

STATION 3: GLITCH LAB – REAL-WORLD SIGNAL SCENARIOS

Scenario 1: The Stormy Commute

You're driving home during a heavy thunderstorm, listening to a local radio station for weather updates. The music fades in and out, static grows louder near lightning strikes, and sometimes voices sound warped but never fully disappear.

Student Task:

- Is this system analog or digital?
- What does this glitch reveal about how the signal handles interference?
- Identify one advantage and one disadvantage of using digital signals instead.

Scenario 2: The Robotic Phone Call

You're on a cell phone call while walking through a parking garage. Sometimes the voice sounds perfectly clear. Other times, the speaker sounds robotic or chopped up, and occasionally the call drops completely, with no sound at all.

Student Task:

- Is the communication system analog or digital?
- Why does the glitch happen suddenly instead of gradually?
- Explain one advantage and one disadvantage of digital signals in this situation.

Scenario 3: Vinyl Night at a Friend's House

Your friend plays a vinyl record on an old turntable. The music sounds warm and full, but you hear popping noises, hiss in quiet parts, and a long scratch causes the same sound to repeat over and over.

Student Task:

- Is the signal analog or digital?
- How does physical damage affect this type of signal?
- Compare how a digital system would handle the same problem.

Scenario 4: Streaming During Peak Hours

You're streaming a movie on your tablet during a busy evening. The picture suddenly becomes blurry, then pauses to buffer. When it resumes, the sound and video are still synchronized, and the movie continues from the exact frame where it stopped.

Student Task:

- What type of signal is being used?
- Why does the system pause instead of continuing with distortion?
- Identify one reliability advantage and one drawback of digital transmission.

Scenario 5: The Old Television Antenna

An older TV uses rabbit-ear antennas to receive broadcasts. As you adjust the antenna, the image shows double outlines (“ghosting”), fuzzy edges, and color distortion, but you can usually still tell what’s happening on screen.

Student Task:

- Is this analog or digital transmission?
- What do the brief skips and missing chunks reveal about how digital signals handle errors?
- What is one advantage and one disadvantage of digital storage in this situation?

Scenario 6: The Corrupted Playlist

You download a music album, but one song has brief moments of silence and tiny skips. The rest of the song, and the rest of the album, plays perfectly. No static, just missing chunks.

Student Task:

- Is this analog or digital transmission?
- What does the gradual distortion tell you about the signal type?
- How would a digital TV respond differently to weak signal strength?

Scenario 7: Weather Satellite Images

Meteorologists receive satellite images showing storm movement. Some images arrive slightly delayed and appear blocky or pixelated, but temperature readings and storm paths are still accurate.

Student Task:

- Identify the signal type.
- Why might visual quality drop without losing key data?
- Explain how digital signals improve reliability in scientific data transmission.

Scenario 8: The Clock Radio Mystery

An old clock radio sits on your nightstand. During a storm, the radio audio becomes filled with static, but the digital clock display continues to show the correct time without interruption.

Student Task:

- Identify the signal type for **each part** of the system.
- Why is one part affected while the other is not?
- What does this tell you about digital and analog reliability?

Scenario 9: GPS Gone Wrong

Your car's GPS suddenly shows you driving through a lake, even though you're clearly on the road. A few seconds later, it corrects itself and resumes accurate directions.

Student Task:

- Is GPS analog or digital?
- Why might errors appear briefly and then disappear?
- Analyze one advantage and one disadvantage of digital signals for navigation.