

# Audio Visual Basics for General and Multi-source Technicians

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## Common Terminology & Definitions

### General Terms which affect all AV disciplines

**Alternating Current AC 1.** A current that periodically reverses its direction of flow. In one cycle, an alternation starts at zero, rises to a maximum positive level, returns to zero, rises to a maximum negative level, and again returns to zero. The number of such cycles completed per second is termed the *ac frequency*.

**Direct Current DC 1.** A current that always flows in the same direction (i.e., the polarity never reverses). The current might be constant, as from a *battery or a regulated power supply*. 2. Pertaining to current that always flows in the same direction.

**Interference 2.** **The interaction of acoustic or electromagnetic** waves from more than one source, especially when they are of the same frequency, producing a characteristic INTERFERENCE PATTERN of high amplitude and low-amplitude regions.

### Common Video Terms

NTSC – National Television Standards Committee

**i = Interlacing** – The horizontal is scanned every other line (odd lines) then rescanned every other line (even lines).

**p = Progressive scan** – The horizontal scanning on one line then the next.

**Component Signal** – A device capable of some dynamic function (such as amplification, oscillation or signal control) refers to separate lines to carry each signal; i.e. .RGBHV, DVI, VGA.

**Composite Signal** – Carries the complete color television signal, including all picture, color, and control components. Refers to a single cable carrying all of the video signal; example - BNC, RCA, SDI.

➤ **Note:** SDI and BNC look the same, but SDI can carry a higher Bandwidth of signal.

**Analog computer-** A computer in which input and output quantities are represented as points on continuous (or small-increment) scales. To represent these quantities, the computer uses voltages or resistances that are proportional to the numbers to be worked on.

**Digital signal** - A signal having an integral number of discrete levels or values, as opposed to a signal whose levels or values vary over a continuous range

**BNC** Abbreviation of *bayonet Neill-Concelman*. – A type of coaxial connector that can be quickly connected and disconnected. It is commonly used with test equipment.

**RCA -phono plug** Also called *RCA plug*. A plug similar to a PHONE PLUG, designed especially for the quick connection and disconnection of coaxial cables used with audio and low-frequency devices.

**Distribution Amplifier- (P2/DA, BNC DA)** A low-output-impedance power amplifier that distributes a radio, television, or audio signal to a number of receivers or speakers.

### General Audio Terms

**Feedback** 1. The transmission of current or voltage from the output of a circuit or device back to the input, where it interacts with the input signal to modify operation of the device. Feedback is positive when it is in phase with the input, and is negative when it is out of phase.

**Mic Level** - Electrical output of a mic is very low level (-40 to -50 dB) It must be pre-amplified for the mixer to use it.

**Line level** - is hotter than mic level – can be either -10 db or +4 dB.

**Audio DI** – converts a line level unbalanced signal to mic level balanced.

**Stereo** - is a pair of information streams with different program material – L and R.

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**Mono** - is a single information stream with program material – M.

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## AUDIO BASICS

### Mic Level vs. Line Level

#### **Mic Level**

Electrical output of a mic is very low level (-40 to -50 dB).

It must be pre-amplified for the mixer to use it.

Mic level channels on a mixer have a preamp gain control, usually at the very top of the channel.

Mic level channels will have an XLR connector.

#### **Line Level**

*Line level* is hotter than mic level – can be either -10 db or +4 dB.

All audio playback devices and audio processors run at line level.

**True line level** mixer inputs will not have an XLR connector – mics cannot be used on these channels.

**Most audio mixers will accept a line level signal at the mic input – adjust the preamp gain.**

### Microphones Two basic types:

1. **Dynamic**

2. **Condenser** - needs power from batteries or **phantom power from the mixer**

**Microphone Dynamic patterns** - Polar patterns; Cardioid; Supercardioid ;{ Omni; Figure 8 (bi-directional) are not used on stage}

### Audio Speakers

Many speakers are **Self-Powered** and plug directly into an Edison power source.

These speakers will also require an **audio input** to work.

**Passive speakers** require an external amplifier to drive them. The *amp* gets Edison power and an audio signal. The *amp* drives the speaker through a connecting cable.

### Speaker Functions

**Mains** – Primary units which face audience from the stage line.

**Delays** – Used in deep rooms in conjunction with the mains, to reach audience in back

**Fills** – Fill in gaps the mains don't cover, usually in the center near the stage.

**Foldback monitors** – placed on stage for presenters to hear playback and Q+A. Also for live musicians to hear themselves.

