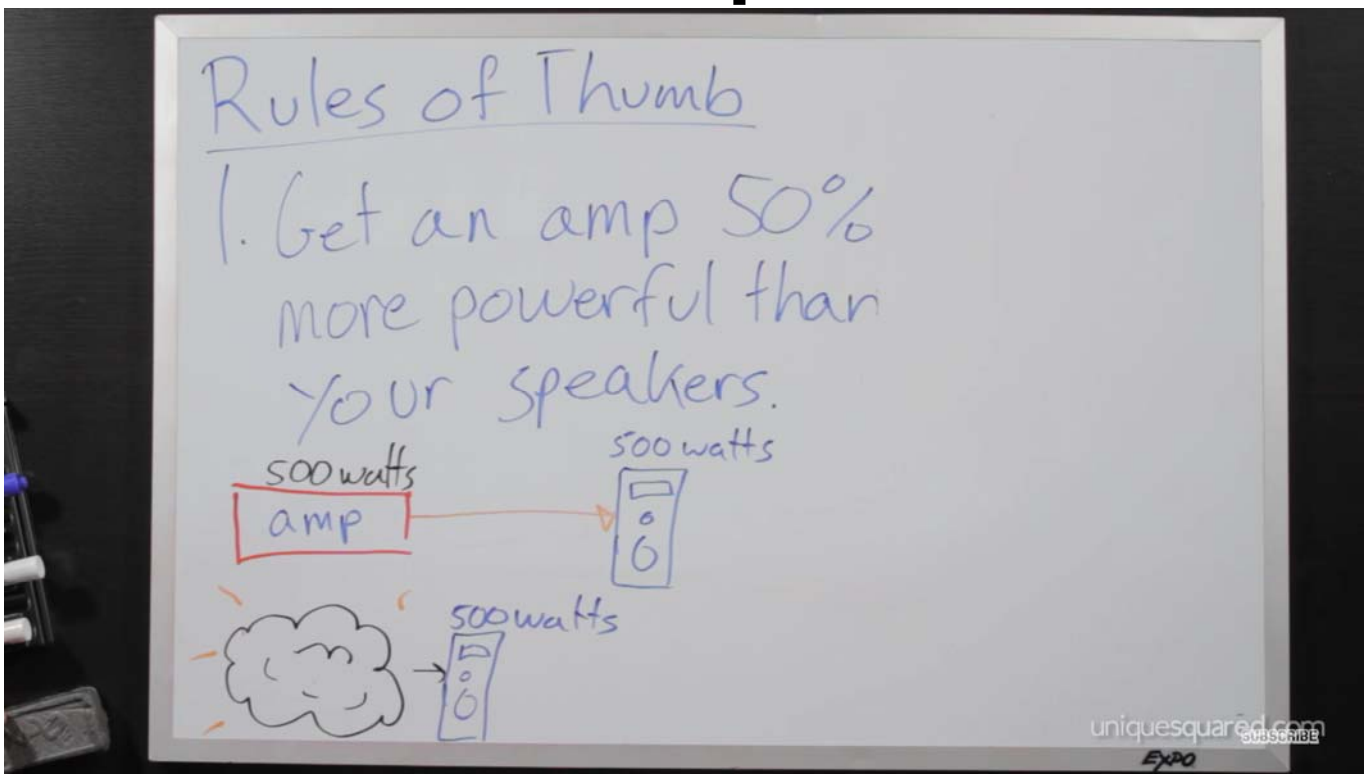


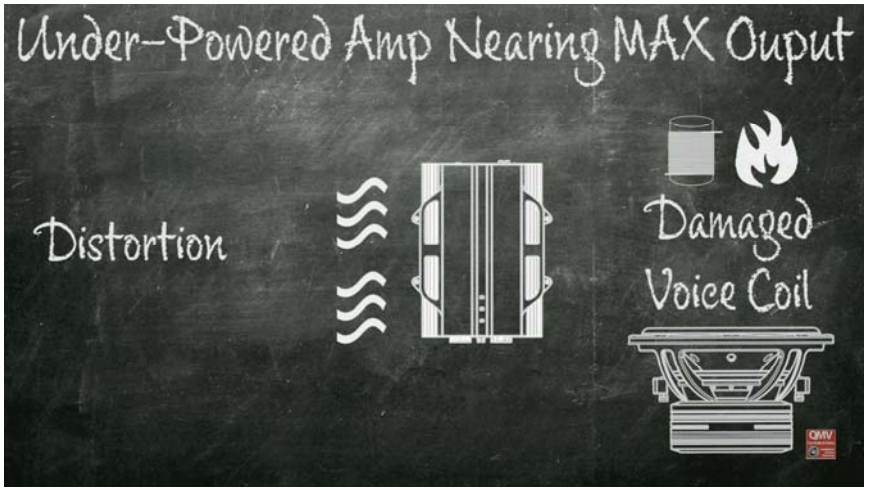
Audio Amplifiers

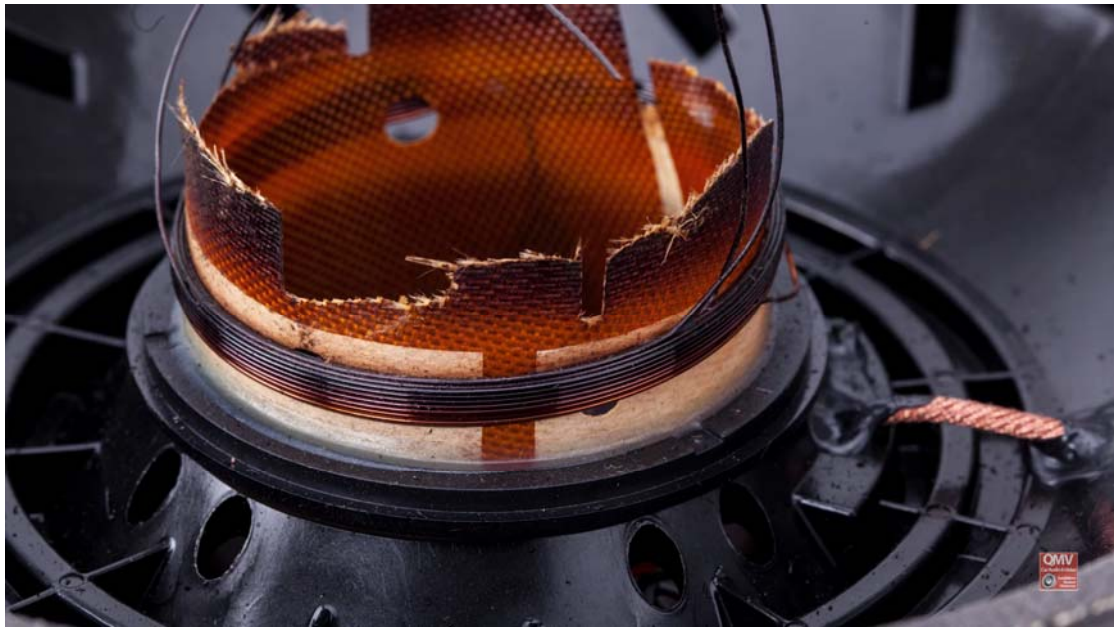
Audio Amplifiers



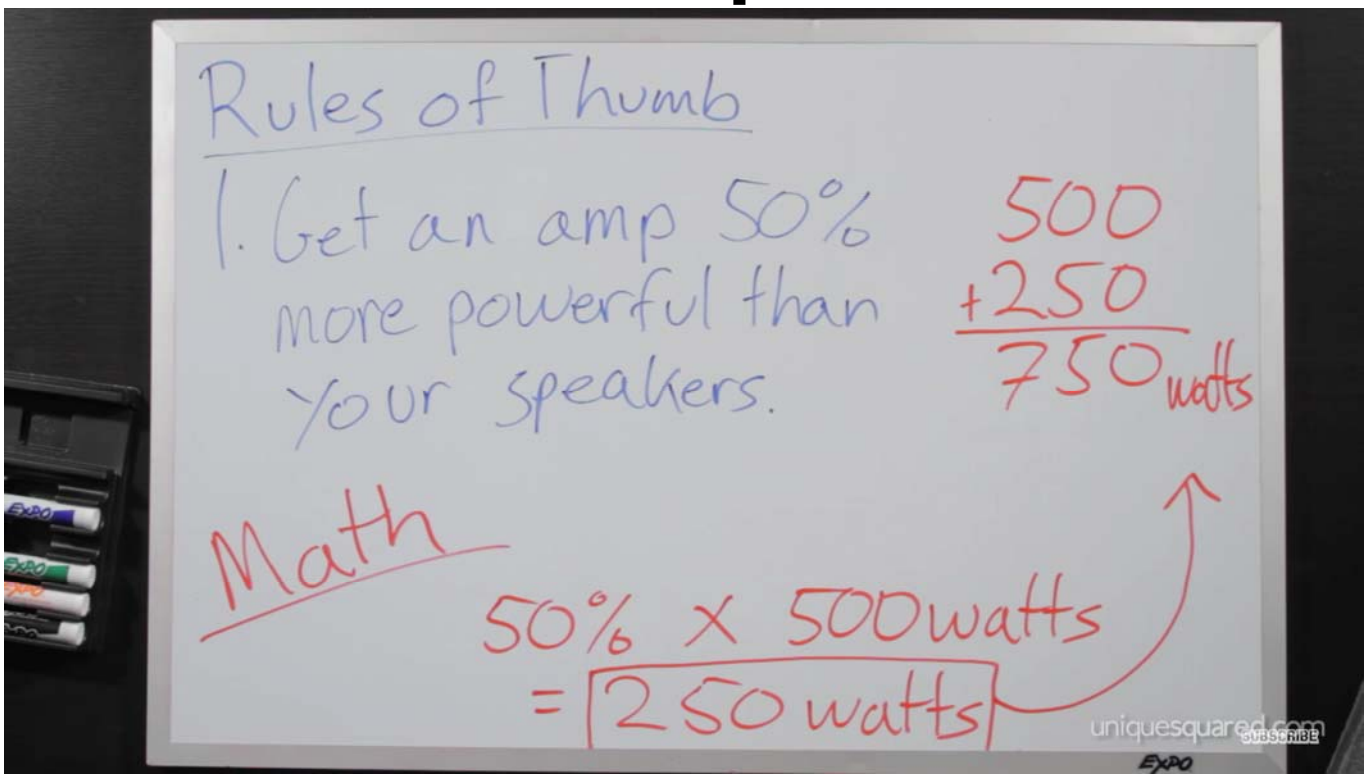
Audio Amplifiers



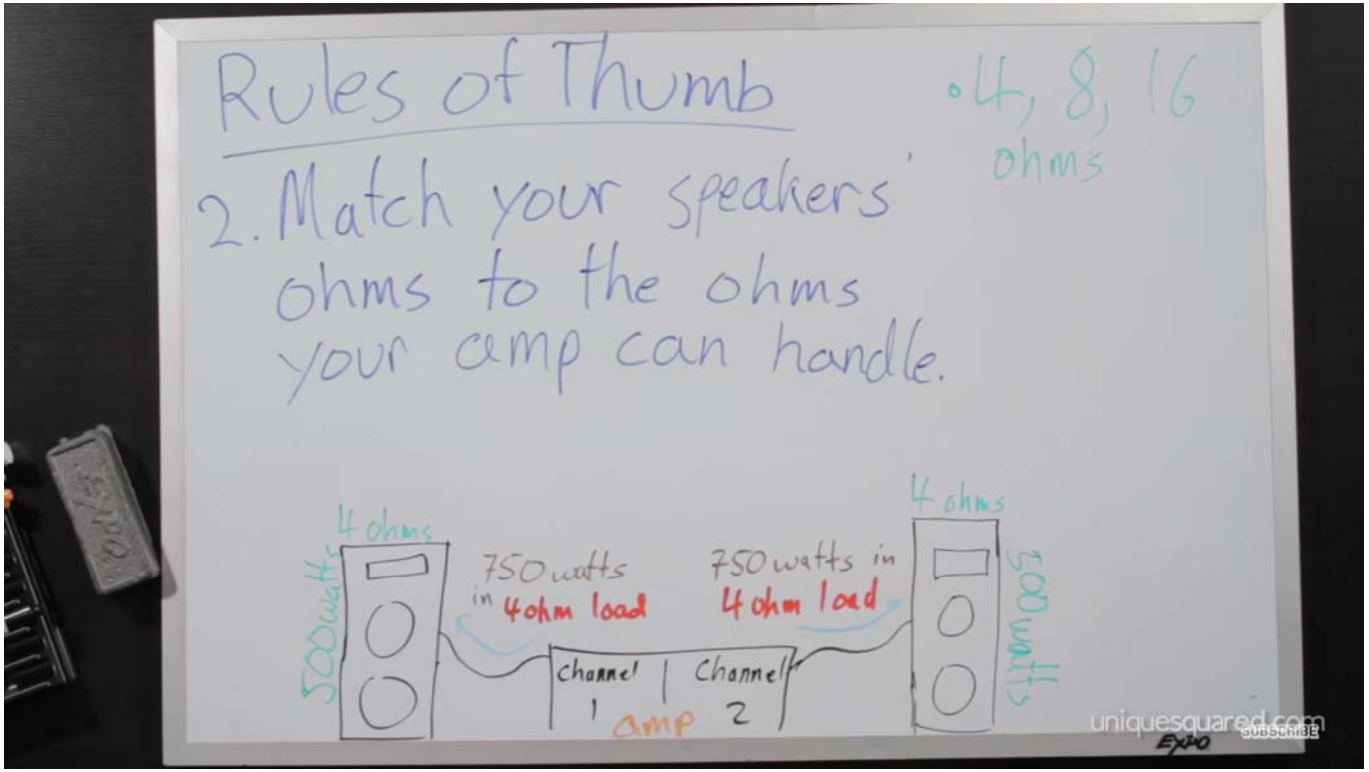

Under-Powered Amp Nearing MAX Ouput
Distortion
Damaged
Voice Coil



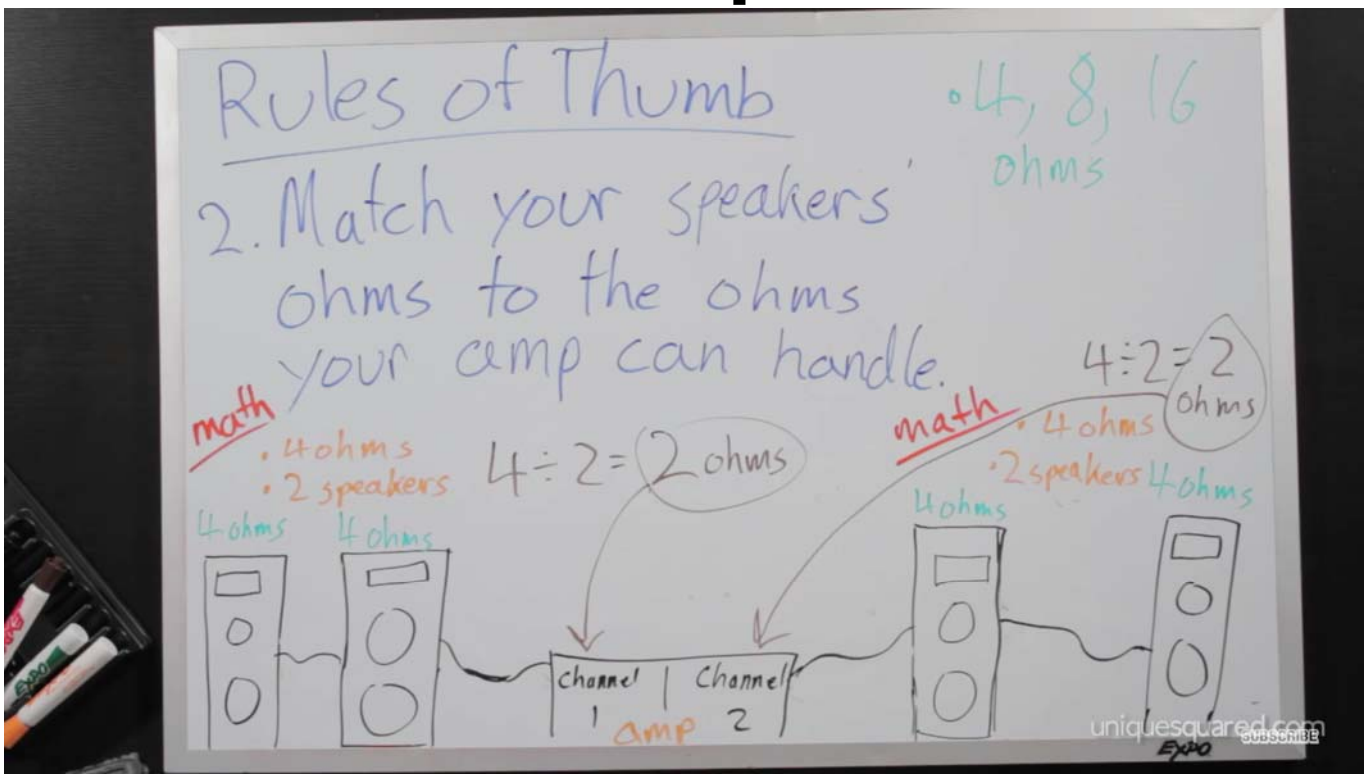
Audio Amplifiers



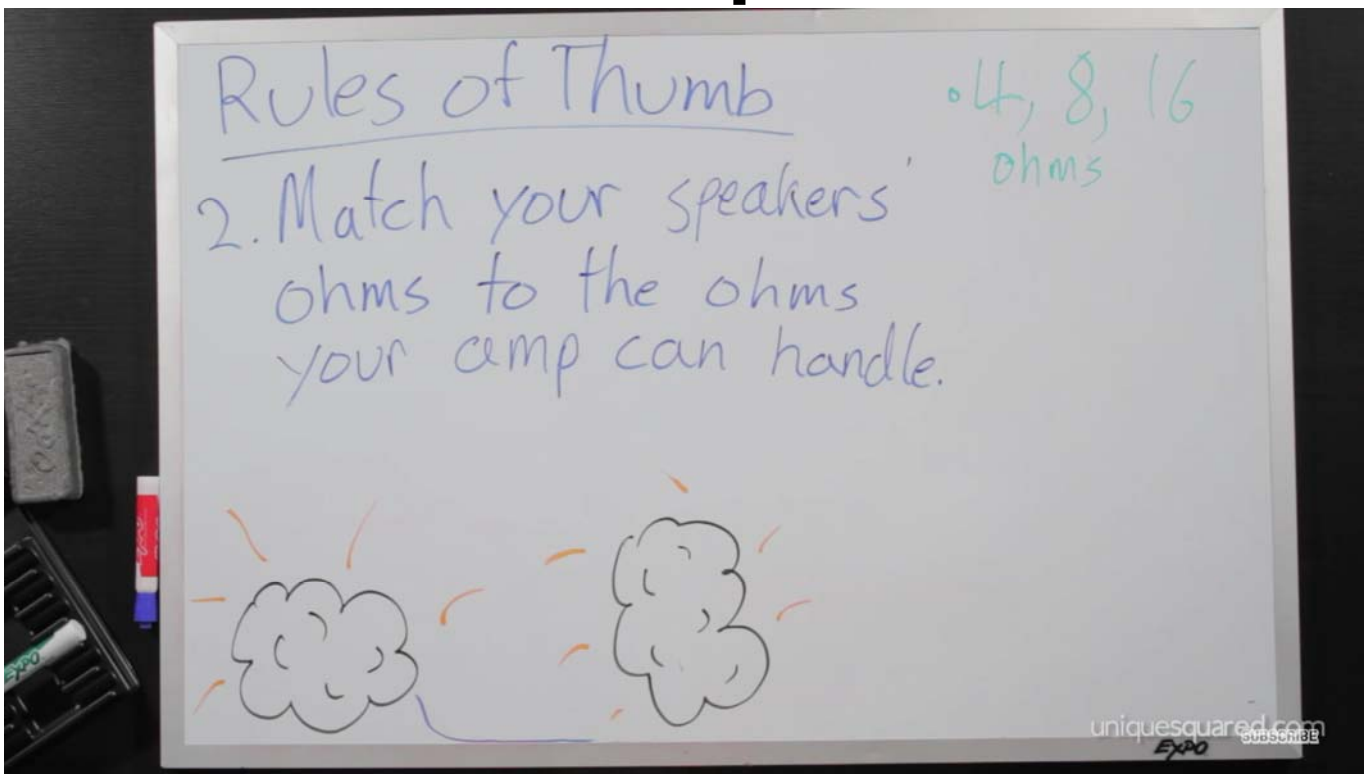
Audio Amplifiers

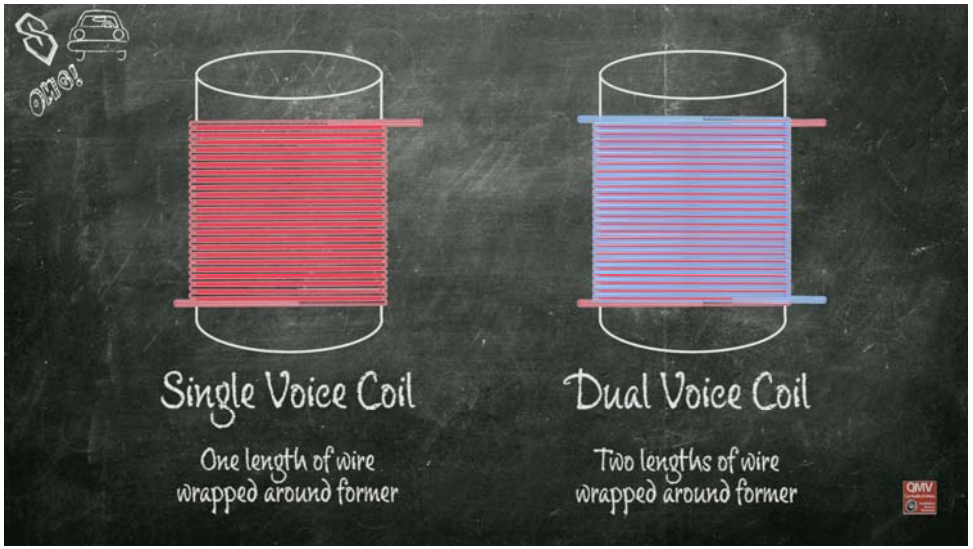


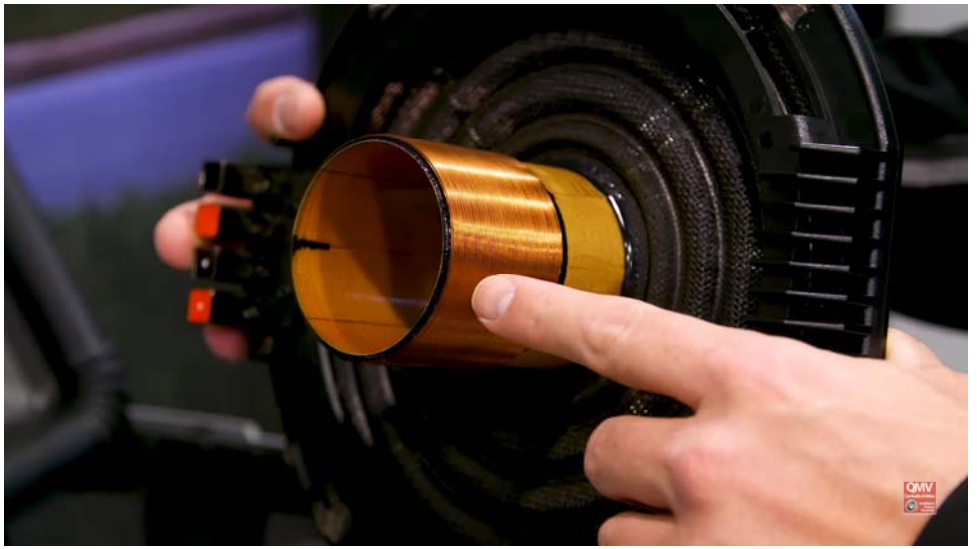
Audio Amplifiers



Audio Amplifiers




Single Voice Coil
One length of wire
wrapped around former
Dual Voice Coil
Two lengths of wire
wrapped around former

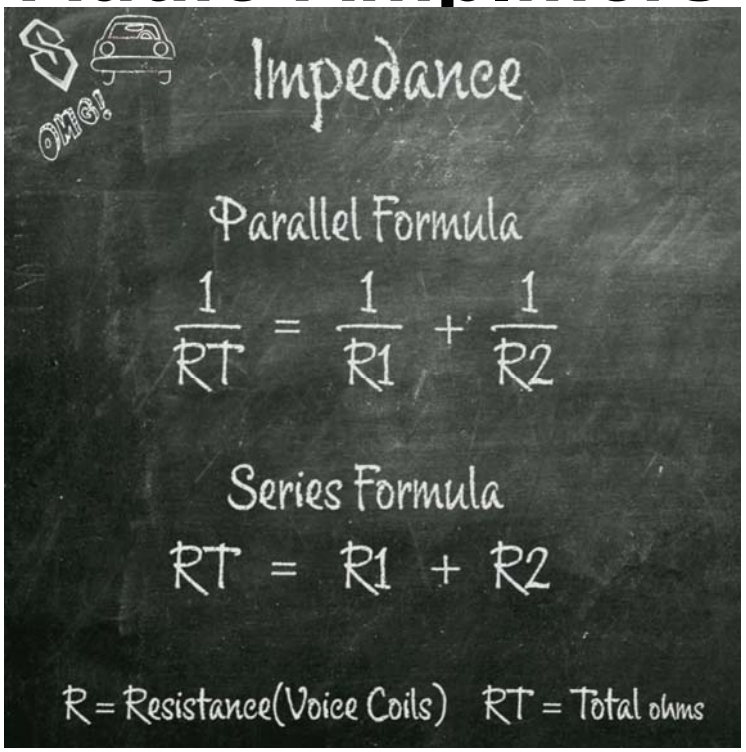



KICKER


KICKER

Audio Amplifiers

If all of the coils are the same impedance, it is very easy to calculate final impedance. You will take the impedance of the voice coils and divide by the number of voice coils. This formula only works if all the voice coils are the same impedance.



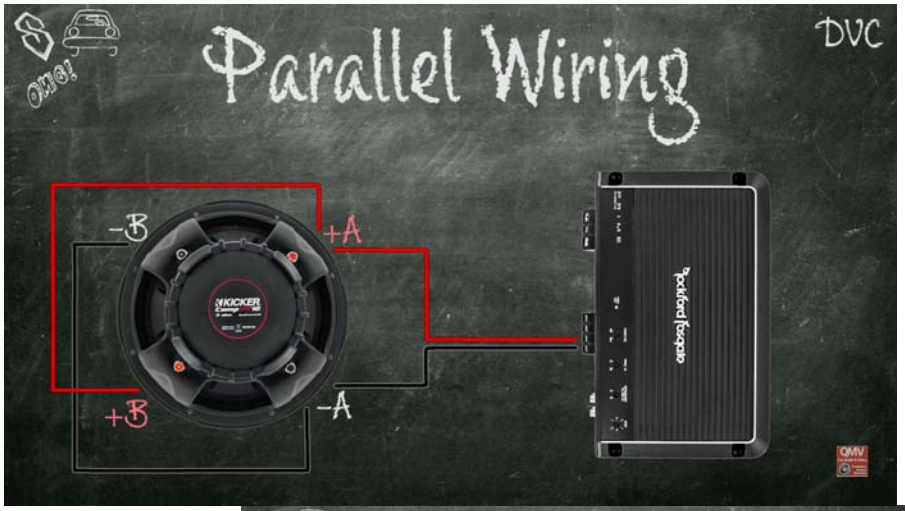
You have two 4 Ω speakers and an 8 Ω speaker:

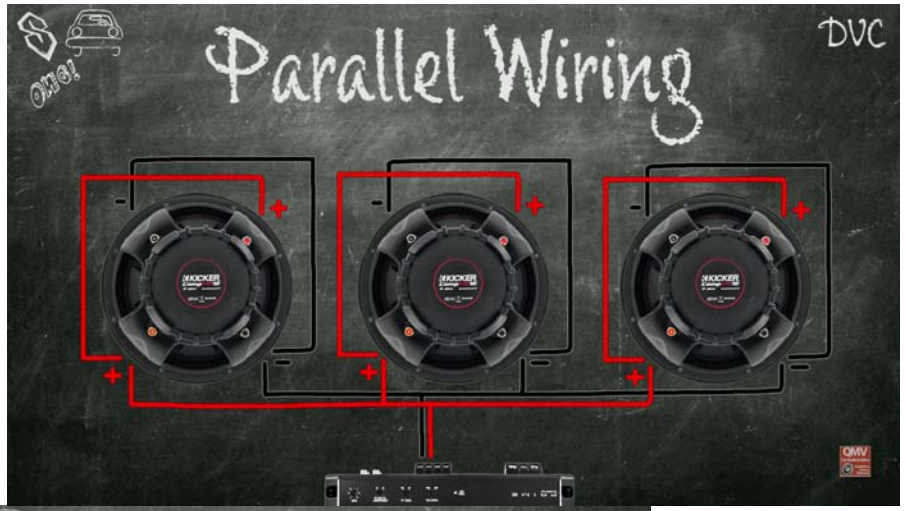
1/4 Ω + 1/4 Ω + 1/8 Ω = 1/Rtotal
.25 + .25 + .125 = 1/Rtotal
.625 = 1/Rtotal
= 1.6 Ω ***not all the speakers will get the same power

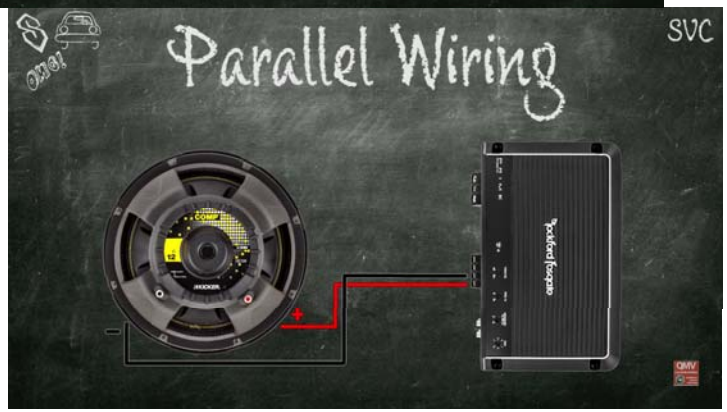
When you wire voice coils in series, you will simply add the resistance of all the voice coils to know what the impedance will be at the amplifier.

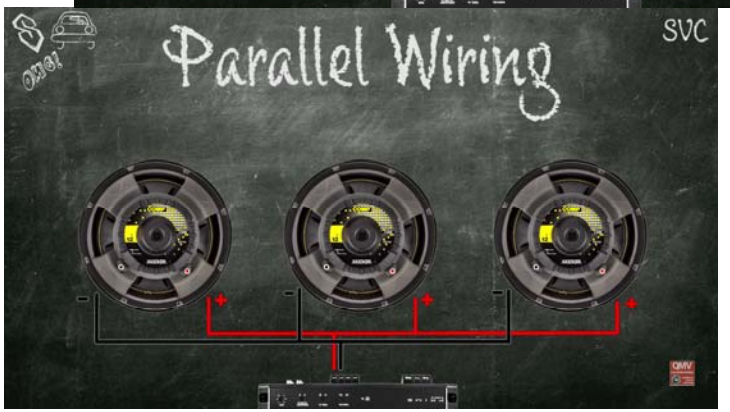
The coils do not need to be the same impedance but it will affect how much power each speaker receives from the amplifier.

It is never recommended to mix impedances of speakers connected to the same terminals.



