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# Signal Level and Cable Type

**Explain** signal flow **(Mic → Mixer → Amplifier → Speaker).**

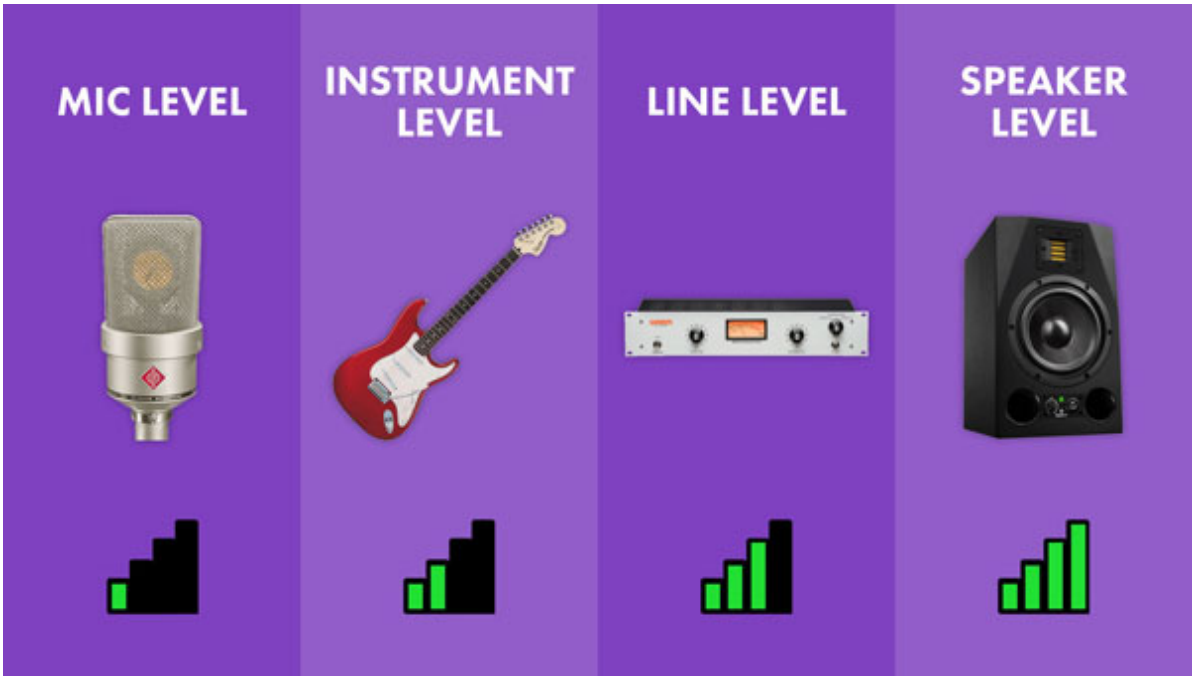
**Show** different cable types **(XLR, RCA, TRS, TS, AUX/3.5mm, Speakon, Powercon, CEE).**

**Practical:**

Trainees identify each cable type.

Practice connecting input/output devices correctly.

Test by tracing signal path.




# Cable Rolling

**Explain** why proper rolling prevents cable damage.
**Demonstrate** the over-under rolling method (5M, 10M, 15M, etc).
**Practical:**

1. Each trainee rolls & unrolls cables.
2. Trainer checks for neatness, no twists/kinks.
3. Timed exercise for efficiency.

# Basic PA

A **public address (PA) system** is an electronic system used to amplify a voice, music, or other sound source and project it to a large audience.

Input -> Process -> Output (Every output will need to link to an input).

- **Microphone (Input Source)**
  - Type of Mic (Wired, Wireless, Condense)
- **Mixer (Control Center)**
  - Different: Digital (X32, M32, M32R) / Analog Mixer (Playground Mixer)
- **Amplifier (Power Source)**
  - Powered vs. Passive Amplifier (will teach in the future, **talk briefly**)
- **Speakers (Output Source)**
  - Powered vs. Passive Speaker
  - Speaker Placement
- **Cables and Connectors**
  - Ask them back some cable knowledge
- **DI**
  - Active vs Passive
  - When to use:
    - **Active DI** use a preamp requiring power (battery or Phantom power) to strengthen the signal
    - **Passive DI** boxes use transformers to convert signals and require no power, offering a "plug and play" solution.

**Opening (MAS)**

Mixer  Amplifier  Speaker

**Closing (SAM)**

Speaker  Amplifier  Mixer

# Mixer

2 Type of Mixer – Digital and Analog

# **SOP:** Start teaching from Input -> Knobs -> Outputs

Explain

ALL THE KNOB AND WORD ON THE BOARD, I MEANT EVERYTHING (If forget referring to Trainee Booklet)

Which is **mono channel,** and which is **stereo channel**

**Demonstrate:**

1. Connect 2 microphone to Channel 1 and 2.
2. Connect a music source (like a phone) to one of the Channels 9/10.
3. Set the gain on each channel correctly.
4. Adjust the HPF and EQ to clean up the sound.
5. Show how compression and pad work
6. Use the channel faders to create a basic mix.
7. **Show what is feedback, how to avoid and how it happens (MUST)**
8. If applicable, add some reverbs to the microphone using the SPX effects.
9. Show them how to use a Group Bus, assign two mics to Group 1-2, music source to Group 3-4.
10. Use the main stereo fader to control the overall volume.
11. Finally, show how AUX sends works

**Practical: (Trainee)**

- 2 Wired mic and 1 sound source
- Test gain, compression, EQ, effect 12 (delay), AUX sends, grouping
- **Make out feedback, ask why feedback occur and how to solve the issue**

# Shure

Demonstrate:

1. Insert batteries.
2. Use Group or Channel button to set frequency **(HOLD)**

Practical:

- Trainees manually
- Adjust volume at mixer.
- Test with two Shure mics at different channels.

