© 2013 InfoComm International

Today's Agenda

- Goals
- System Levels Overview
- Clipping Defined
- Methods for Setting Gain
- Equipment
  - Generators
  - Analyzers

Goals

- Less
  - Hiss
  - Noise
  - Distortion
- Better S/N
- Meets Performance Criteria

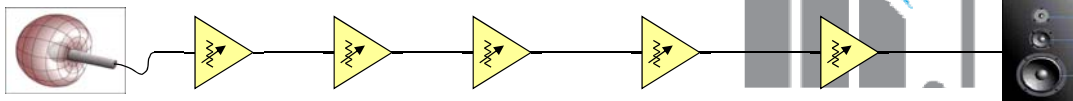Run Mixer near "0" under Normal Conditions

Signal Levels

- Expressed in dBs or volts
- 0 dBu = 0.775 V
- +4 dBu = 1.23 V
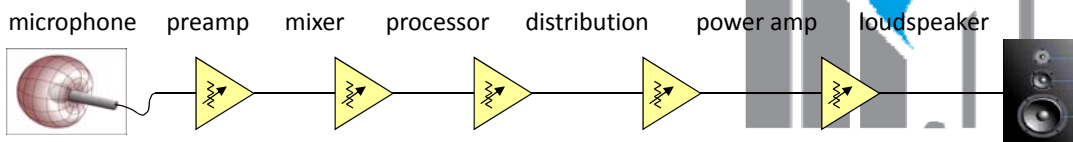- 0 dBV = 1 V
- -10 dBV = 0.316 V (316 mV)

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker

Signal Levels

- **Microphone Level**
  - -60 to -50 dBu (0.001 to 0.002 V)
- **Line Level**
  - Pro 0 dBu to +4 dBu (0.775 to 1.23 V)
  - Consumer -10 dBV (0.316 V or 316 mV)

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker
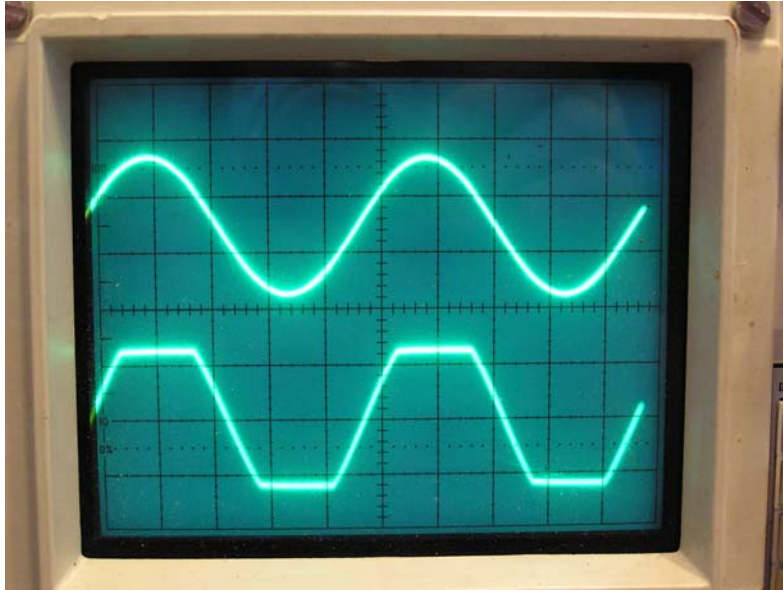
Adjustments

- **Microphone Preamplifiers**
- **Mix Buses**
- **Processing devices**
  - Compressors, Equalizers
- **Power Amplifiers**
- **Wireless Transmitters and Receivers**

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker
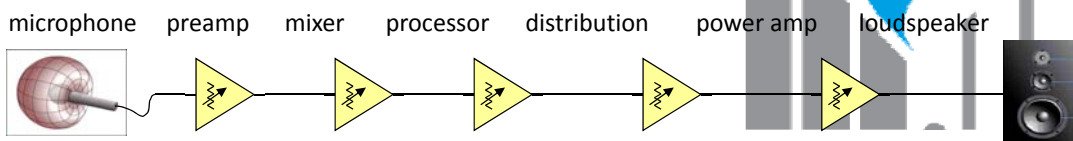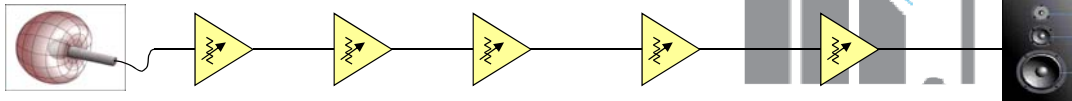
Clipping