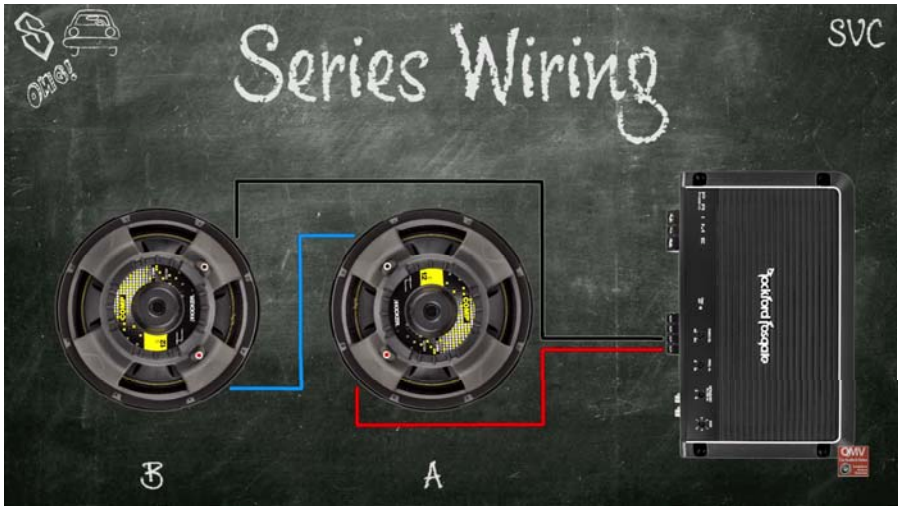


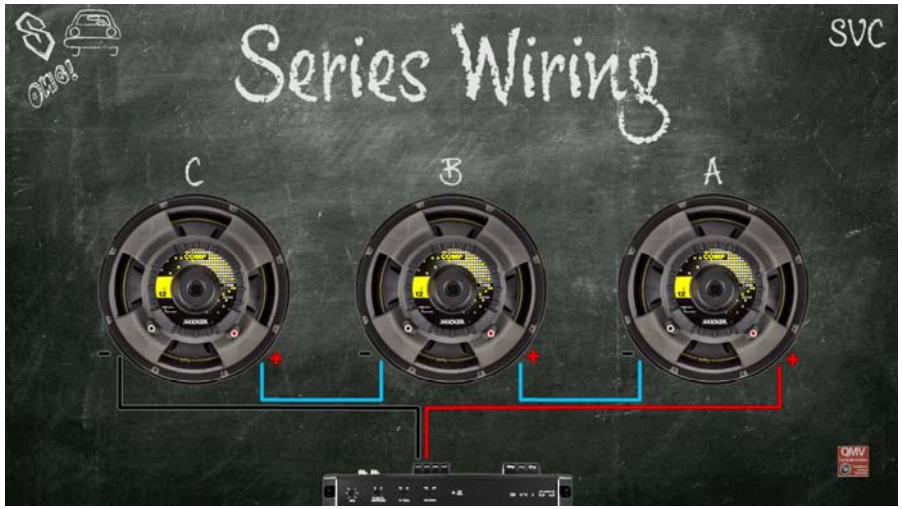




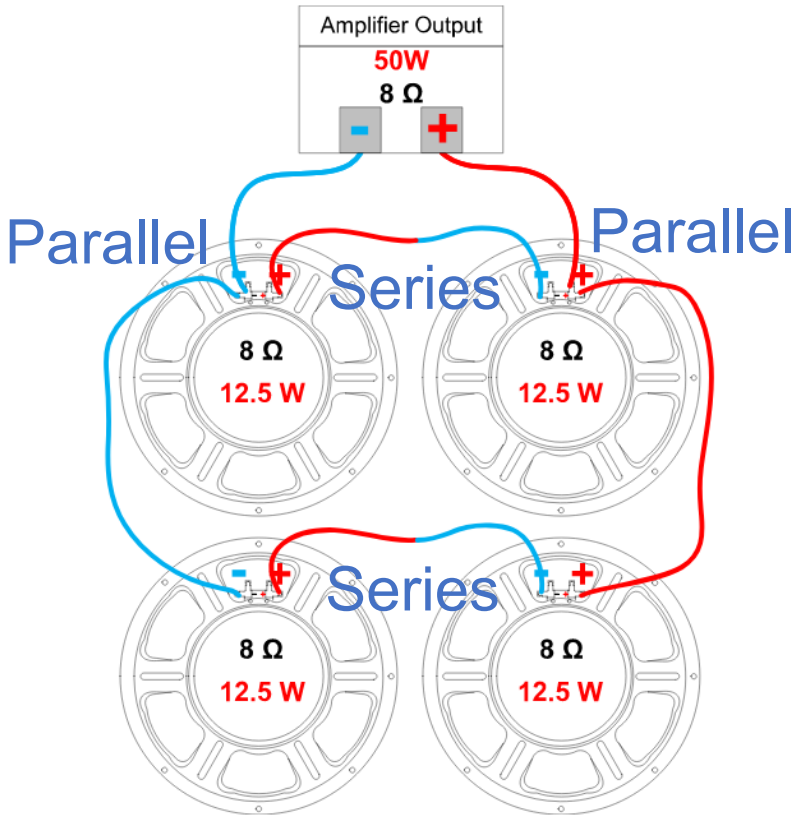
Daisy chain the + on speakers to the + on the amp

Daisy chain the – on the speakers to the – on the amp



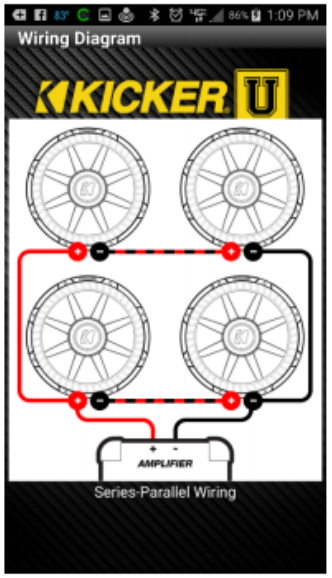


Home run a + then send the – of that speaker to the + of the next
Continue to last speaker and then home run -

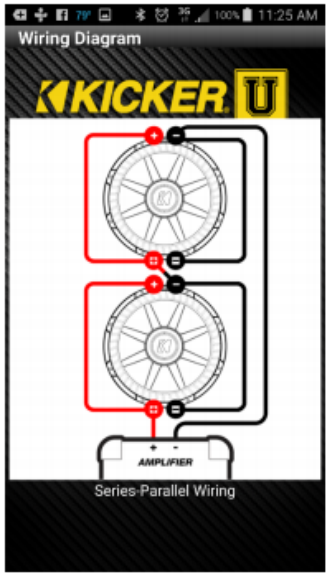


Need 4 Single Coil speakers.
Should have even number of voice coils

Four single voice coil speakers



two dual voice coils speakers

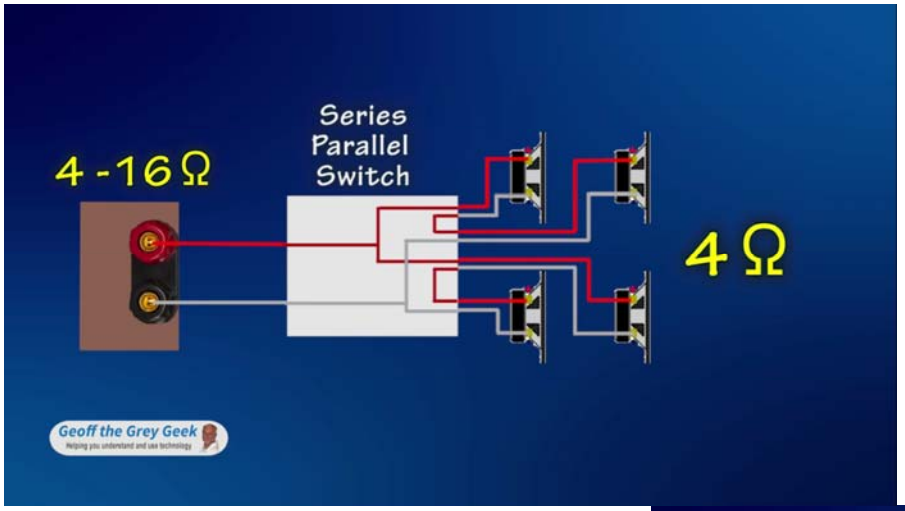


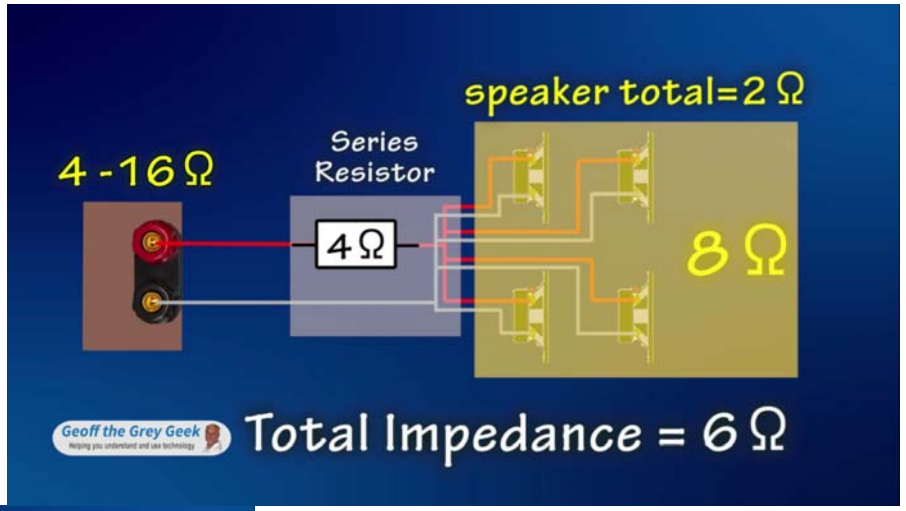
If all four speakers have the same impedance, with series-parallel wiring, the final impedance will be the same as the impedance of a single speaker.

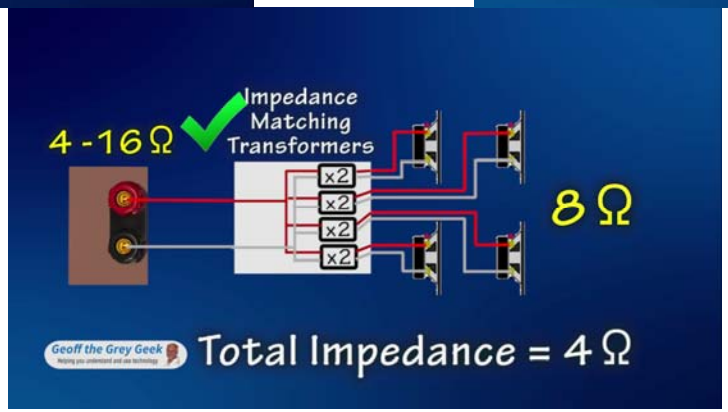
4 Single Coil 4 Ω speaker OR 2 Dual Coil 4 Ω speakers

$4\ \Omega + 4\ \Omega \,//\, 4\ \Omega + 4\ \Omega = 4\ \Omega$

$8\ \Omega \,//\, 8\ \Omega = 4\ \Omega$


4 -16 Ω
Series
Parallel
Switch
4 Ω
Geoff the Grey Geek

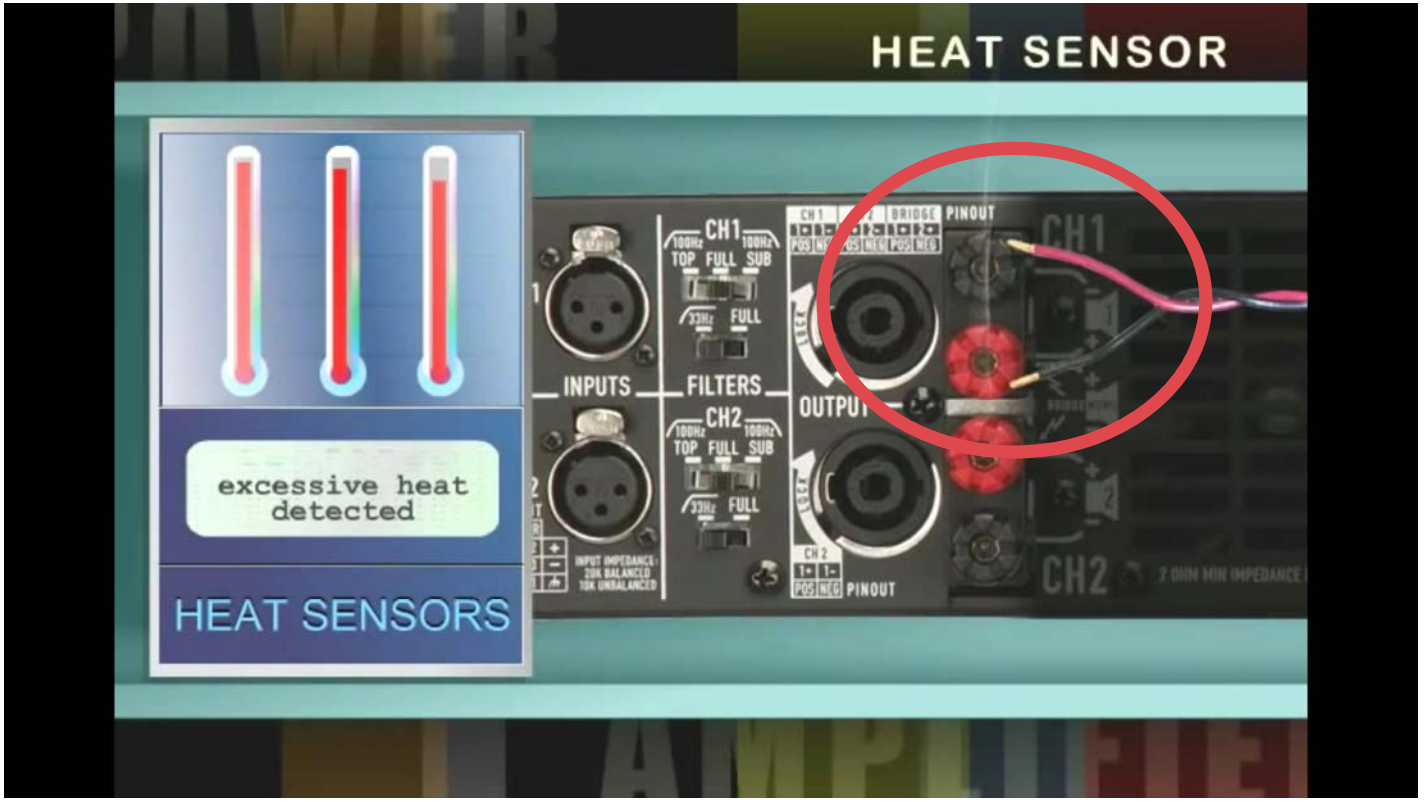

speaker total=2 Ω
4 -16 Ω
Series
Resistor
4 Ω
8 Ω
Geoff the Grey Geek
Total Impedance = 6 Ω

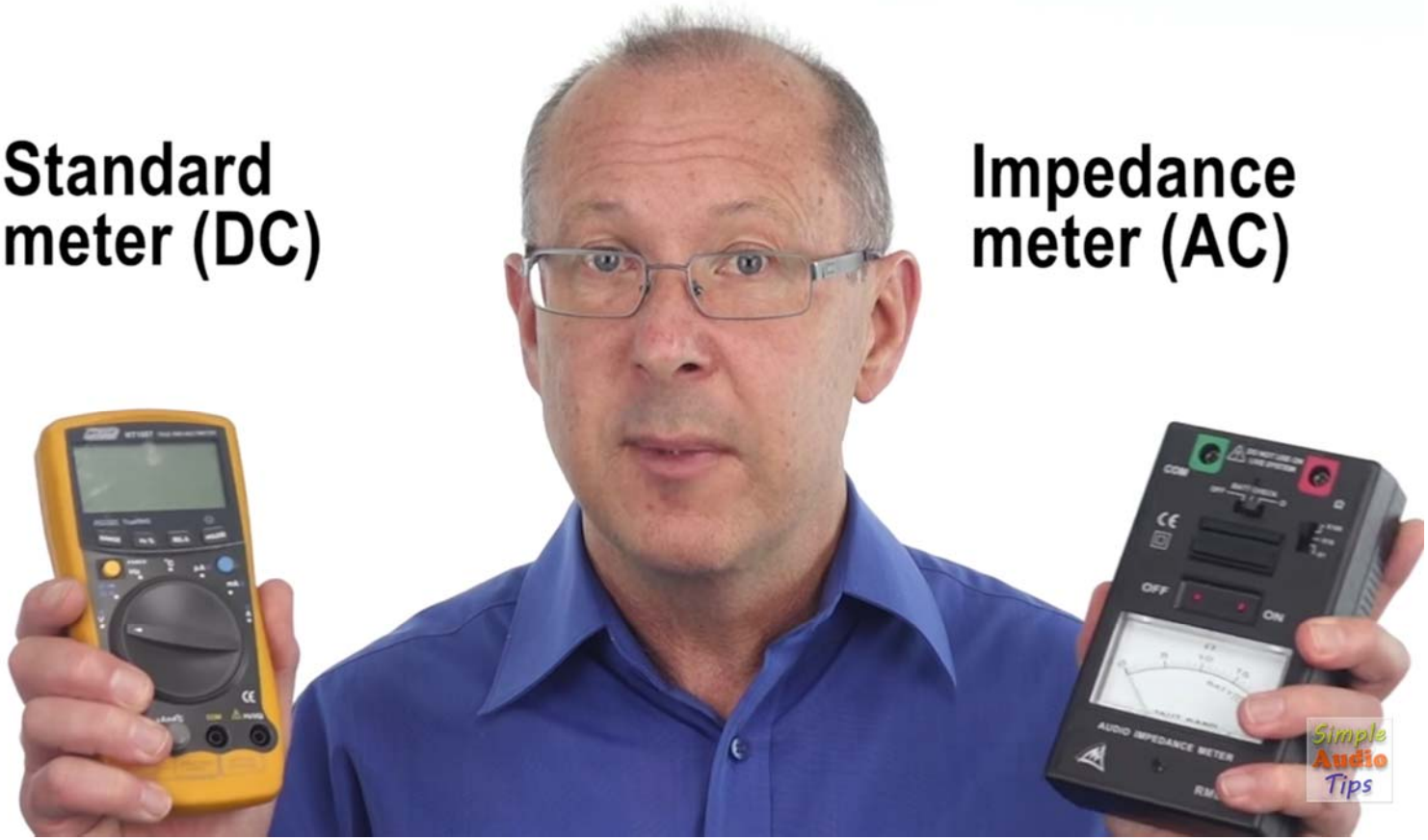

4 -16 Ω
Impedance
Matching
Transformers
x2
x2
x2
x2
8 Ω
Geoff the Grey Geek
Total Impedance = 4 Ω


OMG!
Over-Powered Amplifier
COOLER

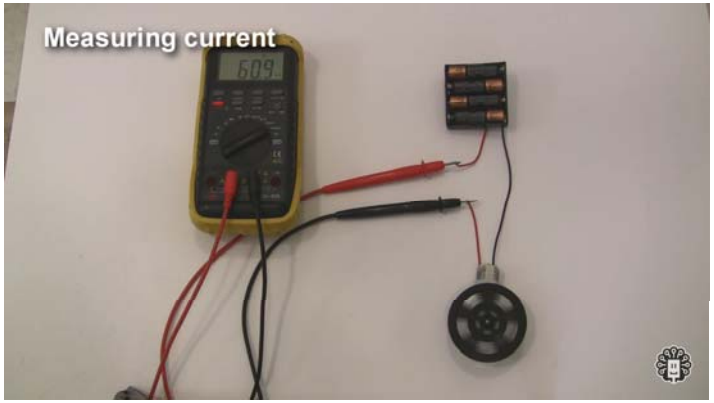

OMG!
Amplifier Power Output
2 Ohms
700W RMS
runs WARM
4 Ohms
350W RMS
runs COOL


OMG!
250W RMS 4 ohm
Four 4 ohm subs wired in Parallel equals a 1 ohm load!
1,000W RMS 1 ohm
Rockford Fosgate
PUNCH
QMV


HEAT SENSOR
excessive heat detected
HEAT SENSORS
INPUTS
FILTERS
CH1
CH2
OUTPUT
PINOUT
CH1
CH2

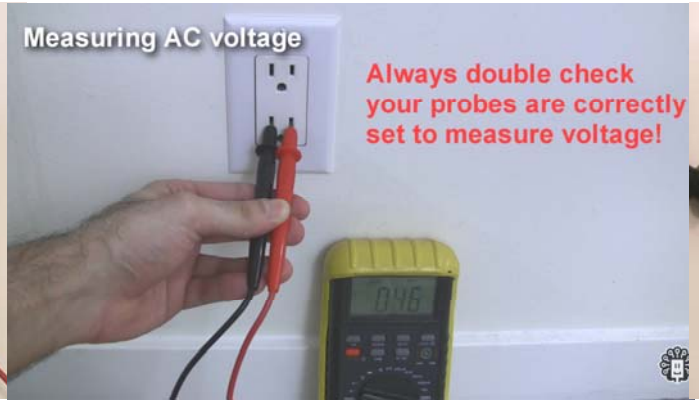

Standard
meter (DC)
Impedance
meter (AC)
OFF
ON
AUDIO IMPEDANCE METER
Simple
Audio
Tips


Continuity
NPN
PNP
hFE
400µA
4mA
Resistance Ω
40mA
400mA
Voltage
Current
V~
10A
OFF
OFF


Measuring current

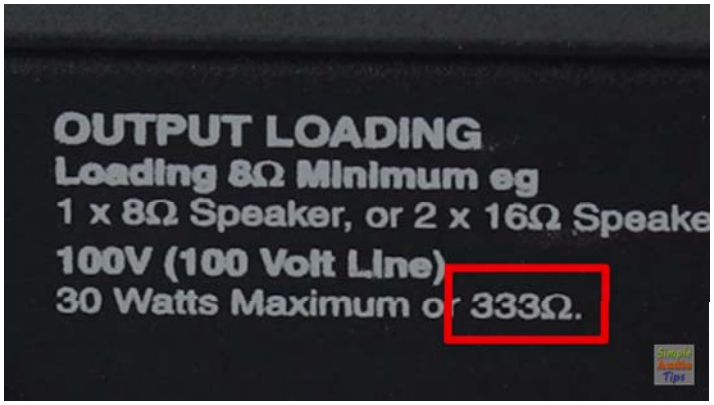

Checking continuity
OL


Measuring DC voltage


Measuring AC voltage
Always double check
your probes are correctly
set to measure voltage!

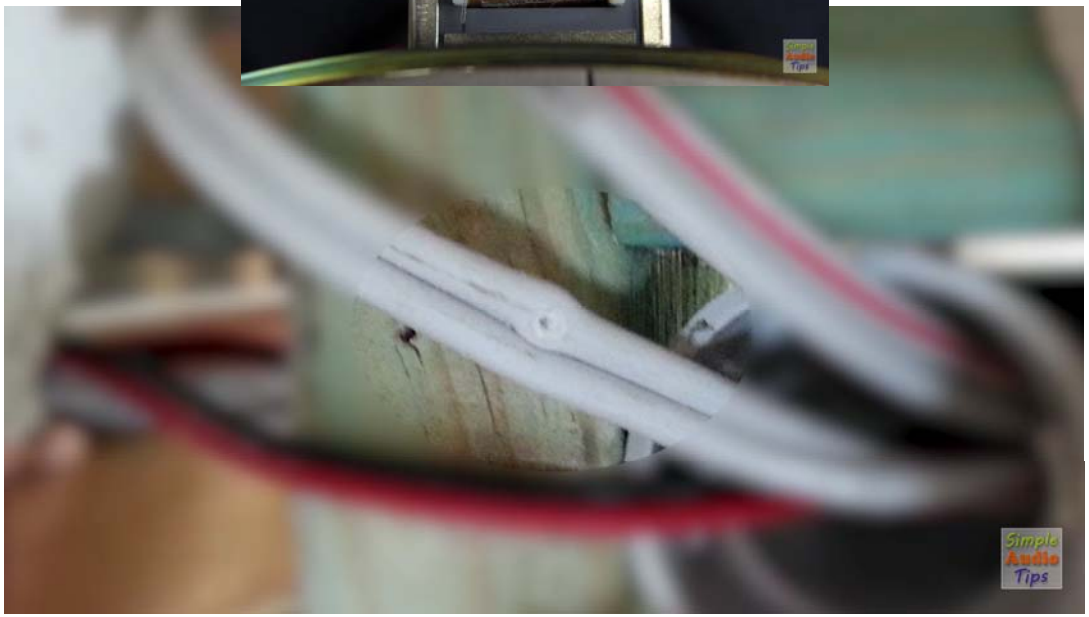

Measuring resistance
AUTO
1.002


10w
10w


OUTPUT LOADING
Loading 8Ω Minimum eg
1 x 8Ω Speaker, or 2 x 16Ω Speake
100V (100 Volt Line)
30 Watts Maximum or 333Ω.


450 Ohms
28 Ohms
COM
OFF
ON
AUDIO IMPEDANCE METER
RMM51
.0L


ATC-5015A
2.5W
5W
10W
15W
COM



MID POWER AMPLIFIER

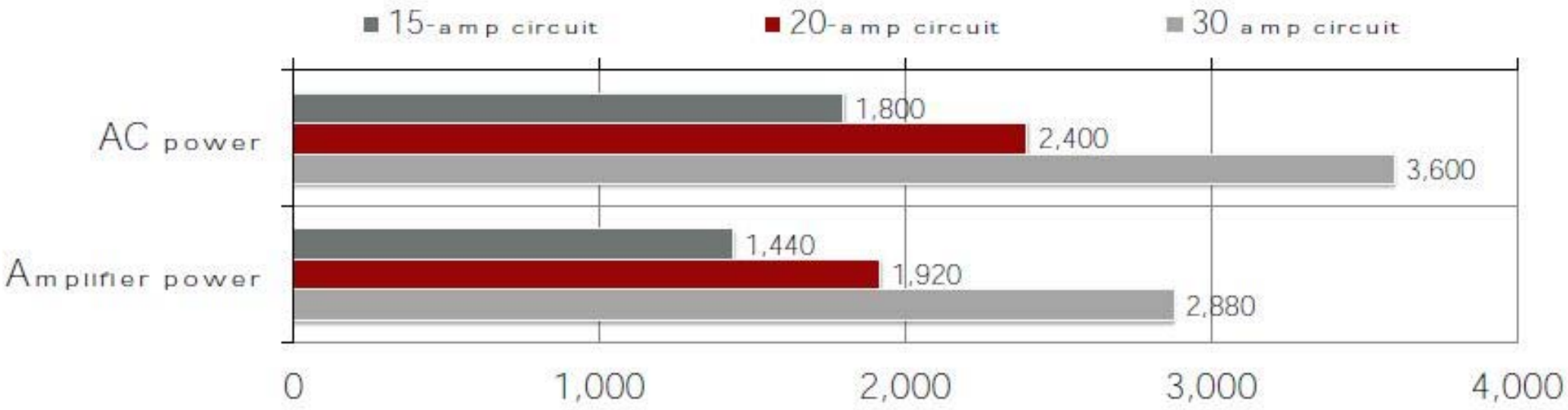
HIGH POWER AMPLIFIER

REMEMBER

THE POWER AMPLIFIER IS DEPENDENT ON THE AC POWER SOURCE TO PRODUCE THE POWER IT WAS DESIGNED TO DELIVER

Amplifier sizing:

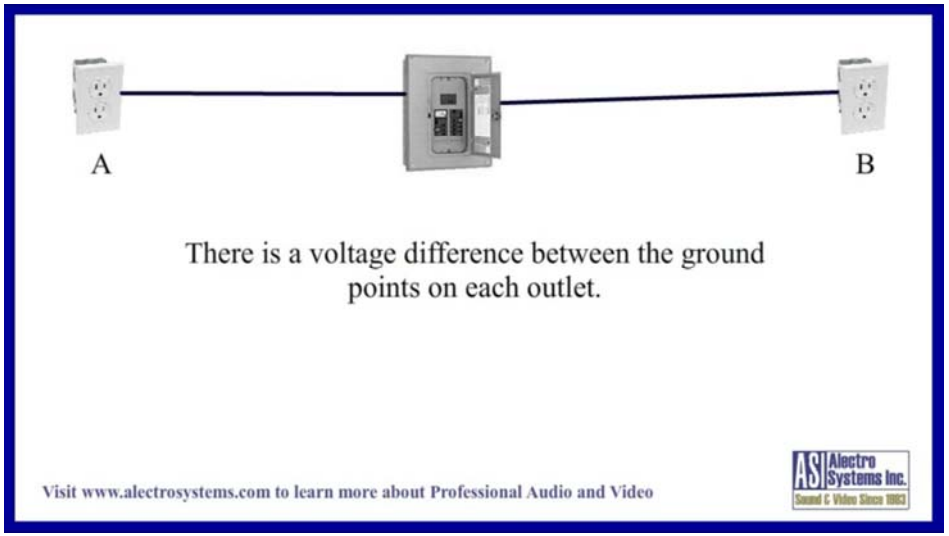
Class D amplification is fairly efficient, so given 80% efficiency:

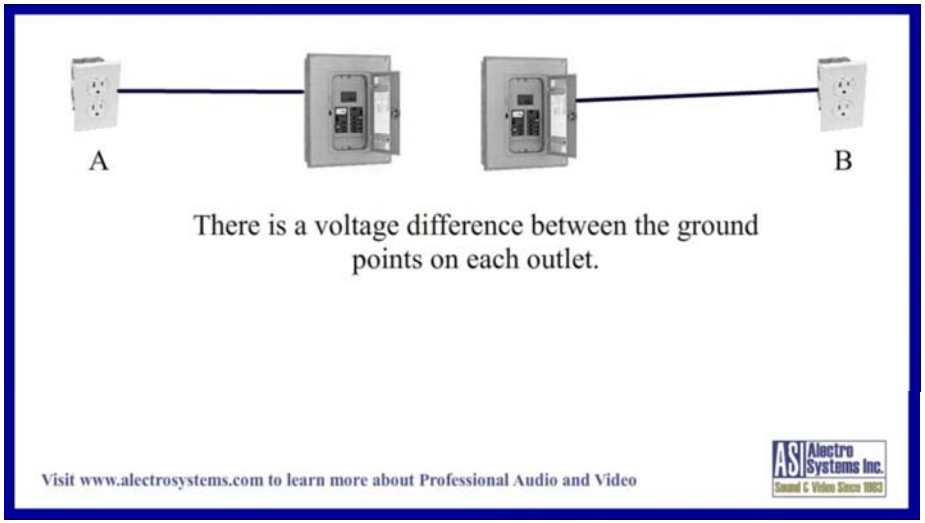


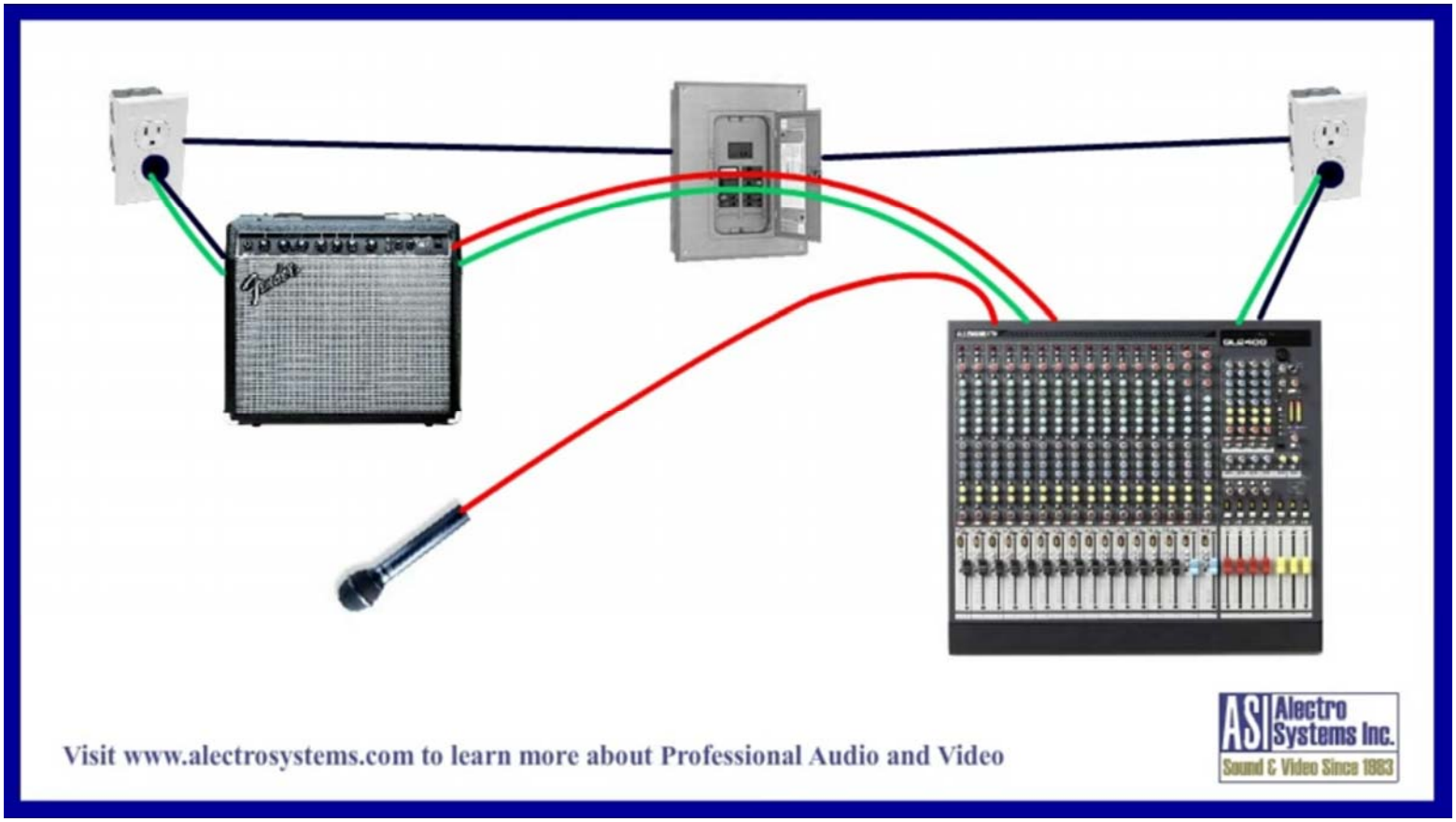
A single 15-amp circuit at 120 VAC delivers 1800 watts (15 X 120) of long-term power, so no matter what an amplifier's power rating is, the AC circuit is the limiting factor