# Relacart

Explain:

- Manual group and channel settings are common.
- May have automatic sync, needs manual frequency matching.

Demonstrate:

1. Insert batteries.
2. Use the SET button on receiver → match mic frequency manually.
3. Adjust AF output at receiver.

Practical:

- Trainees set mic to correct group/channel.
- Check for interference (change channel if needed).

# IVA

Demonstrate:

1. Insert batteries.
2. Use up/down buttons on receiver to find clear channel or long press the set button for auto scanning frequency.
3. Sync mic frequency with the set button to match.

Practical:

- Trainees practice finding interference-free channel.
- Adjust volume from receiver → mixer.

# Mipro

Demonstrate:

1. Insert batteries.
2. Manual search for the channel and group for better frequency (If got interference change to a different group/channel)
3. Sync mic automatically via IR

Practical:

- Trainees perform auto-scan.
- Test mic in atrium (larger space → check range & feedback).
- Simulate multiple mics in use (frequency coordination).

# Hybrid System

## PART 1(Online Class):

The **Hybrid System** is used when we need to connect our PA system to a **PC for online platforms** such as **Microsoft Teams classes, Zoom meetings, or recordings**. It allows **two-way audio flow**:

1. **Lecturer → Online Students (Teams Input):**
    a. The lecturer speaks into the **mic**.
    b. The mic signal goes into the **mixer**.
    c. From the mixer, we send the signal out through **Aux 1 or Aux 2 (set to Pre-Fader)**.
    d. This Aux output connects to the **Audio Interface**, which converts it to digital signal and sends it into the **PC (Teams Mic Input)**.
    e. This lets online students hear the lecturer clearly.

2. **Online Students → Auditorium (Teams Output):**
    a. When online students speak in Teams, the **PC receives their audio**.
    b. That audio needs to be played in the classroom, so we send it **back to the mixer**.
    c. This can be done in **two methods**:
        i. **Method 1:** Teams PC audio out → DI Box → Mixer Line Input → Auditorium Speakers.
        ii. **Method 2:** Teams PC audio out (via Audio Interface Output) →DI Box → Mixer Line Input → Auditorium Speakers.
    d. This allows on-site students and lecturers to hear the online participants.

## Method 1-Audio Interface (Input Only) + DI Box (Output)

### Signal Flow:

- **Lecturer → Teams:** Mic → Mixer Channel → Aux 1 (Pre-Fader) → Audio Interface Input → Teams PC Mic.
- **Teams → Auditorium:** Teams PC Output → DI Box → Mixer Channel → Main Fader → Amp → Auditorium Speakers.

### Steps:

1. Plug lecturer's mic into mixer.
2. Raise Aux 1 (set to Pre-Fader).
3. Connect Aux 1 Out → Audio Interface → Teams PC (Input).
4. Connect Teams PC audio out (headphone/line out) → DI Box → Mixer line input.
5. Raise channel fader → send to Auditorium Speakers.

## Method 2- Audio Interface(CODEC) for Both Input & Output

### Signal Flow:

- **Lecturer → Teams:** Mic → Mixer Channel → Aux 1 (Pre-Fader) → Audio Interface Input → Teams PC Mic.
- **Teams → Auditorium:** Teams PC Audio (USB Return) → Audio Interface Output → Mixer Line Input → Main Fader → Amp → Auditorium Speakers.

### Steps:

1. Set Teams PC **Input = Audio Interface (USB Codec)**, **Output = Audio Interface (USB Codec)**.
2. Plug mic into mixer channel.
3. Raise Aux 1 (set to Pre-Fader).
4. Aux 1 Out → Audio Interface Input → Teams.
5. Audio Interface Output → Mixer Line Input → Main Fader → Auditorium Speakers.

6. Ensure **Aux knob = 0** on Teams return channel (to avoid feedback loop).

## Important Notes

- **Why Aux 1 / Aux 2 are used:**
  - They let us send mic audio **separately from the main mix**.
  - Using **Pre-Fader Aux** means the mic always goes to Teams, even if the fader is down.
- **Why DI Box is sometimes used:**
  - Converts the unbalanced PC output into a balanced signal.
  - Reduces noise, hum, and ground loops (especially in big auditoriums).
- **Why Audio Interface may be used for both in & out:**

Cleaner and simpler but requires careful setup to avoid **feedback loops** (never send Teams return channel back into Aux).