Methods and Equipment

- Unity
- Optimization

- Generator
  - 1 kHz
  - 400 Hz
  - Pink Noise
- Analyzer
  - Analyzer, Volt Meter or maybe something else....
- SPL Meter

Unity – Defining Zero

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker
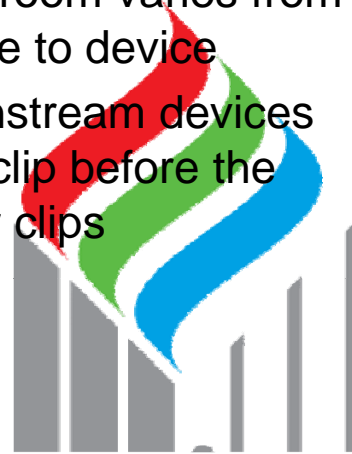
Unity – Defining Zero and Setting Gain Structure

1. Set all mixer trims, faders, crosspoint gains, masters, etc. at their "0" (unity) settings
2. Configure a signal generator to output 1 kHz at 0 dBU (0.775 V) and connect to a line level input of the mixer
3. Adjust the input trim until the mixer's output meter reads "0"
4. Measure the mixer's output with an analyzer or voltmeter
5. Using that level, adjust all downstream devices in the signal path for that same level

Unity – Setting Gain Structure

- Provides adequate S/N for basic audio systems
- Easy and Fast

- Headroom varies from device to device
- Downstream devices may clip before the mixer clips

## Optimization – Setting Gain Structure

1. Set all mixer trims, faders, crosspoint gains, masters, etc. at their "0" (unity) settings
2. Configure a signal generator to output 400 kHz at 0 dBU (0.775 V) and connect to a line level input of the mixer
3. Connect an oscilloscope or piezo tweeter at the output of the mixer
4. Adjust the input trim until clipping is indicated and then reduce the level to just under the clip point
    1. Document the voltage
5. Connect the o'scope or piezo to the next device in the signal path and do the same
    1. Document the level / output voltage at each device
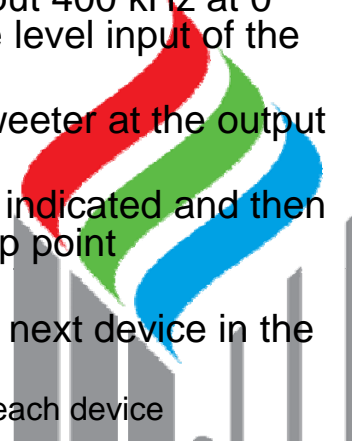
Optimization – Setting Gain

- Maximum S/N
- Each device has the same amount of Headroom
- Mixer indicates system's condition

- Bit more time and skill
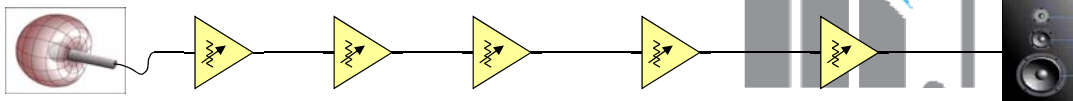- Some devices overloaded (requires inline attenuators
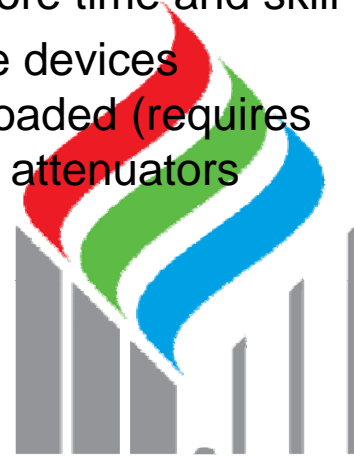
Setting Individual Channel Levels

- Now it's time to set each input channel level
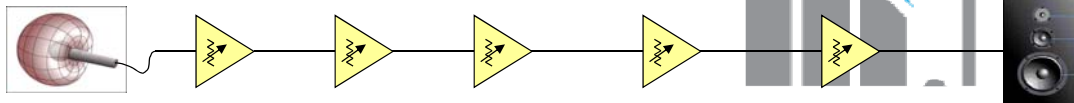 - Microphones
  - Line level devices, pro and consumer