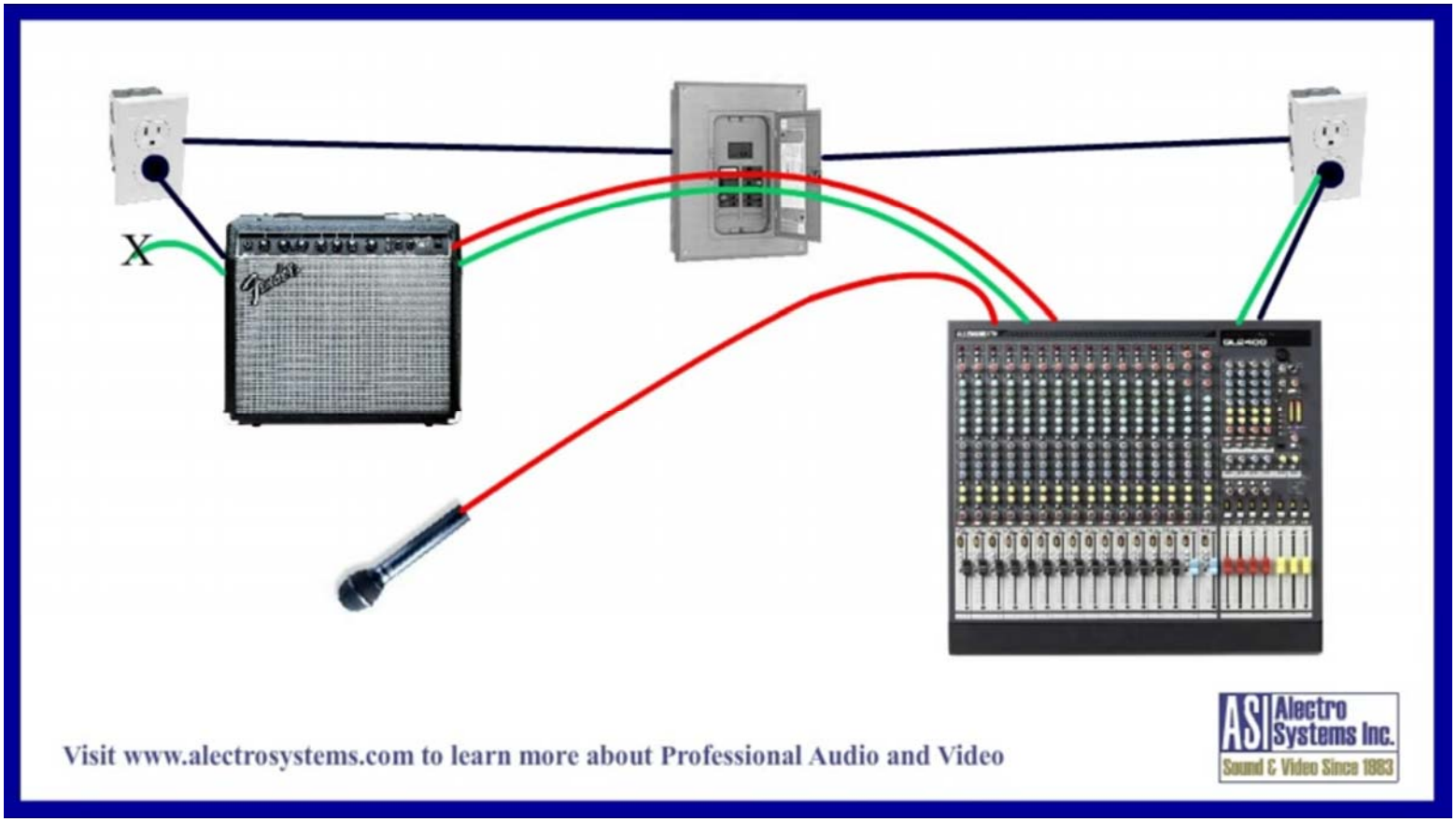

IF THE AC SOURCE IS NOT CLEAN,
HUM
BUZZ
OR IF PROPER GROUNDING IS NOT IMPLEMENTED,

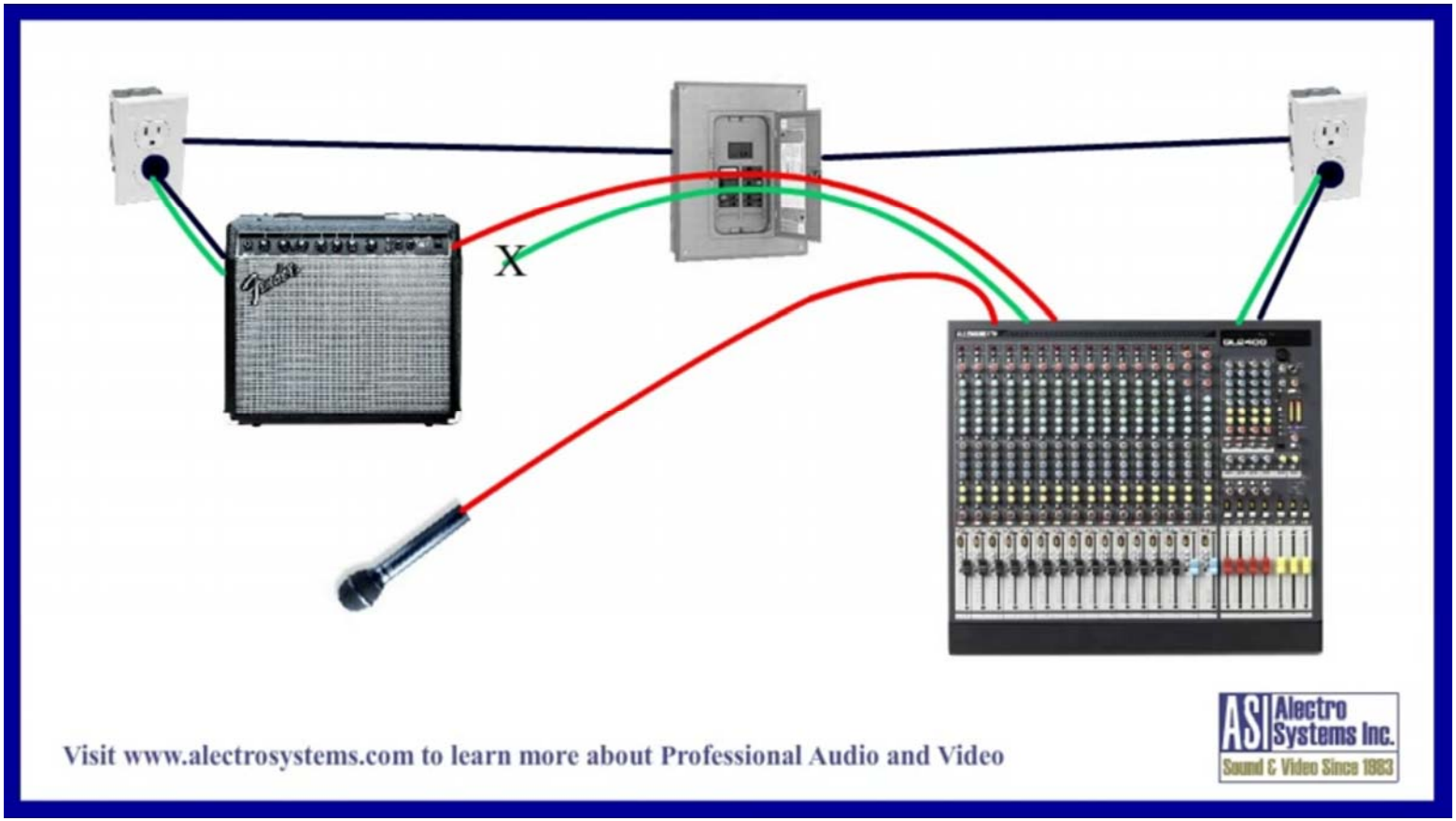

110 VOLTS
POWER CONDITIONER
120 VOLTS
120 VOLTS
120 VOLTS
120 VOLTS

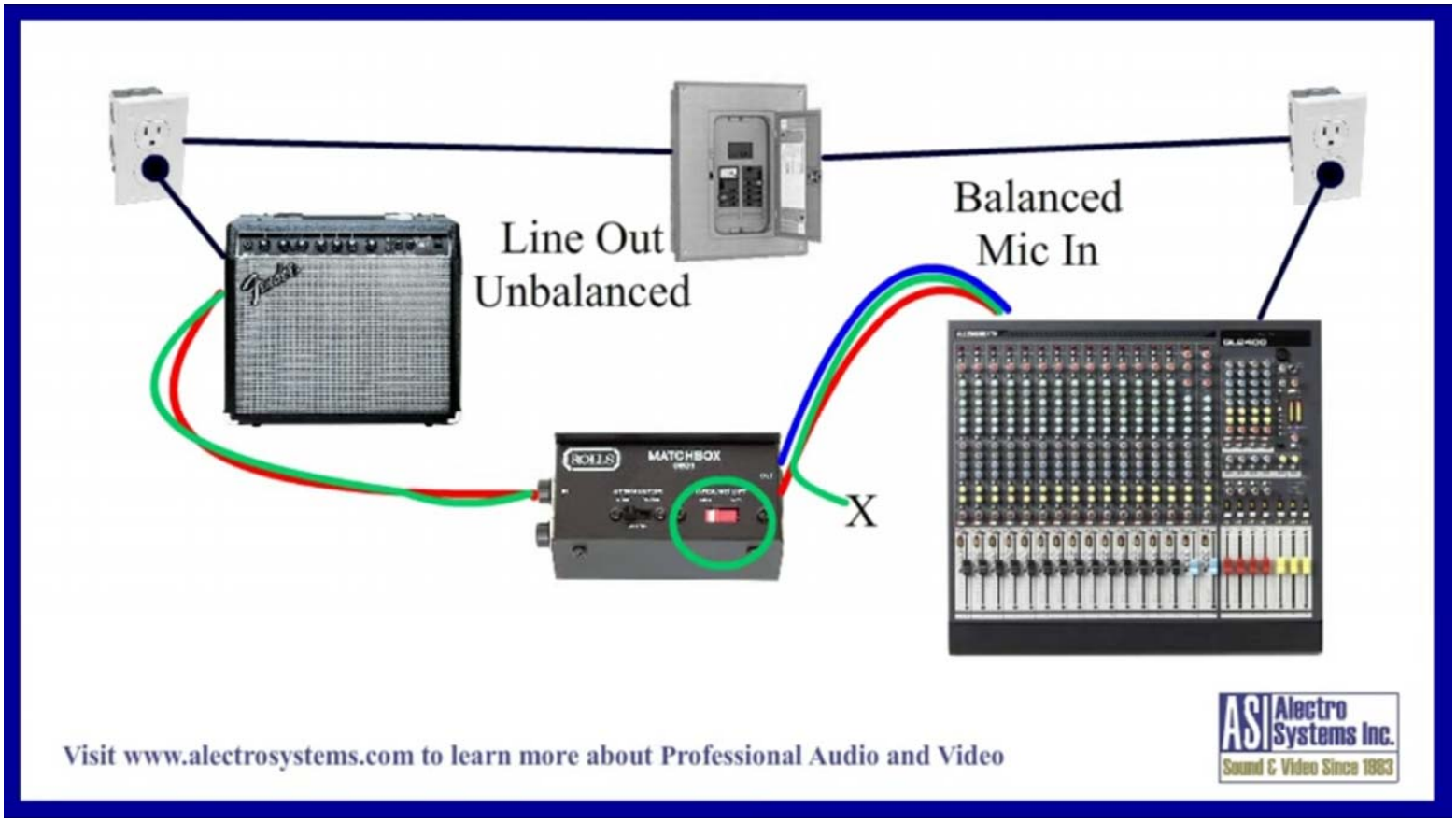

A
B
There is a voltage difference between the ground points on each outlet.
Visit www.alectrosystems.com to learn more about Professional Audio and Video
Alectro Systems Inc.


A
B
There is a voltage difference between the ground points on each outlet.
Visit www.alectrosystems.com to learn more about Professional Audio and Video
Alectro Systems Inc.

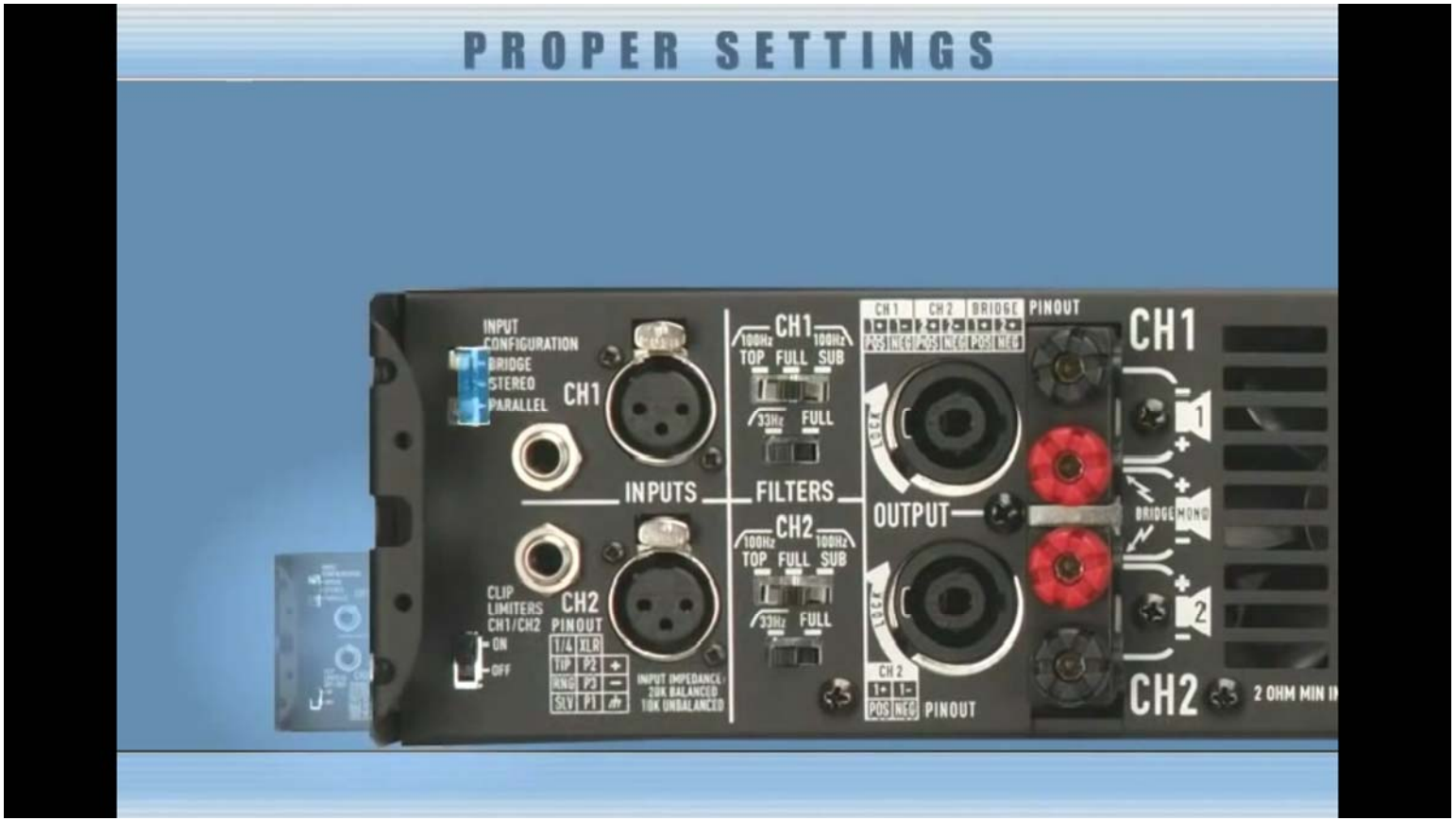

Visit www.alectrosystems.com to learn more about Professional Audio and Video
ASI Alectro Systems Inc.
Sound & Video Since 1983

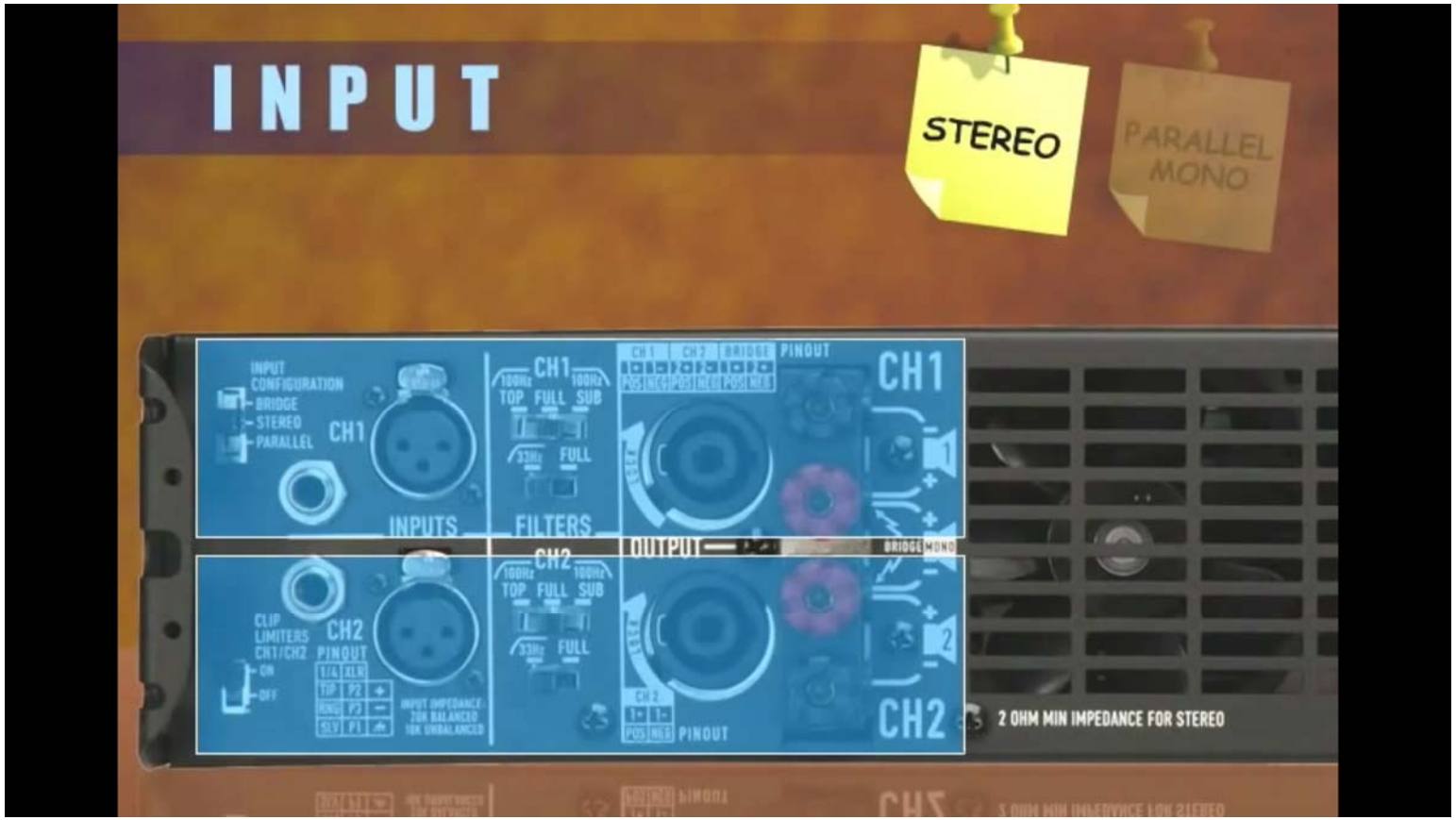

X
Visit www.alectrosystems.com to learn more about Professional Audio and Video
ASI Alectro Systems Inc.
Sound & Video Since 1983

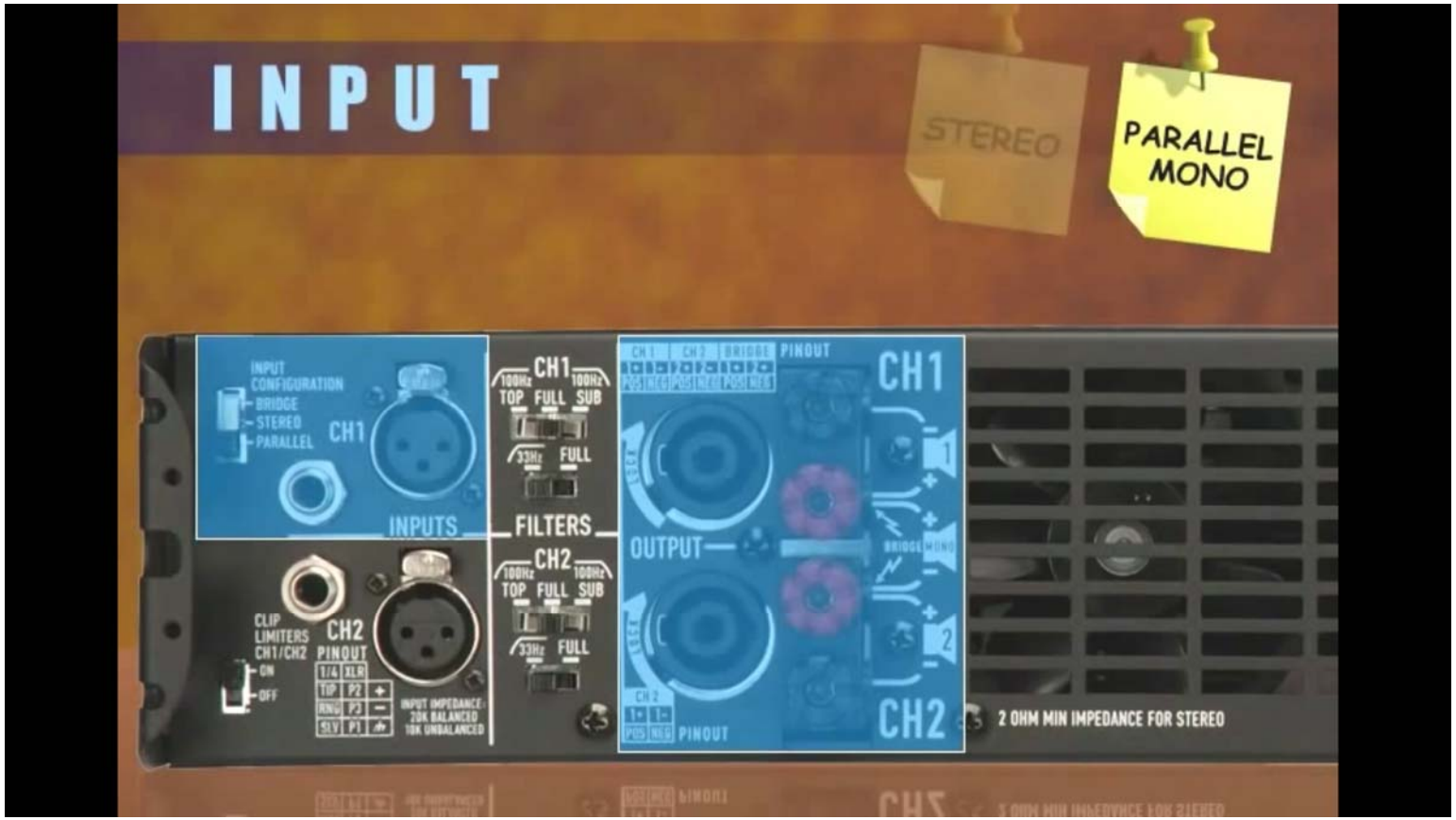

X
Visit www.alectrosystems.com to learn more about Professional Audio and Video
ASI Alectro Systems Inc.
Sound & Video Since 1983

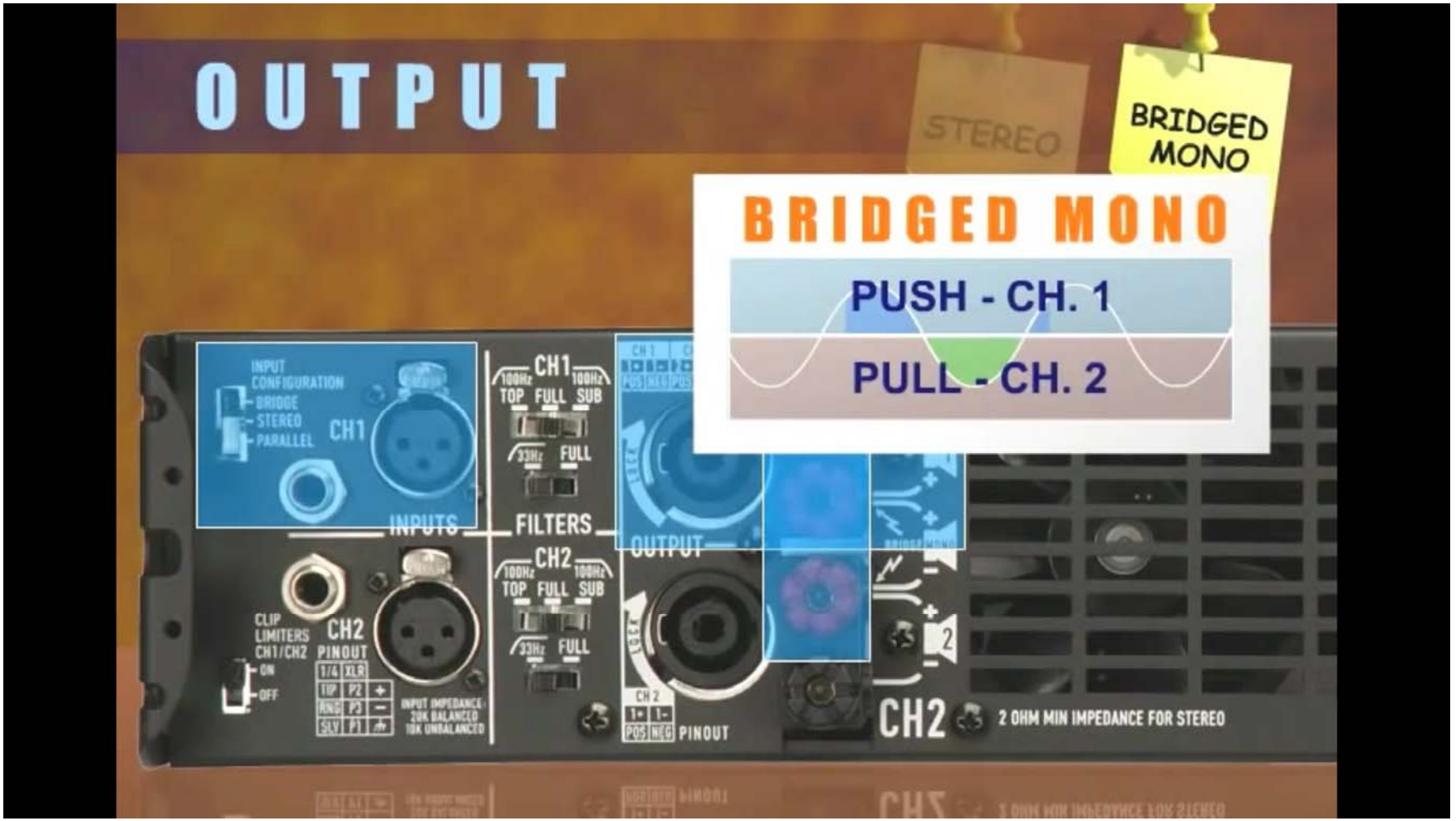

Line Out
Unbalanced
Balanced
Mic In
ROLLS
MATCHBOX
X
Visit www.alectrosystems.com to learn more about Professional Audio and Video
ASI Alectro Systems Inc.
Sound & Video Since 1983

PROPER SETTINGS

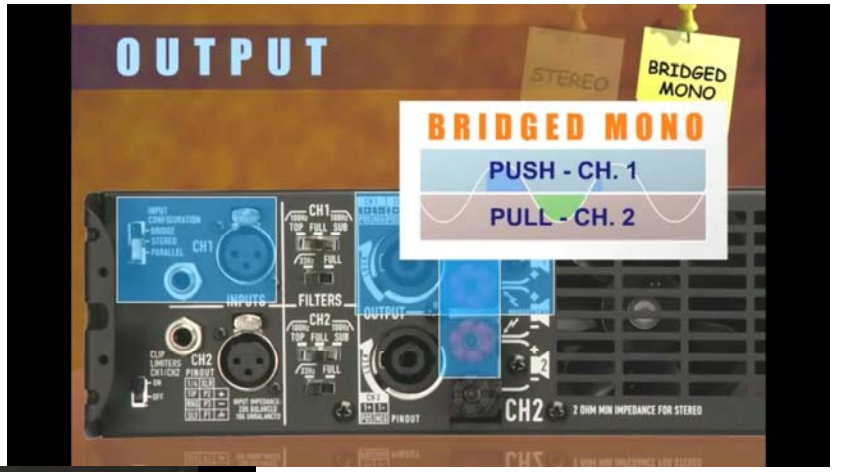



INPUT
STEREO
PARALLEL
MONO
INPUT CONFIGURATION
BRIDGE
STEREO
PARALLEL
CH1
INPUTS
CH1
TOP FULL SUB
FULL
FILTERS
PINOUT
CH1
OUTPUT
BRIDGE MONO
CH2
CLIP LIMITERS CH1/CH2
ON
OFF
CH2 PINOUT
TIP
RING
SLV
CH2
TOP FULL SUB
FULL
PINOUT
CH2
2 OHM MIN IMPEDANCE FOR STEREO


INPUT
STEREO
PARALLEL
MONO
INPUT
CONFIGURATION
BRIDGE
STEREO
PARALLEL
CH1
INPUTS
CH1
100Hz
TOP
FULL
100Hz
SUB
33Hz
FULL
FILTERS
CH2
100Hz
TOP
FULL
100Hz
SUB
33Hz
FULL
CLIP
LIMITERS
CH1/CH2
ON
OFF
CH2
PINOUT
1/4
XLR
TIP
P2
+
RING
P3
-
SLV
P1
INPUT IMPEDANCE
20K BALANCED
10K UNBALANCED
PINOUT
CH1
OUTPUT
CH2
PINOUT
2 OHM MIN IMPEDANCE FOR STEREO


OUTPUT
STEREO
BRIDGED MONO
BRIDGED MONO
PUSH - CH. 1
PULL - CH. 2
INPUT CONFIGURATION
BRIDGE
STEREO
PARALLEL
CH1
INPUTS
CH1
100Hz TOP FULL 100Hz SUB
33Hz FULL
FILTERS
CH2
100Hz TOP FULL 100Hz SUB
33Hz FULL
OUTPUT
CLIP LIMITERS CH1/CH2
ON
OFF
CH2 PINOUT
1/4 XLR
TIP P2 +
RING P3 −
SLV P1
INPUT IMPEDANCE
20K BALANCED
10K UNBALANCED
CH 2
1+ 1−
POS NEG
PINOUT
CH2
2 OHM MIN IMPEDANCE FOR STEREO


OUTPUT
STEREO
BRIDGED MONO
CH1
CH2
INPUTS
FILTERS
OUTPUT
2 OHM MIN IMPEDANCE FOR STEREO


OUTPUT
STEREO
BRIDGED MONO
BRIDGED MONO
PUSH - CH. 1
PULL - CH. 2
CH1
CH2
INPUTS
FILTERS
OUTPUT
2 OHM MIN IMPEDANCE FOR STEREO


POWER AMPLIFIER
MODERN
AMPLIFIER
CH1
CH2
BRIDGE
PINOUT
OUTPUT

Which is NOT a correct statement?