**Backstage monitors** – for backstage crew to hear program.

### Speaker Positions

**Mains** – Single or pair of speakers on the left and right sides at the front of the room.

They should be in front of the mic line or stage line.

▶ Leave a space between speakers and the front row of attendees.

▶ Be aware of sightlines. Make sure speakers are not blocking the audience view of the stage or the screen

**Delays** - are used in long rooms, placed roughly halfway to the last row of the audience

**Front fills** - are placed either on or in front of the stage. They can be a single speaker or multiple speakers, divided evenly across the stage line.

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## Stereo and Mono

*Stereo and mono describe audio signal material*

**Stereo** is a pair of information streams with different program material – L and R.

**Mono** is a single information stream with program material – M.

The number of conductors on a connector does not necessarily indicate mono/stereo, or balanced/unbalanced.

Three conductors on the connector mean the cable is either Mono/Balanced or Stereo/Unbalanced. If a program feed has two signals but they are the same mix, it is called “2-track mono.”

## Cable Theory

Audio signals require 2 wires to function - one positive polarity, and one negative polarity.

Audio cables also have a shield to protect the audio signal from magnetic fields and RF (radio frequency). The shield is metallic.

## Balanced and Unbalanced

**Balanced** cables/connectors have three electrical conductors.

**Unbalanced** cables/connectors have two electrical conductors.

## Speaker Cables

Used to connect amplifier outputs to speaker inputs

Used to connect powered speaker inputs to a mixer

- Heavy gauge wire is used for minimum power loss

## Common Audio Adaptors

XLR (M or F) to ¼” Male (balanced or unbalanced)

Male XLR to Male XLR (turnaround)

Female XLR to Female XLR (turnaround)

Female NL4 to Female NL4 (barrel)

Female RCA to Female RCA (barrel)

⅛”mini to RCA Male (2X) (direct boxes)

⅛”mini to ¼” TS Male (2X) (direct boxes)

NL4 to ¼” Male (speaker cable)

F XLR or M XLR to F XLR or M XLR (X2) (“y” connector, or splitter)

Male ¼” to Female ⅛”mini

Male XLR to ⅛”mini (mono or stereo)

RCA Male to ⅛”mini (mono or stereo)

XLR to XLR Pad (adaptor)

## Important Information to Know

(some info from client, some you will determine)

Where is the Tech table located?

What power and where is it located?

Where will the cable runs be?

Where are the screens located?

Where is the audience located?

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## **Important Rule!**

- Always power on speakers (amps) LAST.
- Always power off speakers (amps) FIRST.
- Always mute an input channel before plugging in a source.

## **Mixing Set Up Basics**

After all cables are run, speakers are set and devices are connected to the mixing board and ***before turning on any power check.***

1. Check the Master Gain /fader is all the way down.
2. Check the Trim Gain to each channel is down (Note: some mixers do not have a separate trim gain for each channel).
3. Check each channel fader is all the way down.
4. Check the Amplifier or speaker gain is all the way down.
5. Aim the speakers for the maximum room coverage.
6. Power up the mixer.
7. Power up the Amplifiers or powered speakers.
8. Set all mixer EQ settings to flat - 12 noon position.
9. Center the pan pots to their detent position.
10. Turn all other pots fully CCW till they stop.
11. Plug in a music source into a mixer channel at the tech table. Play the source and make sure the speakers are turned down (i.e., no sound).

## **Setting the gain structure for the system**

12. Set the Master volume fader to 0db.
13. Set the channel volume fader to -5 db level.
14. While music is playing, slowly raise the channel gain trim while watching the Mains meters.
15. Adjust the gain trim so that the mains meter shows around -20 to -10 while the music is playing.
16. Go to the speaker (amp) and slowly turn up the volume until the music is at a comfortable level – how loud a voice would be during a presentation.

**This gives you a rough system gain structure.**

- ✓ If a dynamic mic (e.g., Shure SM58) is to be used, check that you can get enough gain at the mixer to fill the room. These mics have the lowest output gain of all the sources you will use.
- ✓ Have someone speak into it on stage and listen to the volume in the room. If the gain is insufficient, turn up the speakers (amps) a little bit more until the gain is enough to fill the room properly.
- ✓ When you decide the volume is correct, continue to set channel gains for all your other input sources by playing them into the room.
- ✓ Once you have properly set your gain structure, you should not have to touch your Master output fader again.