## PART 2 (Monitor Speaker using AUX) Just teach how to connect them and use the aux out for speaker:

The reason for this is to understand how to control each monitor for each speaker.

**Demonstrate:**

1. Connect 2 microphones to Channel 1 and 2.
2. Connect a music source (like a phone) to one of the Channels 9/10.
3. Set the gain on each channel correctly.
4. Send mic to Aux 1 and music source to Aux 2 (Ask them about the Pre & Post in the AUX)
5. Connect Aux 1 & 2 to speakers and adjust the Aux According to the Performer (Part-Timer)

# Mic Stand

## Demonstrate

1. Different types (straight, table).
2. Use 2 mic, one for vocal and one for guitar
3. Teach about placement and angle, don’t let it block the view and getting a good sound input

## Practical:

- Trainees assemble/disassemble stands.
- Practice proper mic placement (vocal, instrument).

# Amplifier (Lecture Class)

**1) Quick Theory (what trainees must know)**

**Continuous/RMS power** is the “real” long-term power to use for matching (don’t use peak).

**Impedance (Ω)** matters: lower Ω usually means the amp delivers **more** power; higher Ω means **less** power (always confirm with spec sheet).

**Goal:** Choose an amplifier with **equal or (preferably) higher continuous power** than the speaker’s continuous rating **at the same impedance**.

**Amp modes you’ll see:** Stereo, Dual Mono, Bridge—know which you’re using before you read power numbers.

**2) How to read the amplifier (per channel)**

When you see something like: **“2 × 250 W @ 8 Ω”** it means:

There are **two channels** (A & B).

**Each channel** can deliver **250 W** into an **8 Ω** load.

- Look for front-panel indicators to stay safe while testing:

**Signal** light = input signal is present.

**Clip** light = the input is too hot (turn down gain).

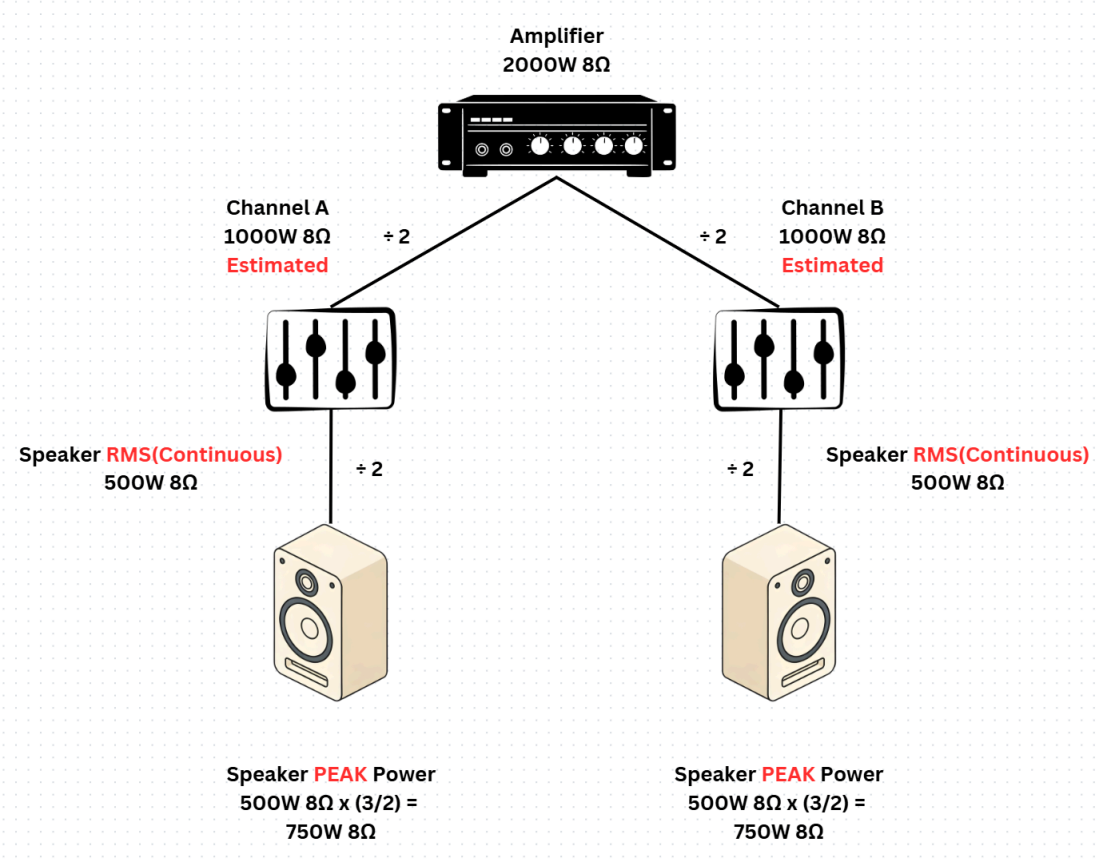
**Protection** light or **TEMP** = amp is protecting/overheating—stop and fix the cause.

**Part- timer tip:** Show the **Gain knobs** for **Channel A** and **Channel B**—explain that power ratings are **per channel** unless the spec explicitly says “bridged.”