A.
Use an amp 20-50% more than your speakers

B.
Speaker wiring and total does not change resistance

C.
A standard meter can be used to check a lot in audio but to measure resistance you should use an impedance meter

D.
You have to pay attention to settings and power for amplifiers to ensure best audio

Sound Pressure Level –SPL:

Loudspeaker Sensitivity: dB SPL 1 watt @ 1 meter
Power: +3dB for every 2x watts
Distance: -6dB for every 2x distance

- 0dB faintest audible sound
- 50-60dB normal conversation
- 120dB painful

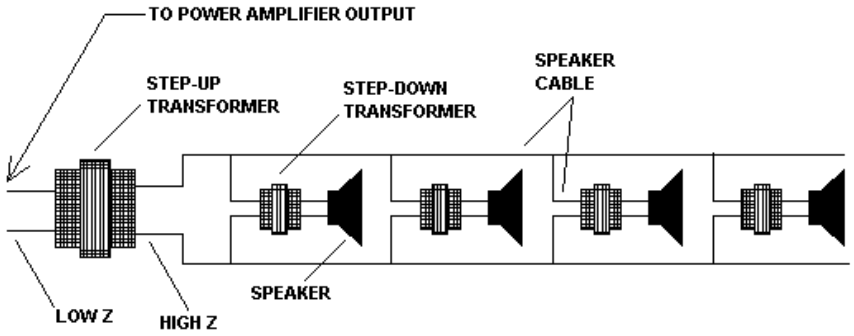
96 dB SPL @ loudspeaker1W/1M
+ 24 dB (250 W) [8 x 3dB] Amplifier Gain
-30 dB (32 M) [5 x -6dB] Distance Loss
---
90 dB SPL at the listener

Doubling
1
2
4
8
16
32
64
128
256

To make the system appreciably louder, the amplifier should be replaced with an amplifier 4 to 10 times more powerful

- 4X the power =6 dB louder, which is perceptively louder in volume
- 10X the power =10 dB louder, which is perceptively twice as loud
- Be sure that the existing loudspeakers can handle the additional power

Crestron – “If you are without a 70-volt amplifier, but need to drive a 70-volt loudspeaker line, a low-impedance amplifier channel rated for 600 watts @ 8 ohms supplies a 69-volt line, for a 100-volt line, 1250 watts @ 8 ohms”

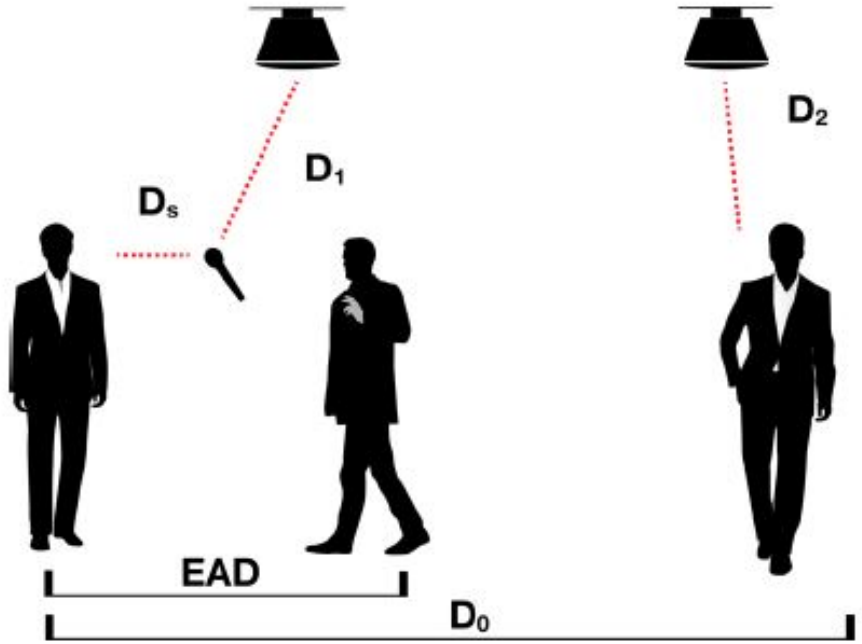


CONSTANT-VOLTAGE DISTRIBUTED SYSTEM

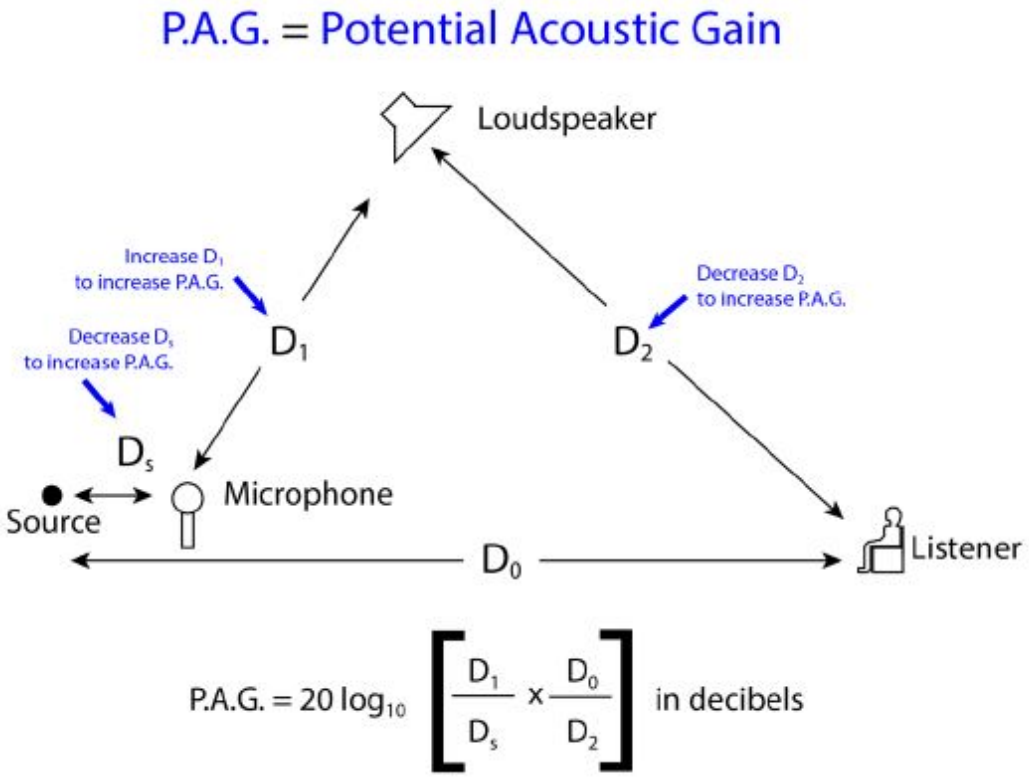
PAG/NAG (Potential Acoustic Gain/Needed Acoustic Gain):

Definitions:

- **D0**Talker-to-farthest-listener distance
- **D1**Mic-to-closest-loudspeaker distance
- **D2**Listener-to-closest-loudspeaker distance
- **DS**Talker-to-mic distance
- **EAD**Equivalent Acoustic Distance, the desired virtual distance between the talker and furthest listener
- **NOM**Number of Open Microphones, always set to 1 when using automatic mixer function
- **FSM**Feedback Stability Margin



Potential Acoustical Gain:



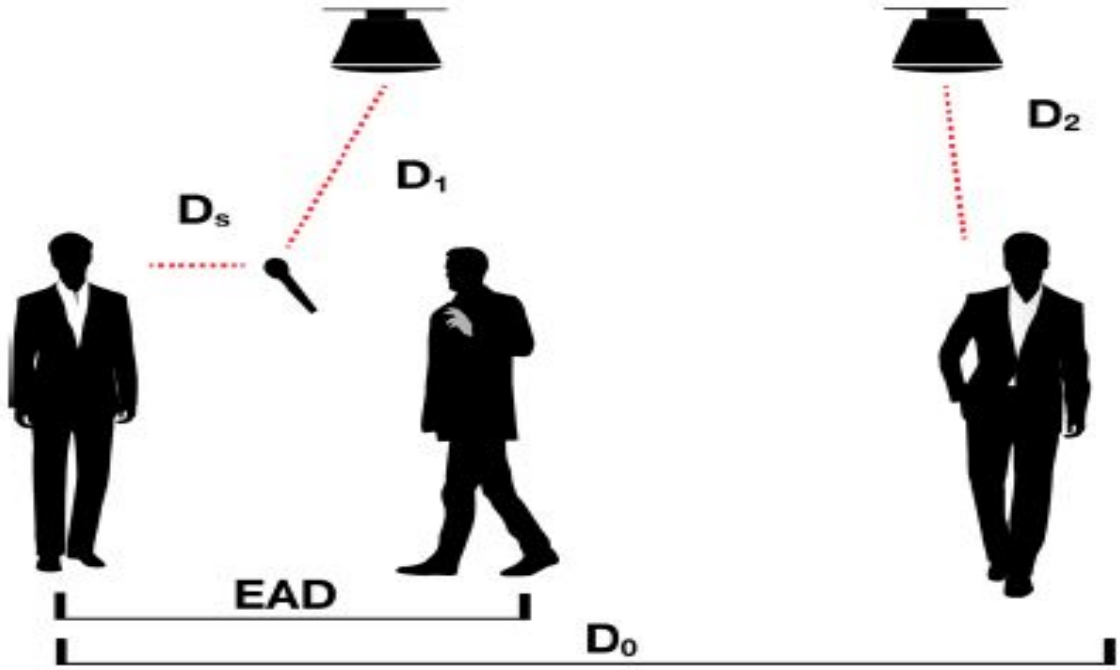
PAG/NAG (Potential Acoustic Gain/Needed Acoustic Gain):

NAG formula:

- NAG = 20Log(D0/EAD)

For example (imperial):

- NAG = 20Log(50 ft./8 ft.)
- NAG = 20Log(6.25)
- NAG = 15.9 dB

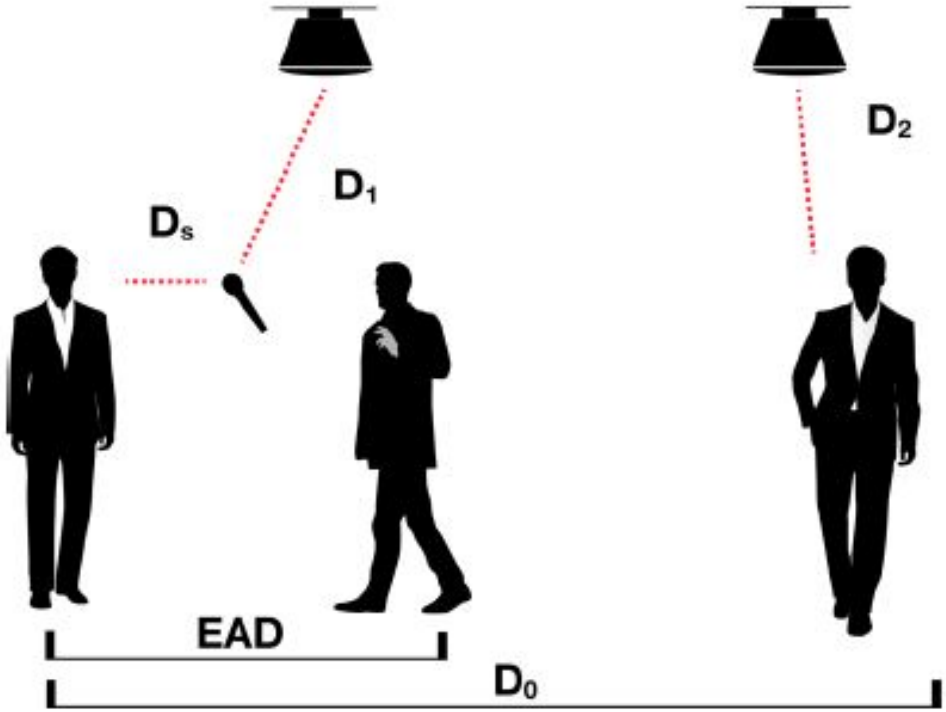


PAG/NAG (Potential Acoustic Gain/Needed Acoustic Gain):

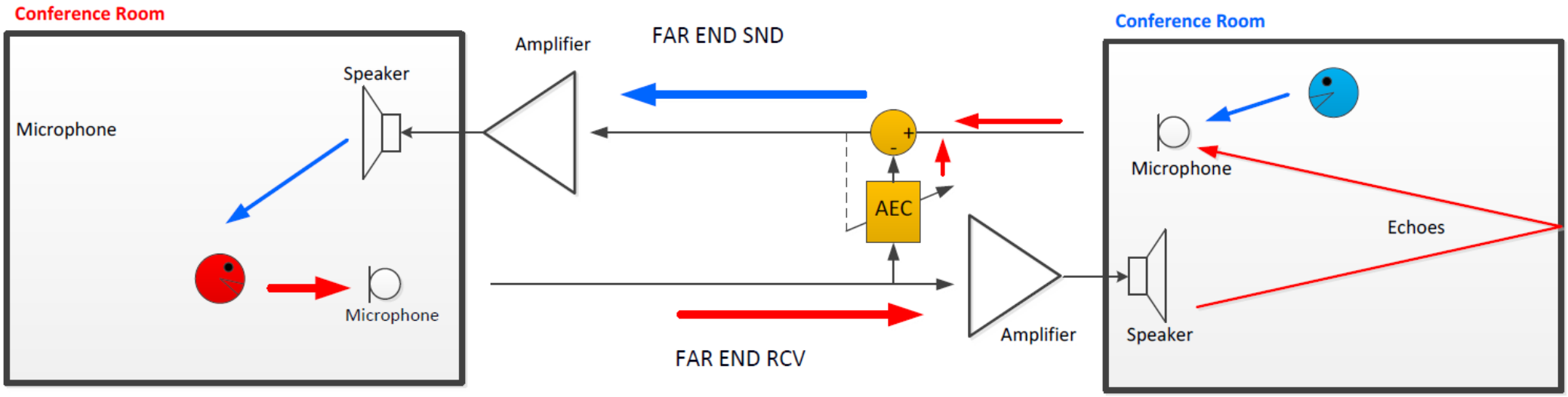
PAG = 22.5 dB [22.4 dB]

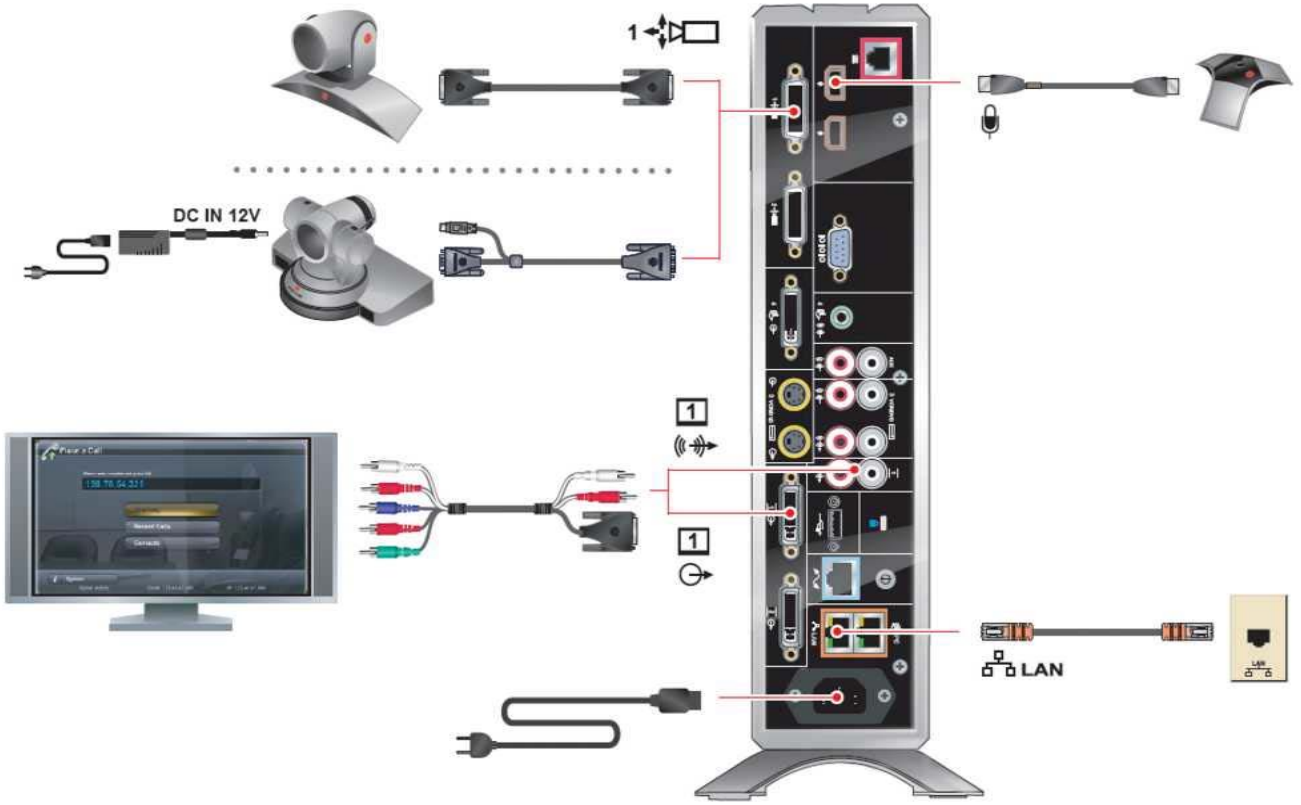
NAG = 15.9 dB [15.6 dB]

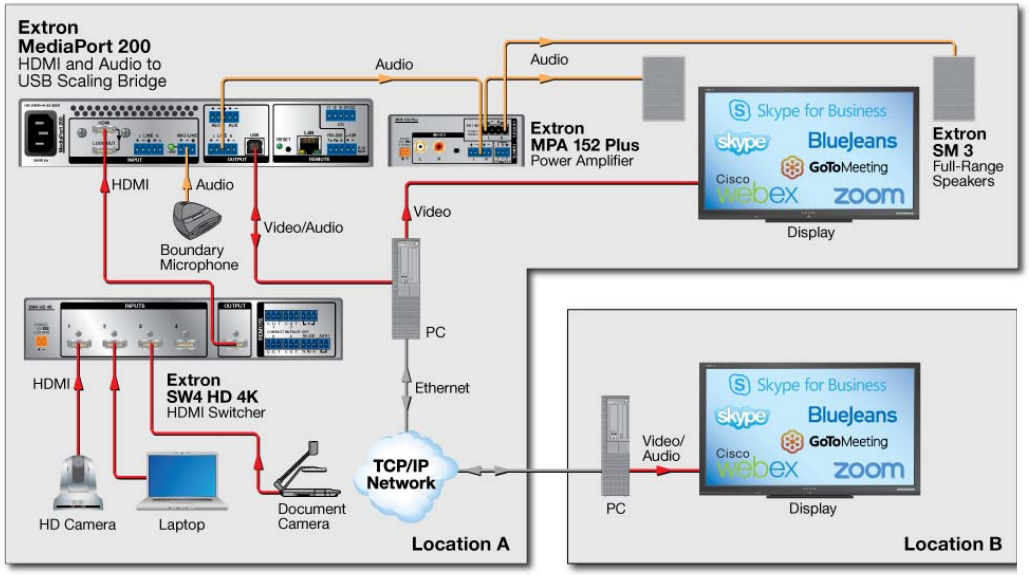
PAG > NAG
The system parameters will provide enough gain-before-feedback to acoustically locate all listeners within 8 ft. [2.5 m] of the talker

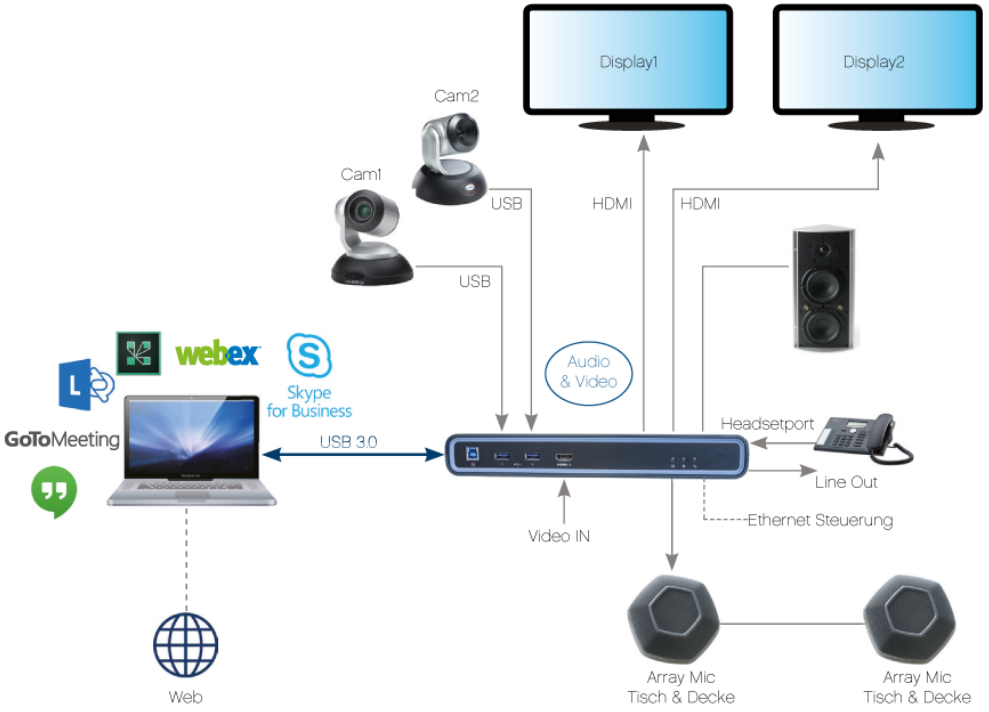


AEC


Conference Room
Microphone
Speaker
Microphone
Amplifier
FAR END SND
AEC
FAR END RCV
Amplifier
Conference Room
Microphone
Echoes
Speaker


1
DC IN 12V
1
1
LAN


Extron
MediaPort 200
HDMI and Audio to
USB Scaling Bridge
Audio
Audio
Extron
MPA 152 Plus
Power Amplifier
Extron
SM 3
Full-Range
Speakers
Skype for Business
BlueJeans
GoToMeeting
webex
zoom
Display
HDMI
Audio
Video/Audio
Boundary
Microphone
Video
PC
Ethernet
HDMI
Extron
SW4 HD 4K
HDMI Switcher
TCP/IP
Network
HD Camera
Laptop
Document
Camera
Location A
PC
Video/
Audio
Skype for Business
BlueJeans
GoToMeeting
webex
zoom
Display
Location B


Display1
Display2
Cam2
Cam1
USB
USB
HDMI
HDMI
webex
Skype
for Business
GoToMeeting
Audio
& Video
USB 3.0
Headsetport
Line Out
Ethernet Steuerung
Video IN
Web
Array Mic
Tisch & Decke
Array Mic
Tisch & Decke

Which is NOT a correct statement?

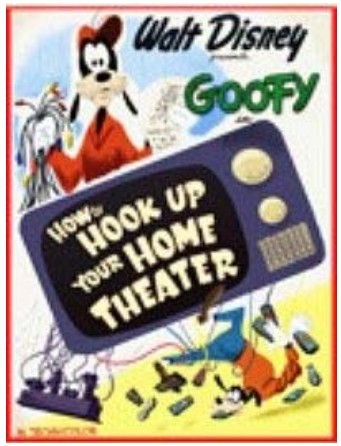
A.
You will have to do a lot of math to get best audio

B.
If a person on the far end is hearing themselves in a conference call it is a problem on your side with AEC

C.
Feedback issues are due to frequency and distances

D.
The most secured and easiest method of video conferencing is still with a codec and not soft conferencing

Step 5 – Control



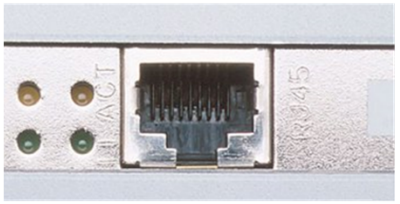
Touch Panels

Keypad

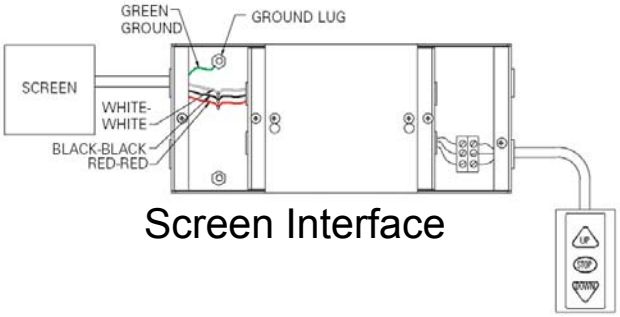
User Interfaces

Control Processor

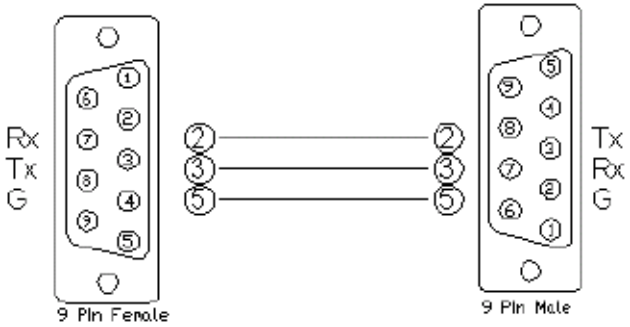
- Control processor with touch panel/software app
- Button panel
- Browser control
- Control anything with
  - Serial
  - IR
  - Ethernet
  - Relay /Contact Closure



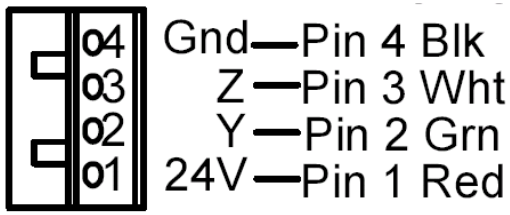
Infrared Emitter



Screen Interface



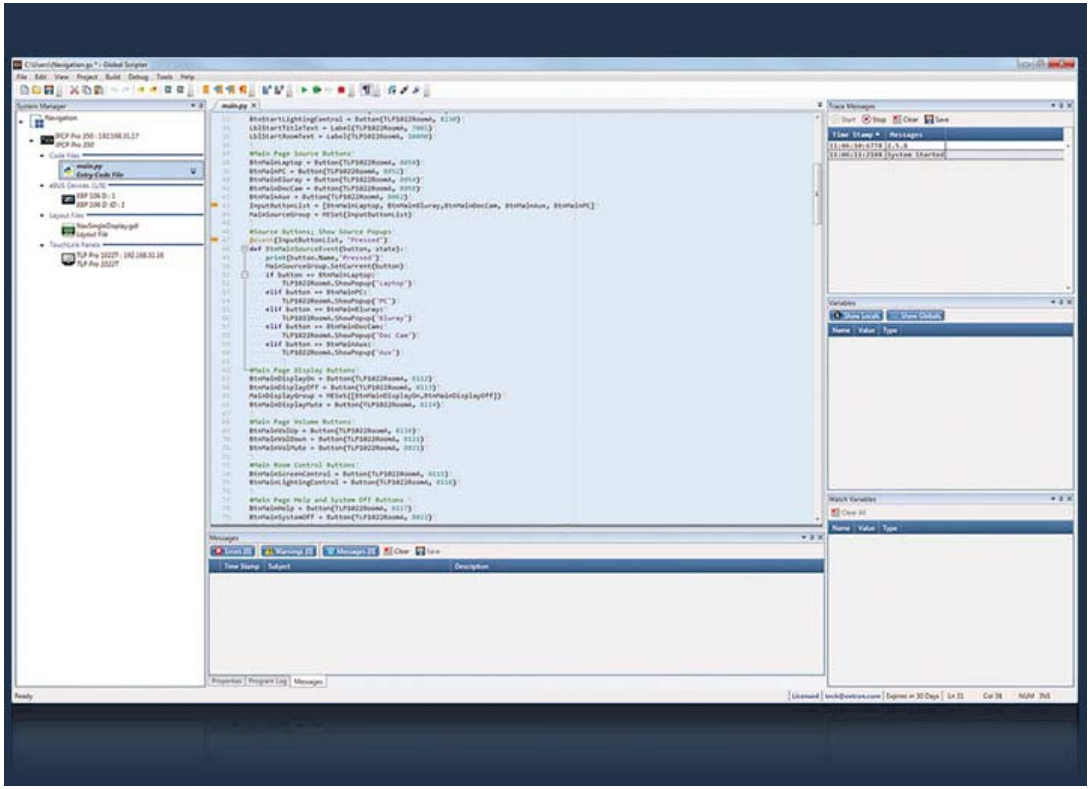
RS232 Cable



Cresnet Wiring

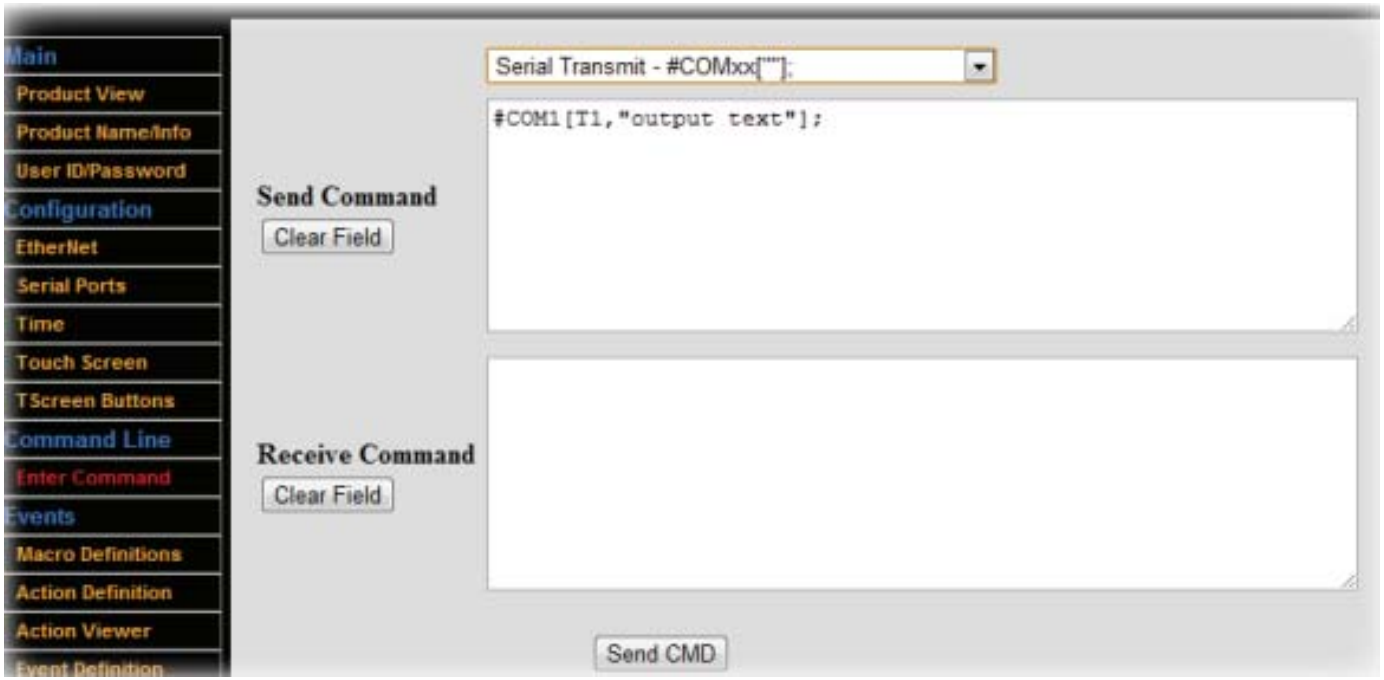
Projector Lift

Programmable Systems



Configurable Systems

Conprogable Systems



Which is NOT a correct statement?

A.
You have to have years of training to be a good programmer

B.
As long as a device has Ethernet, Serial, IR, Contact, or Relay control capabilities we can control it with AV system

C.
The type of user interface for controls depends on inputs and outputs and user perception to simplicity

Let’s Put into Practice

Let's Put into Practice

What you do, ask, and look for in a job walk/review?

- Determine sources & outputs – "Uses of system"
- Determine locations, distances, pathways
- What's existing – likes and dislikes
- Customer Expectations
- Determine existing network and required additions
- Who are the contacts and roles
- Expected timelines

Let's Put into Practice

What tools do you need on a job walk?

- Camera
- Digital Notepad
- Distance Meter
- Stud finder
- Ladder & Tools for access
- Keys

Let's Put into Practice

Scenario 1

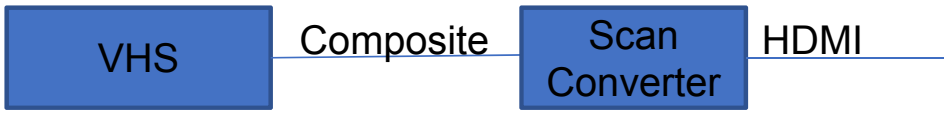
Customer wants a VHS with composite output, Blu Ray with HDMI output, Rack PC with Display Port Output, and Laptop