## Visual Basics

### Types of Video Cables

VGA,  
RGBHV (5 male to male BNC cables in one bundle)  
DVI-I, DVI-D  
SDI  
HDMI  
BNC  
RCA  
S-video  
Display port  
Coaxial  
RF (Radio Frequency)  
Phoenix (Screw Connector)

### Miscellaneous Cables and Devices

- RJ45 – Used for internet, speaker timers and to extend keyboard/mice control to lectern.
- REX – Used for speaker timers and slide projectors.
- P2/DA – Used to split 1 VGA input to several different devices.
- RGB/DA – Same function as P2/DA only for 5 wire devices (RGBHV – component signals).
- RCA DA – same as P2/DA only for RCA composite devices.  
(Note: these can be used for multiple audio outputs too)
- BNC DA – same as PS/DA only for composite BNC devices.
- SDI DA – Functions like BNC DA only is capable to carry a SDI signal – higher bandwidth.

### Devices which are visual sources

- Computers
- Tablets ; smart phones (not common yet)
- Overhead Projector
- DVD or Blue-ray players
- ELMO (electric light magnifier overhead)
- Flipcharts
- Beta Tape player
- 35mm Projector (very rarely these days)
- Cameras for recording or live image shots

### Common Adaptors & Cables

1. Male to Male VGA
2. Male to Female VGA (VGA extension)
3. Female to Female BNC (BNC barrel)
4. Male to Male (VGA barrel)
5. Female to Female (VGA barrel)
6. Male DVI to Female VGA
7. Male DVI to Male VGA
8. Male DVI to Male DVI
9. BNC to RCA (bullet)

## Common Adaptors & Cables continued

10. Female BNC to Male RF
11. BNC to BNC (single male cable)
12. BNC to BNC (female barrel)
13. BNC to Female RCA
14. Male or Female VGA to Male or Female RGBHV (fan out)

## Setting a Room

Note: The Client will have an idea of how they want the room to look.

We are the experts – be aware of room dimensions.

- Take note of ceiling height, room size, and lighting fixtures.
- Also note the location of Emergency Exits, and Staff entry ways.

These things can cause set up problems and need to be addressed before starting.

Things to know before starting;

- Is the projection **Front** or **Rear**?  
Note: some new fabrics look the same and others can do both.
- ❖ How high the bottom of the screen is off the floor?  
Note: commonly set to height of the screen to the screen skirt.
- ❖ Is the full dress kit to be used?  
Note: make sure the supplied dress kit is the correct color desired by the client.

## Setting the Screen

Different types of screen are assembled together in slightly different ways.

The general order of assembly will be.

1. Frame
2. Legs
3. Screen
4. Dress Kit

- Helpful hints:
  - ✓ When attaching the screen avoid getting it dirty or wet.
  - ✓ Avoid using tools such as pliers or a Leatherman to stretch it to fit.  
A canvas stretching tool can be used – but use with caution, not to damage the screen.  
Well worn borders can be very fragile avoid pulling out screen snaps.
- Report to the person in charge - **if the screen or its parts** are damaged, or missing.  
i.e. or more then 3 critical snaps are missing, the frame or legs are broken or bent.

## Striking the Screen

- ✓ When removing a screen from the frame. Popping it off with sudden jerking motions can tear snaps out of the screen fabric, (you might end up getting this same gear on your next job).

## ADDITIONAL VIDEO FACTS

**f.** = the focal distance is measured from the lens nearest the lamp - to the back of front lens in mm.  
**Aspect Ratio** – Is determined by the Width /Height of a screen, or the values of a computer's screen resolution. Note: a 4:3 ratio = 1.33:1 and a 16:9 ratio = 1.78:1.

### Screen to projector placement

- ✓ Distance of projector from screen will be. The Distance = lens **f.** multiplied by width of screen.  
(f. = focus distance :The lens throw dynamics)
- 1. Place the projector on a flat level surface with the lens centered at the screens center point at the calculated distance from the screen.
- 2. To check the projector is center on the screen - Check the measurement from each corner of the screen fabric to the center of the lens. It should be the same.
- 3. If doing FRONT projection - Try to get the projector the same distance off the floor as the bottom of screen surface.
- 4. If doing REAR projection - The lens should be as high to the center of the screen as possible. Make sure the screen settings of the projector correspond to the projectors alignment to the screen. The focus is sharp and the image is filling top to bottom and side to side.