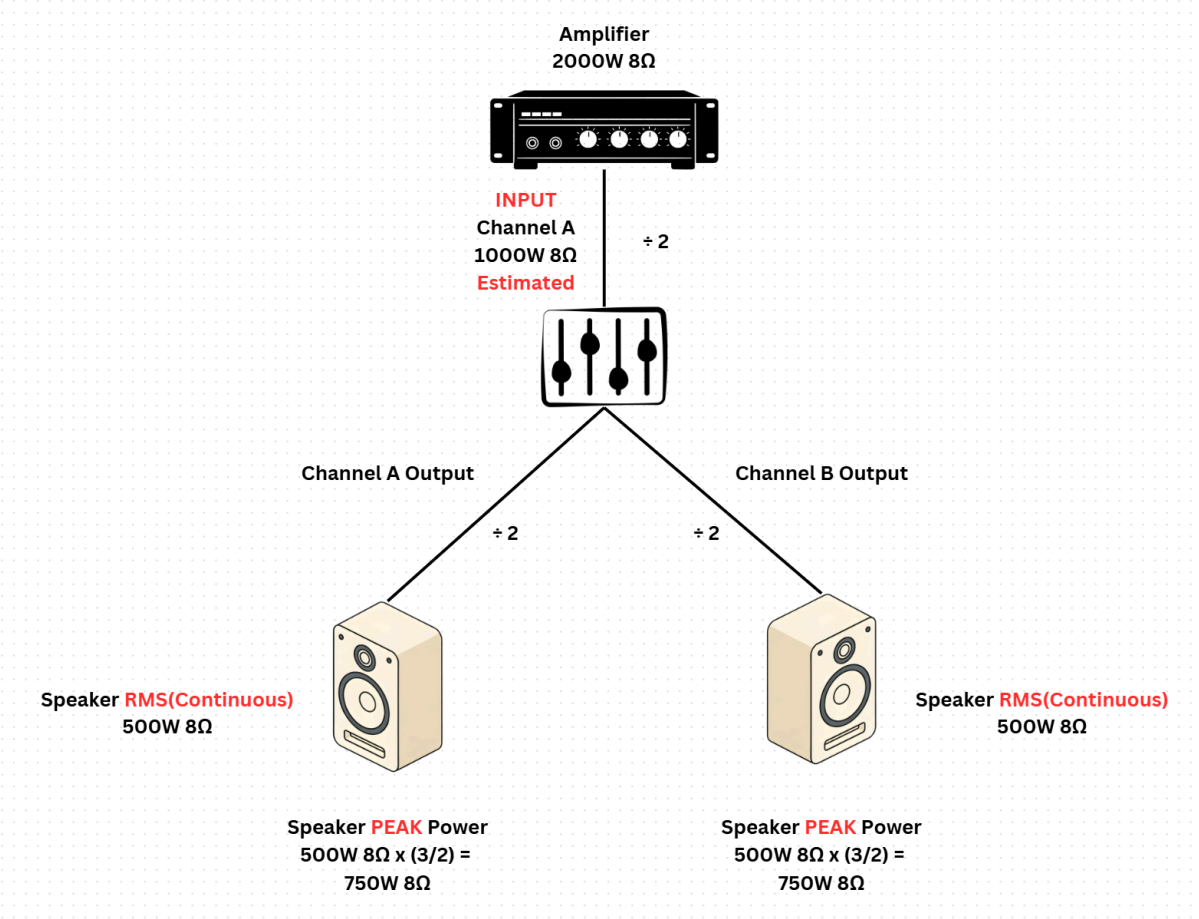
### 3) Matching speaker ↔ amplifier (step-by-step)

1. **Find the speaker spec:** “Continuous/RMS ___ W @ ___ Ω.”
2. **Find the amp spec at the same Ω** (per channel if running one speaker per channel).
3. **Rule of thumb:** Amp **continuous** ≥ Speaker **continuous** (same Ω).
4. If amp spec is at a different Ω, **estimate** power at your target Ω using the manufacturer table (many amps deliver ~2× power going 8 Ω → 4 Ω—**confirm on the spec sheet**).
5. If using **Bridge** mode (one big channel), **check the manufacturer’s minimum impedance and power rating when bridged** before connecting—**do not guess**.