Show on a TV in a room that seats about 6 people

Does not want multiple remote controls

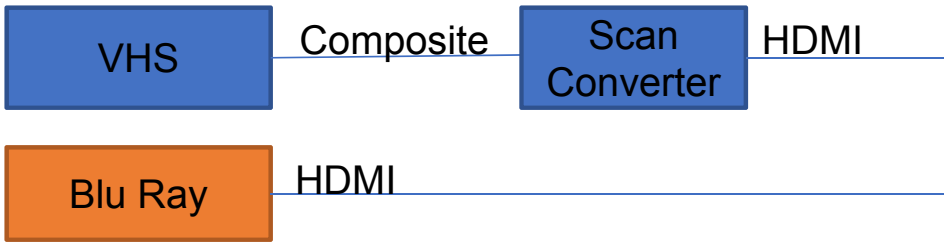
Scenario 1

Inputs = Customer wants a VHS



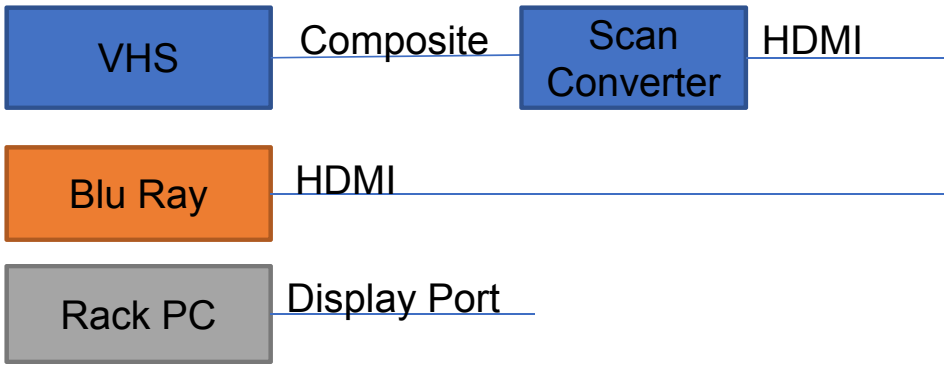
Scenario 1

Inputs = Customer wants a Blu Ray



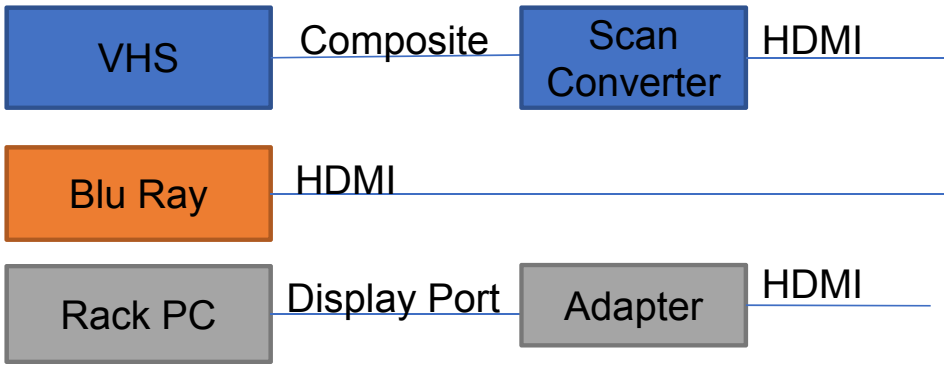
Scenario 1

Inputs = Customer wants a Rack PC



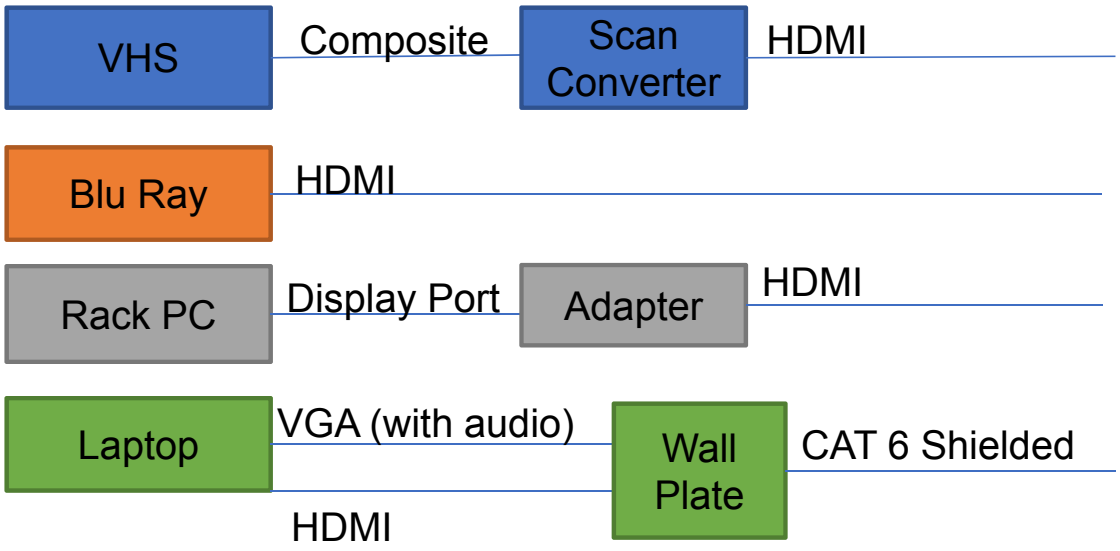
Scenario 1

Inputs = Customer wants a Rack PC



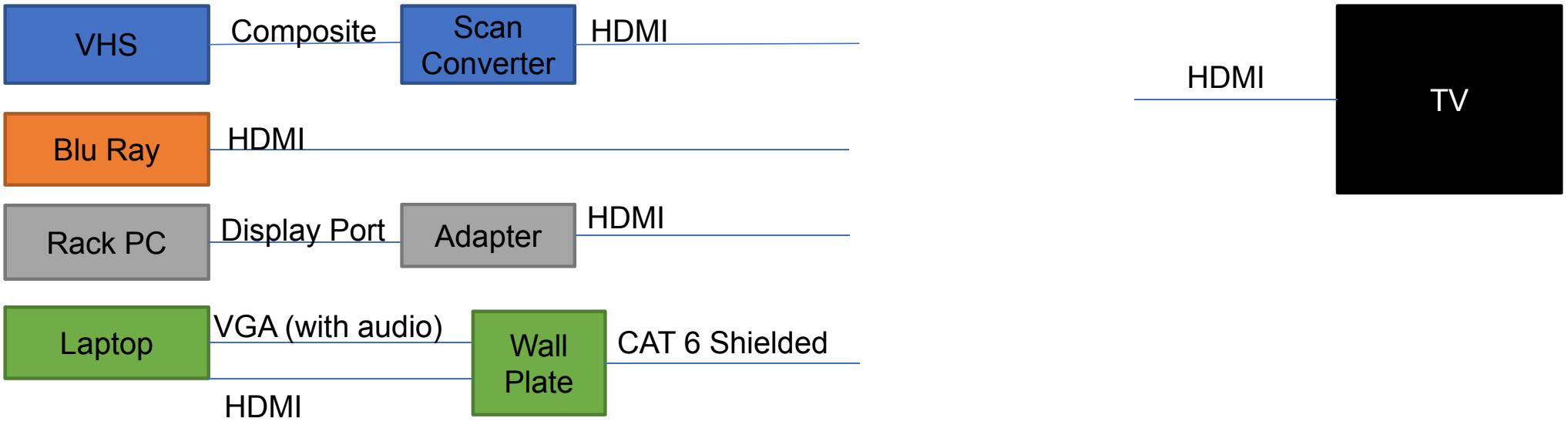
Scenario 1

Inputs = Customer wants a Laptop



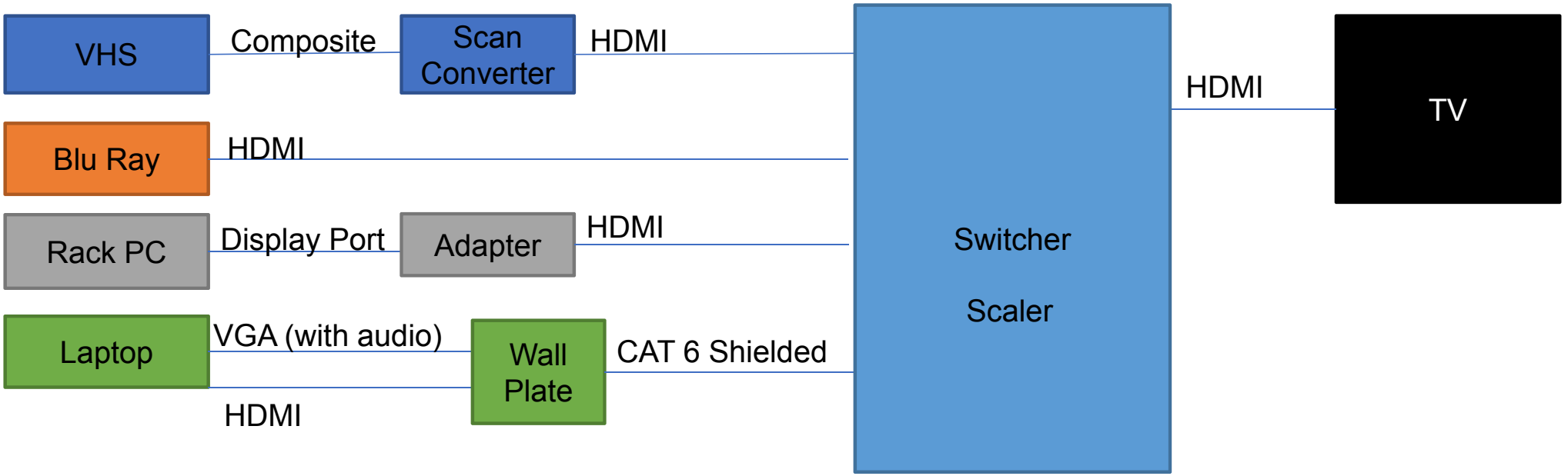
Scenario 1

Outputs = Customer wants a TV



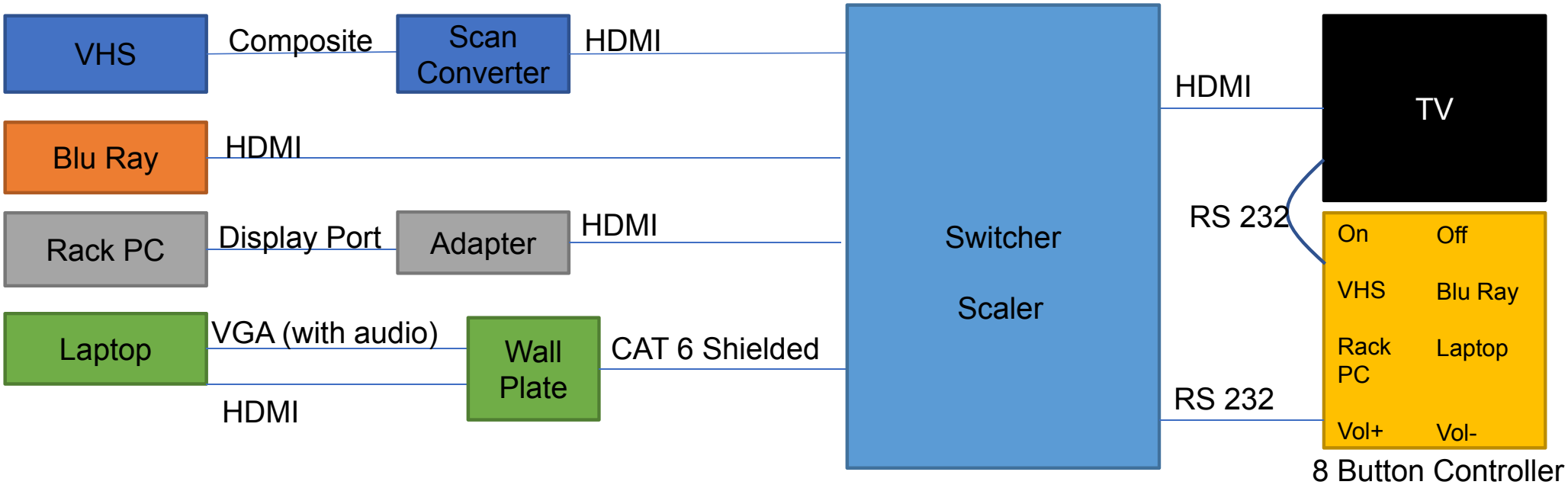
Scenario 1

Process The Signal



Scenario 1

Control = Customer wants one remote



Let's Put into Practice

Scenario 2

2 - Divisible Room with TV tuners, Floor Box Input, BYOD

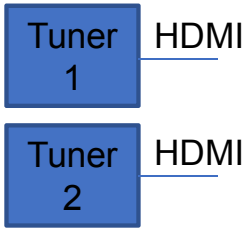
Automatic Switch of controls based on wall status

Projector in each room and monitor at lectern

Want Lesson capture/Streaming

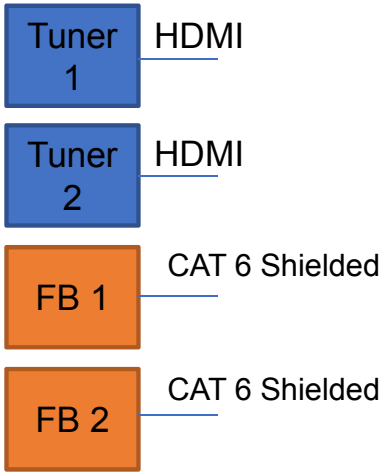
Scenario 2

Inputs = Customer wants TV Tuners



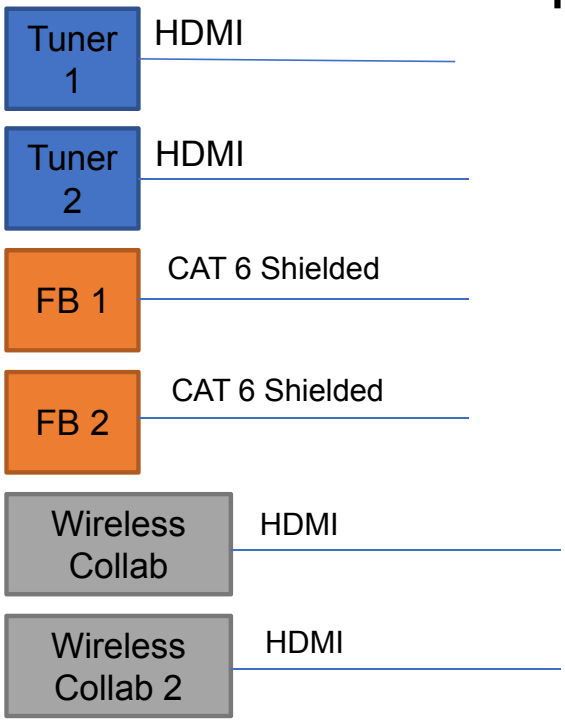
Scenario 2

Inputs = Customer wants Floor Box Inputs



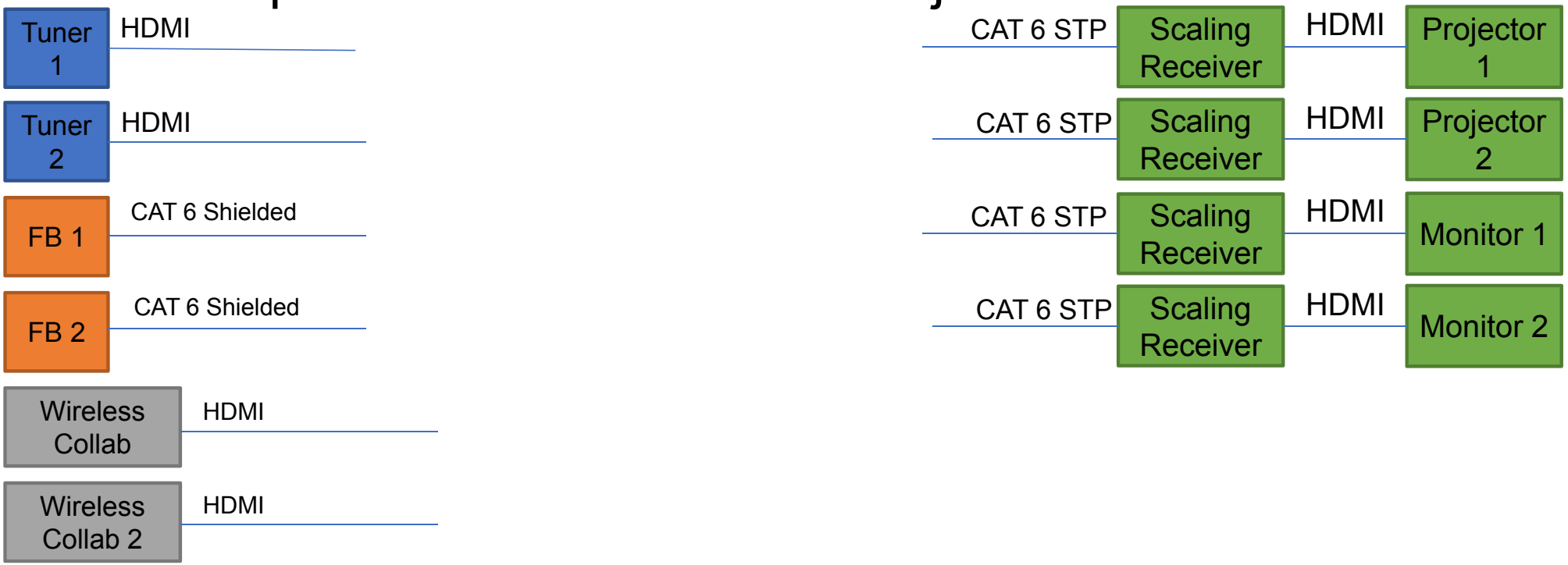
Scenario 2

Inputs = Customer wants B.Y.O.D.



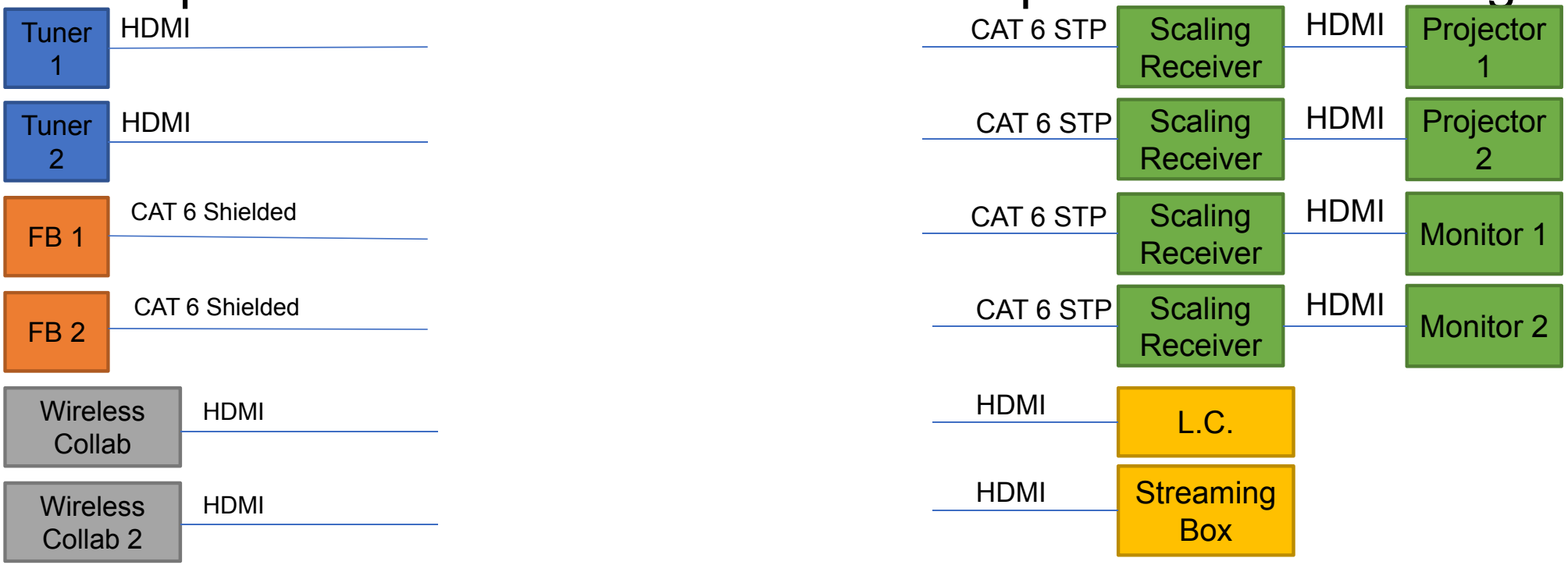
Scenario 2

Outputs = Customer wants Projectors and Monitors



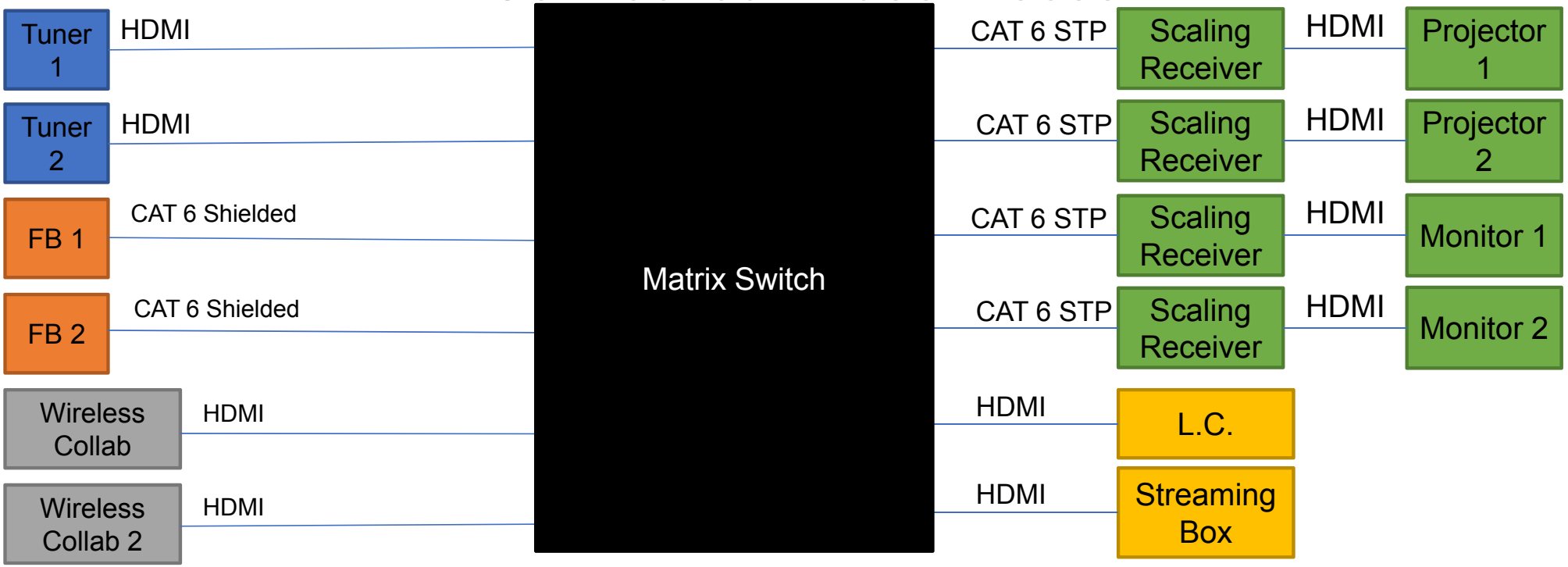
Scenario 2

Outputs = Customer wants Lesson Capture and Streaming



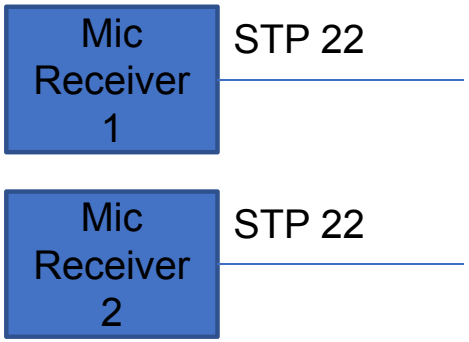
Scenario 2

Connect our Video Pieces



Scenario 2

Don’t Forget the Audio! = Inputs

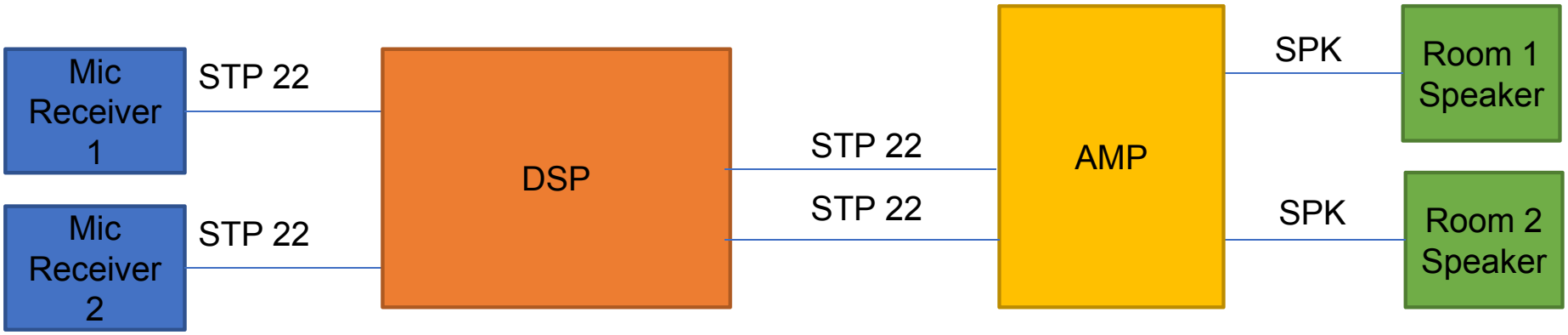


Scenario 2

Don’t Forget the Audio! = Outputs

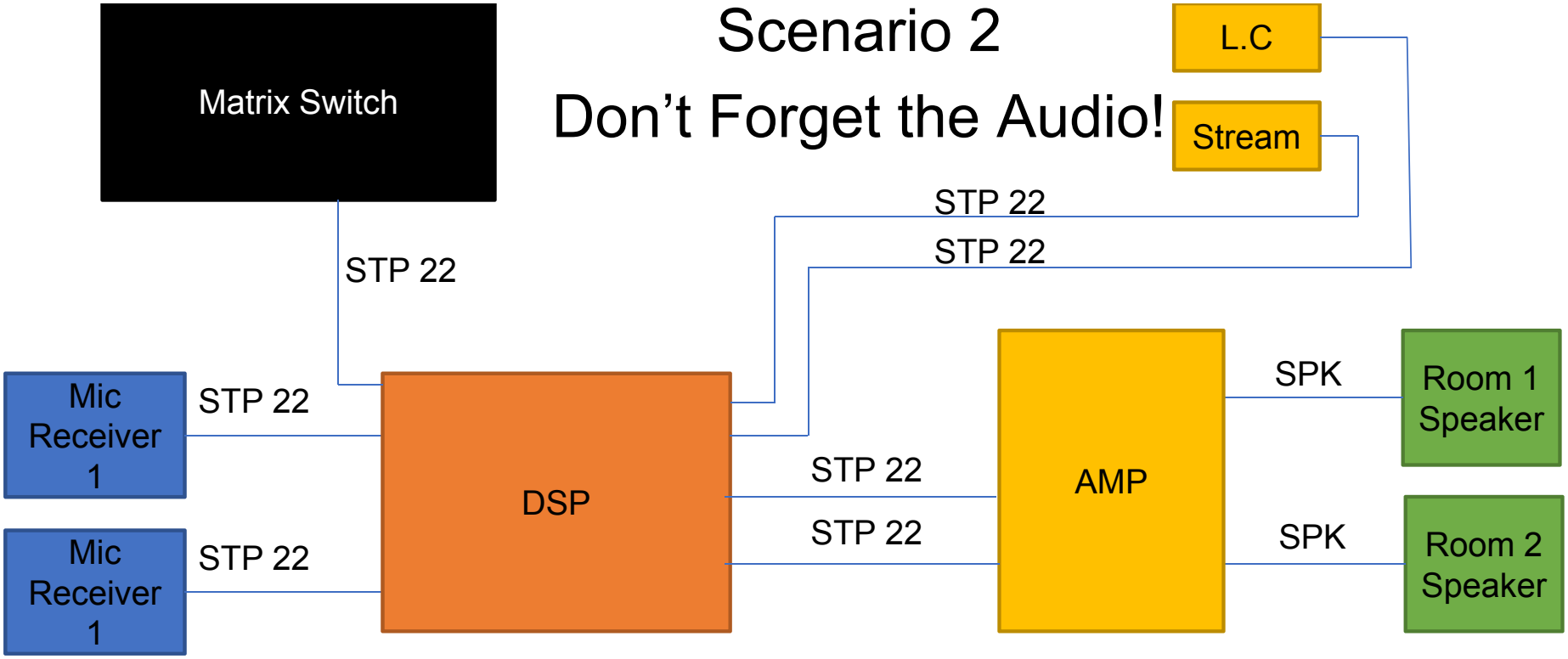
Scenario 2

Don’t Forget the Audio! = Process



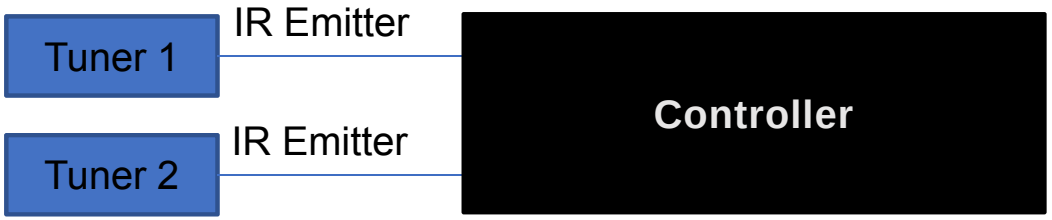
Scenario 2

Don’t Forget the Audio!

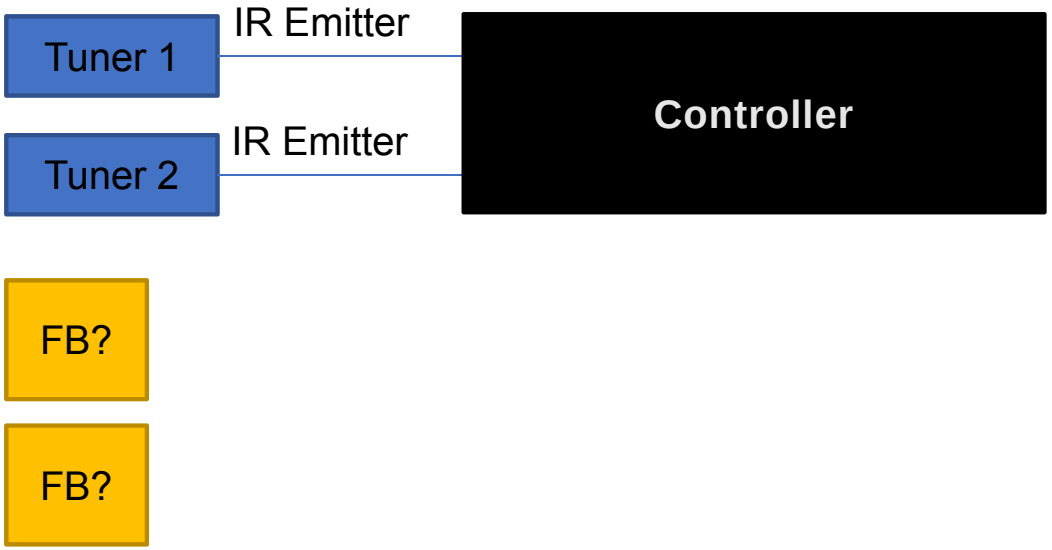


Scenario 2
Don’t Forget Control!

Scenario 2
Don’t Forget Control!

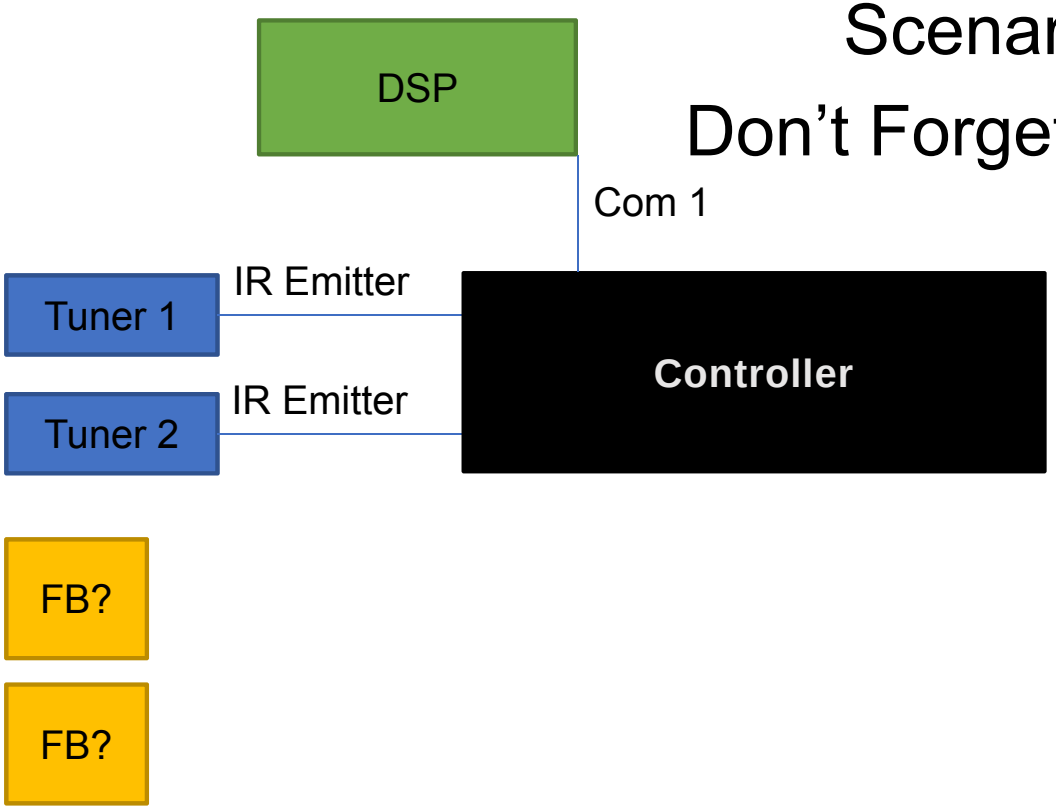


Scenario 2
Don’t Forget Control!



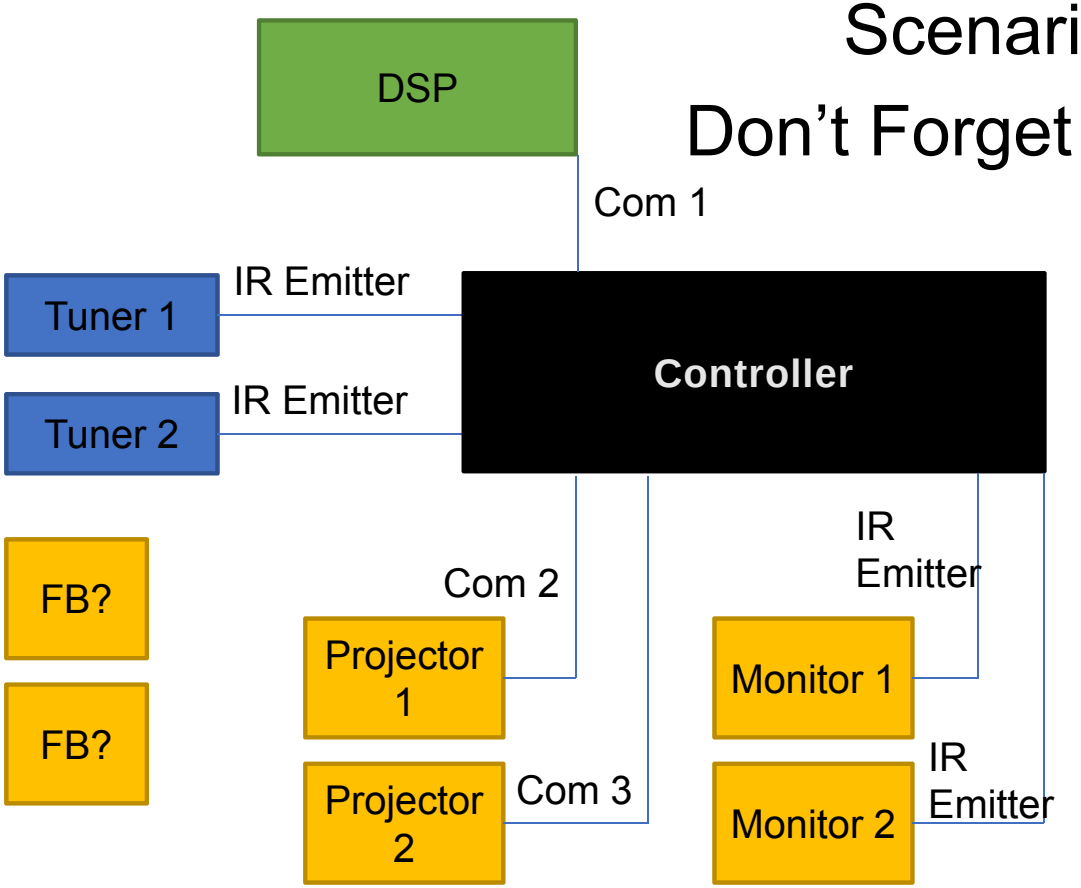
Scenario 2

Don’t Forget Control!



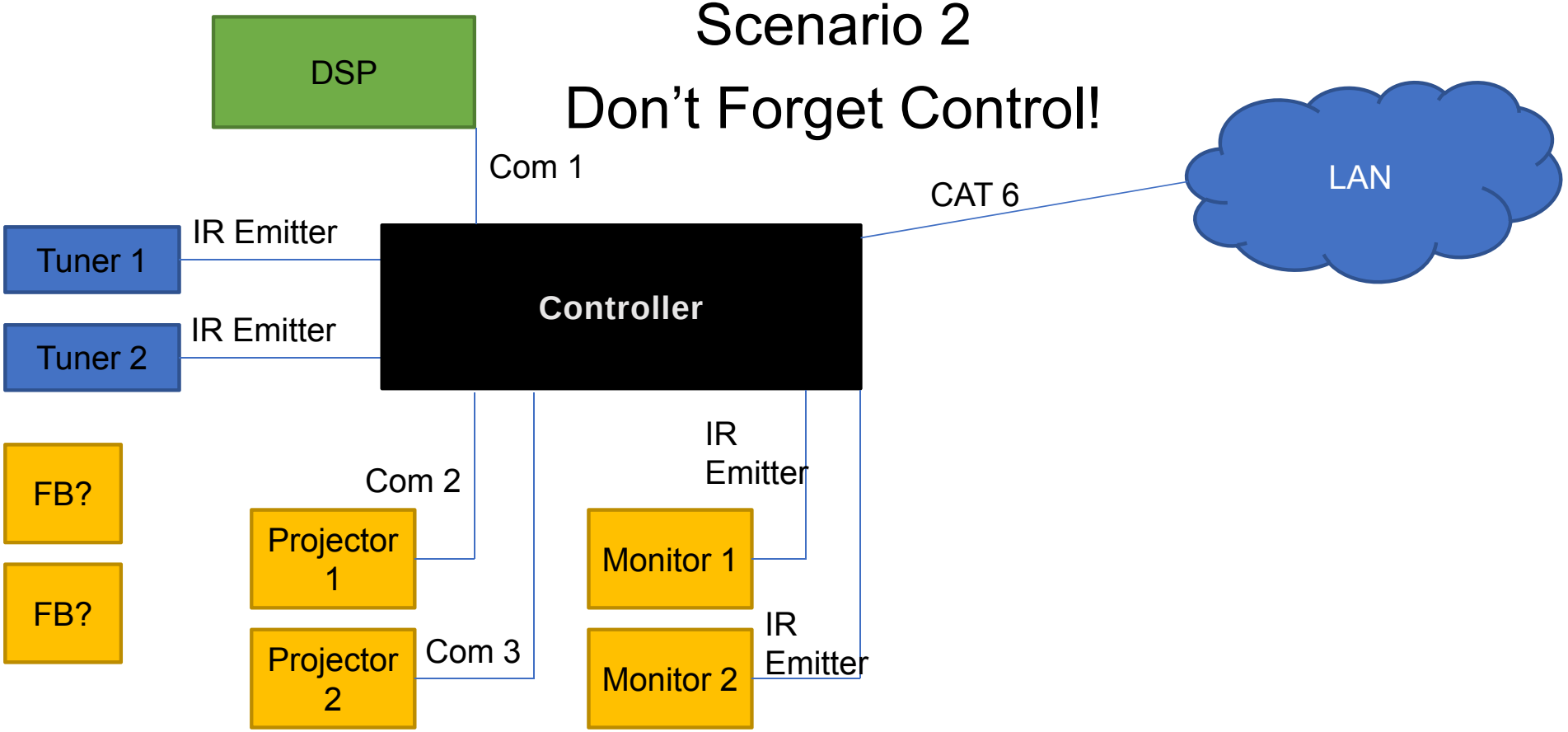
Scenario 2

Don’t Forget Control!