### Projector Image adjustments / fine tuning

- NOTE: Image rough tuning is best done using the test patterns found in a scaling switcher. (If a scaling switch is not available these tests patterns can be sent from a PowerPoint slide show.)  
**Before doing any Image adjustments perform a Factory Reset.**  
This is found deep in a projectors menu.
- ✓ Check total dots displayed, Horizontal and Vertical Image displayed are optimal for the screen resolution being used. Adjust as needed in the projectors PC or Screen Adjustment menu, (the burst pattern in a scaling switcher is the best to help determine this).
- ✓ Adjustment to the Fine Sync is done in this mode to make the burst pattern as clean as possible. NOTE: DUE THIS WITHOUT ANY KEYSTONING ON.
- ✓ Adjust Brightness and Contrast using the scaling switchers Gray Scale pattern. The goal is to see all the bars displayed as white, gray, and black as possible.  
NOTE: If shades of color are seen you need to add or delete color in the projectors Image Color Adjustment menu.
- ★ **Remember to Store these settings when done,** if the projector has that capability!

### Fine Adjustment Note:

- ★ The end user's {the Client} image colors might not appear as they wish. Further color, brightness, contrast, gamma or sharpness adjustments can be used to correct this.
- Remember when a tripod screen is being used you can raise or lower the bottom of the screen to fit the entire image onto the screen. You might need to use the thumb lock on the handle of the screen to accomplish this.

## Pipe & Drape

### Setting up Pipe and Drape

1. Attach the insertion nubs (nipples) to bases.
2. Lay out bases using the cross stays for proper distance between each base.
3. Slide the drape onto the cross stays – remember for more fullness you need more drape.  
☛ **Remember to have the show side of the drape facing the same way!**
4. Put the Uprights onto the nipple.
5. Place the cross stays into the slots in the uprights.  
➤ NOTE: Ladders or scissor lift might be required to accomplish this task.  
**Note: Remember to cap the ends of the drape over the uprights' top.**  
☛ A Chair is NOT a ladder and not OSHA approved to use to do this task.
6. Raise the uprights to the desired height – usually called by a third person in the Front Of House (FOH).
7. Fluff out the bottom of the drape so it evenly spreads the span between its two uprights.
8. Close any gaps where two ends of drape meet using either clothes pins or the large size paper clips.

## Taping Down Cables

Clean straight cable runs are the goal. **Go Over doorways if possible or use cable ramps.**

Keeping cable runs that cross traveled areas as short as possible means less cable to tape down.

1. Tack down each end of the cables to be taped as straight and tight as possible.
2. Starting at one end lay down the tape covering the cables in one single continuous straight line.  
**Note:** sometimes due to the number of cables, or the width of the tape, you have to use multiple single runs of tape.
3. Overlap the second straight run slightly over the first.
4. Repeat as needed to cover all the cables.
5. Walk on top of the taped down cables, sliding your feet as you go to ensure maximum flatness, reducing any tripping hazard.

**REMEMBER TOTO** and for any questions follow the chain of command.

- ☞ When placing objects the end User might wish to move, i.e. **DSM (down stage monitor), Lectern mics, Speaker timer, table mics etc.**
- ☞ **Leave enough extra cable coiled by the object to allow movement without pulling up tape!**
- ☞ **Keep all cable runs neat and labeled.**

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## Basic AV/ Multi-Source Skills Check off

Name: \_\_\_\_\_

Date: \_\_\_\_\_

- \_\_\_\_\_ Demonstrate/Explain the proper Tape down of cables.
- \_\_\_\_\_ Demonstrate/Explain the proper set up and strike of a fast fold screen.
- \_\_\_\_\_ Demonstrate/Explain the proper set up and strike of a Tripod screen.
- \_\_\_\_\_ Demonstrate/Explain the proper set up and strike of an Overhead projector.
- \_\_\_\_\_ Demonstrate/Explain the proper steps to take to set up a Projector.
- \_\_\_\_\_ Demonstrate/Explain the proper set up and strike of Pipe and Drape in a room.
- \_\_\_\_\_ Demonstrate/Explain the proper steps to set up an audio system (include set up 3 sources).
- \_\_\_\_\_ Demonstrate/Explain the understanding in the set up and functioning of a Folsom/Barco switcher.
- \_\_\_\_\_ Explain the difference between an ELMO and an Overhead projector.

Properly identify and explain the function and use of the following:

	Pass	Needs Work
P2 DA	_____	_____
RGB DA	_____	_____
DI	_____	_____
Speaker Timer	_____	_____
Cue Light	_____	_____

Properly identify the types of 5 or more Cables or Adaptors of both audio and video varieties selected by an instructor.

\_\_\_\_\_

Instructor's signature; \_\_\_\_\_