### Stereo Mode:

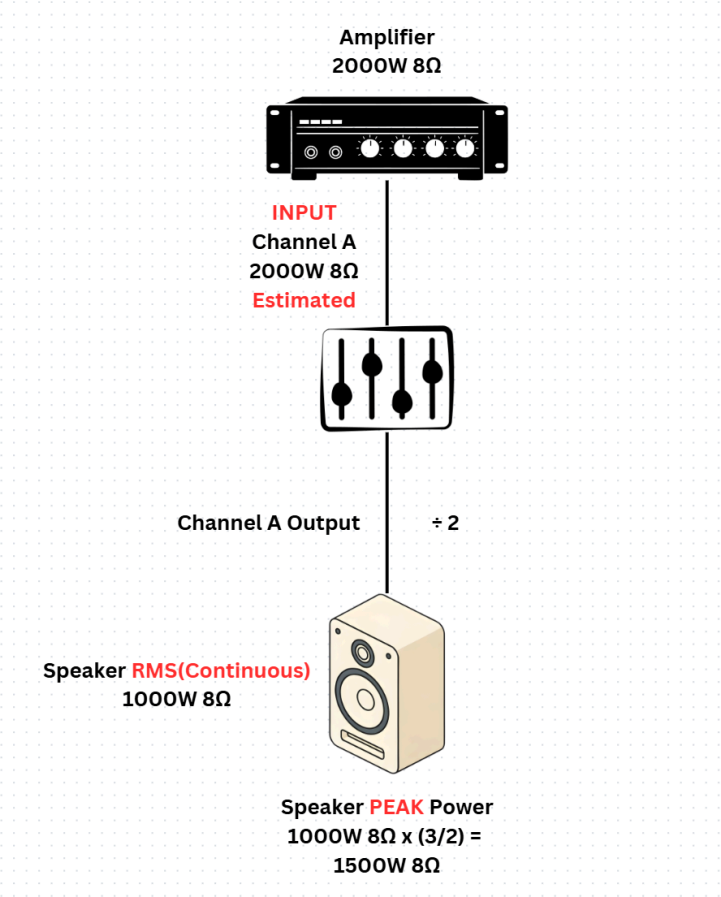


## Parallel/Mono Mode:




In Parallel/Mono mode the Output in the amplifier will be combined Channel A and B to the Speaker but the input is only in Channel A.

Bridge: (Only 1 Input in Channel A and 1 Output in Channel A)




**4) Tiny calculations trainees can do**

**A) "Will this 8 Ω spec amp run my 4 Ω speaker?"**

- **Speaker:** 300 W **continuous** @ **4 Ω**.
- **Amp spec you have:** 250 W **per channel** @ **8 Ω**.
- Many amps roughly **double** power at 4 Ω, so we **expect ≈ 500 W per channel @ 4 Ω** (check spec sheet).
- Result: **Amp ≥ Speaker** at 4 Ω → **Match OK**. (This mirrors your doc's example.)

**B) "Is per-channel power enough?"**

- If the spec says **2 × 300 W @ 4 Ω**, that's **300 W on Ch-A** and **300 W on Ch-B**.
- One **300 W @ 4 Ω** speaker on **each** channel is fine.

Part-timer line to repeat: “**Same Ω, amp’s continuous ≥ speakers continuous. Check the sheet.**”

### 5) Modes, in plain language (what changes for power)

- **Stereo:** Two separate channels (Left/Right). You read **per-channel** power. **(2 Input, 2 Output)**
- **Dual Mono:** Amp often copies **Channel A** input to both power sections; still read **per-channel** power. **(1 Input, 2 Output)**
- **Bridge:** Combines two channels into **one higher-power output** (use a single speaker). **Power and minimum impedance are different in bridged mode—must read the spec table** before wiring. **(1 Input, 1 Output)** [Combine Power]

### 6) Practical checks (make this muscle memory)

**Wiring:** Mixer → Amp (per channel) → Speaker(s). Check **Ω** and **connector** (Speakon).

**Gain staging:**

- Start with **amp gains low**, mixer master at **0 dB (unity)**.
- Set channel **gain/trim** so PFL shows healthy signal.
- Raise amp gains until room level is correct **without** Clip lights.

**Watch the lights:**

- **Clip** = back off mixer channel gain or amp gain.
- **Protection/TEMP** = stop & diagnose (impedance too low? ventilation? cabling?).

# Mobile PA

Explain:

- ALL THE KNOB AND WORD ON THE BOARD, I MEANT EVERYTHING (If forget, refer to Trainee Booklet)
- Placement for speaker using **Speaker Stand**
- Which channel is mono and stereo

Demonstrate:

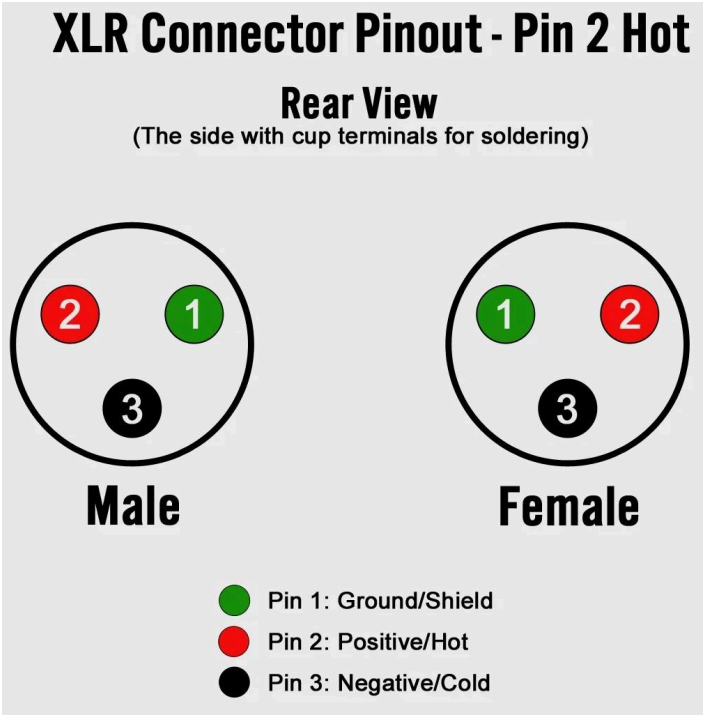
1. Placement: Place the speaker on a stand or on the table
2. **Connect Inputs:** Connect 1 wireless mic and 1 sound source using RCA to 3.5mm
3. Show the EQ and the effect
4. Show VOP by playing the music and use the mic together  (Voice Over Priority)