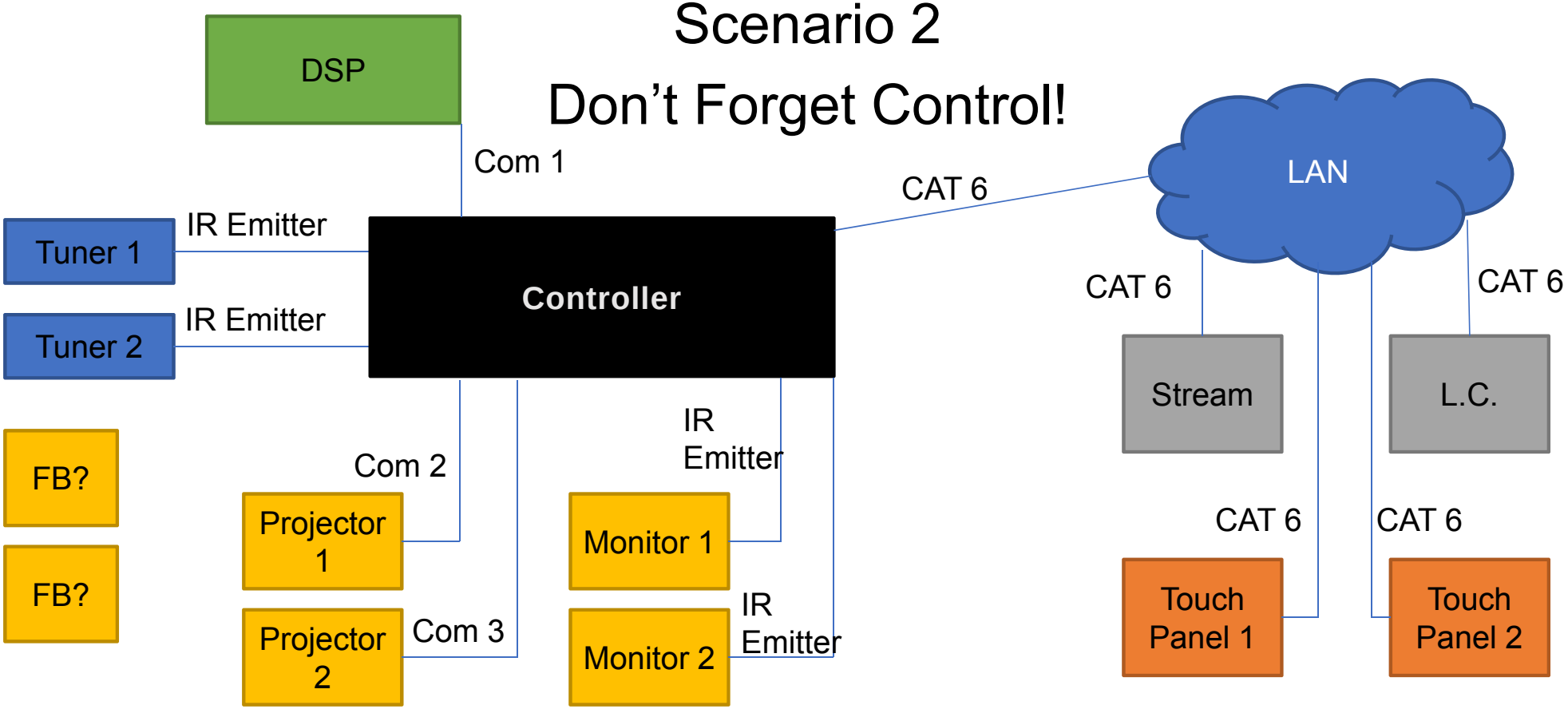
Scenario 2

Don't Forget Control!



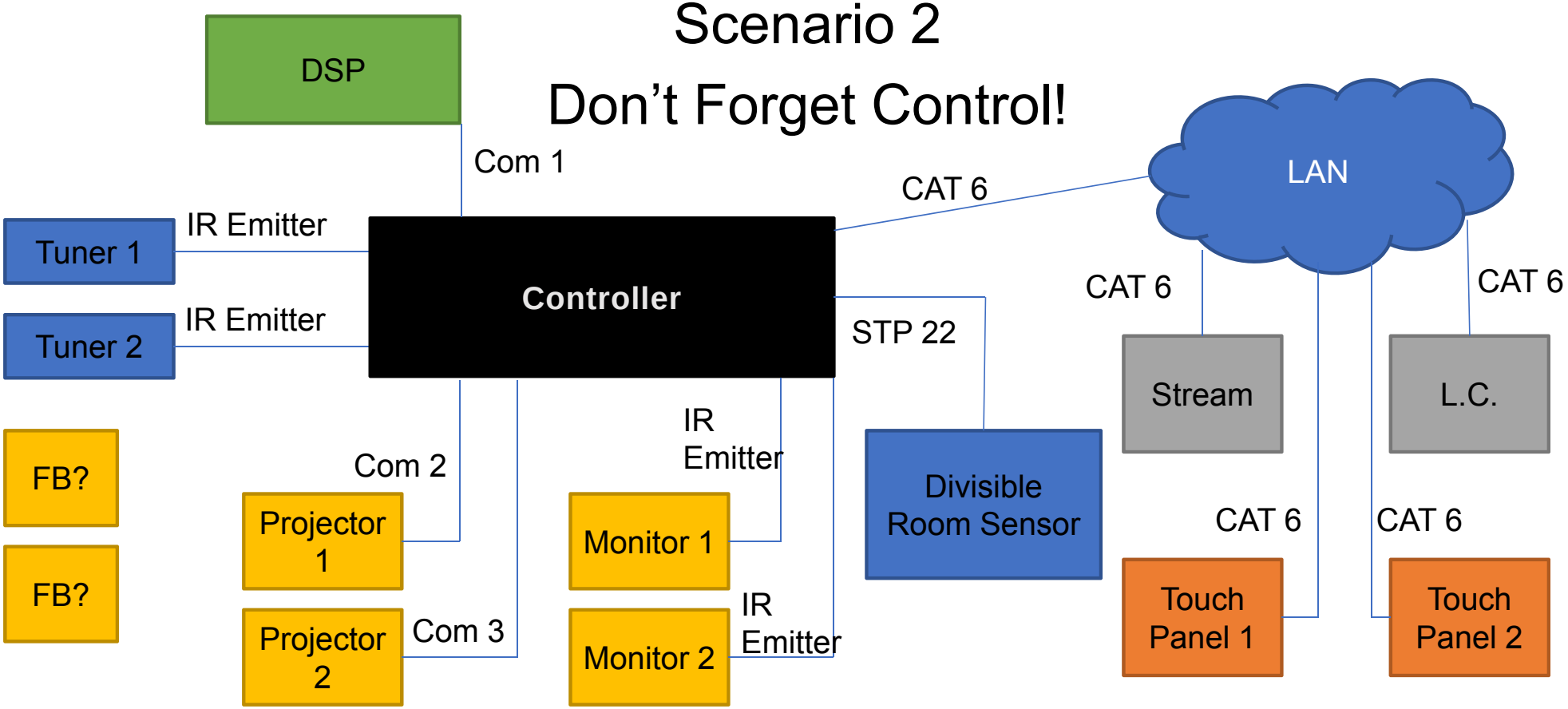
Scenario 2

Don't Forget Control!



Scenario 2

Don't Forget Control!



Let's Put into Practice

Scenario 3

Board Room with – Rack Pc, 1 Table inputs, BluRay, TV Tuner, 1 Guest Input, Document Camera, Two Room Cameras