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker

Setting Individual Channel Levels
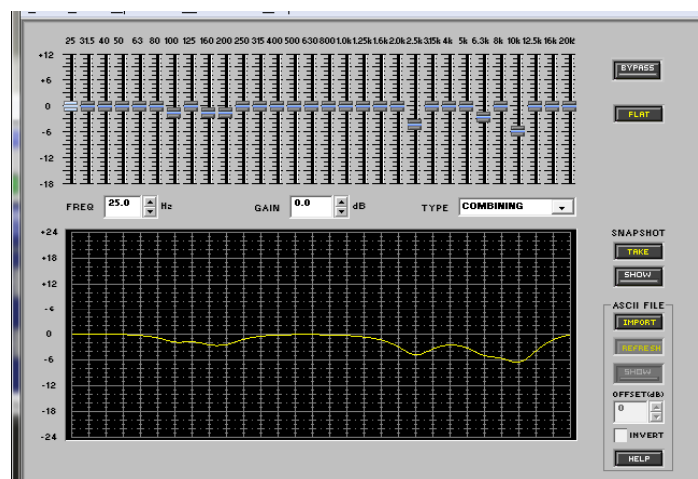
microphone   preamp   mixer   processor   distribution   power amp   loudspeaker

Setting Gain – After Equalization
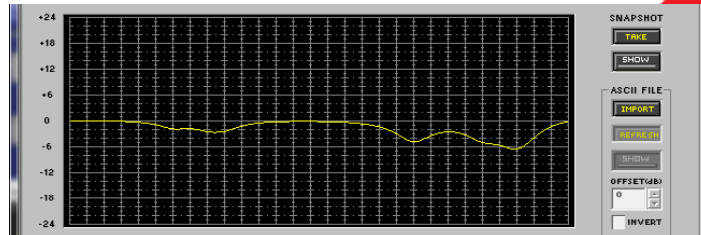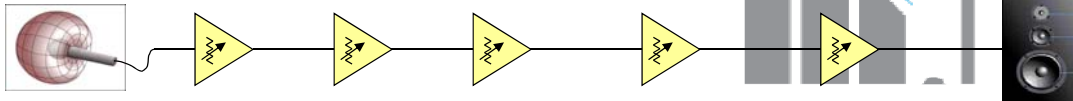
- After equalization…

Setting Gain – After Equalization

- Equalization removes energy from the spectrum
- Configure a generator for pink noise at 0 dBu and connect it to a line level input of the mixer

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker
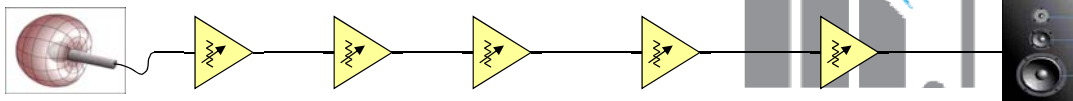
Setting Gain – After Equalization

- Unity
  1. Adjust the input to read "0" at the output of the mixer
  2. Using the reference level discovered before, connect an analyzer at the output of the equalizer
  3. Increase the gain at the EQ until it reaches the reference level

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker

Setting Gain – After Equalization

- Optimization
  1. Adjust the input to read "0" at the output of the mixer
  2. Using the reference level discovered before, connect an analyzer at the output of the equalizer
  3. Using the output voltage at the output of the EQ documented earlier, increase the gain at the EQ until it reaches the reference level

microphone   preamp   mixer   processor   distribution   power amp   loudspeaker
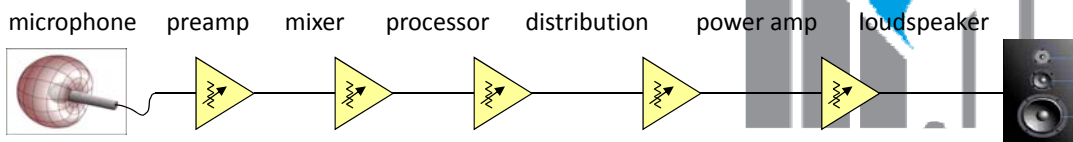
Last Adjustment

- What hasn't been mentioned?

  It's not a

  WATT KNOB

  V450

Thank You

www.infocomm.org