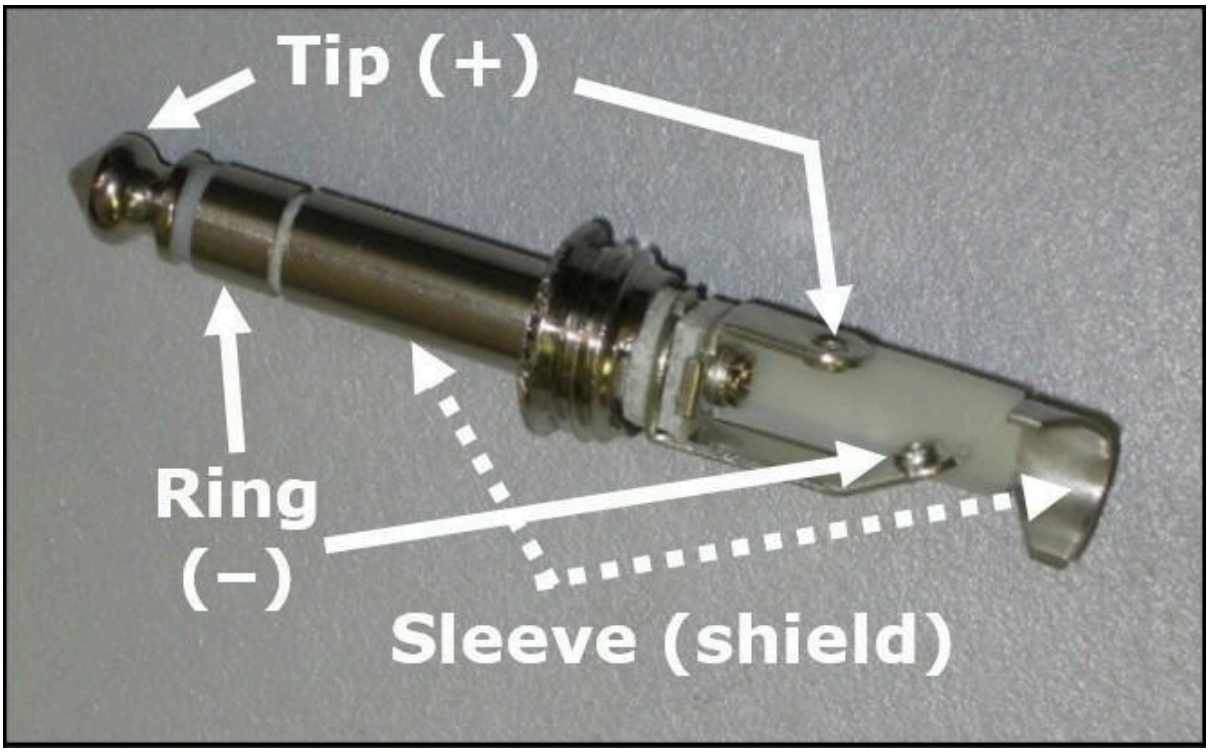
Practical (Trainee):

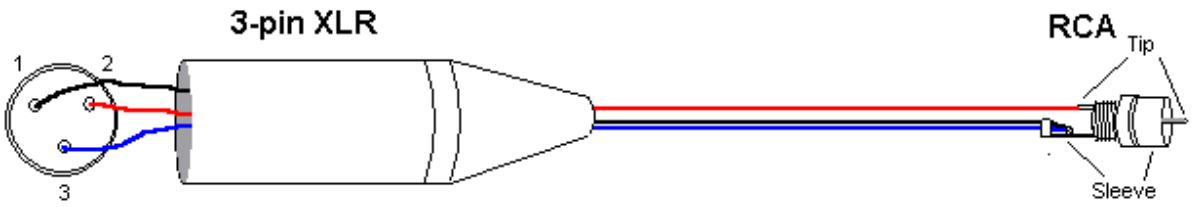
- 1 Shure or Relacart wireless Mic (Channel 2) and 1 sound source (Channel 7/8)
- Tell them to rescan frequency
- Press down the to MP3 mode in Channel 7/8
- Adjust the EQ to for all channel to confuse the trainee
- Let trainee make some effect
- Ask all the knob and input output