2 Side TVs for Audience

10 preview monitors for Board Table

Recording Streaming

Video Conference

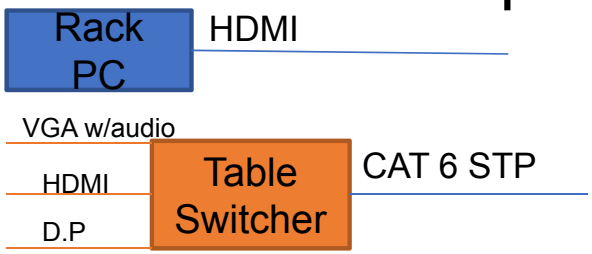
Soft Codec conferencing

Scenario 3

Inputs = Customer wants Rack PC

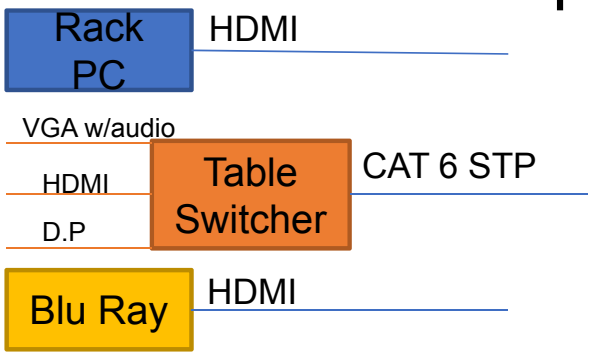
Scenario 3

Inputs = Customer wants Table Input



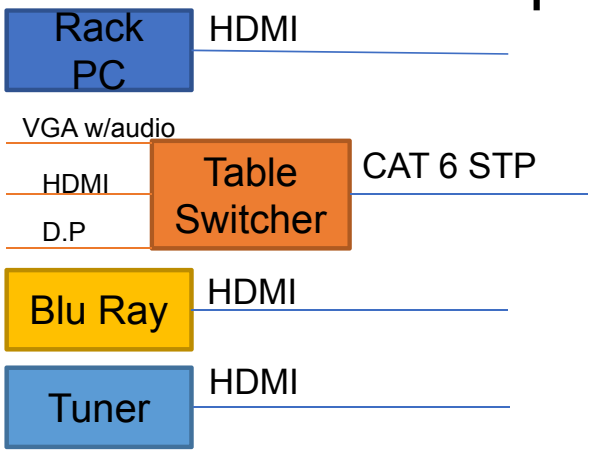
Scenario 3

Inputs = Customer wants Blu Ray



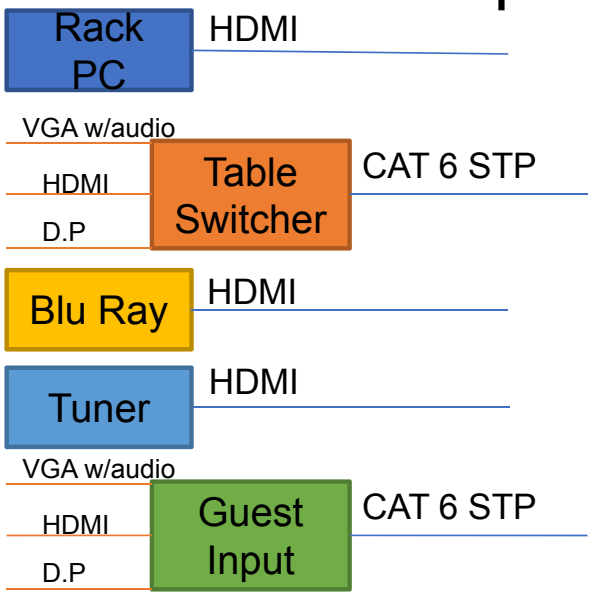
Scenario 3

Inputs = Customer wants TV Tuner



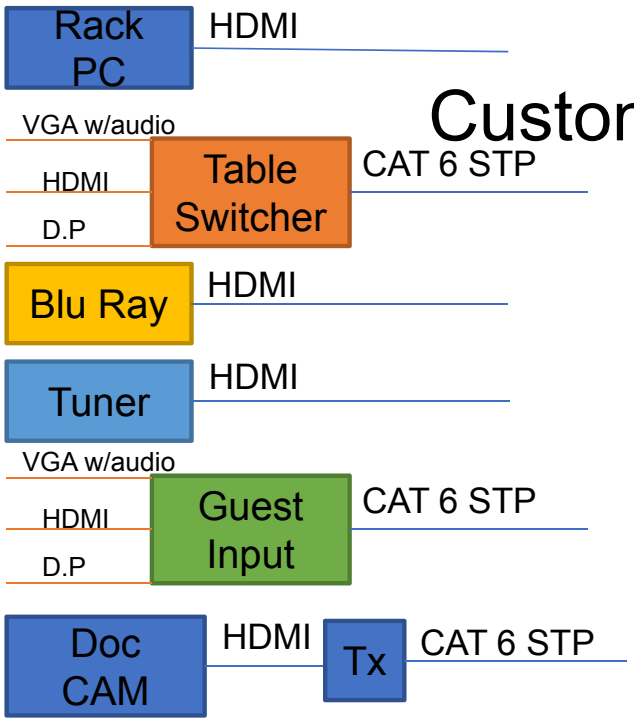
Scenario 3

Inputs = Customer wants Guest Input



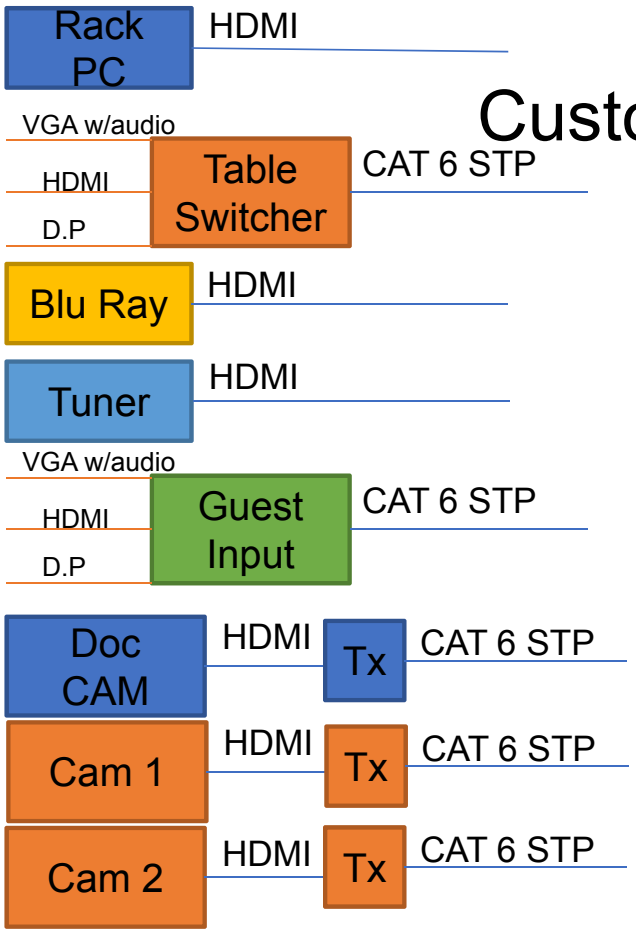
Scenario 3

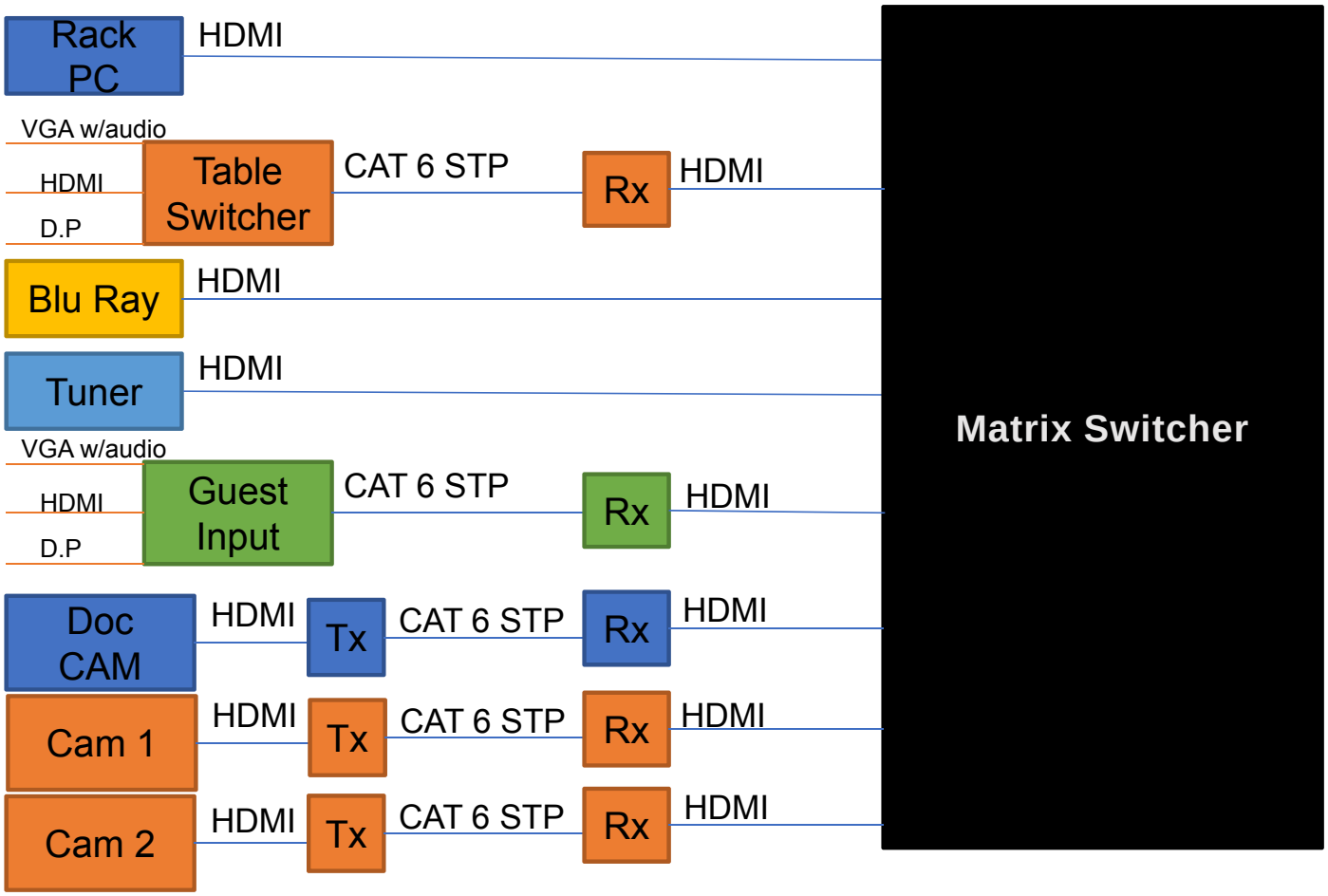
Customer wants a Document Camera



Scenario 3

Customer wants 2 Room Cameras





Scenario 3

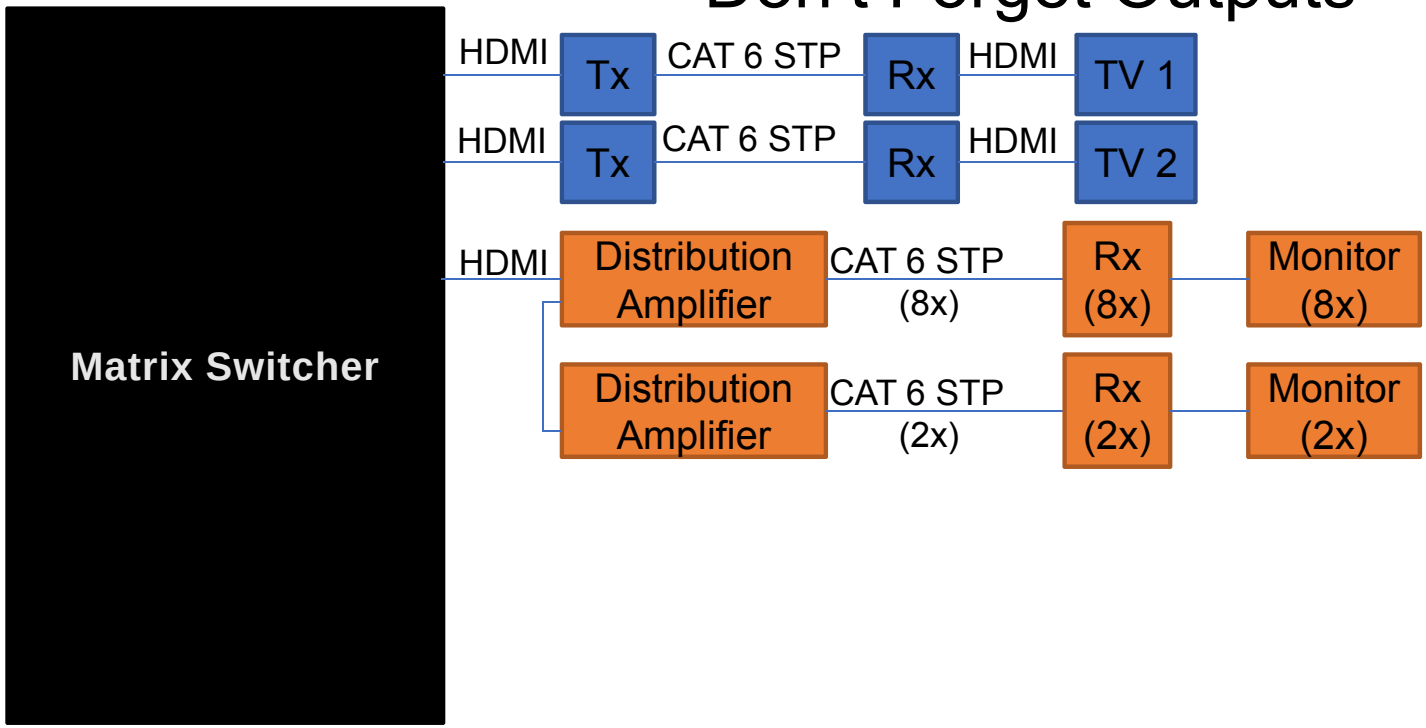
Process = Connect to Matrix

Scenario 3

Don’t Forget Outputs

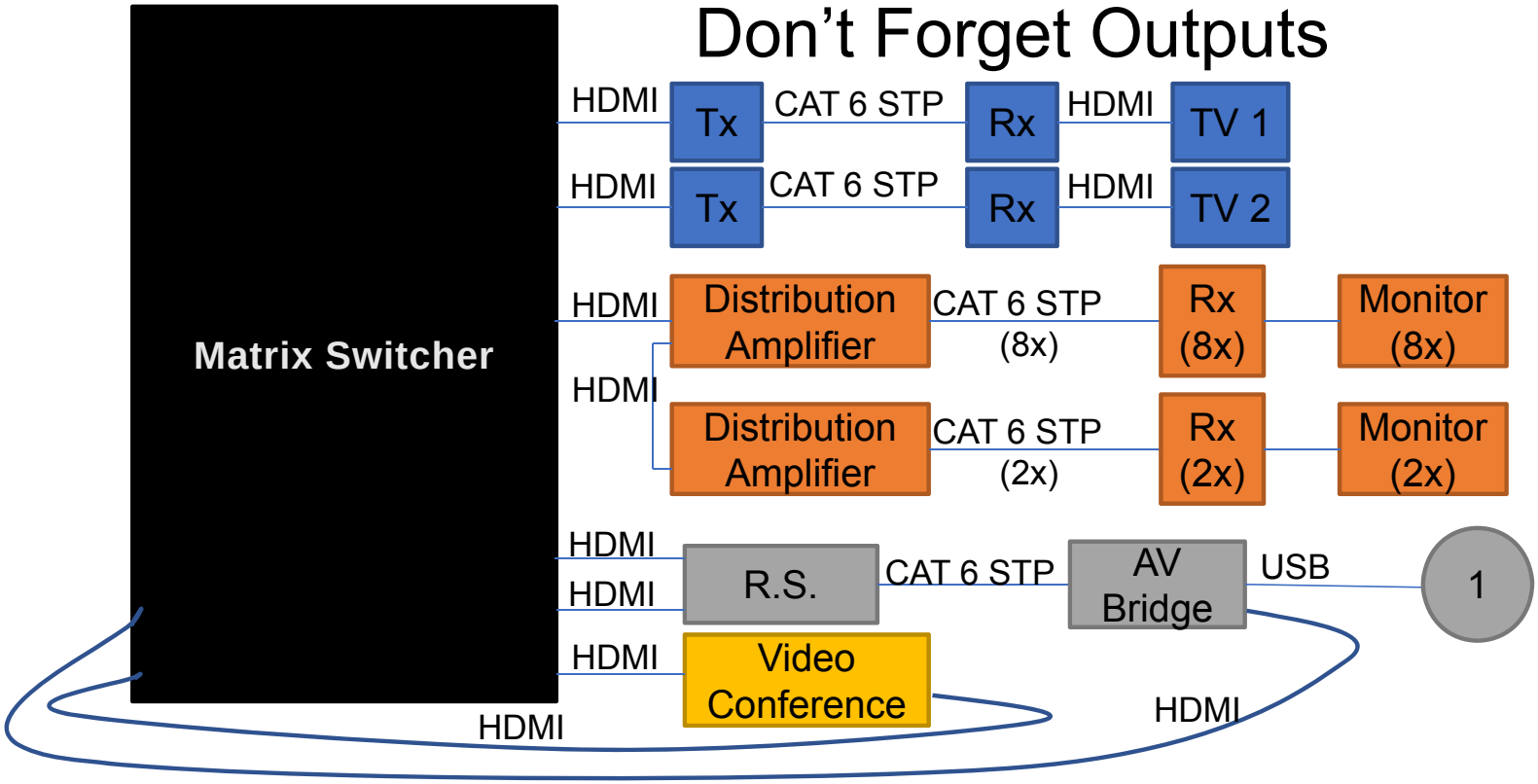
Scenario 3

Don’t Forget Outputs



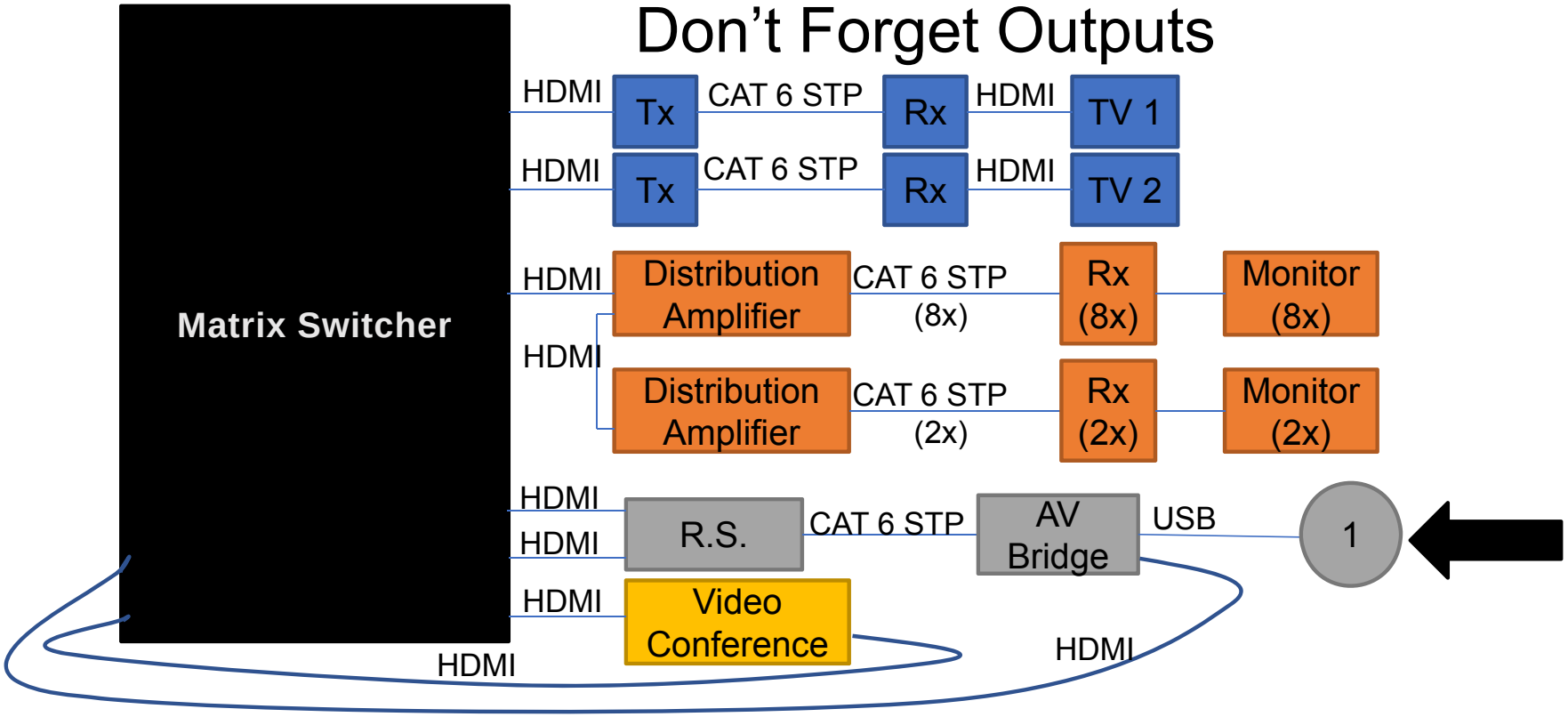
Scenario 3

Don't Forget Outputs

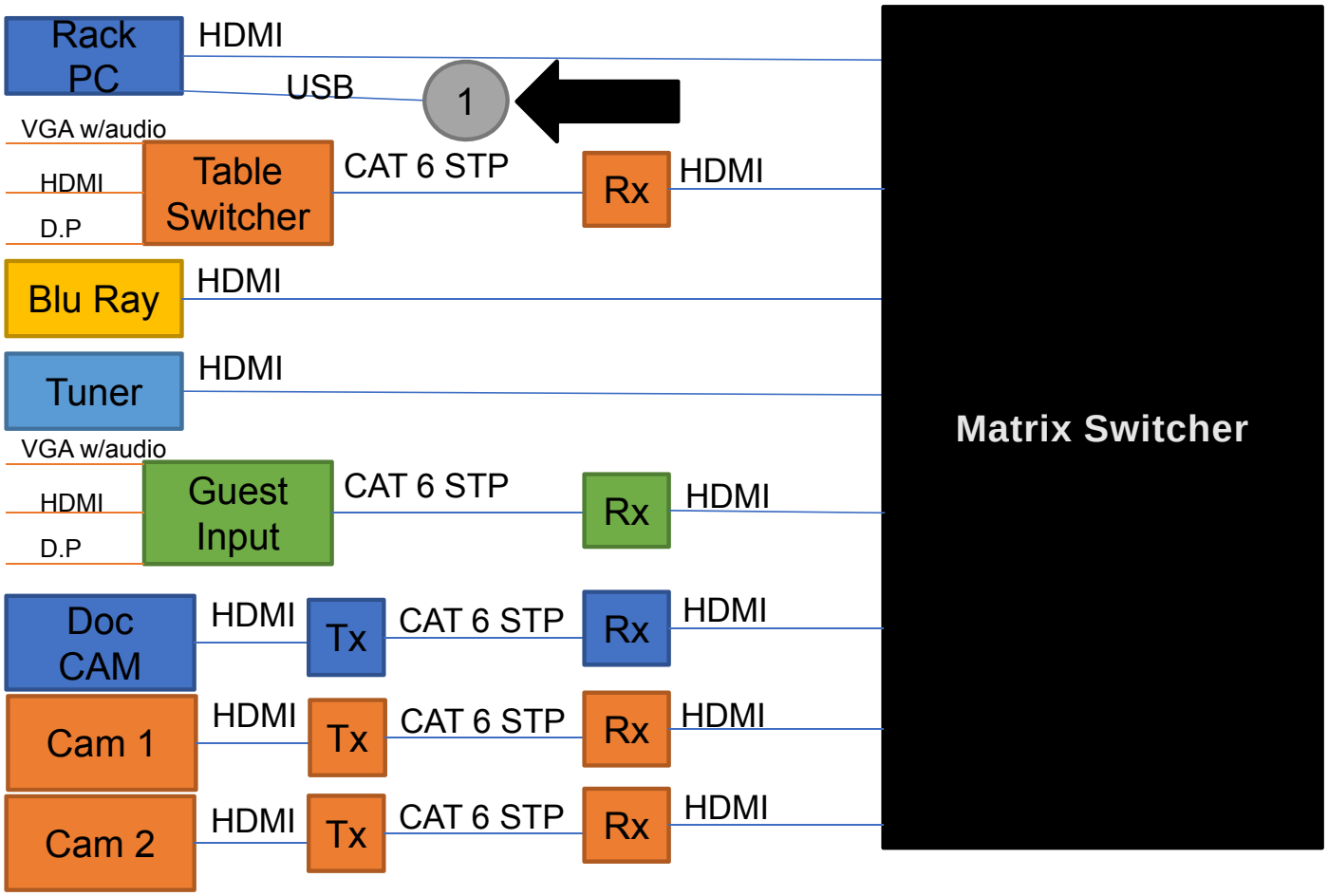


Scenario 3

Don’t Forget Outputs

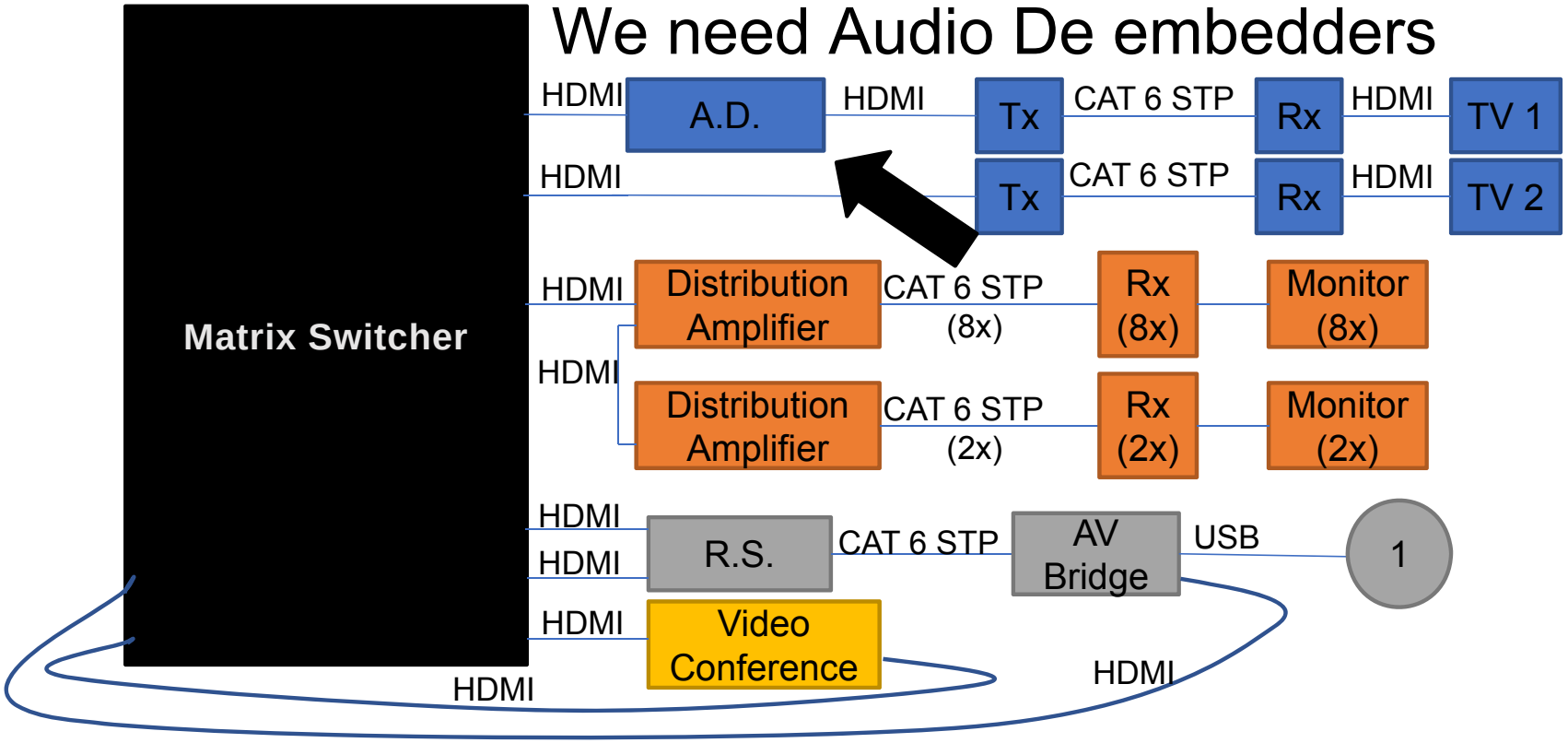


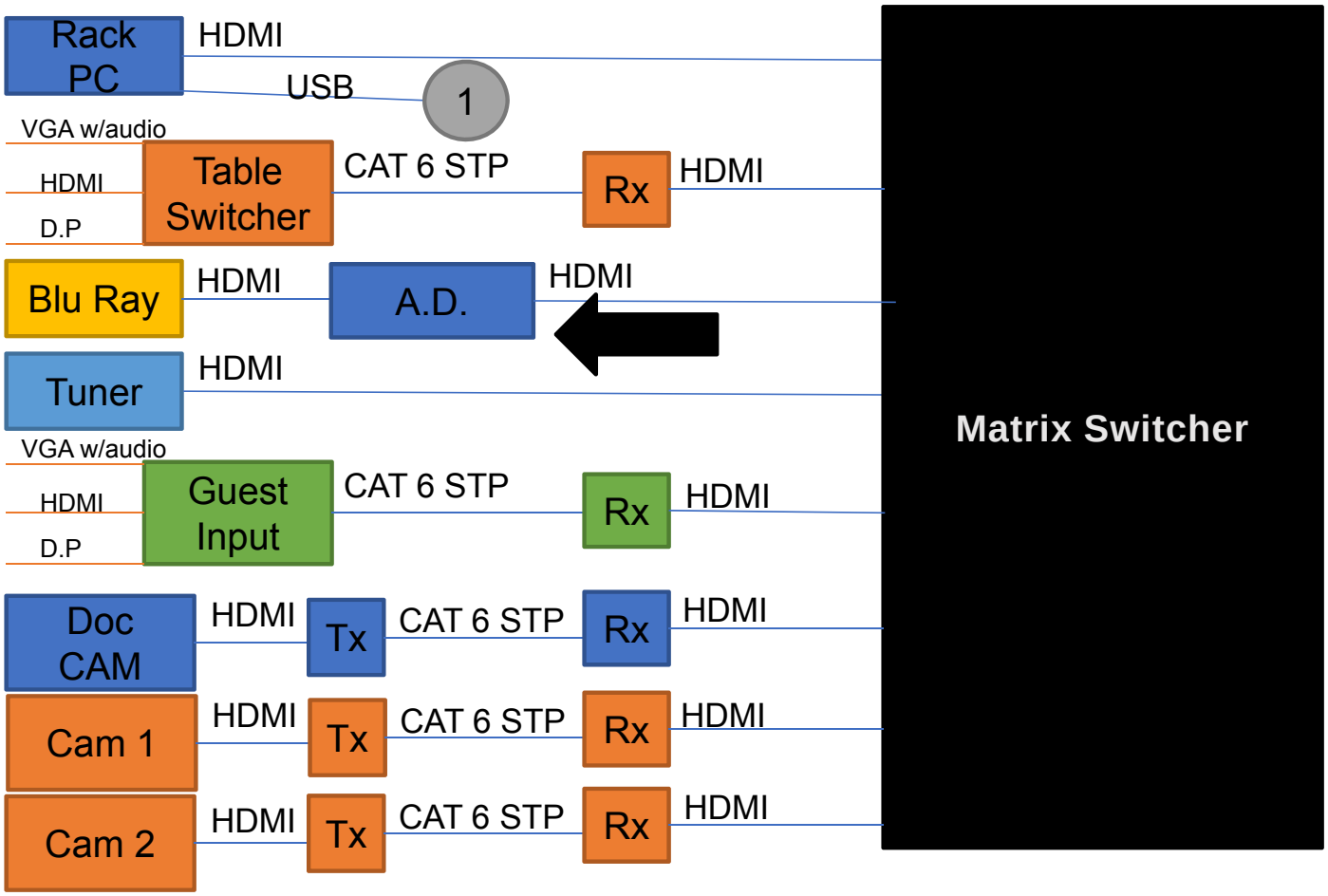
Scenario 3
USB Connection



Scenario 3

We need Audio De embedders

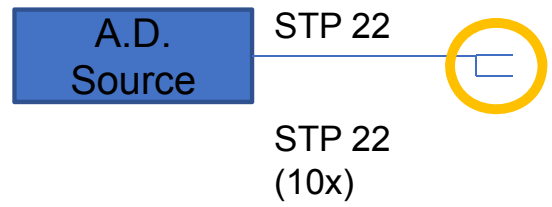


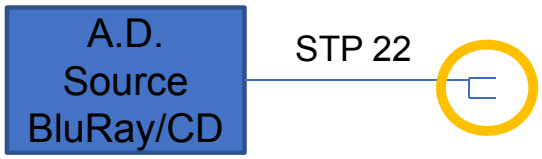


Scenario 3

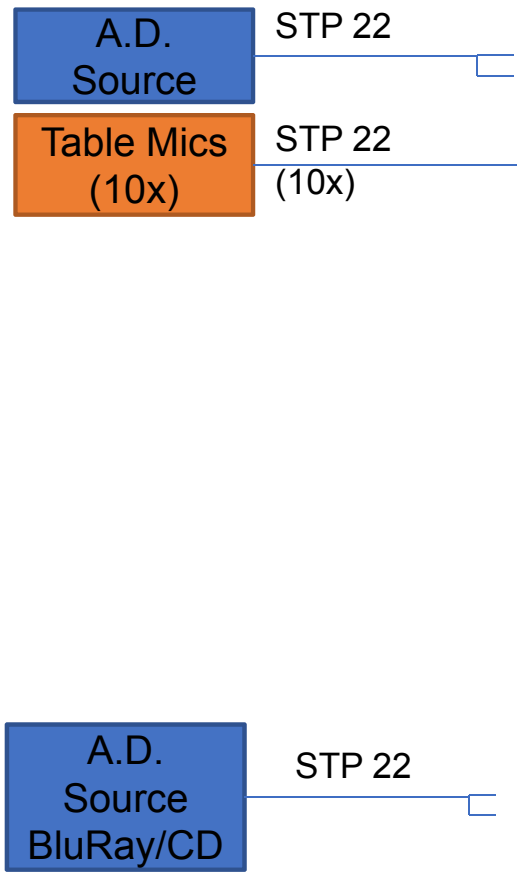
We need Audio De-embedders

Scenario 3
Don't Forget Audio

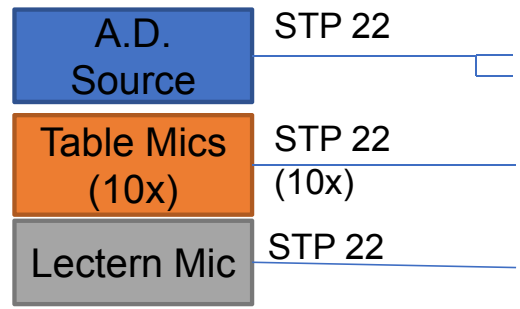


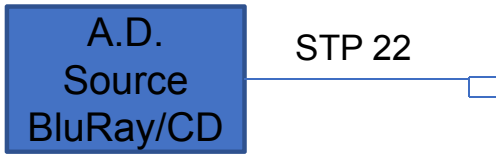


Scenario 3
Don't Forget Audio

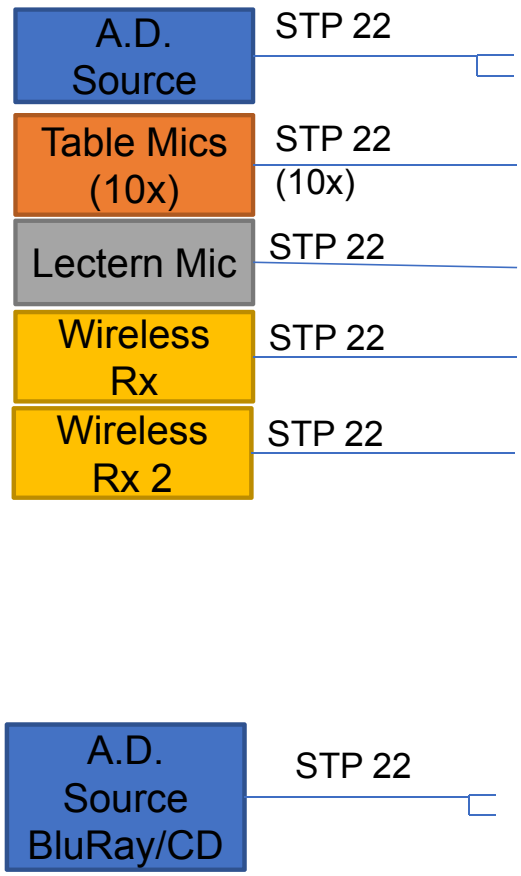


Scenario 3
Don't Forget Audio

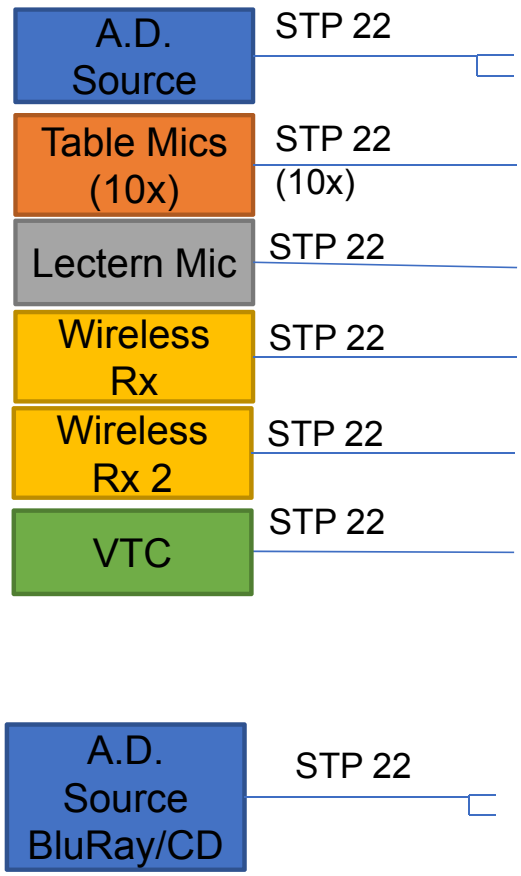




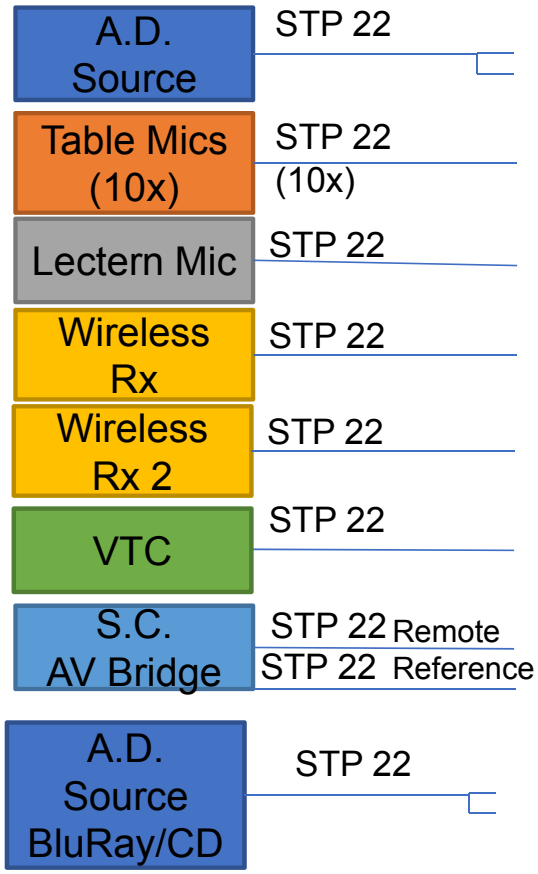
Scenario 3
Don't Forget Audio



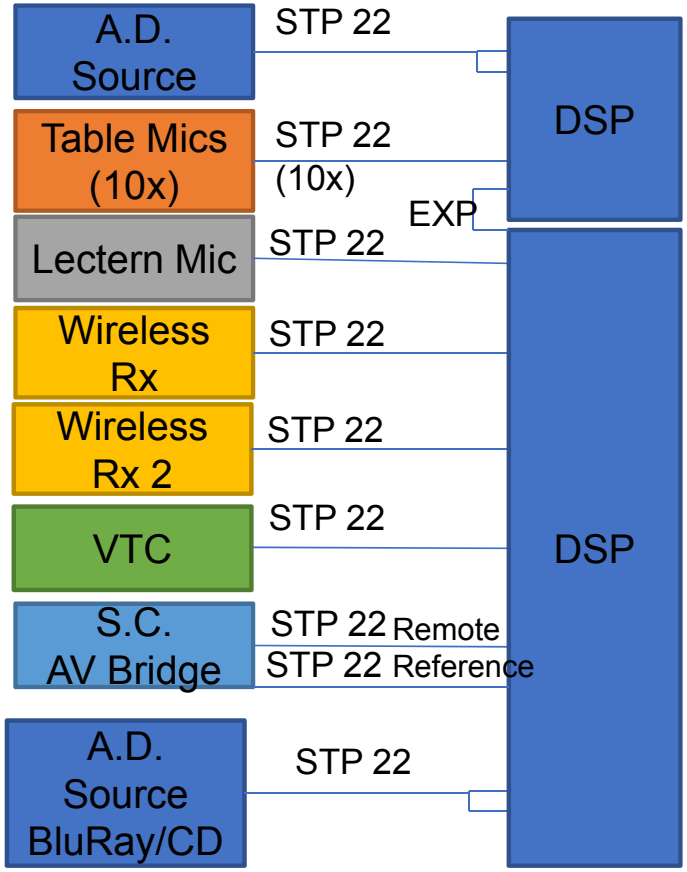
Scenario 3
Don't Forget Audio



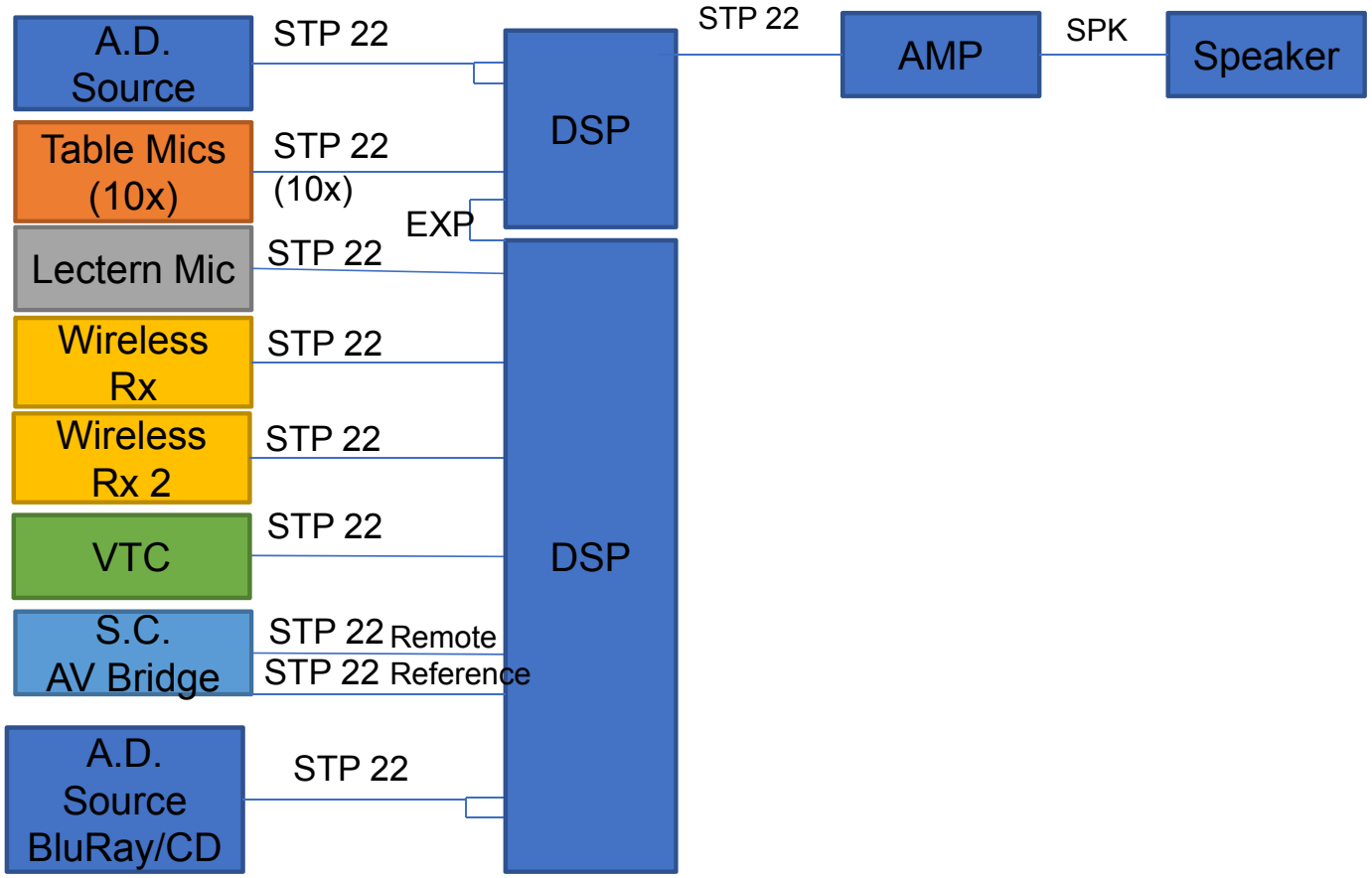
Scenario 3
Don't Forget Audio



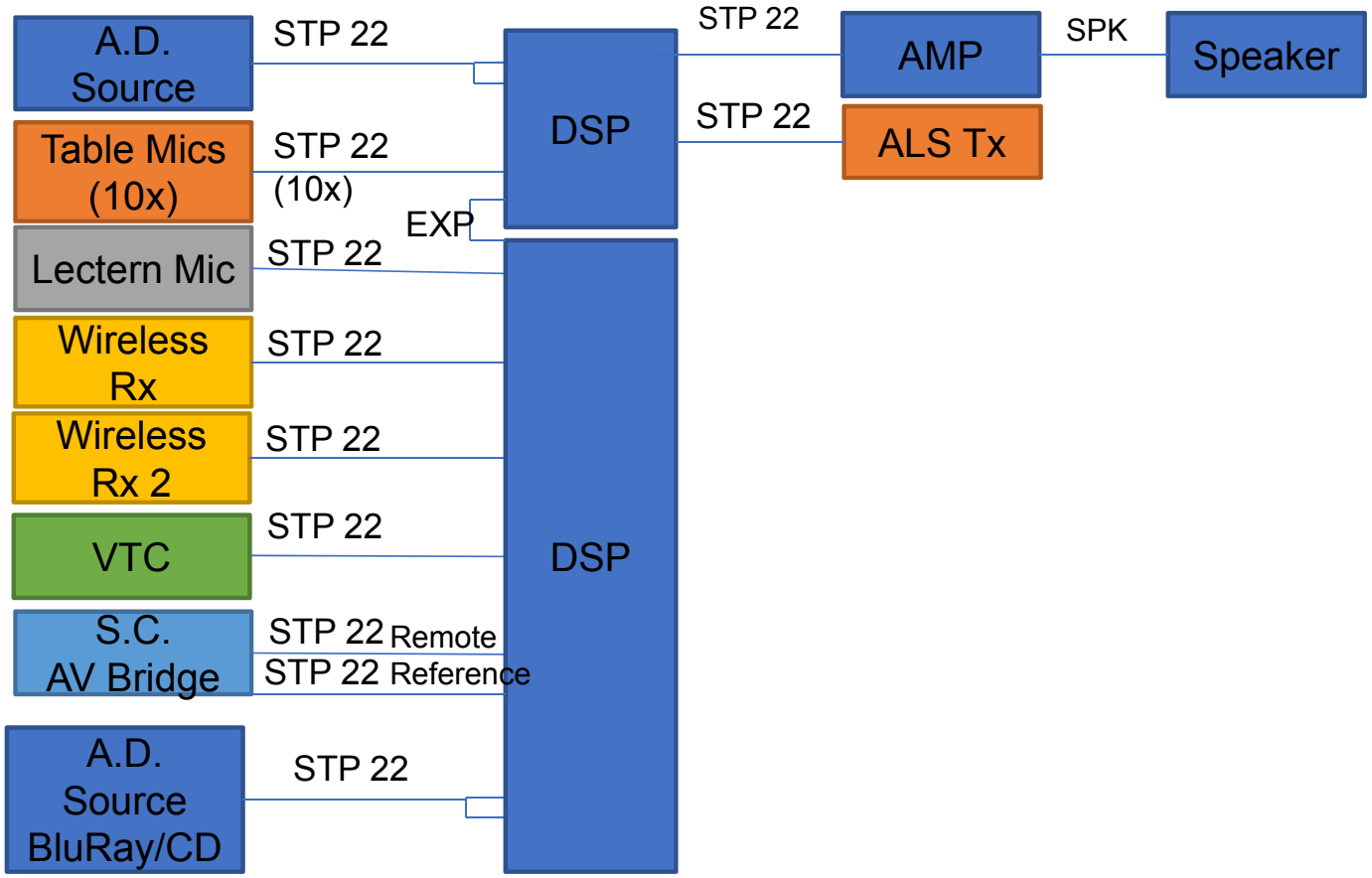
Scenario 3
Don't Forget Audio



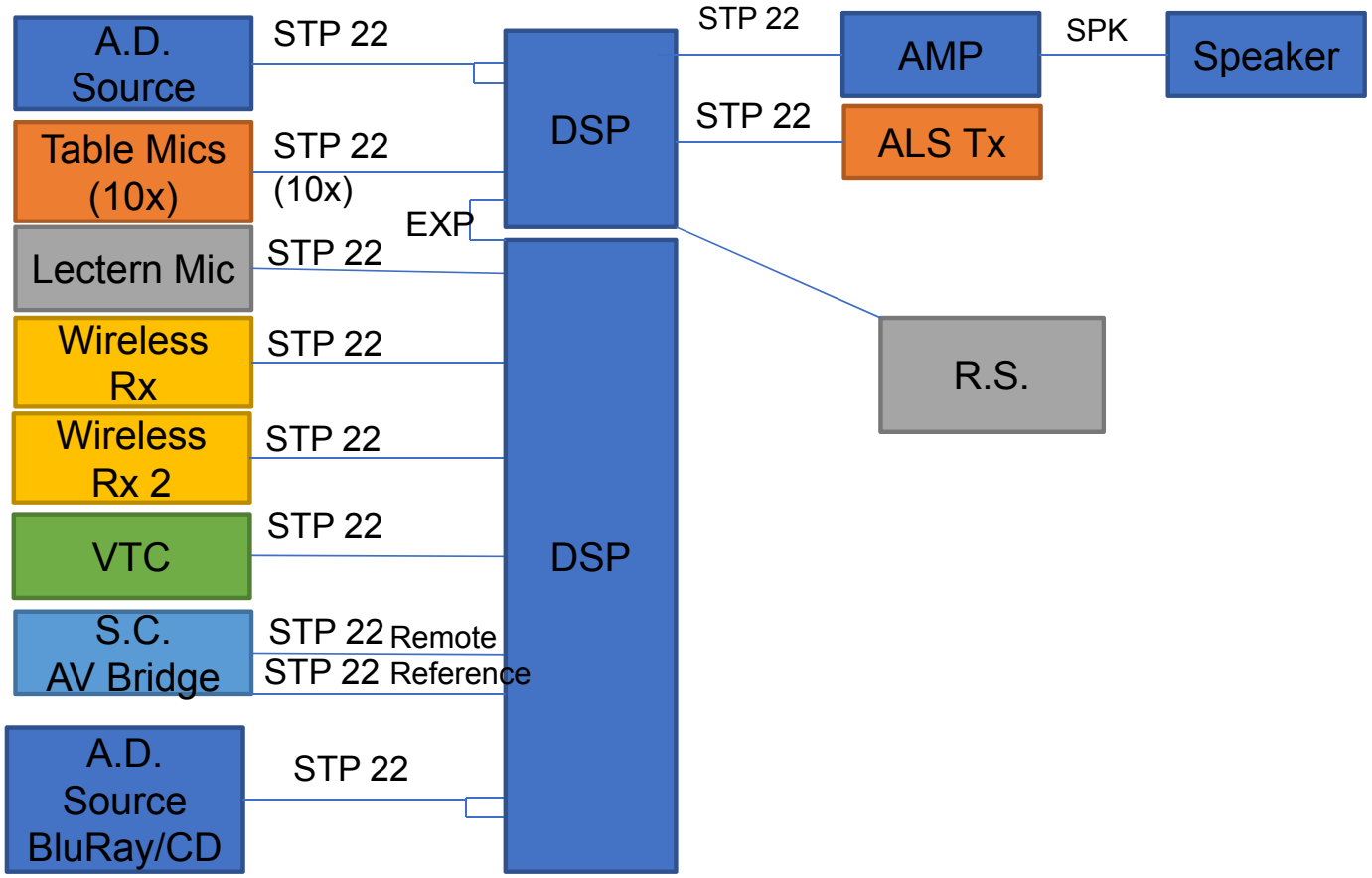
Scenario 3
Don't Forget Audio



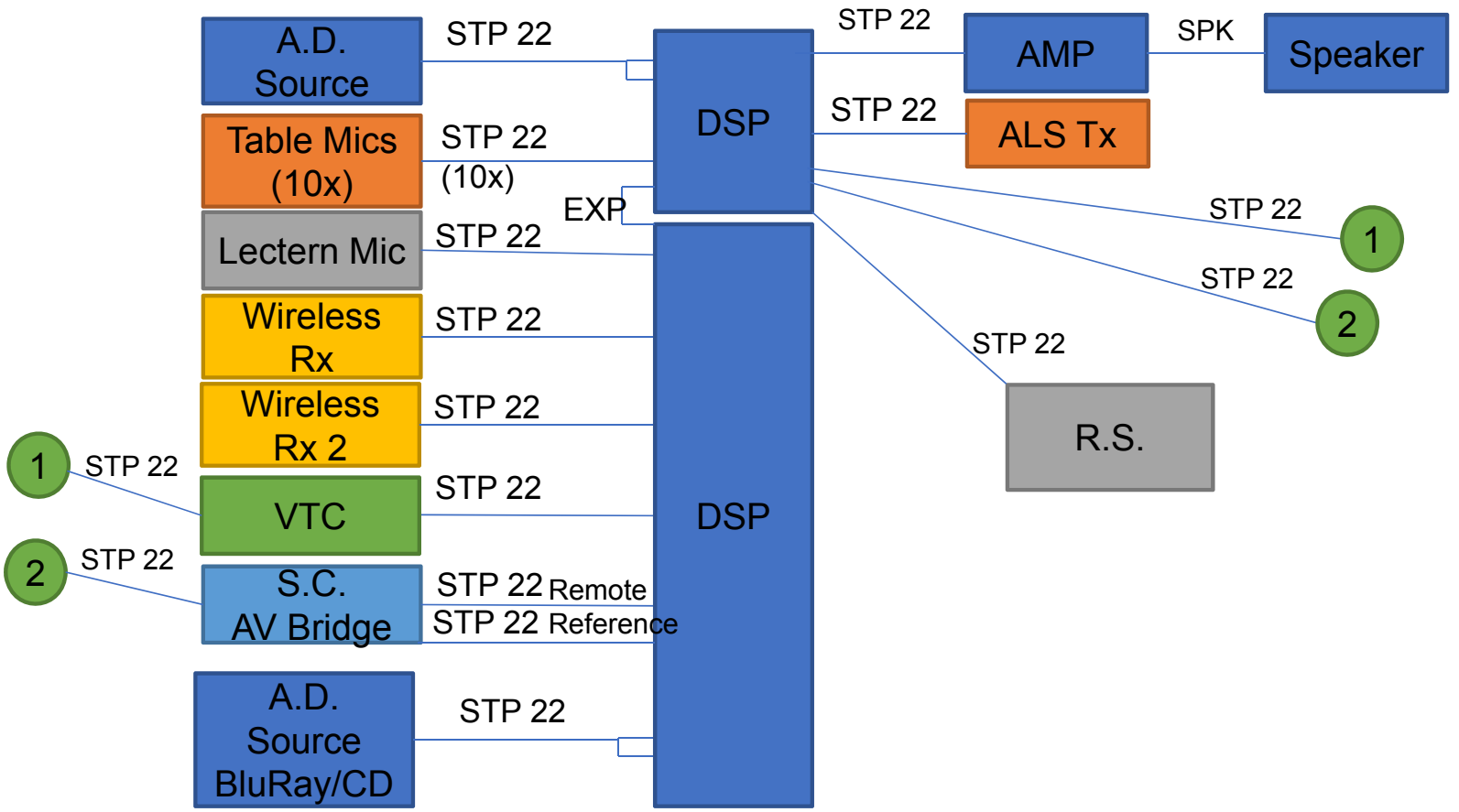
Scenario 3 Don't Forget Audio



Scenario 3 Don't Forget Audio

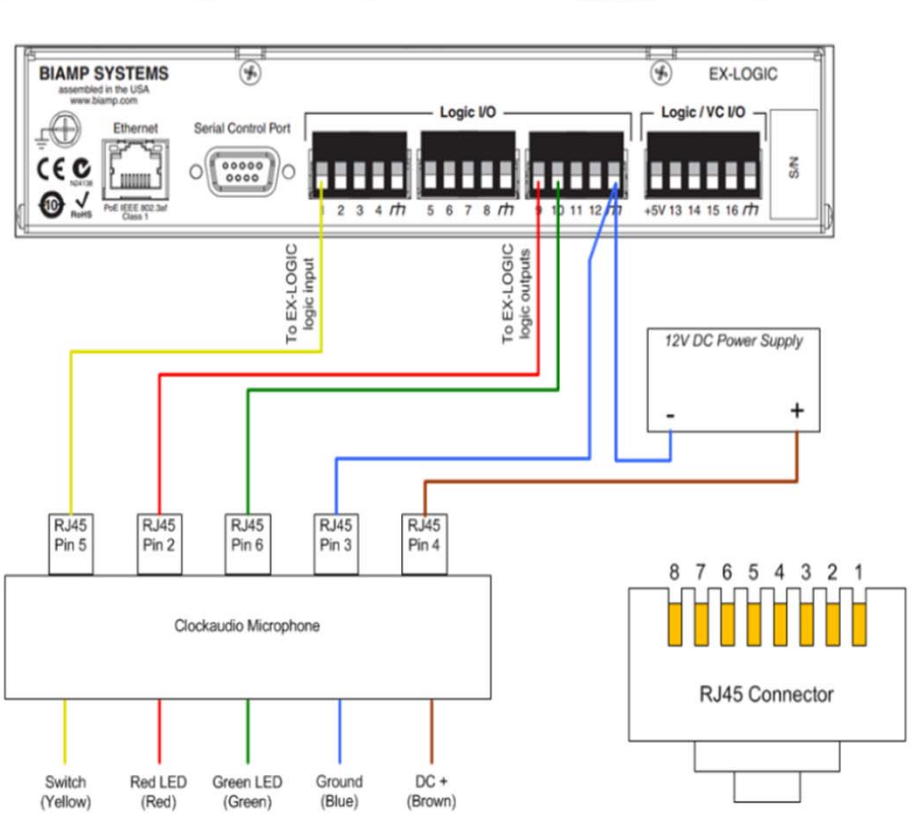


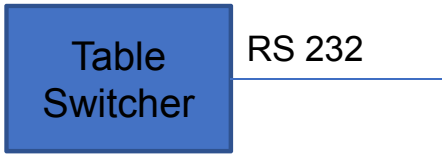
Scenario 3 Don't Forget Audio



Scenario 3

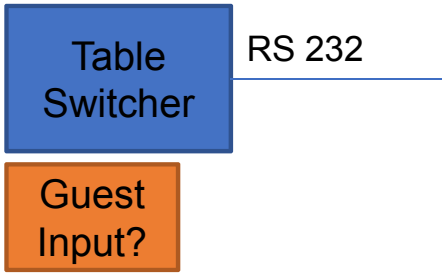
Push to Talk Buttons





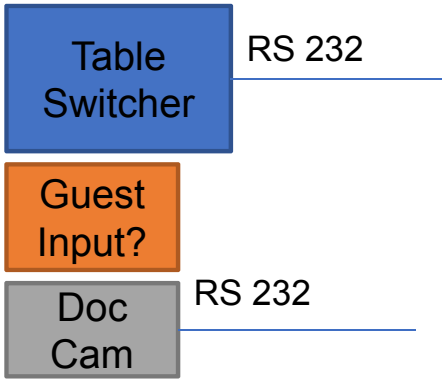
Scenario 3

Don’t forget Control!