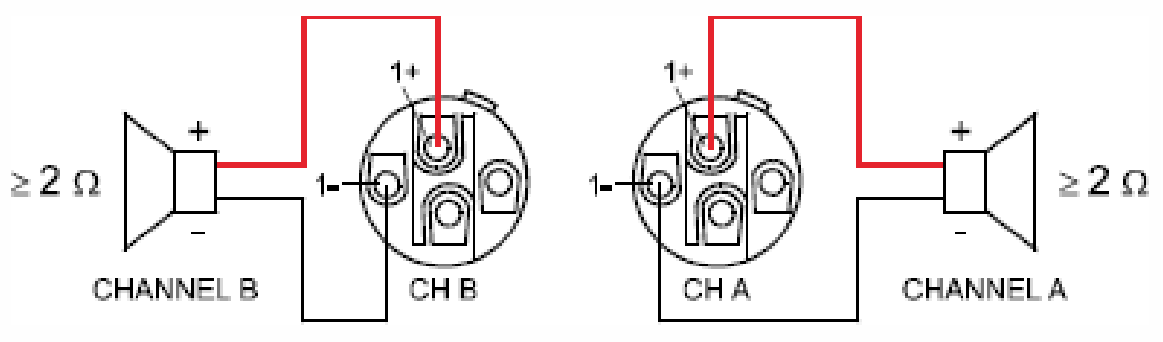
# Soldering

## XLR, TRS, RCA & Speakon






Explain:

How the connection works with XLR and TRS cable

Color

1 -> Grey (grounding purpose)

2 -> White

3 -> Black

- If the color inside is not same never mind, as long both end colour that connect to the number are same.
- The reason of Soldering

Demonstrate:

1. Take a wire beside the table that label Trainee
2. Show them the colour that you said just now
3. Show them how to assemble the XLR and TRS head (Remember put the rubber in first)
4. Show them how the gun and sucker work and what is the correct ways for it
5. Bring a wire that are usable and show them how the wire tester works
6. Remind them the metal part is hot and if it's too long the plastic would melt

GUIDE THEM!!!!!!!!!! (At least see them once 10 minutes)

- Practical (Trainee):

- Give them a wire and let them shoulder it

- Test it by turning the wire gently, and see weather both wire touches each other
- Use the wire tester at the end
- Let them assemble the XLR head to the wire they shoulder
- Remember to turn off the power after training!!!

# Taping

For this module we must teach the trainee's how to Tape bundle of wires in the floor to avoid and accidents during and event.

How to teach the Trainee on this module:

- Put 3 – 4 XLR cables on the floor
- Arrange them neatly and make sure they are not Maggi Goreng
- Show them how to tape it properly and neat (Teach them how to tape when the cable is bended like and L-shape)
- Tape the cables until 2 tiles (because we don't want to waste them a lot)

# Event

For this module the Trainee's will be given the Stage Crew role in an Event.

Parts where the Part-timers need to focus:

- Know organize the event as a stage crew
- Able to handle the pressure of the event
- Able to apply all the modules from office (Mic-Stand, Basic PA, Troubleshooting)
- Able to communicate well with others (FOH, Lights, Stage Crew, Event Organizers, etc.)

# Classroom

**SOP: (Teach in Flow with Hybrid System) Mic -> Mixer -> Amp -> Speaker**

## REMEMBER TO BRING KEY LIAO

Just bring them to any available classroom that has a Mixer **(Not the Portable PA)**(find it at APSpace -> Classroom finder (TEACH TRAINEE HOW TO FIND IT, so they can find the classroom and Audi themselves before filling the timeslot)

### Explain:

- How the connection works (including sound from projector)
- Ask them anything they don't know that are on the mixer
- Tell them what is the common thing that will occur when dealing with troubleshooting in classroom setup. (eg. Electric, gain.....)

### Demonstrate:

Test the sound and do some cable rolling. Thanks bro~~

### Practical (Trainee):

**Must take a Photo on the system (connection and setting on the knob)**

- Unplug the electric, mic channel, audio from projector, connection on the amp and the mixer, speakon and make some changes on EQ, gain, and put some effect.
- Make sure they follow the flow on how to turn on the system.
- After that make sure everything reverts to the normal set up.

Atrium

# SOP:(Teach in Flow )

# Mic -> Mixer -> Amp -> Speaker

## REMEMBER TO BRING KEY LIAO

**1) Explanation (Atrium specifics)**

- **Atriums are large, open spaces** → sound can easily **echo** and **feedback**.
- How feedback happens
- Correct ways holding M**ics**.
- Larger setups mean multiple devices: **wireless mics, mixer, amplifier, speakers, LED screen, and PC**.

**2) Connecting Wireless Mics → Mixer**

**Steps (any brand: Shure, Relacart, IVA, MiPro):**

- Insert batteries into mic with correct polarity.
- Set up Shark-fin.
- Power on receiver & mic.
- Sync frequency (auto or manual depending on brand).
- Connect **Receiver XLR Out → Mixer Channel Input (XLR).**
- Adjust **gain** on mixer.
- Raise **fader** to send to Main Out.

**Check signal lights:**

**RF = connection strength**

**AF = audio level**

Adjust mic volume at receiver before mixer fader.

**3) AMP Selections**

- The **amplifiers in the Atrium are already permanently installed**.
- Use Power Distributer to safely distribute power to Amplifier (Teach to turn it on and off)
- Teach how to unmute from the processor
- Each amp is dedicated to a **specific set of speakers** (front fills, side-fills, mains, delays, etc.).

**Trainees must memorize the mapping**:

**4) Troubleshooting (Hands-On Training)**

No Sound:

- Check power (mic, mixer, amp, speakers).
- Check the correct input channel + fader.
- Verify Aux Send or Main Out routing.

Distorted/Clipping:

- Lower mics gain or amp gain.
- Watch Clip lights on amp & mixer.

Feedback/Howling:

- Move mic behind speakers.
- Lower channel gain

No Wireless Signal:

- Check batteries.
- Resync mic to receiver.
- Change frequency if interference (frequency clash).

Amp in Protection Mode:

- Speaker impedance too low or short in cable.
- Overheating → ensures ventilation.

## 5) Connecting the LED Screen to a PC

### Atrium Method:

- Use **HDMI**
- Connect **PC → LED Screen Input**.
- Show trainee at the back from the LED Screen processor and electric

### Trainer Demonstration:

- Show and explain physical connections.

### LED Processor INPUT SWITCH:






## TOUCH THE HDMI ONLY!!!

HDMI 1 – Mixer Table Area

HDMI 2 – LED Room Laptop

## DONT TOUCH OTHER THAN THIS!!!!

### 6) Practical Training Exercise (Atrium Setup)

Each trainee must:

- Set up **2 wireless mics** and shark-fin → sync & connect to mixer.
- Connect **Mixer → Amp → Speakers** (correct matching).
- Troubleshoot when trainer introduces a “fault” (e.g., clip light, muted fader, wrong cable).
- Connect **PC → LED Screen** → display a slide.

Run a **mini test class**:

- One person speaks with wireless mic.
- Sound is amplified properly.
- Screen shows slides.

Auditorium (1-7)

# SOP: (Teach in Flow with Hybrid System)

# Mic -> Mixer -> Amp -> Speaker

## REMEMBER TO BRING KEY LIAO

## Must take a Photo on the system

## (connection and setting on the knob)

**1) Walkthrough of Audi  Layout**

- Show the **stage box (floor box inputs)** → cables run to **mixer** at control booth.
- Show the **amplifiers in the rack** → explain which amp drives which speaker zone.
- Point out **wireless mic receivers** location (rack).

**2) Tracing Cables (Stage Box → Mixer)**

- **Part- timer demo:** Plug a mic into stage box Input 1 → follow snake cable → show it appears on **Mixer Channel 1**.
- **Trainee task:**
    1. Plug into different stage box ports.
    2. Trace which mixer channel it lands on.

**3) Wireless Mics → Mixer**

1. Power on receiver & mic.
2. Sync mic (brand-specific: Shure / Relacart / IVA / MiPro).
3. Connect **Receiver XLR Out → Mixer Channel Input**.
4. Adjust **gain** and **channel fader**.
5. Show **PFL (Pre-Fader Listen)** to check signal before unmuting.

**4) Amplifiers in Audi**

- Part-timer takes trainees to the **amp rack**.

- **Show which amps drive which speakers** (Left, Right, Subs, Balcony, etc.).
- Point out **channel A / B** on each amp.
- Demonstrate **front panel indicators**:

  **Signal** = audio passing.

  **Clip** = input too strong.

  **Protect/Temp** = amp is protecting or overheating.
- Emphasize: amps are **already matched to the speakers** — trainees only need to **monitor** them, not rewire.

### 5) Hybrid System (Teams/PC Integration)

- **Mic to Teams (Online):** Mic → Mixer Channel → Aux 1 (Pre-Fader) → Audio Interface → Teams PC input.
- **Teams Audio to Auditorium:** Teams PC output (via DI Box or Audio Interface out) → Mixer Line Input → Main Fader → Amps → Speakers.
- **Trainer demo:** Play Teams test call → show audio flows both ways.
- **Trainee task:**
  1. Set up Aux send to Teams PC.
  2. Connect Teams PC output into mixer.
  3. Verify online and in-room sound.

### 6) Troubleshooting in Audi

#### No Mic Sound

- Check batteries in wireless mic.
- Check receiver RF/AF lights.
- Check mixer gain, fader, and mute.
- Check amp signal lights.

#### Distortion / Clipping

- Lower mic gain at receiver or mixer.
- Watch amp Clip light → adjust levels.

### Feedback / Echo

- Move mic behind speakers.
- Lower gain/EQ highs.

### No Teams Audio in Room

- Check PC output device (Audio Interface / headphone out).
- Check DI Box connection.
- Check mixer fader for Teams channel.

### No Audio Reaching Teams

- Verify Aux 1/2 (Pre-Fader) send knob is raised.
- Check Audio Interface input selected in Teams.

## 7) Practical Exercise

Trainees set up for a **mini event**:

1. Wireless mic for speaker.
2. Stage box mic input for backup.
3. Connect PC for slides + audio.
4. Run Teams test call (online participant hears room, and room hears online).

Part-timer KAOCAO TIME (muted fader, wrong Aux setting, loose cable) → trainees must fix.