Scenario 3

Don’t forget Control!



Scenario 3

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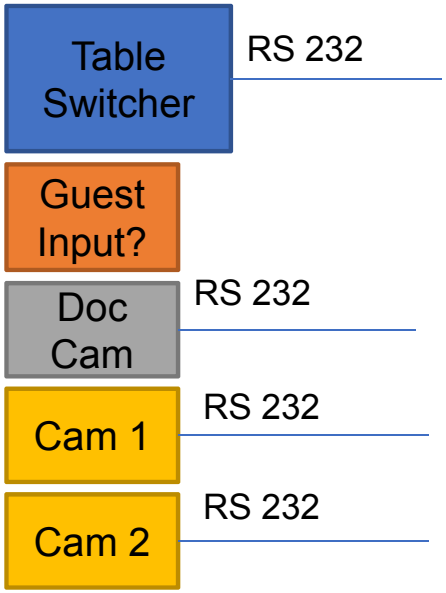

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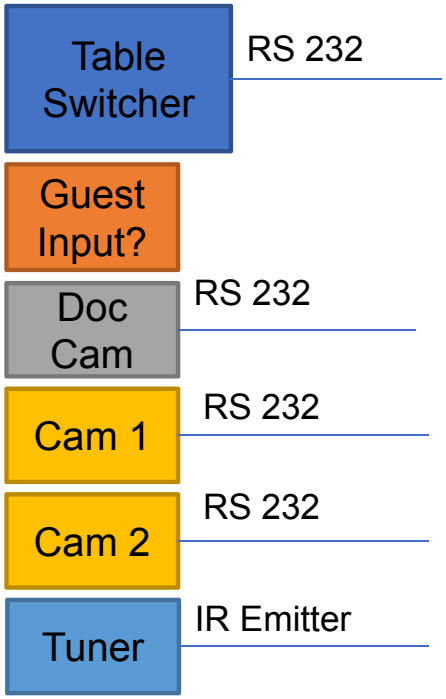

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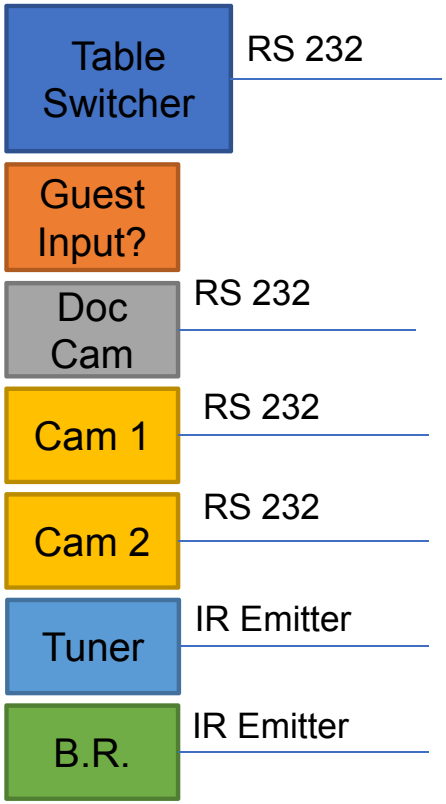

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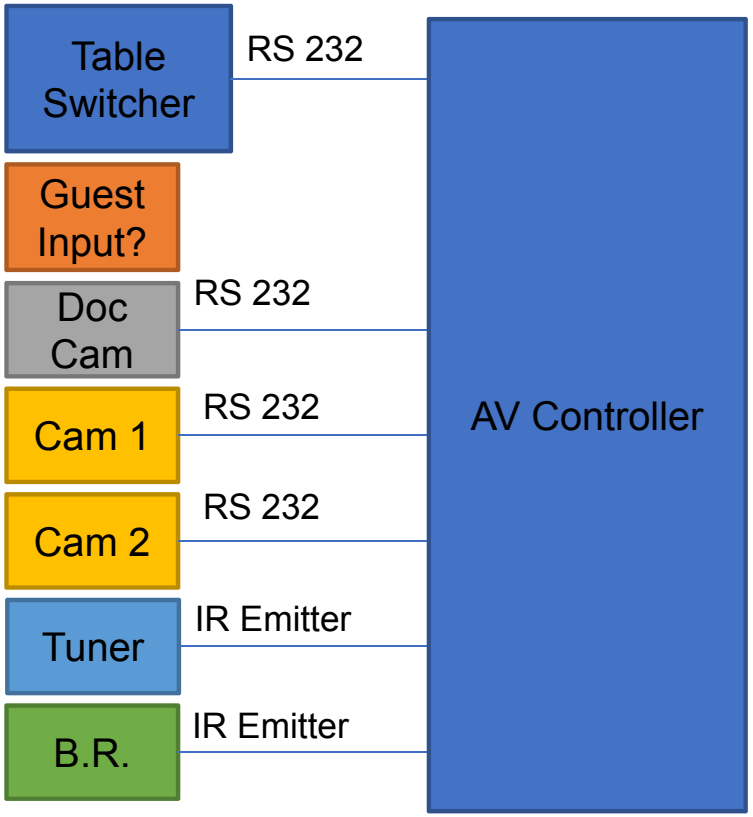

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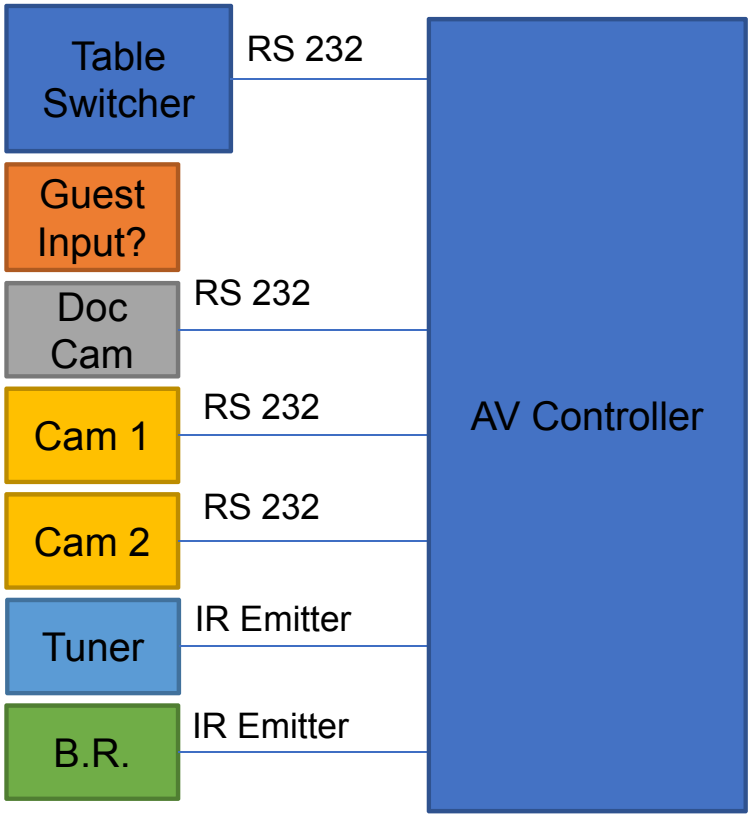

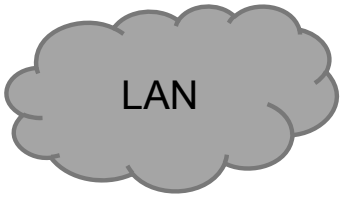

Scenario 3

Don't forget Control!

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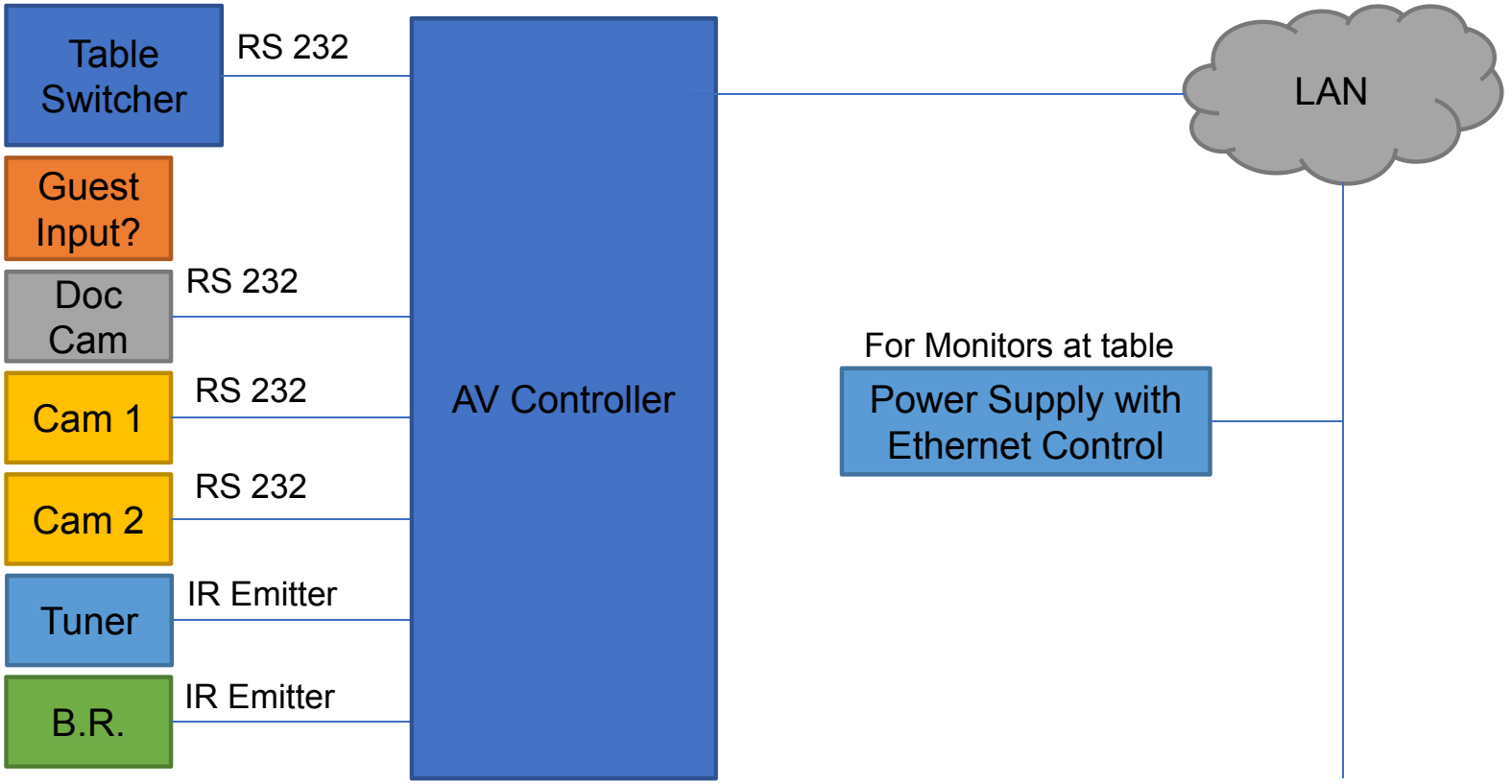

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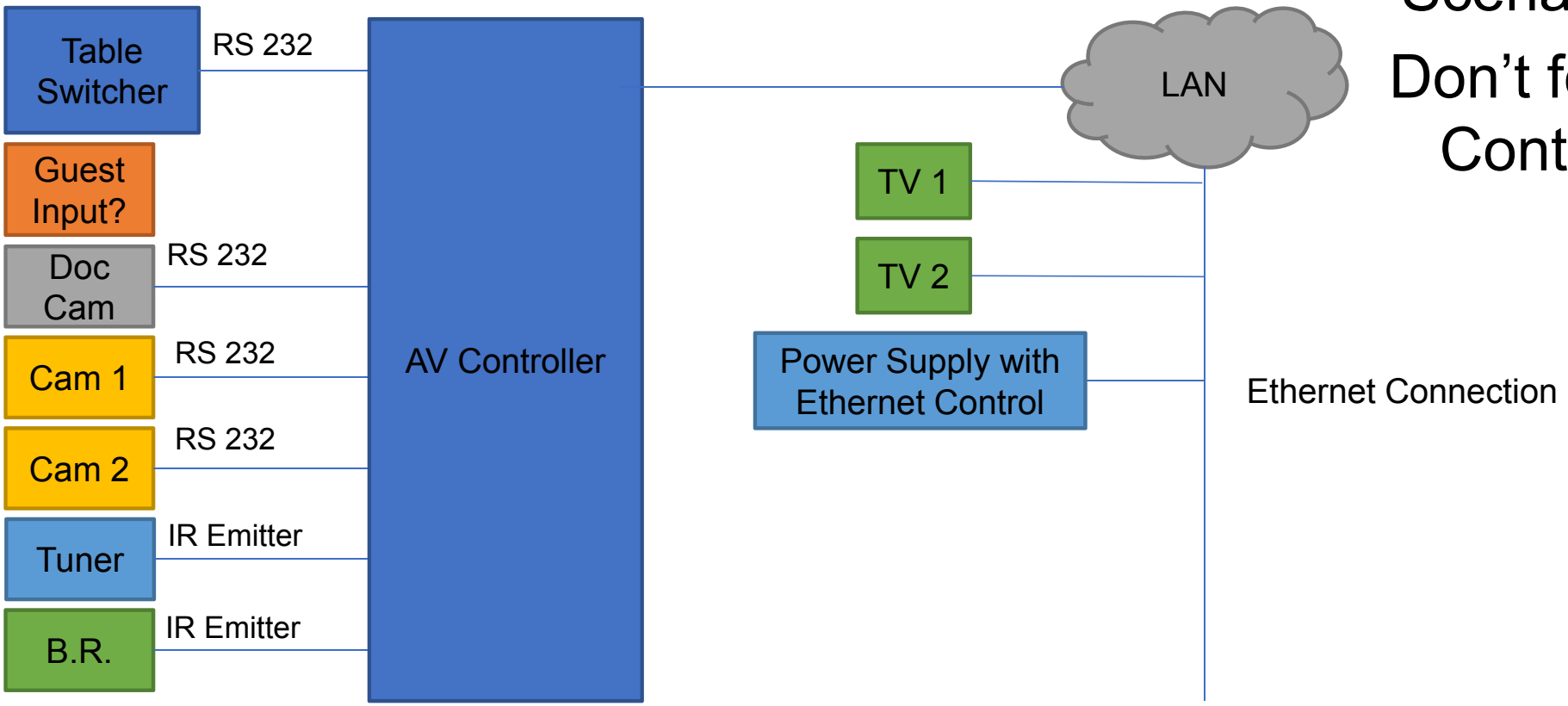

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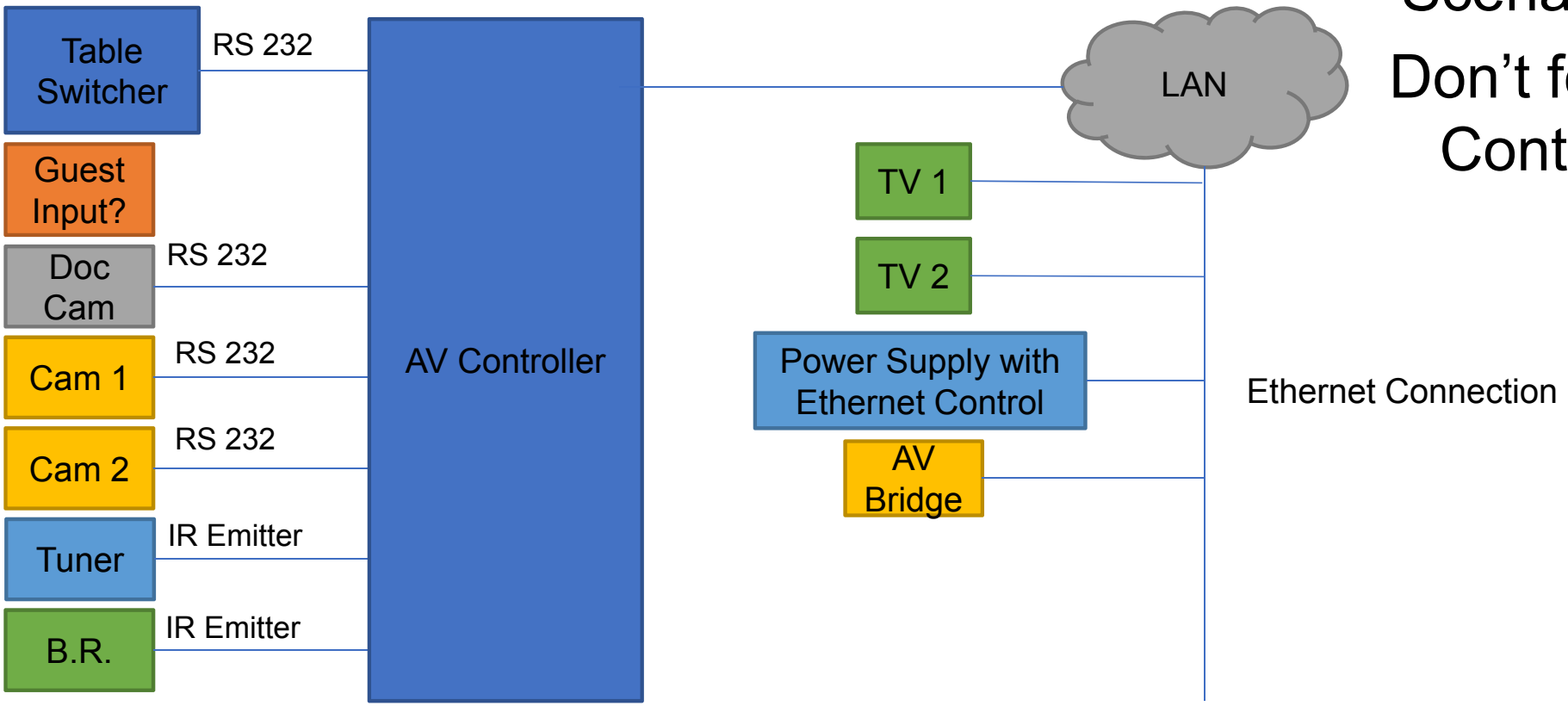

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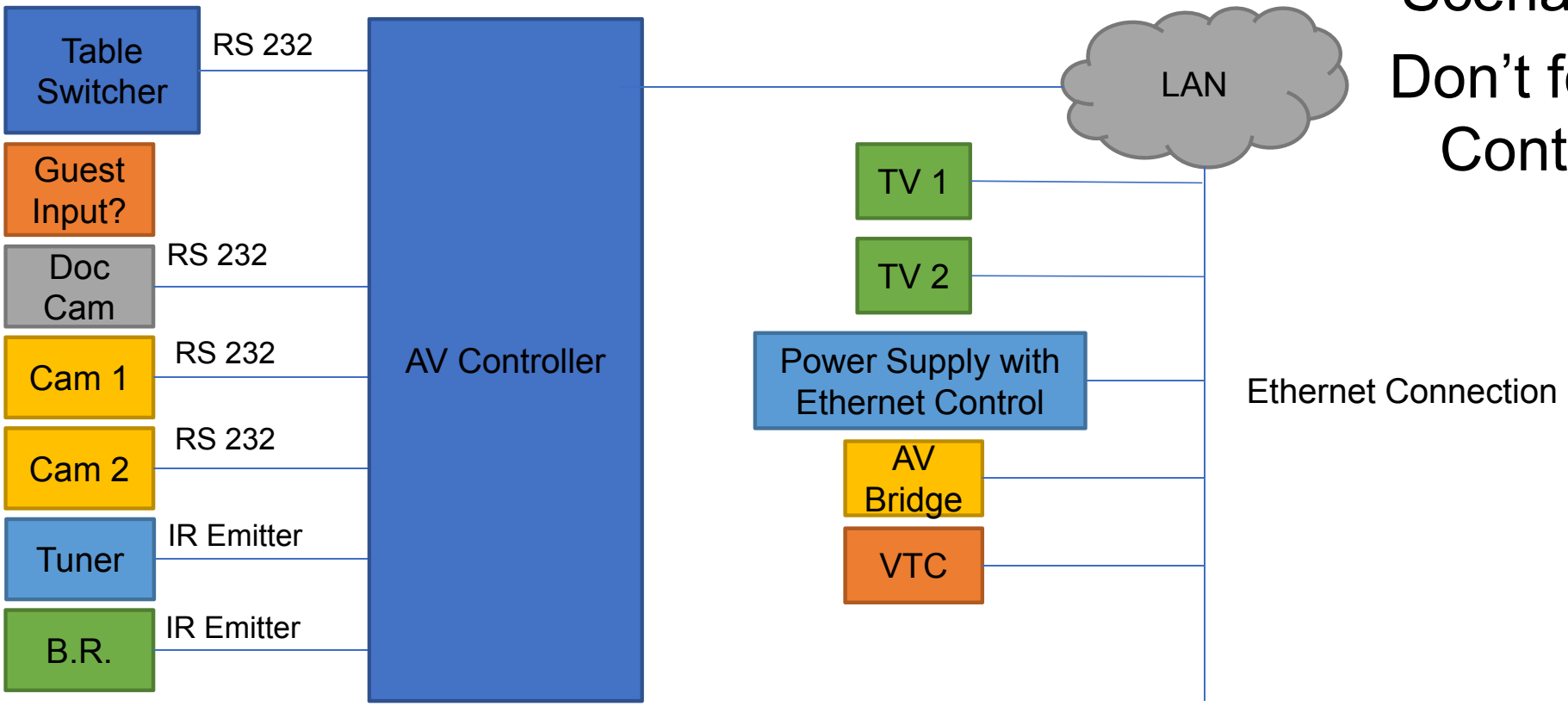

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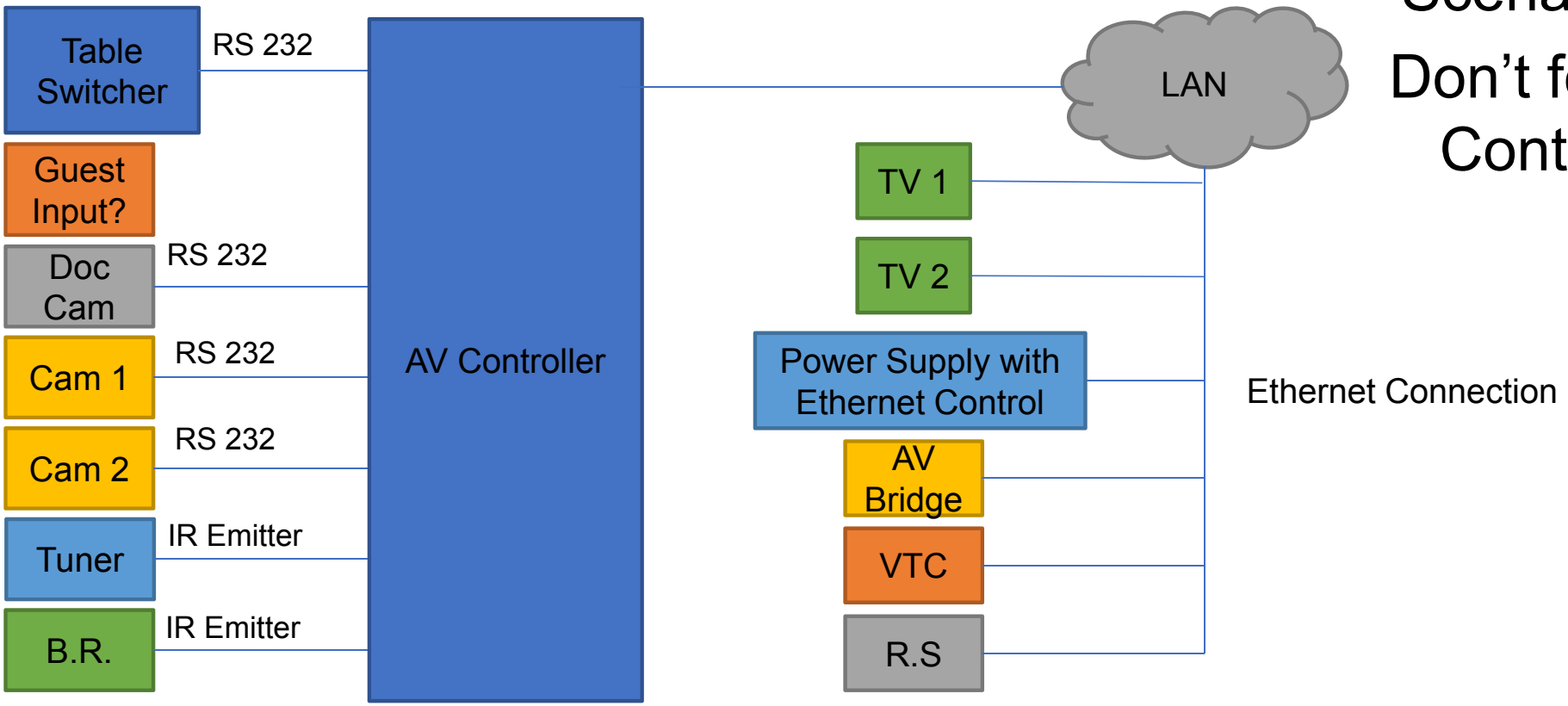
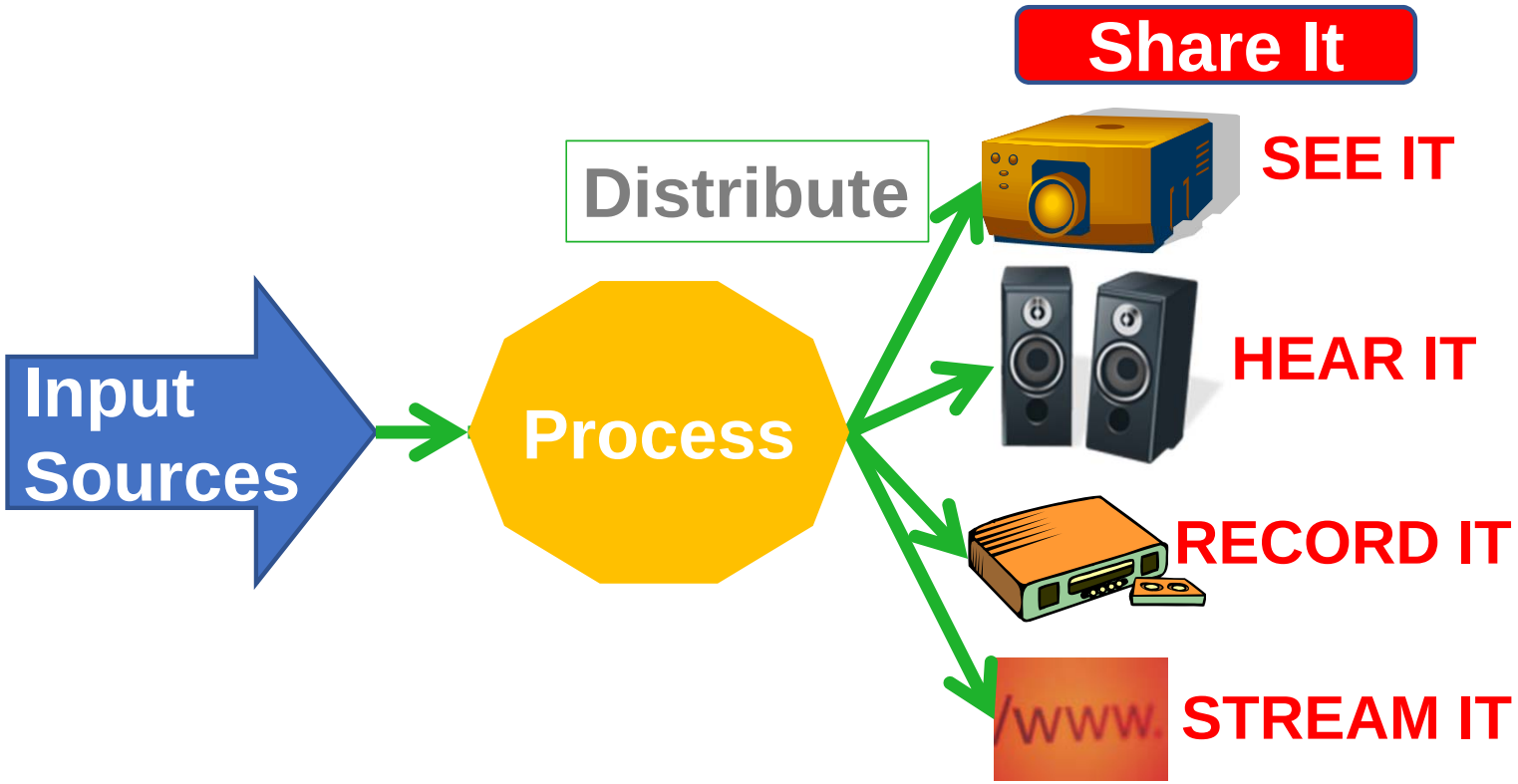
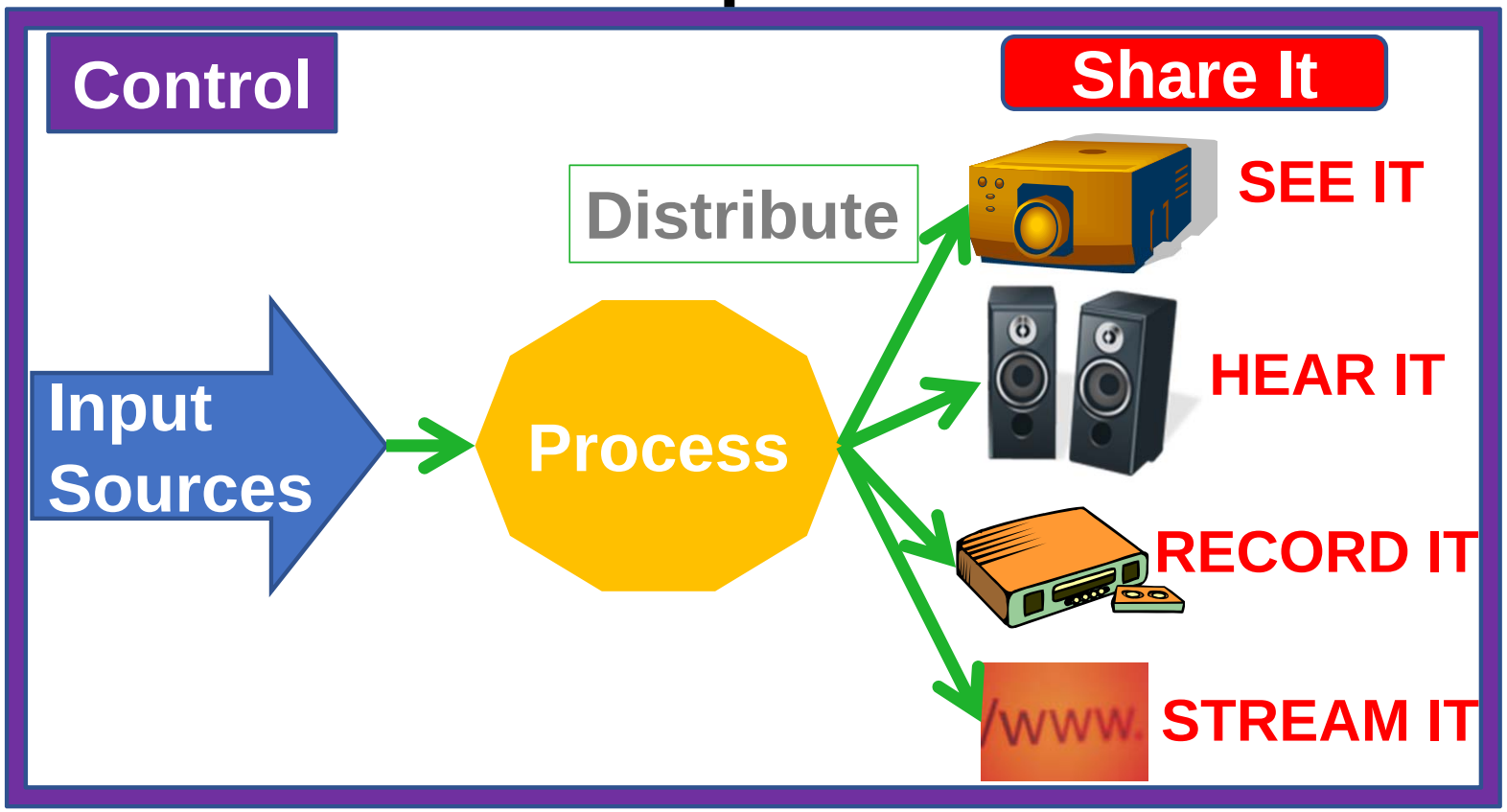


4 Steps of AV


Share It
Distribute
SEE IT
HEAR IT
Input Sources
Process
RECORD IT
/www.
STREAM IT

5th Step of AV



Feel free to contact me:

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